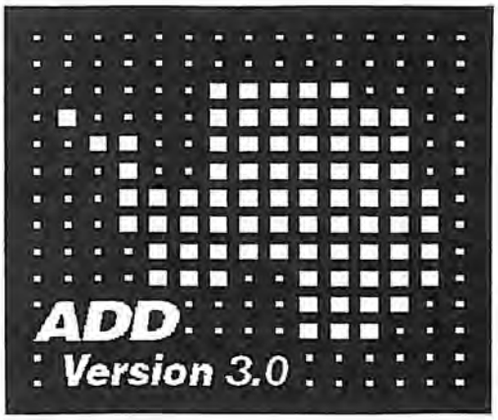
Antarctic Digital Database



Manual and Bibliography

http://www.nerc-bas.ac.uk/public/magic/add_home.html

ADD Version 3.0 prepared by
Mapping and Geographic Information Centre
British Antarctic Survey
on behalf of the ADD Consortium
under the auspices of the
SCAR Working Group on Geodesy and Geographic Information

Scientific Committee on Antarctic Research
July 2000

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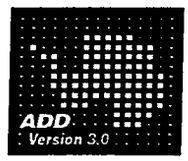
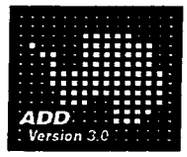
J.W. Thomson, British Antarctic Survey

Contents



Chapter 1



Introduction to the Antarctic Digital Database

History of the Antarctic Digital Database, Version 1.0

An Antarctic topographic database was first mooted in 1984, when the International Geographical Union and the International Cartographic Association considered the development of a *World Digital Database for Environmental Science* (WDDES). However, the WDDES programme was subsumed by the Digital Chart of the World (DCW) project, initiated by the US Defense Mapping Agency in 1988. The DCW project relied on source maps at 1:1,000,000 scale. In August 1989 Petroconsultants (CES) Ltd developed a joint project with the Scott Polar Research Institute (SPRI) in Cambridge, UK, to prepare a digital map of Antarctica. This project, based on maps at 1:1,000,000 scale, was a continuation of work begun by SPRI in 1988 for the Antarctic section of WDDES. Its data capture programme was never completed but the work accomplished was incorporated into a new project, the Antarctic Digital Database Project (ADD).

The ADD was proposed in May 1990 by a Cambridge-based consortium comprising the British Antarctic Survey (BAS), SPRI and the World Conservation Monitoring Centre (WCMC) (now UNEP World Conservation Monitoring Centre). The objective of this new project was to prepare a seamless digital map of the Antarctic from the most appropriate map sources available: time limitations precluded the use of any source data at scales larger than 1:200,000/1:250,000.

International participation in the ADD project was agreed through the Scientific Committee on Antarctic Research (SCAR) and its Working Group on Geodesy and Geographic Information. Thus substantial amounts of data, both in digital form and as hard copy, were provided by various national agencies actively involved in Antarctic mapping programmes. Eleven nations participated in the project and many more supported its aims although they were unable to contribute data at that time.

The ADD was published by SCAR on CD-ROM in 1993, together with the *Antarctic Digital Database User's Guide and Reference Manual*. The manual provided detailed information on the content of the database and a full bibliography of the source material used in the preparation of the ADD Version 1.0. The copyright of the database is held by SCAR.

Although several nations provided digital data to the project, the bulk of the data capture and data management was undertaken in Cambridge. Work on Version 1.0 in the UK was funded initially by BAS and, for a further 18-month period, by The British Petroleum Company p.l.c. (BP). Other contributing nations sponsored their own data capture through either their national mapping agencies or their Antarctic research organizations.

Preparation of ADD Version 2.0

After completion of Version 1.0, the maintenance and revision of the ADD was passed to BAS by the UK Consortium. This action was endorsed by the SCAR Working Group on Geodesy and Geographic Information (WG-GGI) at its meetings in 1992 (XXII SCAR) and 1994 (XXIII SCAR).

The widespread change from PC to Workstation environment for the majority of GIS applications performed at BAS and elsewhere influenced the evolving plans for a new version of the ADD. The major difference between the first and second version of the ADD is that ADD Version 2.0 was developed and maintained in Workstation ArcInfo. Moreover, in ADD Version 1.0, many tiles had to be subdivided because of limits imposed by using PC ARC/INFO. There were no such subdivisions in ADD Version 2.0. **Users of PC ARC/INFO should note that they will be unable to import some tiles of ADD Version 3.0.**

Corrections

External and BAS users of ADD Version 1.0 discovered many small errors and some omissions from the database. These were reported to BAS and they formed the framework for a BAS programme of revisions and enhancements of the database.

ADD Version 2.0 contained many amendments to the original data. Most corrections were made in Quadrant 4, which covers the Antarctic Peninsula, parts of Ellsworth Land and Coats Land. A few features, such as Doake Ice Rumples and Theron Mountains, were inadvertently omitted from ADD Version 1.0, and they were included in the new version. The contours in Coats Land were substantially upgraded because of the Theron Mountains insertion and data for the Ronne and Filchner ice shelves were also upgraded. A new map of James Ross Island was incorporated, and the positions of ice fronts of the northern Larsen Ice Shelf, Wordie Ice Shelf and Wilkins Ice Shelf were amended using the latest available information. Many other minor changes were made and these are documented in the bibliography (see Chapter 5).

Contours - Most of the structural problems in the database were corrected in Version 2.0. However, one general class of reported errors (discontinuous contours) was not corrected because the discontinuity was intentional. The policy adopted for ADD Version 1.0 was that the data derived from the different sources would represent the original source data as closely as possible after edge-matching. Thus, where contour data were extracted from sources with different contour intervals, the original contour discontinuities across the sheet boundaries would be retained. Contour intervals commonly used in the source material are either 100 m or 250 m. Therefore, where a 250 m contour enters a region contoured at 100 m, that contour will end at the sheet margin. Contours are continuous within regions where the source material uses the same contour interval.

Preparation of ADD Version 3.0

The launch of ADD Version 2.0 on the World Wide Web in July 1998 was well received at XXV SCAR and the WG-GGI agreed to continue with the enhancement of the database as part of its programme for 1999/2000. Proceeds from the sale of the CD-ROM, and funding from SCAR, enabled BAS to continue with the maintenance and development of the database during 1999.

Major changes to the database since ADD Version 2.0 are the incorporation of highly precise elevation data over the Antarctic ice sheet, and amendments to the position of the fronts of several large ice shelves. These and other changes are described in the bibliography (Chapter 5). A generalized version of the ADD, at 1:1,000,000 scale, is also available in ADD Version 3.0, and smaller-scale generalization products are planned for the future.

Contours - ADD versions 1.0 and 2.0 were derived mainly from map-based data. Because the most detailed Antarctic maps are of coastal and mountainous regions, map-based elevation data

for the interior of the continent were relatively sparse. However, as part of the RADARSAT Antarctic Mapping Project (RAMP), the Byrd Polar Research Center (BPRC) in Ohio, USA, constructed a digital elevation model (DEM) of the whole continent using mainly ERS-1satellite radar altimeter data, and elevation data taken from ADD Version 1.0 (Liu *et al.*, 1999). Compared with ADD versions 1.0 and 2.0, the DEM provided much higher resolution elevation data for the ice sheet over regions north of 80°S. Thus vector contours derived from the BPRC DEM by BAS have replaced the existing ADD contours in all parts of Antarctica except in coastal areas and regions of high relief.

Acknowledgements

Without the generous contributions of data made by several nations, ADD Version 1.0 (on CD-ROM) would never have been completed within the given time-frame. Due acknowledgement of the organizations and ADD project personnel that contributed to the CD-ROM product, including Petroconsultants SA of Geneva and Environmental Systems Research Institute, Inc. of California, was given in the *Antarctic Digital Database User's Guide and Reference Manual*, published with the CD by SCAR in 1993. Appendix 1 lists the people involved in the production of ADD versions 1.0, 2.0 and 3.0. It also identifies all the organizations that have contributed to, and collaborated in, the ADD project since its inception, known as the ADD Consortium.

Careful documentation prepared by the Byrd Polar Research Center, Ohio, USA, provided a checklist of errors found in ADD Version 1.0. This was particularly helpful in planning the revisions of the database for release as ADD Version 2.0. The DEM prepared by BPRC for RAMP provided a fundamental framework for the revisions leading to the release of ADD Version 3.0.

Funding by SCAR in 1999, which allowed the continuation of effort at BAS and the release of ADD Version 3.0 on the World Wide Web in 2000, is gratefully acknowledged.

Using the database

The ADD is a topographic database compiled from a variety of Antarctic map and satellite image sources. ADD Version 1.0 provided the international Antarctic community with a common geographic framework for a range of research applications and logistic support activities. For example, it formed the definitive geographical setting for international projects such as the RADARSAT Antarctic Mapping Project (RAMP) and Antarctic Bedrock Mapping Project (BEDMAP).

Applications of ADD Version 3.0 include:

- Generating maps for use as insets or location maps.
- Creating customized maps for particular purposes.
- As the geographic layer in a GIS.
- Creating digital elevation models and perspective views (when used in conjunction with appropriate software).
- As a data source for ice sheet models.

The database is provided as ArcInfo export files. These can be used with a wide variety of software, and data translation utilities are available. The ADD has been maintained using the ArcInfo LIBRARIAN subsystem with workstation ArcInfo, and the data are best suited for use with ArcInfo, ArcView and ArcExplorer. ArcExplorer is a free viewing utility which can be downloaded from ESRI's web-site (http://www.esri.com). Software to translate the data from

ArcInfo export format to either ARC coverages or shape-files will be required to use the data with ArcExplorer.

Accessing the database

The ADD Version 3.0 web-site provides a mechanism for downloading data from selected tiles, by clicking the required tile on a map. For each tile selected, an encrypted compressed archive of ASCII ArcInfo export files will be downloaded. On MIME-compliant browsers, the name of the compressed archive file will be set to *tilename*.zip, where *tilename* is the IMW sheet name (e.g. SP19_20.zip).

Database design

The design of the database for ADD Version 1.0 was influenced by factors such as: limits on the number of features and the complexity of topology imposed by PC ARC/INFO, the cartographic nature of the data supplied, a requirement to provide simple access to the data, and existing standards for Antarctic mapping applied to the source material. Although the limitations of PC ARC/INFO are no longer relevant for users of the UNIX version of the database (ADD Version 3.0), the general design features adopted for Version 1.0 have been retained in Version 3.0. These are as follows:

i. The Scale0 data (data at the scale of the source material) are tiled on the International Map of the World (IMW) 1:1,000,000 scale map sheet boundaries; these provide a fixed tiling system which corresponds to the sheet boundaries of many published maps.
ii. The attribute tables are not normalized so as to allow access to the data using simple GIS programs such as ArcExplorer.
iii. Arc and point features have been assigned codes according to the *Standard symbols for use on maps of the Antarctic* (SCAR, 1980).
iv. The map projection is Polar Stereographic, with a standard parallel at 71°S. The spheroid is WGS84. These options correspond to approved SCAR recommendations.

Units of measure

The metric system is used in the ADD for all units of length, elevation and area. Geographical co-ordinates are given as decimal degrees. The ArcInfo software-generated items AREA and LENGTH are expressed in metres^2 and metres.

Standards

Standards in GIS are not yet at a stage where data provided can be transferred between systems transparently. The Open GIS consortium is working towards this goal, through the TC211 subcommittee of the International Standards Organization. Although the TC211 proposals are not yet widely implemented in commercial software, most major GIS suppliers have made commitments to support the Open GIS standards for inter-operability.

The ADD Version 3.0 is not compliant with the current TC211 proposals. The data are provided in ArcInfo Export format, which can be imported into many systems. However, it is acknowledged that the use of a proprietary data format is not satisfactory. It is hoped that future versions of the ADD will be made compliant to Open GIS data exchange standards when the software used to manage the data provides the necessary capabilities.

It is difficult to find appropriate data quality standards. Most standards (e.g. NJUG 13, USGS DLG http://edcwww.cr.usgs.gov/glis/hyper/guide/2mil) are oriented towards digitizing maps of known accuracy in a terrain which is dominated by human features. Therefore, the ADD Project adopted its own standards for accuracy of digitizing and for feature coding (see Appendix 2); these are generally more stringent than commercial standards for digitizing.

Links to relevant web sites

A number of datasets that can be used in conjunction with the Antarctic Digital Database can be accessed via the World Wide Web. These, together with organizations connected with polar research, are given below.

Scientific Committee on Antarctic Research (SCAR)

SCAR (http://www.scar.org) is the committee of the International Council for Science (ICSU) charged with the initiation, promotion and co-ordination of scientific activity in the Antarctic. Its members include nations with active and independent research programmes in the Antarctic, and ICSU unions.

SCAR Working Group on Geodesy and Geographic Information

The surveying and mapping activities of SCAR are co-ordinated by the Working Group on Geodesy and Geographic Information (http://www.scar-ggi.org.au). Formed in 1958 as the Working Group on Geodesy and Cartography, it changed its name in 1988 to reflect the increasing importance of digital geographic information in Antarctic scientific research.

SCAR *Composite Gazetteer of Antarctica*

An hierarchical gazetteer of Antarctic place-names, based on a number of national Antarctic gazetteers, was developed especially for ADD Version 1.0 (see Chapter 5 of the *Antarctic Digital Database User's Guide and Reference Manual,* 1993). However, since 1992, a comprehensive SCAR *Composite Gazetteer of Antarctica* (CGA) has been prepared by the SCAR Working Group on Geodesy and Geographic Information, under the supervision of its Italian member. Because the SCAR CGA is accessible on the World Wide Web, no place-names dataset is included in ADD Version 3.0. The address of the SCAR CGA web site is: http://www.pnra.it/SCAR_GAZE. The web site is updated quarterly on 1 January, 1 April, etc.

The CGA is a comprehensive alphabetical list of 32,955 approved names for 16,563 Antarctic geographical features; 21,552 names in the list are different. The CGA was collated from 20 national gazetteers of Antarctica and one international agency. It includes the geographical co-ordinates of the features and a three-letter code identifying the national supplier of the name. Synonyms for a given feature can be easily identified.

The geographical coverage of the CGA lies south of latitude 60°S, which coincides with the geographical extent of the ADD. The hierarchical names database developed for ADD Version 1.0 does not form part of the CGA but it has been expanded for use in the British Antarctic Survey's Meta Data Management System (MDMS). This new hierarchy, which uses an early version of the CGA database of names, can be viewed at: http://www.nerc-bas.ac.uk:8000/cgi-bin/gazetteer.pl.

The BAS MDMS gazetteer merges the ADD hierarchy with the CGA. The product is a comprehensive compendium of Antarctic place-names that is structured to show the relationship

between smaller geographical features and larger ones. Thus the larger entity of which a name is a part can be traced, and also the smaller features that are included within it can be identified.

Caution - Place-names listed in the national gazetteers are located by a single point, defined by geographical co-ordinates. If the feature is extensive (e.g. a land or a coast) it is described by reference to other named features. However, digital gazetteers require all entries to be as co-ordinate data rather than text. Although the geographical extent of large features such as mountain ranges, large islands and plateaux cannot be reflected meaningfully in a simple pair of co-ordinates, they are represented in the CGA by the co-ordinates of their nominal centre. Different nations have chosen different nominal centres for some features, giving rise to variations in the co-ordinates applied to the same features (see Annex H of the CGA). Because the co-ordinates of names in the CGA have not been derived directly from the map sources used for the compilation of the ADD, the co-ordinates listed in the CGA may not match the geographical co-ordinates of the feature seen on screen views of maps derived from the ADD Version 3.0.

Atlas of Antarctic Research

An on-line atlas of Antarctica has been developed by the US Geological Survey (USGS). The atlas is based on the Antarctic Digital Database Version 1.0, and it incorporates large-scale maps and digital raster graphics (DRGs) of 1:250,000 scale Antarctic maps published by the USGS. The web site is: http://usarc.usgs.gov/antarctic_atlas.

List of Protected Areas in Antarctica

The different types of protected areas designated in Antarctica are listed in the UK Foreign & Commonwealth Office's publication *List of Protected Areas of Antarctica*, published in 1997. This publication, which also shows the geographical distribution of the protected areas on maps of the continent, can be accessed from either the ADD pages or via the World Wide Web at: http://www.nerc-bas.ac.uk/public/magic/protected-area.

UK consortium for ADD Version 1.0

Three Cambridge-based institutes, referred to as the UK consortium, collaborated in the preparation of ADD Version 1.0. Links to their web sites are given below.

British Antarctic Survey (http://www.antarctica.ac.uk) has been responsible for the British Government's scientific research in the Antarctic since 1962. The survey originated as a wartime naval operation in 1943 and it transferred to the control of the Colonial Office in 1945, when it was known as the Falkland Islands Dependencies Survey. In 1967 BAS became a component body of the Natural Environment Research Council and, since 1984, it has been the national Antarctic mapping agency for the UK.

Scott Polar Research Institute (http://www.spri.cam.ac.uk) is part of the Geography Department of the University of Cambridge. It is involved in research in Antarctica and the Arctic and maintains the world's leading polar library and archive. It was founded in 1920 as the national memorial to Captain R.F. Scott.

UNEP World Conservation Monitoring Centre (formerly World Conservation Monitoring Centre) (http://www.unep-wcmc.org/) provides information for policy and action to conserve the living world. The Centre's work, from an office in Cambridge, is an integral part of the United Nations Environment Programme (UNEP), which has its headquarters in Nairobi, Kenya. The

work of UNEP-WCMC is closely linked to the UNEP Programme on Environmental Information, Assessment and Early Warning.

RAMP

The RADARSAT Antarctic Mapping Project (RAMP) achieved the first complete synoptic image coverage of Antarctica within a period of a few weeks during September/October 1997 (Jezek, 1998). A digital elevation model (DEM) of Antarctica was constructed for the project by the Byrd Polar Research Center (BPRC), based mainly on ERS-1 satellite radar altimeter data, and elevation data taken from ADD Version 1.0. The DEM was used to ortho-rectify the Antarctic SAR imagery, enabling a seamless mosaic of the imagery to be prepared (see http://www-bprc.mps.ohio-state.edu/).

References

Anon. 1997. *List of protected areas in Antarctica.* Foreign & Commonwealth Office, London, in collaboration with the British Antarctic Survey, 33 pp.

BAS, SPRI and WCMC. 1993. *Antarctic digital database user's guide and reference manual.* Scientific Committee on Antarctic Research, Cambridge, 156 pp. This manual accompanies a CD-ROM.

Jezek, K.C. 1998. RADARSAT Antarctic Mapping Project: Proceedings of the post-Antarctic Imaging Campaign-1 Working Group meeting. *Byrd Polar Research Center Report*, No. 17, 40 pp.

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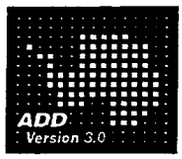
Chapter 2



Database concepts and organization

Introduction

The ADD Version 3.0 is a digital topographic database created from published medium-scale and small-scale maps of Antarctica up-dated using information derived mostly from remotely sensed data. The ADD data are provided in the form of Workstation ArcInfo coverages, at the original scale of data capture (Scale0) and as data generalized to 1:1,000,000 scale (Scale1); other generalized datasets are planned for the future. The design and structure of the database allow the data to be used in a range of mapping and scientific research applications.

Feature codes are used to indicate the type of feature represented by a particular arc or point; they are the key access code to information in the database. The ADD feature codes (ADD codes) are based on the codes devised for the *Standard symbols for use on maps of Antarctica* published by the Scientific Committee on Antarctic Research (SCAR) in 1980.

Cautions on data usage

The data provided are as complete and accurate as possible, and much effort has been expended to harmonize the data and update them where appropriate. During harmonization, features which spanned different map sheets and/or different map series were made consistent in both their geometry (edge-matching) and attributes. However, the original data varied considerably in quality and content, and it was not entirely possible to eliminate variations of mapping style. Therefore, the user is advised to check the data sources before using ADD Version 3.0 for critical applications. **Note that, in particular, the absence of a feature from this database does NOT mean that no feature exists; it may simply reflect a lack of information on the original maps.**

Map projection used

All data provided in the ADD are projected into the Polar Stereographic projection, with a standard latitude of 71°S, and a central meridian of 0°. The co-ordinates are in metres with the origin at the South Pole. The spheroid used is WGS84. This choice of map projection adheres to the recommendations of SCAR. The orientation of the continental map on the screen is such that the 0° meridian points toward the top of the screen.

The projection chosen is conformal, which means that the shapes of objects are correctly represented; at any point on the map, the scale is the same in all directions. However, it should be noted that the scale of the map varies with latitude: a metre in map co-ordinates is only equal to a metre measured on the ground at 71°S. At other latitudes, the relationship between map units and distances on the ground is given by Snyder (1987) as:

$$k=\left(\frac{1+\sin\phi_c}{1+\sin\phi}\right)\sqrt{\left(\frac{1+e\sin\phi}{1+e\sin\phi_c}\right)^{1+e}\left(\frac{1-e\sin\phi}{1-e\sin\phi_c}\right)^{1-e}}$$

where k is the number of metres on the map which represent one metre on the ground, ϕ is the latitude, ϕ_c is the latitude of true scale (71°S) and e is the eccentricity of the ellipsoid (= 0.08181919 for WGS84).

The consequence of this relationship is that areas and lengths measured at different latitudes are not directly comparable. If these data are to be used for making area or length-related measurements over a wide range of latitudes, then the map projection should be changed to an equal area projection (e.g. Lambert Azimuthal Equal Area) using the ArcInfo command PROJECT, or its equivalent in other systems.

Co-ordinate precision refers to the maximum number of digits allocated within a data file for the storage of an x, y, or z co-ordinate value. Single precision maps store up to seven significant digits for each co-ordinate. ADD data are provided in single precision. Thus any x, y co-ordinate in the Scale0 database has a worst-case locational resolution of approximately 3 m for features far from the origin.

Organization of the database

The principal content of the database is topographic data digitized from various documentary sources, mostly cartographic. The sources and data acquisition are described in more detail in Chapter 4. The tiling scheme adopted, which allows the user to locate their area of interest, and the directory structure used during the preparation of the database are described below.

Tiling scheme and directory structure

The database currently contains data at the scale of data capture (Scale0) and at 1:1,000,000 (Scale1). The directory structure adopted during the preparation of ADD Version 3.0 (Fig. 2.1) is provided as an example for other users to follow but its suitability will depend on the specific software available to the user. Its design allows for expansion of the database to incorporate coverages at different scales (for example, 1:5,000,000 or Scale5 and 1:10,000,000 or Scale10).

The tiling scheme used to divide the Scale0 and Scale1 datasets into areas corresponds to the boundaries of the International Map of the World (IMW) 1:1,000,000 map sheets (Fig. 2.2). An additional sheet, designated SW01_60, is used to cover the region between 88°S and the South Pole. Smaller-scale generalized datasets will not be tiled. The tiling scheme works well with ArcInfo's LIBRARIAN subsystem, which has been used to access and manage the data during the preparation of the database. The LIBRARIAN subsystem allows data to be accessed and viewed across several or all of the tiles.

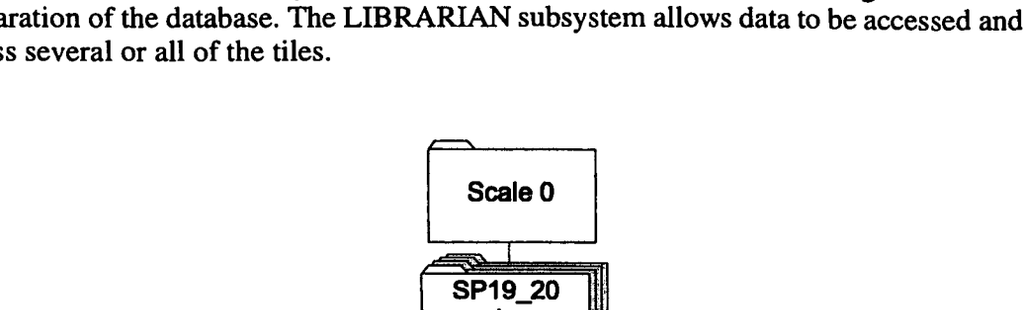


Fig. 2.1. A sample of the directory structure used for the preparation of ADD Version 3.0. is shown. Each IMW sheet (e.g. SP19_20) has its own folder in the directory, and all layers are present in each folder. For brevity several of the layers (shaded boxes) have been omitted from this diagram.

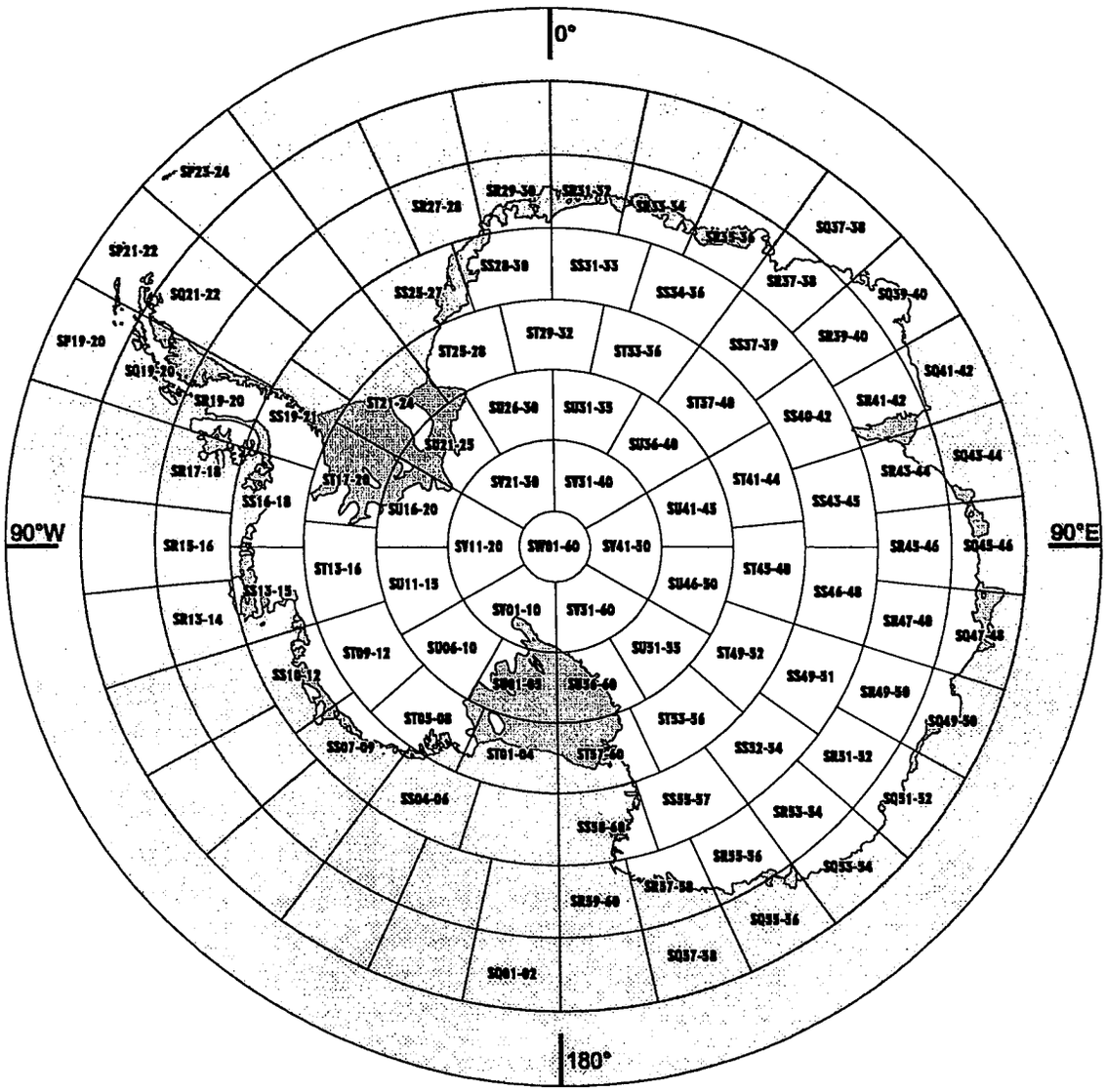


Fig. 2.2. IMW 1:1,000,000 scale map sheet boundaries of Antarctica, showing the numbering convention adopted for the ADD Scale0 tiling scheme. The map is divided into 4° latitudinal bands (from 60°S to 88°S) and the longitudinal divisions are 12° for bands SP, SQ and SR, 18° for band SS, 24° for band ST, 30° for band SU and 60° for SV.

Division of data into layers

The data within each IMW sheet boundary are subdivided into feature layers (Table 2.1), on the basis of the feature code (Table 2.2). Table 2.1 illustrates the feature layers found within each layer of the ADD Version 3.0; brief descriptions of the features, and notes on feature type (whether it is an arc, point or polygon), are also included. More detailed descriptions of the feature code values and features are given later in this chapter and the layers are described fully in Chapter 3.

Table 2.1. Summary of database layers for map data at Scale0

Layer name	*Description*	*Type*
CLIFF	Steep slope on ice and on ice-free areas; inland ice cliff, rock cliff or escarpment	Arc
COAST	Ice and rock coastline; includes the grounding line of ice shelves or glacier tongues and the front of ice shelves.	Arc & polygon
CONTOUR	All contours or formlines on ice and rock including index contours, definite and approximate contours and depression contours.	Arc
ELEVATION	All points with height information. Distinguishes between trigonometrical, airborne altimetric, photogrammetric, satellite, astronomical, and survey control stations. All measurements are in metres.	Point
FAUNA	All points giving the location of Adélie and Emperor penguin rookeries, and petrel and seal colonies as plotted on source maps; Specially Protected Areas (SPAs)	Point
FLOWLINE	Glacier flowlines	Arc
GLACIER MARGIN	Glacier margins; shear zones at margins of ice streams	Arc
HUMAN	All point data relating to human activity; aerodromes, radio masts, scientific stations, buildings, oil tanks, water tanks, automatic weather stations, Historic Monuments and Sites of Special Scientific Interest	Point
ICE DOME	Isolated ice hillock or dome	Point
LAKES	Lakes on ice and rock	Arc & polygon
MORAINE	Outlines areas of moraine	Arc & polygon
ROCK	All areas of rock outcrop including rock coastline, rock against ice shelf	Arc & polygon
STREAMS	Meltwater streams	Arc
TRAVERSE	Tracks of oversnow traverses. TRV00INF contains the name of the traverse and its date	Arc

Attributes

The ADD has been compiled from a variety of map series published by different national Antarctic mapping agencies. Whereas most of the map series conform to the preferred standardization of cartographic symbols recommended by SCAR in 1980, not all the maps carry the full range of topographic features. The largest-scale maps carry the greatest range of features.

All features included in ADD Version 3.0 carry a feature code (ADD code). Scale0 also carries date, sheet, editor, source and revision date attributes. The height attribute is only present where needed, that is for elevation points and contour lines. The textual information attribute (text), while always present, is commonly left blank; it is used primarily for names of traverses and for comments. All data have appropriate attribute tables.

Feature code - This numeric attribute is the primary description of a feature in the ADD. The codes are based on the standard SCAR symbols for use on Antarctic maps (SCAR, 1980) but additional codes have been introduced where necessary. Features marked with an asterisk are not present in ADD Version 3.0. Table 2.2 gives a detailed description of the codes available for use.

Table 2.2. Values of feature code used in the map data

Description	*SCAR code*	*ADD code*
Coastal features		
Ice coastline (definite)	2.1	22010
Rock coastline (definite)	2.1	22011
Grounding line (definite)	2.1	22012
Rock against ice shelf (definite)	-	22013
Ice wall (approximate)	2.2	22020
Rock coastline (approximate)	2.2	22021
Grounding line (approximate)	2.2	22022
Rock against ice shelf (approximate)	-	22023
Iceberg tongue	2.3	22030
Floating glacier tongue	2.4	22040
Ice shelf and front	2.5	22050
Ice rumples (distinct)	-	22090
Ice rumples (indistinct)	-	22100
Features on ice-covered areas		
Glacier margins (including shear zones at margins of ice streams)	3.1	23010
Plottable features on glacier (flowlines)	3.1	23011
Meltwater stream	3.6	23060
Lake on ice	3.6	23061
Steep slope on snow	3.7	23070
Inland ice cliff or escarpment	3.8	23080
Index contours on ice or snow (definite)	3.9	23090
Contours on ice or snow (definite)	3.9	23091
Index contours on ice or snow (approximate)	3.10	23100
Contours on ice or snow (approximate)	3.10	23101
Depression contour on ice or snow	3.11	23110
Depression area on ice or snow*	3.12	23120
Ice hillock, ice dome	3.13	23130
Ridge line on ice	-	23240
Features on ice-free areas		
Ice-free area (rock outcrop)	3.15	23150
Index contours on ice-free area (definite)	3.16	23160
Contours on ice-free area (definite)	3.16	23161
Index contours on ice-free area (approximate)	3.17	23170
Contours on ice-free area (approximate)	3.17	23171
Depression contour on ice-free area	3.18	23180
Rock cliff or escarpment	3.19	23190
Mountain or hill of exposed rock (uncontoured)*	3.20	23200
Moraine field (not linear features)	3.23	23230
Steep slope on ice-free area	-	23260
Lake on rock	3.6	23062

* Feature not present in ADD Version 3.0.

Table 2.2. Values of feature code (continued):

Description	*SCAR code*	*ADD code*
Features related to survey control		
Elevation on rock (differential levelling or trigonometrical)	4.1	24010
Elevation on ice (differential levelling or trigonometrical)	4.1	24011
Elevation on rock (airborne altimetric, surface barometric)	4.2	24020
Elevation on ice (airborne altimetric, surface barometric)	4.2	24021
Elevation on rock (photogrammetric)	4.3	24030
Elevation on ice (photogrammetric)	4.3	24031
Ice thickness	4.4	24040
Geodetic satellite observation station (precise)	4.5	24050
Geodetic satellite observation station (less precise)*	4.5	24051
Astronomical station (monumented)	4.6	24060
Astronomical station (not monumented)	4.6	24061
Survey control station (monumented)	4.7	24070
Survey control station (not monumented)	4.7	24071
Bench mark and elevation*	4.8	24080
Oversnow traverse (marked)	4.9	24090
Oversnow traverse (unmarked)*	4.10	24100
Features related to human activity		
Aerodrome (with facilities) suitable for wheeled aircraft	4.11	24110
Aerodrome (without facilities) suitable for wheeled aircraft	4.11.1	24111
Aerodrome (with facilities) suitable for ski-equipped aircraft only	4.12	24120
Aerodrome (without facilities) suitable for ski-equipped aircraft only*	4.12.1	24121
Helicopter aerodrome (with facilities) unsuitable for fixed wing aircraft*	4.13	24130
Helicopter aerodrome (without facilities) unsuitable for fixed wing aircraft*	4.13.1	24131
Aircraft wreckage*	4.16	24160
Single radio mast*	4.18	24180
Multiple radio masts*	4.18	24181
Scientific stations	4.19	24190
Occupied building	4.20	24200
Abandoned building	4.20	24201
Refuge	4.21	24210
Oil tanks (in use)	4.24	24240
Oil tanks (disused)*	4.24	24241
Water tanks (in use)*	4.24	24242
Water tanks (disused)*	4.24	24243
Automatic weather station*	4.25	24250
Historic Sites and Monuments (sites listed in Antarctic Treaty)*	4.26	24260
Sites of Special Scientific Interest (SSSI)*	4.27	24270
Features related to animals, birds and vegetation		
Adélie penguin rookery	5.1	25010
Emperor penguin rookery	5.2	25020
Seal colony	5.3	25030
Petrel colony	5.4	25040
Specially Protected Area (SPA)*	5.5	25050

* Feature not present in ADD Version 3.0.

Height - Contours and heighted positions have their height in metres in this column and ice thickness in metres is also given; the feature code may be used to distinguish between surface elevations and ice thickness.

Date - Several features in Antarctica vary with time, especially the positions of ice-shelf fronts and the extent of glacier or iceberg tongues. Where appropriate, this attribute gives the date of the map or satellite image from which the feature was digitized. The information is presented as a character field rather than a date field because many of the dates available are incomplete: for example, 1978 or Dec 1978, rather than 13 Dec 1978.

Text - A text field is used for any other useful information about the feature.

Sheet - The name or IMW designation of the source map (see Fig. 2.1). It may be used to link the digital data with the detailed list of source data.

Editor - The initials of the member of the project staff who last revised the feature. This is blank if the feature has not been edited. The possible values are shown in Table 2.3.

Table 2.3. Editor codes

Value	*Description*	*Value*	*Description*
AJF	Adrian Fox	OJCO	Olivier Cottray
APRC	Paul Cooper	PKD	Peter Derbyshire
CWMS	Charles Swithinbank	SDE	Stephen Evans
EMRE	Mary Edwards	SRJ	Sue Jordan

Source - An alphabetical code denoting the source of the data (see Table 2.4).

Table 2.4. Source data codes

Value	*Description*	*Value*	*Description*
AUS	Australia	CWMS	Charles Swithinbank
CHL	Chile	PROJ	Project staff
DEU	Germany	SCAR	Scientific Committee on Antarctic Research
GBR	United Kingdom		
JPN	Japan	USA	Byrd Polar Research Center, USA
NOR	Norway	USGS	United States Geological Survey
RUS	Russia		

Revision - The date of the last revision carried out on the feature. It is blank if no revision has taken place.

Generalization

The ADD Version 1.0 was created by digitizing data from maps at a wide variety of scales, mainly between 1:100,000 and 1:5,000,000. In most cases, the variation of source scale will have had little effect on the use of the database because the source maps were at a scale appropriate to the level of known detail in the region at that time. For the majority of the regions where there is significant topography, data were captured from maps at scales of 1:250,000, 1:500,000 and 1:1,000,000.

In order to allow their use at 1:1,000,000 scale, the data have been simplified using a range of techniques and processes; smaller-scale datasets at 1:5,000,000, 1:10,000,000 and 1:30,000,000 will be generated in the future. Features such as bases, traverses, survey data, fauna, SSSIs, SPAs and Historic Sites and Monuments, have not been generalized. Features that should be included at each level of generalization are shown in Table 2.5, and the methods of generalization, which vary with the scale of generalization and the type of feature, are described below. All processes were carried out using ArcInfo software.

Table 2.5. Features included at each level of generalization

Scale	*Features included*	*Recommended point data*
1:1,000,000	Coast, ice front, grounding line, contour, glacier flowlines, cliff, rock outcrop, moraine, selected lakes and islands, ice rumples	All
1:5,000,000	Coast, ice front, grounding line, contour, flowline (selected by length to eliminate small glaciers), rock outcrop, large islands and lakes	Traverses and bases
1:10,000,000	Coast, ice front, grounding line, contour, rock outcrop and selected islands	Bases
1:30,000,000	Coast, ice front of major ice shelves, grounding line, islands, IMW sheet boundaries	None

Coastline - The generalized coastlines were generated from the Scale0 data as follows. First, all features with an area less than πr^2 were deleted. This removed small islands and ice rises. Next, the Douglas-Peucker algorithm was used to simplify the arcs, with an offset distance or *r* (see Table 2.6). The resulting arcs were smoothed using a cubic spline, with a point spacing of *r/2*, and surplus points removed using the Douglas-Peucker algorithm with an offset of *r/10*. Topological errors were manually corrected, and finally any important features removed by the processing were restored manually.

Table 2.6. Values for the parameter *r*

Scale	*r (metres)*
1:1,000,000	200
1:5,000,000	1000
1:10,000,000	2000
1:30,000,000	6000

Contours - Elevation grids were generated from the Scale0 contours for each quadrant of Antarctica using a grid cell size set to 600 m. The grids were converted to contours and the resulting arcs were edited to eliminate unwanted features, e.g. island contours with a parameter of less than 10 km. The contours were smoothed and those that crossed as a result of the generalization procedures were identified and edited. Finally, the four quadrants were edge-matched and combined into one continental contour coverage.

Rock outcrops - Lines parallel to the edge of rock outcrops but outside them at a distance of *r* were generated. A model surface was generated using the edge of the rock outcrop as isolines with

a value of zero, the lines outside the rock outcrop as isolines with a value of -1, and the label points of the rock outcrop polygons with a value of +1. The resulting model was contoured at a value of -0.5, and the contour used as the border of the generalized rock outcrops.

Naming conventions

A systematic method of naming both coverages and attributes has been used in the ADD Version 3.0. *Coverage names* are in two parts - a three-letter code giving the type of feature in the coverage followed by a two-digit scale indicator. Version 3.0 contains data at Scale0, Scale1, Scale5 and Scale10. A list of the main coverage names is given in Table 2.7.

Table 2.7. Coverage names for topographic data at Scale0

Description	*Scale0*
Cliffs	CLIFF00
Coastline and grounding lines	COAST00
Contours	CONT00
Elevations	ELEVN00
Fauna	FAUNA00
Glacier flowlines	GFLOW00
Glacier margins	GMARG00
Human or cultural features	HUMAN00
Ice domes	IDOME00
Lakes	LAKES00
Moraine	MORAN00
Rock outcrop	ROCK00
Streams	STRMS00
Overland traverses	TRAV00

Attribute names have a three-letter code indicating the type of features in the coverage, a two-digit scale code, and a three-letter code for the type of information. A sample of the codes used is shown in Table 2.8 and a fuller definition of them is given in Chapter 3, Tables 3.1–3.3.

Table 2.8. Attribute coding conventions used in the ADD Version 3.0

Layers		*Scale*		*Attribute type*	
Description	*Code*	*Description*	*Code*	*Description*	*Code*
Cliff	CLF	1:100,000, 1:200,000,	00	ADD code	TYP
Coast	CST	1:250,000, 1:500,000,		Height	HGT
Contour	CNT	etc.		Date	DAT
Elevation	ELV	1:1,000,000	01	Text	INF
Fauna	FNA	1:5,000,000	05	Sheet	SHT
Flowline	FLW	1:10,000,000	10	Editor	EDT
Glacier margin	GMG	1:30,000,000	30	Source	SRC
Human	HMN			Revision date	REV
Ice dome, etc.	ICD			Surface type	SRF
				Nation	NAT
				Latitude	LAT
				Longitude	LON

References

SCAR. 1980. *Standard symbols for use on maps of Antarctica.* Edn 2. Scientific Committee on Antarctic Research, Working Group on Geodesy and Cartography, Canberra, 15 pp.

Snyder, J.P. 1987. Map projections - a working manual. *U.S. Geological Survey Professional Paper,* **1395**, 383 pp.

Chapter 3

Layer descriptions

Introduction

The summary descriptions of the different layers in the Antarctic digital database are arranged alphabetically according to the layer name. Each layer description is organized into three parts:

- The **layer name, coverage file name** (includes a two-digit number to indicate the scale at which these data are available) and **feature class** (point, line or polygon).
- **Items, codes and values** which list the attribute names, feature code (ADD code), brief definitions of the features in the layer, and the equivalent SCAR code. Note that the features listed appear on Antarctic maps in general but not all of them are present in ADD Version 3.0.
- **Feature attribute table** that includes the item names and field definitions, and the number of the column in which the fields begin. Dates are not held in a date field because they may be incomplete; they may be quoted, for example, as 1980, June 1980 or 5 June 1980 depending on the availability of the information.

An introductory paragraph at the beginning of most layer descriptions summarizes the features briefly and includes comments for special attention. A tabular summary of the database layers provided is given in Chapter 2, Table 2.1. Note that the **zero contour** represents the coastline and it is, therefore, in the COAST layer rather than in the CONTOUR layer.

Naming conventions

Naming conventions have been established to allow the user to identify the layers and their basic contents from the name. Coverage names begin with an abbreviated form of the theme name and end with a numeric code indicating the scale of the data, e.g. CONT00 represents Scale0 contours. The three types of coverages are line, point and polygon. Line coverages have lines with attributes attached, such as the STREAMS layer. Other layers may contain only point data, such as the FAUNA layer. Some coverages combine both lines and polygons into a coverage type; these are referred to as polygon coverages. For example, the ROCK coverage includes individual line segments that define the rock areas, the polygon enclosed by the line, and a point that acts as a seed point for the polygon.

The item names within the coverages also carry a naming convention to ensure that they are unique within the database. All item names are preceded by a three-letter theme abbreviation, a two-digit code for the scale of the coverage and a three-letter abbreviation for the type of attribute. The naming conventions used in the database are given below in Tables 3.1–3.3.

Segmentation

The tiling scheme adopted for the Scale0 and Scale1 data corresponds to the boundaries of the International Map of the World 1:1,000,000 scale map sheets (see Chapter 2, Fig. 2.1). The Scale5 and Scale10 datasets are not tiled.

Table 3.1. Theme abbreviations (layers)

Topographic data			
Code	*Description*	*Code*	*Description*
CLF	Cliff	HMN	Human
CNT	Contour	ICD	Ice dome
CST	Coast	LAK	Lakes
ELV	Elevation	MRN	Moraine
FLW	Flowline	RCK	Rock
FNA	Fauna	STR	Streams
GMG	Glacier margin	TRV	Traverse

Table 3.2. Numeric codes used to denote the different scales

Code	*Description*
00	Basic scale of data capture (1:100,000, 1:250,000, etc.)
01	1:1,000,000
05	1:5,000,000
10	1:10,000,000
50*	1:30,000,000

* Dataset planned for the future, after the release of Version 3.0

Table 3.3. Codes denoting attribute type

Code	*Description*	*Code*	*Description*
TYP	Feature code	EDT	Editor
HGT	Height	SRC	Source
DAT	Date	REV	Revision date
INF	Text	SRF	Surface type
SHT	Sheet		

Layers for topographic data

CLIFF layer

Coverage name: CLIFF00
Feature class: Line
Items, codes and values:

CLF00TYP - This cliff line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
23070	Steep slope on snow	3.7
23080	Inland ice cliff or escarpment	3.8
23190	Rock cliff or escarpment	3.9
23260	Steep slope on ice-free area	-

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	CLIFF00-ID	25	4, 5, B
Cliff line type	CLF00TYP	29	5, 5, I
Date	CLF00DAT	34	10, 10, C
Text	CLF00INF	44	100, 100, C
Sheet	CLF00SHT	144	10, 10, C
Editor	CLF00EDT	154	10, 10, C
Source	CLF00SRC	164	50, 50, C
Revision date	CLF00REV	214	10, 10, C

COAST layer

This layer contains the coastline and the grounding line of ice shelves or glacier tongues; it divides the area into sea, ice shelf, ice rumples or land. Note that the zero contour represents the continental coastline against open water but that a grounding line does **NOT** correspond to the zero contour.

Coverage name: COAST00
Feature class: Line and polygon
Items, codes and values:

CST00TYP - This coast line item contains feature codes with the following values:

ADD code	Definition	SCAR code
22010	Ice coastline (definite)	2.1
22011	Rock coastline (definite)	2.1
22012	Grounding line (definite)	2.1
22013	Rock against ice shelf (definite)	-
22020	Ice wall (approximate)	2.2
22021	Rock coastline (approximate)	2.2
22022	Grounding line (approximate)	2.2
22023	Rock against ice shelf (approximate)	-
22030	Iceberg tongue	2.3
22040	Floating glacier tongue	2.4
22050	Ice shelf and front	2.5
22090	Ice rumples (distinct)	-
22100	Ice rumples (indistinct)	-
0	Part of a tile boundary	-

CST00SRF - This coast surface item contains the following values:

ice shelf
ice tongue
land
ocean
rumple

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin*	*Item definition*
Feature ID	COAST00-ID	25	4, 5, B
Coast line type	CST00TYP	29	5, 5, I
Date	CST00DAT	34	10, 10, C
Text	CST00INF	44	100, 100, C
Sheet	CST00SHT	144	10, 10, C
Editor	CST00EDT	154	10, 10, C
Source	CST00SRC	164	50, 50, C
Revision date	CST00REV	214	10, 10, C

Polygon attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	COAST00-ID	13	4, 5, B
Coast surface type	CST00SRF	17	10, 10, C

CONTOUR layer

The height attribute gives the contour or formline elevation in metres.

Coverage name: CONT00

Feature class: Line

Items, codes and values:

CNT00TYP - This contour line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
23090	Index contours on ice definite	3.9
23091	Contours on ice (definite)	3.9
23100	Index contours on ice (approximate)	3.10
23101	Contours on ice (approximate)	3.10
23110	Depression contour on ice	3.11
23160	Index contour on ice-free area (definite)	3.16
23161	Contours on ice-free area (definite)	3.16
23170	Index contours on ice-free area (approximate)	3.17
23171	Contours on ice-free area (approximate)	3.17
23180	Depression contour on ice-free area	3.18

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	CONT00-ID	25	4, 5, B
Contour line type	CNT00TYP	29	5, 5, I
Height	CNT00HGT	34	4, 12, F, 3
Date	CNT00DAT	38	10, 10, C
Text	CNT00INF	48	100, 100, C
Sheet	CNT00SHT	148	10, 10, C
Editor	CNT00EDT	158	10, 10, C
Source	CNT00SRC	168	50, 50, C
Revision date	CNT00REV	218	10, 10, C

ELEVATION layer

This layer contains all points with height information. The height attribute gives the elevation of the point, except for ADD code 24040, when the height attribute shows the ice thickness. All measurements are in metres. Lack of height information for a point is indicated by 0.

Coverage name: ELEVN00

Feature class: Point

Items, codes and values:

ELV00TYP - This item contains the feature codes with the following values:

ADD code	Definition	SCAR code
24010	Elevation on rock (differential levelling or trigonometrical)	4.1
24011	Elevation on ice (differential levelling or trigonometrical)	4.1
24020	Elevation on rock (airborne altimetric, surface barometric)	4.2
24021	Elevation on ice (airborne altimetric, surface barometric)	4.2
24030	Elevation on rock (photogrammetric)	4.3
24031	Elevation on ice (photogrammetric)	4.3
24040	Ice thickness	4.4
24050	Geodetic satellite observation station (precise)	4.5
24051*	Geodetic satellite observation station (less precise)	4.5
24060	Astronomical station (monumented)	4.6
24061	Astronomical station (not monumented)	4.6
24070	Survey control station (monumented)	4.7
24071	Survey control station (not monumented)	4.7
24080*	Bench mark and elevation	4.8

* Feature not present in ADD Version 3.0

Feature attribute table (Point attribute table)

Variable	*Defined name item*	*Begin column*	*Item definition*
Feature ID	ELEVN00-ID	13	4, 5, B
Elevation point	ELV00TYP	17	5, 5, I
type Height	ELV00HGT	22	4, 12, F, 3
Date	ELV00DAT	26	10, 10, C
Text	ELV00INF	36	100, 100, C
Sheet	ELV00SHT	136	10, 10, C
Editor	ELV00EDT	146	10, 10, C
Source	ELV00SRC	156	50, 50, C
Revision date	ELV00REV	206	10, 10, C

FAUNA layer

The point data in this layer, giving the location of bird or seal colonies, represent information derived from published map sources. Note that not all map series display this type of information and the coverage is, therefore, incomplete. Information on protected areas in Antarctica is available on the World Wide Web at: http://www.nerc-bas.ac.uk/public/magic/protected-area, which is accessible from the ADD pages.

Coverage name: FAUNA00

Feature class: Point

Items, codes and values:

FNA00TYP - This fauna point item contains the feature codes with the following values:

ADD code	Definition	SCAR code
25010	Adélie penguin rookery	5.1
25020	Emperor penguin rookery	5.2
25030	Seal colony	5.3
25040	Petrel colony	5.4
25050*	Specially Protected Area (SPA)	5.5

* Feature not present in ADD Version 3.0

Feature attribute table (Point attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	FAUNA00-ID	13	4, 5, B
Fauna point type	FNA00TYP	17	5, 5, I
Date	FNA0000DAT	22	10, 10, C
Text	FNA00INF	32	100, 100, C
Sheet	FNA00SHT	132	10, 10, C
Editor	FNA00EDT	142	10, 10, C
Source	FNA00SRC	152	50, 50, C
Revision date	FNA00REV	202	10, 10, C

FLOWLINE layer

Contains glacier flowlines. Note that other mappable features on glaciers, such as crevasses and crevasse fields, are not recorded in the database for lack of comprehensive source material over the whole continent. In the majority of cases the flowlines have been amended so that they flow downhill. This was achieved by obtaining the height at each end of the arcs by interpolation from the BPRC DEM, and changing the direction of those lines where the beginning of the line was lower than the end. On ice shelves, where slopes are low, obvious errors have been corrected. The process has been applied with minimal checking; the results are not guaranteed to be correct but the majority of the lines now point in the correct direction.

Coverage name: GFLOW00

Feature class: Line

Items, codes and values:

FLW00TYP - This flow line item contains the feature code with the following value:

ADD code	Definition	SCAR code
23011	Plottable feature on glacier	3.1
23240	Ridge line on ice or snow	-

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	GFLOW00-ID	25	4, 5, B
Flow line type	FLW00TYP	29	5, 5, I
Date	FLW00DAT	34	10, 10, C
Text	FLW00INF	44	100, 100, C
Sheet	FLW00SHT	144	10, 10, C
Editor	FLW00EDT	154	10, 10, C
Source	FLW00SRC	164	50, 50, C
Revision date	FLW00REV	214	10, 10, C

GLACIER MARGIN layer

Only glacier margins, including shear zones at the margins of ice streams, are present in this layer.

Coverage name: GMARG00

Feature class: Line

Items, codes and values:

GMG00TYP - This glacier margin line item contains the feature code with the following value:

ADD code	Definition	SCAR code
23010	Glacier margin/shear zone at margin of ice stream	3.1

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	GMARG00-ID	25	4, 5, B
Glacier margin line type	GMG00TYP	29	5, 5, 1
Date	GMG00DAT	34	10, 10, C
Text	GMG00INF	44	100, 100, C
Sheet	GMG00SHT	144	10, 10, C
Editor	GMG00EDT	154	10, 10, C
Source	GMG00SRC	164	50, 50, C
Revision date	GMG00REV	214	10, 10, C

HUMAN layer

This layer contains all point data related to human activity.

Coverage name: HUMAN00

Feature class: Point

Items, codes and values:

HMN00TYP - This human point item contains the feature codes with the following values:

ADD code	Definition	SCAR code
24160*	Aircraft wreckage	4.16
24180*	Single radio mast	4.18
24181*	Multiple radio masts	4.18
24190	Scientific station†	4.19
24191	Summer-only scientific station (records incomplete)	
24200	Occupied building	4.20
24201	Abandoned building	4.20
24210	Refuge	4.21
24240	Oil tanks (in use)	4.24
24241*	Oil tanks (disused)	4.24
24242*	Water tanks (in use)	4.24
24243*	Water tanks (disused)	4.24
24250*	Automatic weather station	4.25
24260*	Historic Sites and Monuments‡ (sites listed in Antarctic Treaty)	4.26
24270*	Sites of Special Scientific Interest‡	4.27

* Feature not present in ADD Version 3.0

† The positions of scientific stations have been derived from published map sources, at a range of scales, and from the most up-to-date SCAR list of permanent Antarctic stations (see Appendix 4). The latter source identifies the locations to a minute of arc only and the stations may not be positioned accurately when viewed on screen at a scale of 1:250 000.

‡ These items are derived from published map sources but not all sites are recorded on maps and some have been designated after the source maps were published. A comprehensive, up-to-date list of such sites, derived from approved management plans for protected areas, is available on the World Wide Web at http://www.nerc-bas.ac.uk/public/magic/protected-area (accessible from the ADD pages).

Feature attribute table (Point attribute table)

Variablle	*Defined item name*	*Begin column*	*Item definition*
Feature ID	HUMAN00-ID	13	4, 5, B
Human point type	HMN00TYP	17	4, 6, B
Name	HMN00NAM	21	50, 50, C
Latitude	HMN00LAT	71	8, 20, F, 5
Longitude	HMN00LON	79	8, 20, F, 5
Nationality	HMN00NAT	87	3, 3, C
Date	HMN00DAT	90	10, 10, C
Text	HMN00INF	100	100, 100, C
Sheet	HMN00SHT	200	10, 10, C
Editor	HMN00EDT	210	10, 10, C
Source	HMN00SRC	220	50, 50, C
Revision date	HMN00REV	270	10, 10, C

ICE DOME layer

Point data indicating the presence of isolated ice hillocks or domes are included in this layer.

Coverage name: IDOME00

Feature class: Point

Items, codes and values:

ICD00TYP - This ice dome item contains the feature code with the following value:

ADD code	Definition	SCAR code
23130	Ice hillock, ice dome	3.13

Feature attribute table (Point attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	IDOME00-ID	13	4, 5, B
Ice-dome point	ICD00TYP	17	5, 5, I
type Date	ICD00DAT	22	10, 10, C
Text	ICD00INF	32	100, 100, C
Sheet	ICD00SHT	132	10, 10, C
Editor	ICD00EDT	142	10, 10, C
Source	ICD00SRC	152	50, 50, C
Revision date	ICD00REV	202	10, 10, C

LAKES layer

Outlines of lakes and melt-pools are present in this layer. Note that ephemeral melt-pools on ice shelves are not recorded in the database although they were plotted on some series of Antarctic maps used as source material.

Coverage name: LAKES00

Feature class: Line and polygon

Items, codes and values:

LAK00TYP - This lake line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
23061	Lake or melt-pool on ice	3.6
23062	Lake or melt-pool on rock	3.6

LAK00SRF - This lake surface item contains the following values:

lake

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	LAKES00-ID	25	4, 5, B
Lake line type	LAK00TYP	29	5, 5, I
Date	LAK00DAT	34	10, 10, C
Text	LAK00INF	44	100, 100, C
Sheet	LAK00SHT	144	10, 10, C
Editor	LAK00EDT	154	10, 10, C
Source	LAK00SRC	164	50, 50, C
Revision date	LAK00REV	214	10, 10, C

Polygon attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*
Feature ID	LAKES00-ID	13	4, 5, B
Lake surface type	LAK00SRF	17	10, 10, C

MORAINE layer

Contains the outlines of superficial deposits on ice and on rock.

Coverage name: MORAN00

Feature class: Line and polygon

Items, codes and values:

MRN00TYP - This moraine line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
22011*	Rock coastline (definite)	2.1
22021*	Rock coastline (approximate)	2.2
22013*	Rock coast against ice shelf (definite)	-
23220	Scree/outwash	3.22
23230	Moraine on ice and on rock	3.23
23061*	Lake on ice	3.6
0	Part of a tile boundary	-

* Codes only used on data derived from one map (James Ross Island area, Antarctic Peninsula).

MRN00SRF - This moraine surface item contains the following values:

moraine
out-wash

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	MORAN00-ID	25	4, 5, B
Moraine line type	MRN00TYP	29	5, 5, I
Date	MRN00DAT	34	10, 10, C
Text	MRN00INF	44	100, 100, C
Sheet	MRN00SHT	144	10, 10, C
Editor	MRN00EDT	154	10, 10, C
Source	MRN00SRC	164	50, 50, C
Revision date	MRN00REV	214	10, 10, C

Polygon attribute table

Variable	*Defined name item*	*Begin column*	*Item definition*
Feature ID	MORAN00-ID	13	4, 5, B
Moraine surface type	MRN00SRF	17	10, 10, C

ROCK layer

All lines delimiting exposed rock areas are included in this layer.

Coverage name: ROCK00

Feature class: Line, polygon and point

Items, codes and values:

RCK00TYP - This rock line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
22011	Rock coastline (definite)	2.1
22013	Rock against ice shelf (definite)	-
22021	Rock coastline (approximate)	2.2
22023	Rock against ice shelf (approximate)	-
23062	Lake on rock	3.6
23150	Ice-free area (rock outcrop)	3.15
23220	Scree/outwash	3.22
23230	Moraine	3.23
0	Part of a tile boundary	-

RCK00SRF - This rock surface item contains the following value:

rocks

Feature attribute tables

Arc attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	ROCK00-ID	25	4, 5, B
Rock line type	RCK00TYP	29	5, 5, I
Date	RCK00DAT	34	10, 10, C
Text	RCK00INF	44	100, 100, C
Sheet	RCK00SHT	144	10, 10, C
Editor	RCK00EDT	154	10, 10, C
Source	RCK00SRC	164	50, 50, C
Revision date	RCK00REV	214	10, 10, C

Polygon attribute table

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	ROCK00-ID	13	4, 5, B
Rock surface type	RCK00SRF	17	10, 10, C

STREAMS layer

Only melt-streams on rock and on continental ice are present in this layer. Melt-streams on ice shelves are not recorded in the database although they have been plotted on some series of Antarctic maps used as source material.

Coverage name: STRMS00

Feature class: Line

Items, codes and values:

STR00TYP - This stream line item contains the feature code with the following value:

ADD code	Definition	SCAR code
23060	Meltwater stream	3.6

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	STRMS00-ID	25	4, 5, B
Stream line type	STR00TYP	29	5, 5, I
Date	STR00DAT	34	10, 10, C
Text	STR00INF	44	100, 100, C
Sheet	STR00SHT	144	10, 10, C
Editor	STR00EDT	154	10, 10, C
Source	STR00SRC	164	50, 50, C
Revision date	STR00REV	214	10, 10, C

TRANSPORT layer

Contains features such as air strips and helicopter landing sites.

Coverage name: TRANSPORT00

Feature class: Point

Items, codes and values:

TRN00TYP - This transport item contains the feature codes with the following values:

ADD code	Definition	SCAR code
24110	Aerodrome (with facilities) suitable for wheeled aircraft	4.11
24111*	Aerodrome (without facilities) suitable for wheeled aircraft	4.11.1
24120	Aerodrome (with facilities) suitable for ski-equipped aircraft only	4.12
24121	Aerodrome (without facilities) suitable for ski-equipped aircraft only	4.12.1
24130	Helicopter aerodrome (with facilities) unsuitable for fixed wing aircraft	4.13
24131	Helicopter aerodrome (without facilities) unsuitable for fixed wing aircraft	4.13.1

* Feature not used in ADD Version 3.0

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	TRANSPORT00-ID	13	4, 5, B
Transport type	TRN00TYP	17	4, 6, B
Name	TRN00NAM	21	50, 50, C
Latitude	TRN00LAT	71	8, 20, F
Longitude	TRN00LON	79	8, 20, F
Nationality	TRN00NAT	87	3, 3, C
Date	TRN00DAT	90	10, 10, C
Text	TRN00INF	100	100, 100, C
Sheet	TRN00SHT	200	10, 10, C
Editor	TRN00EDT	210	10, 10, C
Source	TRN00SRC	220	50, 50, C
Revision date	TRN00REV	270	10, 10, C

TRAVERSE layer

Contains the tracks of overland traverses. The attribute 'text' contains the name of the traverse and its date.

Coverage name: TRAV00

Feature class: Line

Items, codes and values:

TRV00TYP - This traverse line item contains the feature codes with the following values:

ADD code	Definition	SCAR code
24090	Oversnow route (marked)	4.9
24100*	Oversnow route (unmarked)	4.10

* Feature not used in ADD Version 3.0

Feature attribute table (Arc attribute table)

Variable	*Defined item name*	*Begin column*	*Item definition*
Feature ID	TRAV00-ID	25	4, 5, B
Traverse line type	TRV00TYP	29	5, 5, I
Date	TRV00DAT	34	10, 10, C
Text	TRV00INF	44	100, 100, C
Sheet	TRV00SHT	144	10, 10, C
Editor	TRV00EDT	154	10, 10, C
Source	TRV00SRC	164	50, 50, C
Revision date	TRV00REV	214	10, 10, C

Chapter 4

Database production

Data capture

ADD Version 1.0

The bulk of the data capture was carried out in the UK at WCMC and SPRI using ArcInfo software; digitizing undertaken at BAS used Laser-Scan's HORIZON and LITES2 packages. In the UK all the map data and vectorized image-interpretations were digitized by hand. Film plots were prepared for initial quality assurance checks and minor amendments were made to rectify any errors. Edge-matching and/or incorporation of more up-to-date information then followed and new film plots were created for further quality assurance. Once the primary and secondary data were accepted as correct, the digital files were merged and finally edited to produce a seamless digital map of Antarctica (Scale0). Using ArcInfo software, techniques were developed during this last editing and harmonization phase of the seamless map to produce a number of generalized smaller-scale maps.

ADD Version 2.0

Before any major corrections or amendments were made to ADD Version 1.0, the ADD Scale0 dataset for the whole of Antarctica was transferred from PC ARC/INFO to Workstation ArcInfo. It was also restructured into ArcInfo Librarian format. This provides a seamless view of the Scale0 dataset, allowing the user to pan and zoom around the continent instead of being restricted to viewing the data on a tile-by-tile basis.

The Scale0 seamless map (ADD Version 1.0), prepared from maps at a variety of scales, was corrected for the following types of errors:

- Spurious data such as digitizing spikes, contours overlapping tile boundaries, and miscoded items.
- Data that were incorrectly positioned/needed adjusting or updating (e.g. ice fronts).
- Data known to have been omitted from Version 1.0 (e.g. Theron Mountains).

New data were either digitized manually from paper maps and film separates or incorporated from digital sources. Merging techniques used for ADD Version 1.0 were adopted in Version 2.0, the line segments drawn by ADD staff being coded differently from those derived from the original source material.

Quadrant 4 (0° to 90°W) was the last part of the mosaic to be completed during the preparation of ADD Version 1.0 and the work on Version 2.0 concentrated on improving the quality of the data in this quadrant. Because much work still had to be done on updating the database continent-wide, no new generalization products were created for Version 2.0. Thus ADD Version 2.0 contained only Scale0 data.

ADD Version 3.0

Elevation data - The DEM created by the Byrd Polar Research Center (BPRC) for RAMP (Liu *et al.*, 1999) provided a major source of elevation data for improving the quality of contours over the Antarctic ice sheet. Generated primarily from ERS-1 data and the contour layer of ADD Version 1.0 by BPRC, the DEM was converted to vector contours at BAS for incorporation in ADD Version 3.0. In general, only contours over the interior ice sheet and ice shelves have been amended; they have been merged with the original contours (derived from medium-scale published maps) in coastal regions and in areas of high relief. Elevation data for Latady Island (tile SR17_18) and a small part of Alexander Island, where SAR data were unreliable, were generated from a simple ice-flow model (as a function of distance from coast) controlled by radio-echo sounding data.

Other features - Relatively little new topographic data have been captured from maps (either digital or analogue) since ADD versions 1.0 and 2.0. Satellite imagery has been used to up-date the position of fronts of major ice shelves (e.g. Larsen Ice Shelf, Ross Ice Shelf), and in the Antarctic Peninsula region to locate small rock outcrops and islands that had been omitted from earlier versions of the ADD (e.g. Flyspot Rocks in Marguerite Bay, Antarctic Peninsula).

A few features shown on several US Geological Survey maps were inadvertently left out of ADD versions 1.0 and 2.0, e.g. glacier flowlines (8 maps) and glacier margins (6 maps). The missing data were digitized on-screen from the relevant maps via the on-line US Atlas of Antarctic Research (http://usarc.usgs.gov/antarctic_atlas/) and merged with the existing data.

Comparison between the BPRC DEM and the original printed maps identified a discrepancy of several hundred metres in the position of the Ellsworth Mountains, at the boundary between tiles ST13_16 and ST17_20. BPRC generated new control points which enabled the mountain range to be adjusted to its correct position and these changes have been incorporated in ADD Version 3.0.

Generalization - After completing the final editing phase of the Scale0 dataset, generalization techniques were applied to the data to enable them to be viewed meaningfully at a number of smaller scales. The generalization process included selection of certain layers, and simplification, smoothing, aggregation and area conversion. For example, the contours for the 1:1,000,000 scale dataset were regenerated from a DEM created from Scale0 data. The 1:1,000,000, 1:5,000,000 and 1:10,000,000 scale generalized products are already available and a smaller-scale dataset at 1:50,000,000 is planned. The features included at each level of generalization are shown in Chapter 2, Table 2.5.

Data sources

Caution

Information has been obtained from sources that are believed to be reliable. However, the accuracy of the data and their completeness cannot be guaranteed and the absence of features in the database does not mean that such features do not exist. For example, all crevasses and crevassed areas have been omitted because their extent and location are subject to natural change. Moreover, not all the map series used as source material recorded the existence of such features. While every effort has been made to provide accurate information, users should always check the ADD against the original data for verification.

The Scale0 data prepared for ADD Version 1.0 were extracted from a variety of sources (mostly maps) at different scales (Fig. 4.1) and the data merged to produce a seamless map. The database has been considerably enhanced by the incorporation of new elevation data over the Antarctic ice sheet (north of 80°S) in ADD Version 3.0. The new contours generated for the ice sheet have improved the resolution of the database overall but to avoid meaningless map products, the data should not be enlarged beyond the scale at which the source data were captured.

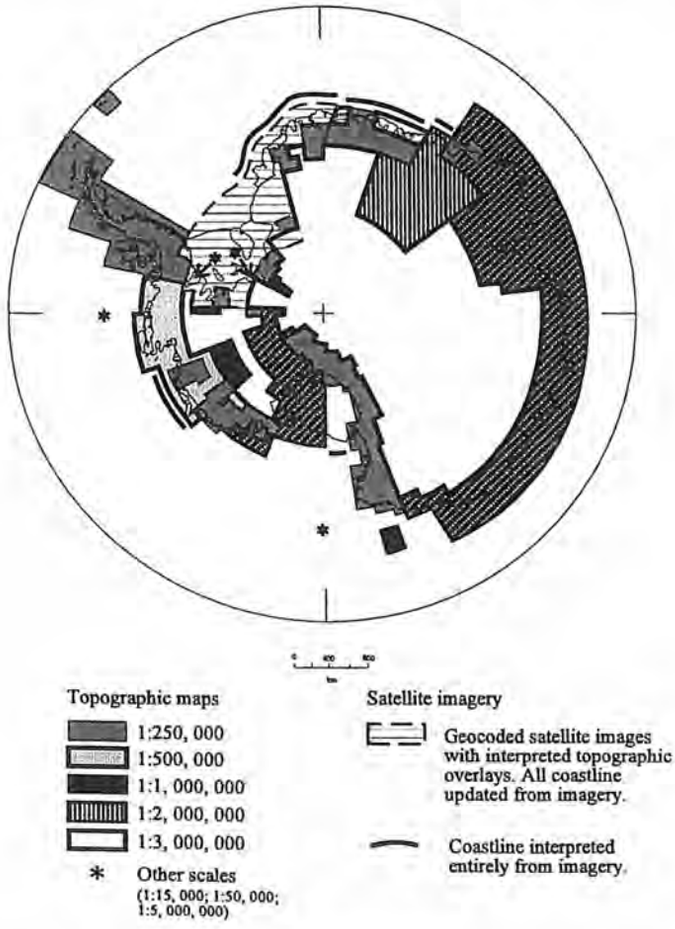


Fig. 4.1. Geographical extent of the different types of source material used in the compilation of the ADD Version 1.0, as a guide for assessing effective plotting scales for ADD Version 3.0. The resolution of the contours over the Antarctic ice sheet north of 80°S is now comparable to the 1:250,000 scale maps rather than the original 1:2,000,000 and 1:3,000,000 scale maps used in ADD Version 1.0.

International sources

ADD Version 1.0 incorporated digital data provided by eight nations and also data captured in the UK from sources published by another three nations. The sources used included map data, satellite imagery and place-names gazetteers. Place-names no longer form part of the ADD (see Chapter 1) and there are no special datasets derived from maps at scales larger than 1:200,000/1:250,000. Table 4.1 details the international effort and types of data that were combined during the preparation of ADD Versions 1.0–3.0.

Table 4.1. International effort and sources incorporated in ADD Versions 1.0–3.0

Country	*Contribution*
Argentina	Part of contour detail for James Ross Island derived from 1 map.
Australia	Digital data for 22 sheets at 1:1,000,000 scale of coastal eastern Antarctica (Enderby Land to Oates Land); part of 1 geological map of the Bunger Hills area at 1:250,000 scale digitized in the UK in 1999.
Germany	Coastal regions of Filchner and Ronne ice shelves, Coats Land and western Neuschwabenland based on 100 geocoded satellite images with topographic interpretation overlays; data captured at 1:400,000 scale. Updated from German map in UK, December 1997.
Japan	3 paper maps (1:250,000 and 1:2,000,000 scale) digitized in the UK.
New Zealand	Digitized 8 US Geological Survey sheets, at 1:250,000 scale, of northern Victoria Land.
Norway	Digital data for 32 sheets, at 1:250,000 scale of Dronning Maud Land.
Russia	Permission given for UK to digitize 13 1:1,000,000 scale and 2 1:200,000 scale Antarctic maps for the project.
UK	Digitized the following maps: 1 100,000 scale UK map of South Orkney Islands; 2 1:200,000 Russian maps of Marie Byrd Land; 54 BAS 1:250,000 sheets of the Antarctic Peninsula region and parts of Ellsworth Land and Coats Land; 70 US Geological Survey (USGS) sheets at 1:250,000 of Ellsworth Land, Marie Byrd Land and parts of the Transantarctic Mountains; 2 Japanese sheets at 1:250,000 of Dronning Maud Land; 3 USGS sheets at 1:500,000; 13 Russian sheets at 1:1,000,000 of continent and 2 US 1:1,000,000 maps of Ross Ice Shelf; 1 Japanese map at 1:2,000,000 of Dronning Maud Land; large part of interior of continent at 1:3,000,000 scale (SPRI); part of 1:2,000,000 scale German map of Filchner and Ronne ice shelves; small part of 1 Argentine Hydrographic Chart; minor parts of 1 US map at 1:5,000,000. Coastline derived from these maps amended using satellite imagery wherever possible. Also incorporated 1 UK digital 1:100,000 scale map of James Ross Island in 1998 and digitized 2 1:200 000 maps of the Theron Mountains. Glacier flow lines digitized on-screen from several USGS 1:250,000 scale DRGs of the Horlick Mountains in 1999.
USA	Supplied film positives of 78 USGS 1:250,000 scale sheets of Ellsworth Land, Marie Byrd Land and Transantarctic Mountains, to assist digitization in UK and New Zealand. Elevation data derived from BPRC DEM incorporated by UK in 1999, and data incorporated from on-line DRGs by UK in 2000.

Dates indicate when updates were made to the ADD Version 1.0 database

Map scales

The data capture programme for ADD Version 1.0 was designed for a specific time-frame, using the most appropriate map sources available for different parts of the continent. The larger-scale maps (1:200,000 to 1:250,000) provided detail for coastal regions, areas of high relief and extensive areas of exposed rock (e.g. Antarctic Peninsula, Transantarctic Mountains, parts of Dronning Maud Land and Marie Byrd Land). Data for coastal areas not covered by such maps were taken from 1:500,000, 1:1,000,000 and 1:2,000,000 scale maps, and the contoured elevation data for the continental interior from one 1:3,000,000 scale map. The distribution of the different data sources incorporated in ADD Version 1.0 is shown in Fig. 4.1.

Table 4.2 indicates the numbers of maps at different scales used by the project, and their country of origin. The total number of maps incorporated in ADD Version 3.0, either as a complete map sheet or in part only, is 220

Table 4.2. Number of map sheets used at the different scales

Scale	*Country of origin*	*No.*	*Total*
1:15,000	USA	1	1
1:100,000	UK	2	
	USA	1	3
1:200,000	Russia	2	
	UK	2	4
1:250,000	Japan	2	
	Norway	32	
	UK	54	
	USA	78	166
1:500,000	USA	3	3
1:1,000,000	Australia	22	
	Russia	13	
	USA	2	37
1:1,500,000	Argentina	1	1
1:2,000,000	Japan	1	
	Germany	1	2
1:3,000,000	UK	2	2
1:5,000,000	USA	1	1

Imagery

Many of the maps used for ADD Version 1.0 were published either before satellite imagery became available or at a time when cloud-free imagery of Antarctica had a relatively restricted geographical coverage. Wherever possible, therefore, reference was made to photographic products of satellite imagery during the editing work in the UK: these were mostly Landsat multi-spectral scanner (MSS) data but also included Landsat Thematic Mapper (TM) and Sojuzkarta. The incorporation of coastline and ice-fronts interpreted from these data sources enhanced the reliability of the map provided on the CD-ROM. Newer image sources (Landsat TM, AVHRR, ERS-1 and RADARSAT) have been used to update the position and shape of some of the ice fronts published in ADD Version 3.0 (*see* British Antarctic Survey, 2000).

While reference was made to Landsat 4 and 5 image data for parts of the coastline in ADD Version 1.0, only Landsat 1, 2 and 3 images were available for the majority of the coastal areas. A few of the images were digitally enhanced but most of the photographic prints consulted were made from unrectified raw data using band 7 of Landsat MSS (0.8-1.1 μm). Some were of poor quality, with insufficient contrast for reliable interpretation. About 5% of the coastline had no cloud-free cover at all. In cloud-covered areas it was necessary to refer back to small-scale maps, many of which were compiled from sketch maps made without ground control. Where there is control it is confined to rock outcrops. However, in places there were no outcrops within the image area and in

these cases it was necessary to mosaic two or more images together by identifying tie points in the overlap areas.

Vector data covering the Ronne and Filchner ice shelves and parts of Ellsworth Land, Coats Land and western Neuschwabenland, between 5°E and 80°W, were provided by Germany for ADD Version 1.0. These data were derived from a georeferenced raster mosaic of 100 Landsat MSS images at 1:400,000 scale. A more up-to-date interpretation has been digitized in the UK from a German map, published in 1996, based on 65 Landsat 4 and 5 MSS scenes, data from NOAA AVHRR imagery, and ERS-1 surface elevation data.

Much of the coastline of Dronning Maud Land between 5°E and 45°E was not covered by conventional, medium-scale linework maps. A coastline was prepared for ADD Version 1.0 by digitizing interpreted vector data direct from photographic products of Landsat MSS scenes, at 1:500,000 scale. Features identified on each scene and on the corresponding published maps of the area (where available) provided control for the photo-mosaic.

There has been a significant improvement in the resolution of the elevation data for the Antarctic ice sheet in ADD Version 3.0. The new data were derived from a digital elevation model prepared by the Byrd Polar Research Center, Ohio University, using mainly ERS-1 satellite radar altimetry and topographic data from ADD Version 1.0.

Other sources

During the preparation of ADD Version 1.0 reference to other sources was made where it was considered that more detail would be beneficial to the user. Such data included contour elevation for the Ross Ice Shelf (Shabtaie and Bentley, 1988), recent changes to the ice front of the Ross Ice Shelf (Keys *et al.*, 1990), and interpretation of enhanced images of Antarctica (Swithinbank, 1988). Further reference to scientific publications has been made when revising the ADD for versions 2.0 and 3.0 (e.g. Doake and Vaughan, 1991; Vaughan *et al.*, 1993; Sheraton and Tingey, 1994; Keys *et al.*, 1998; Liu *et al.*, 1999).

Bibliography

A full bibliography of the sources used for each International Map of the World (IMW) sheet and sub-sheet incorporated in the ADD is given in Chapter 5.

Editing the data

The procedures described below were developed during the production of ADD Version 1.0. New work undertaken for ADD Versions 2.0 and 3.0 followed the same methods for merging map data with map data. However, digital imagery and a DEM were available for the revisions, enabling the bulk of the new digitizing and editing to be carried out manually on-screen.

The seamless map

Because of the large size of the digital files acquired in preparing the seamless map of Antarctica for ADD Version 1.0, the data were subdivided into geographical blocks. To some extent, these blocks coincided with the geographical limits of national contributions of data. Towards the end of the ADD Version 1.0 project, the continent was divided into quadrants, to facilitate the merging of coastal data with the contour data for the interior.

Merging data

Essentially two types of data had to be merged during the preparation of ADD Version 1.0: map data at one scale with map data at another scale, and map data with image-derived data. A new form of editing was required for ADD Version 3.0, where contours derived from a DEM were merged with the existing database.

Map data with map data - After careful checking and correcting of all the data digitized from map sources in the UK, individual sheets from the same map series were edge-matched directly on screen; all feature codes were checked and recoded where necessary after edge-matching. Where the data were complex, because of the number of source maps in use at different scales, plots were prepared at a common scale, usually at 1:3,000,000. These showed where there were discrepancies in the position of coastline (grounding line/ice front) and formlines/contours derived from the different map series.

Coastline. When merging the coastline from the different map series, reference was made to photographic products of satellite images since these usually provided a more up-to-date and clearer overview of the shape and position of the coastal features.

Formlines. Point elevation data (from traverses, TWERLE balloon readings and radio-echo sounding) were used for control when repositioning formlines from the different map sources. Preference was given to data taken from either the larger-scale or more up-to-date maps.

Map data with image-derived data - The corrected map sheets were plotted at 1:1,000,000 scale on clear acetate film and overlaid on photographic prints of satellite images; some topographic features were suppressed on the plots (e.g. all but the 200 m contour) to enable detail on the imagery to be seen more easily. Film plots of several map sheets were joined to make mosaics and these were overlaid on the corresponding image mosaics. Linework interpretation of features such as grounding line, glacier margin, glacial flow lines and ice fronts were made directly on to the image scenes and these data were transferred by hand to the film overlays using headlands and rock outcrops for position control. Adjustment to scale was sometimes necessary before the new shape and position of features could be transferred to the acetate films. The revised vector data were then digitized directly from the acetate films.

After digitizing, the new and original map-derived versions were displayed together on screen and edge-matching and repositioning of contours, flow lines etc. were made digitally whenever possible. However, in complicated areas where more detailed maps (1:250,000 scale) were available, the old and new versions were plotted on film at a common scale, and the initial editing was done by conventional pen-and-ink methods. The revised linework was then digitized and merged on screen with the original digital data that did not need to be changed.

The method used to merge image-derived data for parts of the Dronning Maud Land coast that were not covered by conventional maps was similar, with on-screen editing techniques being used once the new data from the images had been digitized.

Merging ADD Version 2.0 with the BPRC DEM - New elevation data incorporated in ADD Version 3.0 were derived from the BPRC DEM (Liu *et al.*, 1999). The DEM was converted at BAS to vector contours at 50 m interval using ArcInfo software; a weed tolerance of 300 m was selected to reduce the stepping effect created during the conversion from raster data without losing the accuracy of the contour. The new contours were edited on screen against a backdrop of ADD Version 2.0 contours. The altimetry data were used by BPRC only in areas where the surface slope

was less than 0.8°, or between 0.8° and 1.0° if other data sources were sparse or of poor quality. As a guide to integrating the BPRC data with the ADD, a 0.6° slope cover was created at BAS as a backdrop to help determine where to cut and merge the two datasets. In most cases it was clear where the DEM had been generated using the ADD contours and where altimetry data had been used. Complex areas, with conflicting data or closely spaced contours, were merged manually on large-scale paper plots and the new contours digitized for final incorporation into the database.

The final edit

ADD Version 1.0 - Initial editing tasks concentrated on maps and images of the coastal regions of Antarctica, including those covering the major ice shelves. When compilation for those regions was nearing completion, work began on making the data compatible with the 1:2,000,000 and 1:3,000,000 scale contour data available for the interior of the continent.

All the data for the coastal regions were plotted on film at 1:3,000,000 scale and overlain by a 1:3,000,000 scale compilation of contoured elevation data for the whole continent (Drewry, 1983, sheet 2). Pen-and-ink editing of the contour information was then carried out to merge the larger-scale data with the small-scale dataset, control being taken from the more up-to-date point data, irrespective of scale. The new linework was digitized and then merged with the original data by on-screen editing.

All versions - Automatic data checks were carried out after all feature editing had been completed. Such checks ensure, for example, that all lines of equal elevation have been merged correctly, that lines do not cross others, and that contours crossing from ice to rock, or rock to ice, are coded correctly.

Attribute codes

Attribute codes (ADD code, height, date, text, sheet and source) were assigned to point and arc data when they were captured from the source map (see Chapter 2, Tables 2.2–2.4). Changes made to the data were coded with attributes that showed the date (revision) and person (editor) making the revisions; if a new source was used to amend the original data, this also was included in the revision attribute code. Full bibliographical details of all map sheets and comments on amendments made to them are given in Chapter 5.

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Sheraton, J.W. and Tingey, R.J. 1994. *Bedrock geology of the Bunger Hills–Denman Glacier region* (1:250 000 scale map). Canberra, Australian Geological Survey Organisation.

Swithinbank, C.W.M. 1988. Satellite image atlas of glaciers of the world: Antarctica. *US Geological Survey Professional Paper*, **1386-B**, 278 pp.

Vaughan, D.G., Mantripp, D.R., Sievers, J. and Doake, C.S.M. 1993. A synthesis of remote sensing data on Wilkins Ice Shelf, Antarctica. *Annals of Glaciology*, **17**, 211–218.

Chapter 5

Bibliography

A full bibliography of the sources used for each International Map of the World (IMW) 1:1,000,000 scale sheet incorporated in the digital map is provided below. Not only does each reference provide the bibliographical details of the original map data but also, where possible, it includes comments in square brackets on (1) how the original map was compiled, (2) what data have been used to amend the map during the preparation of ADD Version 1.0, (3) amendments made for Version 2.0, and (4) new data added in ADD Version 3.0.

The bibliography is arranged in the alphanumeric order of IMW sheet numbers. The most northerly sheets have numbers beginning with SP and those farther south are arranged in the consequential order SQ to SW. Reference to Fig. 5.1 will help in finding the IMW number for a given geographical area of interest. The convention for sheet division and numbering maps at scales of 1:500,000 and 1:250,000 is based on 4 and 16 subdivisions of the IMW sheets respectively. For example, SP 19-20/NW is the 1:500,000 scale map occupying the north-west corner of IMW sheet SP 19-20 whereas SP 19-20/1 is the 1:250,000 scale map in the same position. The sixteen 1:250,000 scale subdivisions are numbered from left to right across four rows such that SP 19-20/4 occupies the north-east corner of IMW sheet SP 19-20, and SP 19-20/13 and SP 19-20/16 are at the south-west and south-east corners respectively.

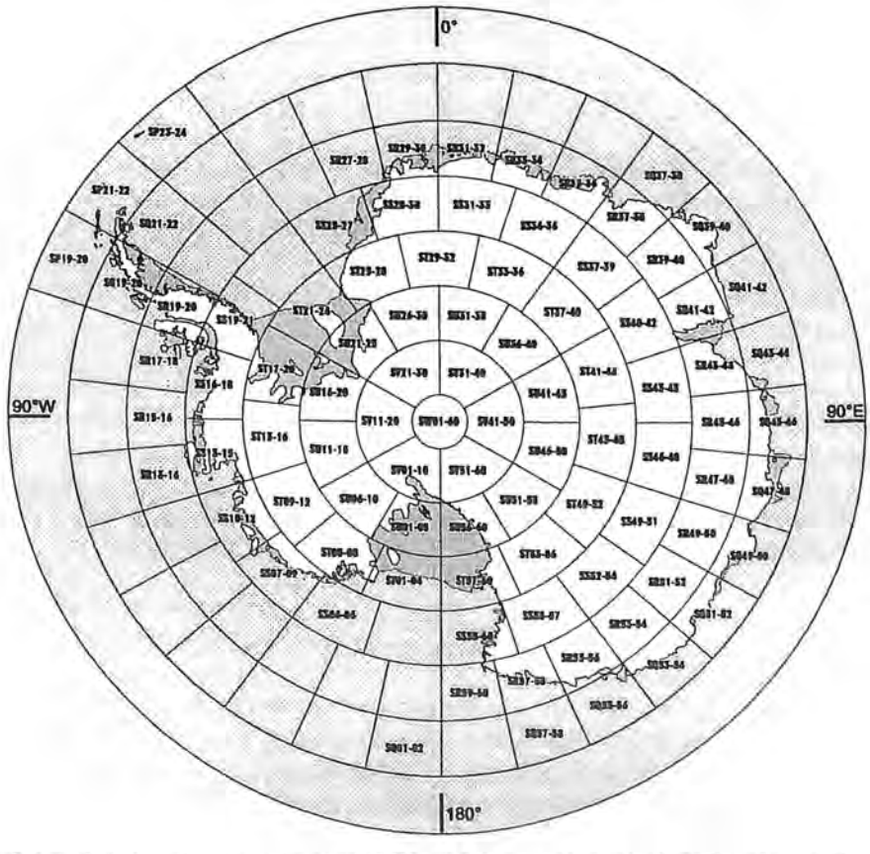


Fig. 5.1. Map of Antarctica showing the IMW sheet numbers (see also Chapter 2, Fig. 2.2).

IMW Sheets SP 19-20 to SP 23-24

See glossary in Appendix 3 for explanation of the acronyms and abbreviations used in this chapter.

SP 19–20

SP 19-20/12 (extended). Scale 1:250,000. 1977. Sheet 8, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 56.]

SP 19-20/16. Scale 1:250,000. 1978. Sheet 11, unpublished BAS sketch map by Fleming, E.A. and Thomson, J.W. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) i. Position of Smith and Low islands plotted using enlarged Landsat-1 imagery in conjunction with Admiralty Chart 3205. Relative positions of Hoseason, Trinity and Intercurrence islands based on DOS unpublished sheet W63 60 and adjusted to position of Trinity Peninsula and northern tip of Brabant Island. Map extended (by FIDASE PLDs) from published sheets BAS 250 SQ 19-20/4 and SP 21-22/13. ii. Detail sketched from air photography (PLDs). iii. Height sketch lines from PLDs using approximate heights known for peaks on Smith and Trinity islands. Deception Island from DOS 610, W 6260. (2) Trinity, Hoseason, Intercurrence and Liège islands redrafted using Landsat 233/105 (E1532-12311, Jan. 74) and reference to PLDs 28, 30, 31 by H. Rogers, Jan. 1990 and S.R. Jordan, Nov. 1990. Coastline adjusted by J.W. Thomson from Landsat image E30352-12180; formlines correspondingly adjusted by S.R. Jordan, Jan. 1991.]

SP 21–22

SP 21-22/6. Scale 1:250,000. 1978. Sheet 7, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W61 54 (extended).]

SP 21-22/9. Scale 1:250,000. 1977. Sheet 9, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 58.]

SP 21-22/10. Scale 1:250,000. 1977. Sheet 10, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on photographically reduced version of 1:200,000 scale map in DOS 610 series, Sheet W62 60.]

SP 21-22/13. Scale 1:250,000. 1978. Sheet 12, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on BAS 250 series, Sheet SP 21-22/13. (2) Coastline in SW of map [Cape Kater to Cape Roquemaurel] adjusted by J.W. Thomson from Landsat image E30352-12180, Jan. 1991. Formlines and outcrop positions correspondingly adjusted by S.R. Jordan, Feb. 1991. (3) James Ross Island and Vega Island data derived from these sources now excluded (see Part SP 21-22/13).]

Part **SP 21-22/13**. Scale 1:100,000. 1995. James Ross Island. BAS 100 Series, Sheet 2. British Antarctic Survey. (Lambert Conformal Conic, standard parallels 60°40'S, 63°20'S)
[(1) Map data derived from multiple sources including vertical and oblique aerial photography and digital Landsat satellite imagery (Feb. 1977 and Feb. 1988). Contours adjusted from existing map sources (see compilation details on original map). (3) All layers of data incorporated into ADD by S.D. Evans, 1998 from original ARC/INFO coverages.]

SP 21-22/14. Scale 1:250,000. 1978. Sheet 13, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on BAS 250 series, Sheet SP 21-22/14.]

SP 23–24

SP 23-24/1,2. Scale 1:250,000. 1979. Sheet 6, unpublished BAS sketch map by Harris, J.S. and Thomson, J.W. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail from Landsat image E30308-11305 (1979), 1:100,000 DOS 510 series, South Orkney Islands (West sheet) (1963), and Admiralty Chart 1775 (South Orkney Islands), 1:200,000 (1967). Additional detail for Laurie Island from photographs in reports and from field sketch maps. (2) BAS 100 Series, South Orkney Islands, East sheet (provisional) (1988) incorporated by S.R. Jordan, April 1991.]

IMW Sheets SQ 1-2 to SQ 57-58

SQ 1–2

[**SQ 1-2**]. Scale 1:15,000. 1962. Scott Island and approaches. Hydrographic Chart, Map H.O. 6668. US Navy, Hydrographic Office. (Mercator)
[(1) Only information for Scott Island used in database; original compilation based on British National Antarctic Expedition, 1902-1903, and US Navy surveys in 1960 and 1961.]

SQ 19–20

[**SQ 19-20**].See sub-sheets below for details of the source material used for the compilation of Version 1.0.
[(2) Ice front from Jason Peninsula south to Ewing Island interpreted from NOAA AVHRR image (23 Jan. 90). (4) Larsen Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray, and a small ice rise south of Jason Peninsula incorporated, taken from the RAMP mosaic. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 19-20/3. Scale 1:250,000. 1978. Sheet 14, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) i. Position fitted to BAS ground control and adjacent BAS 250 series, Sheet SQ 19-20/14. ii. Detail sketched from air photography and exploratory survey. iii. Formlines interpolated from DOS 610 series, Sheet W64 62 (1956).]

SQ 19-20/4. Scale 1:250,000. 1978. Sheet 15, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Rock outcrops taken from BAS 250 series, Sheet SQ 19-20/4 with amendments from geologists' maps: M. Fleet, G.J. Hobbs, S.M. West, Alarcón et al., Clarkson et al. (2) Mainland coastline in NE of map adjusted by S.R. Jordan, Nov. 1990 using Landsat 233/105 (E1532-12311, Jan. 74) and 232/105 (E30352-12180) and corresponding adjustments to formlines with reference to FIDASE PLDs 28, 30, 31. (3) Larsen Ice Front up-dated by S.D. Evans in 1998 using ERS-1 image (21 March 1997).]

SQ 19-20/6,7. Scale 1:250,000. 1979. Sheet 17, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) DOS 610 series, Sheet W65 64 adjusted to WGS 72 co-ords; area west of 66°W from Landsat image E1209-12413 and FIDASE PLDs. Renaud Island adjusted using Landsat E1209-12413. Height from DOS 610 series, Sheet W65 64, image E1209-12413 (65°55'S 64°07'W).]

SQ 19-20/8. Scale 1:250,000.1979. Sheet 18, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Landsat images E30244-12184, E1532-12314, E1173-12403. Eastern coastline from: APC sheet W65 62, RDFO sheet W65 60 and TMA aerial photographs 2158 F33, 2143 F33, 2147 F31 and 2152 (all). Formlines: Western half sketched from images, eastern half from APC and RDFO sheets, adjusted using images. Coastline of Beascochea Bay amended by J.W. Thomson, Feb. 1983, from Landsat E30244-12184. (2) Eastern mainland coast and outcrops adjacent to coast amended by J.W. Thomson and S.R. Jordan from image E50730-1230 (Mar. 86) in Oct. 1991. (3) Larsen Ice Front up-dated by S.D. Evans in 1998 using ERS-1 image (21 March 1997).]

SQ 19-20/10. Scale 1:250,000. 1979. Sheet 19, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Landsat images E1209-12413, E30283-12360. Weertman Island and adjacent Adelaide Island coast from RDFO sheet W66 66. Positions of some small islets in Crystal Sound from D.C. Goldring (BAS geologist), unpublished map. Formlines based on RDFO sheets W66 66 and W66 68. (2) Southern half revised by A.J. Fox, March 1990. Planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73) and E30299-12550 (Dec. 78). Detail from aerial photography: FIDASE (26/FID/62, 63, 66, 67, 69–71, 86–88), TMA (2160, 2161, 2164, 2166), BAS (8/86), RARE (M-5).]

SQ 19-20/11. Scale 1:250,000. 1979. Sheet 20, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Western half of sheet: coastal and exposure detail from image E1209-12413, formlines based on RDFO W66 64 and DCS 601 adjusted using imagery and TMA photos. Eastern half of sheet: position control from image E1173-12410, coastal and exposure detail from TMA photos. NE corner: formlines based on RDFO sheets W66 62, W66 64 and fig 2 in A.F. Marsh, Univ. of Birmingham Ph.D. thesis, 1968. SE corner: formlines based on RDFO W66 64 (see Fig. 2 in G.M. Stubbs, Univ. of Birmingham Ph.D. thesis, 1968. (2) Southern half of map revised by A.J. Fox, March 1990 with further amendments in July 1991: planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73) and E50730-12310 (Mar. 86); detail from aerial photography: FIDASE (26/FID/71, 83, 84, 86–88), TMA (2138–2142), BAS (5/86), RARE (M-4, M-6).]

SQ 19-20/12. Scale 1:250,000. 1979. Sheet 21, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Position in NW corner based on RDFO Sheet 66 62 and Fig. 2 in A.F. Marsh, Univ. of Birmingham Ph.D. thesis, 1968, adjusted using TMA photography. SW corner from RDFO sheet W66 62 adjusted using TMA photography. Eastern half from RDFO W65 60 and W66 60, with limited position control from Landsat E30244-12184, adjusted using TMA photography. Additional exposure detail taken from TMA photography. (2) Sheet revised by A.J. Fox, July 1991 using enlarged Landsat imagery E50730-12301 (Mar. 86) and E50730-12304 (Mar. 86), and with reference to TMA sorties 2143, 2149, 2150, 2152, 2159, 2187. (3) Larsen Ice Front up-dated by S.D. Evans in 1998 using ERS-1 image (21 March 1997).]

SQ 19-20/14. Scale 1:250,000. 1979. Sheet 22, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) From BAS 250P series, Sheet SQ 19-20/14: Landsat images E1532-12323, E2405-12375, E1535-12491 and E1209-12413. Control by triangulation and EDM traversing by BAS (1957-75) and geoceiver fixes, 1976. Detail from FIDASE aerial photography. (2) Sheet completely updated by A.J. Fox, April 1990. Planimetry from enlarged Landsat imagery E1532-12323 (Jan. 74), E30299-12250 (Dec. 78), E50730-12304 (Mar. 86), E50735-12490 (Mar. 86) and E50735-12493 (Mar. 86). Detail from aerial photography: FIDASE (26/FID/62, 63, 66, 67, 69–71, 86–88), IfAG (02-22 to 02-26, 03-31 to 03-37, 04-38, 05-48), TMA (2160, 2161, 2163–2166), BAS (6/86, 7/86), RARE (M-2, M-5).]

SQ 19-20/15. Scale 1:250,000. 1979. Sheet 23, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Western half of map from BAS 250P series, Sheet SQ 19-20/14 (Ext) and images E1173-12410, E1532-12323 and E1209-12413, with formlines adjusted from APC W67 66 and unpublished maps by A.K. Hoskins and D.C. Goldring (BAS geologists); outcrop detail from images. Eastern half based on Fig. 2 in G.M. Stubbs, Univ. of Birmingham Ph.D. thesis, 1968, adjusted using image E1173-12410, RDFO sheet W67 64 and TMA aerial photography; also incorporates unpublished DOS map EW 1000A/84 by R. Barrett. (2) Sheet completely updated by A.J. Fox, April 1990. Planimetry from enlarged Landsat imagery E1209-12413 (Feb. 73), E50735-12493 (Mar. 86), E50730-12310 (Mar. 86), E30299-12250 (Dec. 78). Detail from aerial photography: FIDASE (26/FID/63, 69–71, 86–88), IfAG (04-38, 04-39, 05-49), TMA (1812, 1813, 1822, 1843, 2141, 2142), RARE (M-2, M-6).]

SQ 21–22

[SQ 21–22]. See sub-sheets below for details of the source material used for the compilation of Version 1.0.

[(4) Larsen Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 21-22/1,2. Scale 1:250,000. 1978. Sheet 16, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Position: as BAS 250 series, Sheet SQ 21-22/14 (from triangulation and sledge-wheel and compass traverses). Detail of mainland from BAS 250 sheet (from TMA, FIDASE, AAEE photography). Height of mainland - photogrammetric. (2) i. Formlines in NW adjusted by S.R. Jordan, Feb. 1991 to correspond with coastline and formline adjustments from satellite imagery on adjacent sheets 11 and 12 using Landsat E30352-12180 and E1532-12311. ii. Prince Gustav Channel and mainland coastline redrafted by J.W. Thomson and S.R. Jordan, July 1991 using 1:250,000 photo of Kosmos satellite image (Kate-200, No. 0596, F200,360 0596 61739378-II). (3) Data for James Ross, Seymour and Snow Hill islands taken from "James Ross Island", BAS 100 Series, Sheet 2, 1995. i. Map data derived from multiple sources including vertical and oblique aerial photography and digital Landsat satellite imagery (Feb. 1977 and Feb. 1988). Contours adjusted from existing map sources (see compilation details on original map. ii. All layers of data incorporated into ADD from original ARC/INFO coverages by S.D. Evans in 1998.]

SQ 21-22/5. Scale 1:250,000. 1979. Sheet 18a, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Seal Nunataks: Landsat images E30244-12184, E2740-11461, RDFO sheets W65 60, W65 58, formlines from RDFO sheets. Jason Peninsula: coastline and formlines based on RDFO sheet W65 60 and adjusted using TMA photographs. Exposure detail from TMA photographs. (2) Jason Peninsula, Seal Nunataks, Robertson Island and ice front positions adjusted using Landsat E50730-12301 (Mar. 86) by J.W. Thomson and S.R. Jordan, Oct. 1991. (3) Larsen Ice Front up-dated by S.D. Evans in 1998 using ERS-1 image (21 March 1997).]

SQ 37–38

SQ 37-38. Scale 1:1,000,000. 1974. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) i. Part of map replaced by Japanese 1:250,000 scale map of Prince Olav Coast, 1990. ii. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1525-04593 (Dec. 73) and E1490-05055 (Nov. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

Parts **SQ 37-38/15** and **SR 37-38/3.** Scale 1:250,000. 1990. Prince Olav Coast. Geographical Survey Institute, Japan. (Lambert Conformal Conic, standard parallels 68°S, 70°S)
[(1) Prepared by reducing 1:25,000 scale maps compiled from JARE air photography and ground control 1957-62. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. Coastline amended by C.W.M. Swithinbank, 1992 using Landsat E1528-05164 (Jan. 74).]

SQ 38–39

SQ 38-39/11. Scale 1:250,000. 1963. Mount Riiser-Larsen, Enderby Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal control obtained by Australian National Antarctic Research Expeditions 1956-1958, with additional information from USSR Hydrographic Chart No. 5594. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 38-39/12 (extended). Scale 1:250,000. 1964. Mount Codrington and Proclamation Island, Enderby Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal control obtained by Australian National Antarctic Research Expeditions 1956-60, with additional information from the British, Australian and New Zealand Antarctic Research Expedition 1929-30. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 38-39/16. Scale 1:250,000. 1964. McLeod Nunataks, Enderby Land. Division of National Mapping. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography, with horizontal and vertical control obtained by Australian National Antarctic Research Expeditions 1956-60. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 39–40

SQ 39-40. Scale 1:1,000,000. 1969. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1490-05055 (Nov. 73), E1525-04593 (Dec. 73) and E1525-04590 (Dec. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 40–41

SQ 40-41/14. Scale 1:250,000. 1966. Law Promontory, Kemp Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography, horizontal control and other information obtained by Australian National Antarctic Research Expeditions 1954-56-59-60-61-65 and United States trimetrogon air photography 1947. Contours are derived from oblique photo measurements controlled by radar altimeter and surface barometric heights. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 40-41/15 (extended). Scale 1:250,000. 1964. Mawson and Mount Twintop, Mac. Robertson Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Compiled from trimetrogon air photography and horizontal and vertical control obtained by Australian National Antarctic Research Expeditions 1954-1962, with some additional information from United States trimetrogon air photography 1947. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 41–42

SQ 41-42. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels, 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1137-04053 (Dec. 72), E1137-04051 (Dec. 72) and E1242- 03484 (Mar. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 43–44

SQ 43-44. Scale 1:1,000,000. 1969. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images

E1142-02510 (Dec. 72), E1176-0239 (Jan. 73) and E30933-02152 (Sept. 80). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 45–46

SQ 45-46. Scale 1:1,000,000. 1969. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E30933-02152 (Sept. 80) bands B, C and D, E1480-02245 (Nov. 73), E1207-02103 (Feb. 73) and E1584-01593 (Feb. 74). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 47–48

SQ 47-48. Scale 1:1,000,000. 1969. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1129-01353 (Nov. 72), E1132-01531 (Dec. 72), E1449-01103 (Oct. 73), E1469-01214 (Nov. 73) and E1580-01364 (Feb. 74). (4) Queen Mary Coast and Shackleton Ice Shelf digitized from AGSO 1:250,000 geological map: Bedrock geology of the Bunger Hills–Denman Glacier region (1994) by O.J. Cottray, 1999. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 49–50

SQ 49-50. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1178-01064 (Jan. 73), E1192-00441 (Jan. 73), E1460-00300 (Oct. 73), E1482-00530 (Nov. 73), E1209-00384 (Feb. 73) and E2415-23548 (Mar. 76). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 49-50/9. Scale 1:250,000. 1969. Vincennes Bay, Wilkes Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Vertical and oblique air photography: Australian National Antarctic Research Expeditions 1956, 1962, 1963 and United States Navy 1947. Horizontal and vertical control: ANARE surveys 1956, 1959-60, 1962-65 with additional heights obtained by radar altimeter 1962-63. United States surveys 1948, 1957-58. Selected heights from USSR 1:200,000 series sheets: SQ-49-XIX, XX; SQ-49-XXV, XXVI; SQ-49-XXI, XXII, published 1963. (2) Map used only for interpretation of formline detail across rock outcrops.]

SQ 51–52

SQ 51-52. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1149-00041 (Dec. 72), E1466-23270 (Nov. 73), E1468-23383 (Nov. 73), E1469-23441 (Nov. 73) and E1543-23542 (Jan. 74). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal

resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 53–54

SQ 53-54. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1190-22551 (Jan. 73), E1210-23065 (Feb. 73), E1224-22440 (Mar. 73), E1464-23153 (Oct. 73) and E1466-23270 (Nov. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 55–56

SQ 55-56. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 64°40'S, 67°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1224-22440 (Mar. 73), E1509-22233 (Dec. 73) and E1509-22240 (Dec. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SQ 57–58

SQ 57-58. Scale 1:1,000,000. 1966. Oceanic islands: Map X. Balleny Islands, Atlas Antarctica, I, Bakayev, V.G. (ed.). Main Administration of Geodesy and Cartography, USSR.
[(1) Compiled from US Navy Hydrographic Chart No. 6645, 1:1,500,000 (1961) and USSR Chart No. 5996, 1:2,500,000 (1961).]

IMW Sheets SR 13-14 to SR 59-60

SR 13–14

Parts **SR 13-14 & SS 13-15**. Scale 1:500,000. 1968. Antarctica sketch map, Thurston Island-Jones Mountains. US Geological Survey. (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1960-1961; compiled in 1967 from US Navy tricamera aerial photography 1966. (2) i. Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Further adjustments to formlines by C.W.M. Swithinbank, 1990, S.R. Jordan and J.W. Thomson, 1991. ii. Coastline adjustments by C.W.M. Swithinbank, 1990 using Landsat images 001/112 (E1191-14264, 30 Jan. 73), 249/111 (E1134-14091, 4 Dec. 72), 243/112 (E1182-13345, 21 Jan. 73), 247/112 (E1168-13574, 7 Jan. 73), 002/111 (E1174-14314, 13 Jan. 73), 247/111 (E1168-13572, 7 Jan. 73), 246/114 (E1185-13530, 24 Jan. 73) and 248/114 (E1205-14044, 13 Feb. 73). iii. Thurston Island coastline prepared by A.J. Fox in 1990 using Landsat images E1174-14314 (13 Jan. 73), E1191-14264 (30 Jan. 73), E1134-14091 (4 Dec. 72) and E1168-13572 (7 Jan 73), as used in the compilation of Thurston Island-Thwaites Glacier area, Antarctica, satellite image map, 1:1,000,000, US Geological Survey 1972-1974; formlines compiled by S.R. Jordan, 1991. iv. Adjustment of formlines in the Jones Mountains area by J.W. Thomson and S.R. Jordan, 1991; amendments to outcrops and formlines by B.C. Storey (BAS), 1992, from local field knowledge. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 15-16

SR 15-16. Scale 1:50,000. 1988. Peter I Øy. Norsk Polarinstitutt topographic map (Universal Transverse Mercator)

[(1) Photogrammetric compilation from air photographs dated 1987. (2) Simplified version of map at 1:100,000 (LeMasurier and Thomson, 1990, Antarctic Research Series, **48**, American Geophysical Union, fig. F.11.1) used for database.]

SR 17-18

[**SR 17–18**]. See sub-sheets below for details of the source material used for the compilation of Version 1.0. [(4) Wilkins Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 17-18/7,8. Scale 1:250,000. 1978. Sheet 27, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Outline of Charcot Island from interpretation by R.D. Crabtree (BAS) on 1:500,000 scale print of Landsat image E11211-12541; formlines from APC sheet W69 74. (3) Position of Wilkins Ice Front interpreted by S.D. Evans, 1998 from ERS-1 images (22 Mar. 95, 15 Jan. 97).]

SR 17-18/11,12. Scale 1:500,000. 1978. Sheet 32a, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Compiled at 1:500,000 from Landsat image E1139-12541. (3) Position of Wilkins Ice Front interpreted by S.D. Evans, 1998 from ERS-1 images (27 Feb. 92, 22 Mar. 95, 15 Jan. 97) and Landsat TM 221/109 (42752-13022, 27 Jan. 90).]

SR 17-18/15,16. Scale 1:250,000. 1978. Sheet 36, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P series, sheet SR 17-18/15,16 (plan as extended from Sheet 37). Height from EW 1000A/204 (BAS Archives map). (3) Position of Wilkins Ice Front interpreted by S.D. Evans, 1998 from Landsat TM image 221/109 (42752-13022, 7 Jan. 90).]

SR 19-20

[**SR 19-20**]. See sub-sheets below for details of the source material used for the compilation of Version 1.0. [(2) Ice front from Jason Peninsula south to Ewing Island interpreted from NOAA AVHRR image (23 Jan. 90). (4) George VI Ice Front and Larsen Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 19-20/1. Scale 1:250,000. 1978. Sheet 24, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Based on northern part of BAS 250P series, Sheet SR 19-20/5 [extended]. (4) Position of Flyspot Rocks interpreted by O.J. Cottray, 1999, from Institut für Angewandte Geodäsie georeferenced Landsat TM mosaic of the Antarctic Peninsula, image 220/108 50735-12433 (6 Mar. 86).]

SR 19-20/2. Scale 1:250,000. 1979. Sheet 25, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Outline and detail from BAS 250P series, Sheet SR 19-20/2. Additional detail from unpublished map by H.M. Fielding (BAS Archives, 1:100,000 map EW 1000A/162). Formlines from Fig. 2, R.B. Wyeth, BAS Bulletin, No. 46 (adjusted). (2) NW edge revised by A.J. Fox, April 1991. Planimetry from enlarged Landsat imagery E50735-12493 (Mar. 86) and E30299-12250 (Dec. 78). Reference to Institut für Angewandte Geodäsie photo sorties 04/38, 04/39, 05/48–05/50 (Feb. 1989).]

SR 19-20/3. Scale 1:250,000. 1979. Sheet 26, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and rock outcrop detail from US Geological Survey 1:500,000 sketch map "Northern Palmer Land", adjusted using image E1532-12323. Formlines from Fig. 2, R.B. Wyeth, BAS Bulletin No. 46

(adjusted), and Fig. 2, A.G. Fraser and P.H. Grimley, BAS Scientific Reports No. 67. Detail in N from Fig. 2, G.M. Stubbs, Univ. of Birmingham Ph.D. thesis, 1968. (2) Kenyon Peninsula redrawn by A.J. Fox, April 1991 from enlarged Landsat imagery E50730-12310 (Mar. 86) and with reference to TMA sorties 1816–1818, 1825.]

SR 19-20/5,6. Scale 1:250,000. 1978. Sheet 28, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/5; west of 72°30'W from image E1535-12500 and 1:125,000 map by B. Care (BAS geologist), formlines sketched from BAS Archives map EW 1000A/205 and RDFO W69 70. Rothschild Island from B. Care's 1:125,000 map. Additional information from Landsat E30335-12255. (2) Adjustments to edge match with changes made to Sheet 32 by A. Perkins (BAS), July 1991. (3) Position of Wilkins Ice Front interpreted by S.D. Evans, 1998 from ERS-1 image (22 Mar. 95). (4) Position of Burkitt Nunatak and Wade Ice Rise interpreted by O.J. Cottray, 1999, from Institut für Angewandte Geodäsie georeferenced Landsat TM mosaic of the Antarctic Peninsula, image 218/109 42411-12441 (20 Feb. 89).]

SR 19-20/6. Scale 1:250,000. 1978. Sheet 29, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Position and detail from BAS 250P, Sheet SR 19-20/6. Height (sketchlines) for Alexander Island from DOS 610 W69 70 with W69 68. Palmer Land (69°-69°50'S, 67°-63°10'W) from R.B. Wyeth, BAS Bulletin, No. 46, elsewhere from BAS Archives map EW 1000A/180. (2) Updated from Landsat E30335-12253 and E30335-12255 (Feb. 79) by J.W. Thomson, Sept. 1990. (3) Parts of sheet (Mount Edgell, Bristly Peaks and Crescent Scarp) remapped by M.L. Gray, April 1996. Planimetry and position of Wordie Ice Front from Landsat TM 218/109 (42411-12441, Feb. 89). Detail from BAS photography (7/93, 13/93, 3/95, 7/95). Data incorporated into ADD from original ArcInfo coverages by S.D. Evans, 1998.]

SR 19-20/7. Scale 1:250,000. 1979. Sheet 30, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coast and exposure detail: W of 66°W from BAS 250P series, Sheet SR 19-20/6 and Landsat images E1532-12325 and E2291-12054. E of 66°W from US Geological Survey sketch map "Northern Palmer Land" (adjusted) and images as above (Eternity Range adjusted using BAS geological sources). Formlines adjusted from R.B. Wyeth, Fig. 2, BAS Bulletin, No. 46.]

SR 19-20/8. Scale 1:250,000. 1979. Sheet 31, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Positioning from Landsat image E2291-12054 and Geoceiver stations. Coastline, ice front and exposure detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" (adjusted using TMAs). Formlines from APC sheet W69 62 (adjusted using TMAs). Ewing Island positioned from NOAA satellite image of Antarctic Peninsula (1973). (3) Position and detail of Gipps Ice Rise interepreted by S.D. Evans, May 1998 from Landsat TM 215/108 (42022-12162, 28 Jan. 88).]

SR 19-20/9. Scale 1:250,000. 1978. Sheet 32, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/9 (edn 1) with additional detail from Landsat E30335-12255 (added in 1979). Formlines from DOS 1:200,000 maps, BAS Archives map EW 1000A/205, and R. Burns (BAS geologist) field map adjusted to satellite image and BAS 250P. (2) Coastline and outcrop positions corrected by A. Perkins, July 1991 using Landsat E30335-12255 (Feb. 79). Corrections to Colbert Mountains using BAS photography (Misc/91/10, Misc/91/11) and field knowledge from J. McCarron (BAS geologist).]

SR 19-20/10. Scale 1:250,000. 1978. Sheet 33, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail and plan from BAS 250P, Sheet SR 19-20/10. Height for Alexander Island from APC W70 68, and for Palmer Land from BAS Archives map EW 1000A/180, with minor additions from APC W70 66.

(2) Formlines and outcrops at western boundary adjusted in accordance with repositioning on Sheet 32. Palmer Land outcrops still poorly positioned (Aug. 1991).]

SR 19-20/11. Scale 1:250,000. 1979. Sheet 34, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposure detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land", adjusted using BAS geological sources, and TMA photographs. Formlines W. of 64°W based on BAS Archives map EW 1000A/180 adjusted using TMAs, and E. of 64°W sketched from TMAs, geophysical height data and map by J. Yates in J.F. Anckorn, BAS Field Report G4/1973/E (unpublished).]

SR 19-20/12. Scale 1:250,000. 1979. Sheet 35, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) BAS 250 series, sheet SR 19-20/12, some small exposures at western limit of sheet from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land".]

SR 19-20/13. Scale 1:250,000. 1978. Sheet 37, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/13 with Landsat E30299-12261 and E30335-12255. Height from BAS Archives map EW 1000A/204. (2) Adjusted by S.R. Jordan, July 1991, at northern limit, to correspond with corrections to Sheet 32 (*see* SR 19-20/9).]

SR 19-20/14. Scale 1:250,000. 1978. Sheet 38, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Planimetry and detail from BAS 250P, Sheet SR 19-20/14 and Landsat image E30335-12255. Height for Alexander Island from EW 1000A/205 (with additions from DOS 610 Sheet W71 68), and for Palmer Land from BAS Archives map EW 1000A/180. (2) Adjustments made by S.R. Jordan, July 1991, at northern limits to correspond with corrections made to Sheet 32 (*see* SR 19-20/9).]

SR 19-20/15. Scale 1:250,000. 1978. Sheet 39, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Plan and detail from BAS 250P, Sheet SR 19-20/14 and US Geological Survey 1:500,000 sketch map "Northern Palmer Land". Height from BAS Archives map EW 1000A/180, USGS sketch map, and BAS geophysical height data.]

SR 19-20/16. Scale 1:250,000. 1979. Sheet 40, unpublished BAS sketch map by Fleming, E.A. and Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) East of 63°W: BAS 250, Sheet SR 19-20/16. West of 63°W: US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" (enlarged) and fitted to control. Additional exposure from BAS geological sources. Formlines sketched from USGS map using BAS geophysical height data for guidance.]

SR 27-28

SR 27-28 [on SR 29-30 extended]. Scale 1:1,000,000. 1991. Ekströmisen. Topographic map, preliminary edition digital data. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (4) Contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SR 29-30

[SR 29-30]. Scale 1:6,000,000. 1983. Sheet 2, Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(1) Formlines on 1:3 million scale compilation for Sheet 2 used for database and adjusted to new coastline data. Formlines merged where map replaced by Norwegian 1:250,000 scale maps, Sheets F5 and G5. (2) Grounding line, glacier margins and flowlines, and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see Topographic map, preliminary edition digital data, 1:1,000,000 scale, Sheet

SR 29-30). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 29-30/15. Scale 1:250,000. 1962. Giaeverryggen, Maudheimvidda. Dronning Maud Land, Map F5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique air photography 1951-1952. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline, grounding line, flowlines and glacier margins supplied by Institut für Angewandte Geodäsie.]

SR 29-30/16. Scale 1:250,000. 1961. Ahlmannryggen, Maudheimvidda. Dronning Maud Land, Map G5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Coastline, grounding line, flowlines and glacier margins supplied by Institut für Angewandte Geodäsie.]

SR 31-32

SR 31, 32. Scale 1:1,000,000. 1976. Novolazarevskaja. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(2) Only the elevation details for the northern part of this map sheet have been incorporated in the database. i. New formlines constructed by J.W. Thomson, 1992 to merge with those from adjacent Norwegian 1:250,000 scale maps, Sheets H5, J5, K5 and L4. ii. Coastline, grounding line and flowlines between 0° and 3°30'E supplied by Institut für Angewandte Geodäsie. Coastline, grounding line and flowlines between 3° and 12°E interpreted from satellite imagery by C.W.M. Swithinbank, 1992 using Landsat E2278-07250 (Oct. 75), E1478-07247 (Nov. 73), E1499-07413 (Dec. 73), E2306-06391 (Nov. 75), E2382-07005 (Feb. 76), E2278-07253 (Oct. 75), E2308-06502 (Nov. 75) and E2279-07311 (Oct. 75). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 31-32/12. Scale 1:250,000. 1973. Schirmacheroasen, Fimbulheimen/Prinsesse Astrid Kyst. Dronning Maud Land, Map L4. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography, 1958-59. (2) Coastline, grounding line and flowlines amended by C.W.M. Swithinbank, 1992 using Landsat images E1478-07242 (Nov. 73), E2306-06391 (Nov. 75), E2382-07005 (Feb. 76) and E2308-06502 (Nov. 75).]

SR 31-32/13. Scale 1:250,000. 1961. Jutulgryta, Fimbulheimen. Dronning Maud Land, Map H5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Coastline and grounding line supplied by Institut für Angewandte Geodäsie.]

SR 31-32/14. Scale 1:250,000. 1966. Mühlig-Hofmannfjella Nord, Fimbulheimen. Dronning Maud Land, Map J5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59.]

SR 31-32/15. Scale 1:250,000. 1984. Filchnerfjella Nord (Fimbulheimen). Dronning Maud Land Landsat Satellite Map, Map K5. Norsk Polarinstitutt.
[(1) Test map compiled from: i. Landsat E1133-0710203 (Dec. 72). ii. Norsk Polarinstitutt: Dronning Maud Land 1:250,000 K5 Filchnerfjella Nord.]

SR 31-32/16. Scale 1:250,000. 1968. Humboldtfjella. Dronning Maud Land, Map L5. Norsk Polarinstitutt.

[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59.]

SR 33-34

[**SR 33-34**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) i. 1:3 million scale compilation used for database with amendments to merge formlines with those on Norwegian 1:250,000 scale maps, Sheets M4, N5, P5 and Q5. ii. Coastline, grounding line and flowlines interpreted from satellite imagery by C.W.M. Swithinbank, 1992 using Landsat E2306-06385 (Nov. 75), E2308-06495 (Nov. 75), E2270-06385 (Oct. 75), E1164-06410 (Jan. 73), E1487-06324 (Nov. 73), E1485-06214 (Nov. 73), E1485-06212 (Nov. 73), E1483-06095 (Nov. 73), E1483-06092 (Nov. 73), E1212-06072 (Feb. 73), E1480-05530 (Nov. 73), E2306-06301 (Nov. 75), E2308-06052 (Nov. 75), E1479-05465 (Nov. 73) and E1480-05524 (Nov. 73). iii. Elevation detail for area to north of Norwegian maps taken from USSR 1:1 million scale map, Sheet SR 33, 34 (1976). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 33-34/9. Scale 1:250,000. 1973. Starheimtind, Fimbulheimen/Prinsesse Astrid Kyst. Dronning Maud Land, Map M4. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation and oblique aerial photography 1958-60. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline, grounding line and flow lines amended by C.W.M.Swithinbank, 1992 using Landsat images E2306-06385 (Nov. 75), E2308-06495 (Nov. 75), E2306-06391 (Nov. 75) and E2308-06502 (Nov. 75).]

SR 33-34/13. Scale 1:250,000. 1968. Wohlthatmassivet, Fimbulheimen. Dronning Maud Land, Map M5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-60.]

SR 33-34/14. Scale 1:250,000. 1975. Forposten, Fimbulheimen. Dronning Maud Land, Map N5. Norsk Polarinstitutt.
[(1) Triangulation and other field work: the Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SR 33-34/15. Scale 1:250,000. 1988. Einsteten, Sør-Rondane. Dronning Maud Land, Map P5. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land-Enderby Land map (1988), National Institute of Polar Research, Japan.]

SR 33-34/16. Scale 1:250,000. 1988. Utsteinflya, Sør-Rondane. Dronning Maud Land, Map Q5. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

SR 35-36

[**SR 35-36**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) i. 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets R5 and S5. Amendments made also to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. ii. Exposed rock in the Yamato Mountains taken from USSR 1:1 million scale map,

Sheet SR 35, 36 (1976). iii. Coastline interpreted from satellite imagery by C.W.M. Swithinbank, 1992 using Landsat E1478-05404 (Nov. 73), E1479-05463 (Nov. 73), E1479-05465 (Nov. 73), E1480-05524 (Nov. 73) and E1490-05055 (Nov. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 35-36/13. Scale 1:250,000. 1988. Byrdbreen, Sør-Rondane. Dronning Maud Land, Map R5. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land-Enderby Land map (1988), National Institute of Polar Research, Japan.]

SR 35-36/14. Scale 1:250,000. 1988. Balchenfjella Nord, Sør-Rondane. Dronning Maud Land, Map S5. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

SR 37-38

SR 37-38. Scale 1:1,000,000. 1974. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Parts of map replaced by Japanese 1:250,000 scale maps of Lützow-Holm Bay (1989) and Prince Olav Coast (1990). Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land-Enderby Land (1988), Japan. Coastline amended by C.W.M. Swithinbank using Landsat image E1547-05221 (Jan. 74). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

Parts **SR 37-38/1, 3, 5, 6, 9, 10**. Scale 1:250,000. 1989. Lützow-Holm Bay. Geographical Survey Institute, Japan. (Lambert Conformal Conic, standard parallels 68°S, 70°S)
[(1) Prepared by reducing 1:25,000 scale maps compiled from JARE air photography and ground control 1957-62. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. Coastline amended by C.W.M. Swithinbank, 1992 using Landsat image E1547-05221 (Jan. 74); amendments to glacier tongues based on 1:2 million scale East Queen Maud Land - Enderby Land map (1988).]

SR 39-40

SR 39-40. Scale 1:1,000,000. 1969. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-69, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 41-42

SR 41-42. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images

E1236-03153 (Mar. 73), E1580-03211 (Feb. 74) and E1580-03205 (Feb. 74). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 41-42/10. Scale 1:250,000. 1970. Crohn Massif, Mac. Robertson Land. Australian Division of National Mapping. (Universal Transverse Mercator)
[(1) Vertical and oblique air photography: Australian National Antarctic Research Expeditions 1956 and 1965. Terrestrial photography: ANARE surveys 1954-1956-1966. Horizontal and vertical control: ANARE survey 1966. (2) Map used only for interpretation of formline detail across rock outcrops.]

SR 43-44

SR 43-44. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping.(Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat images E1542-03102 (Jan. 74), E1196-02514 (Feb. 73), E1179-02571 (Jan. 73), E31492-02354C (Apr. 82) and E1196-02512 (Feb. 73). (3) Grounding line in the Gillock Island-Reinbolt Hills area taken from provisional data supplied by I. Allison, Australian Antarctic Division, 7 October 1992. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 45-46

[SR 45-46]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SR 47-48

[SR 47-48]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SR 49-50

[SR 49-50]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SR 51-52

[SR 51-52]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SR 53-54

[**SR 53-54**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian maps; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SR 55-56

SR 55-56. Scale 1:1,000,000. 1974. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 57-58

SR 57-58. Scale 1:1,000,000. 1975. Australian Antarctic Territory - Ross Dependency, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Parts of map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SR 57-58/6*, 10 and 14. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) Except in mountainous parts, where original mapped contours are used, ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SR 57-58/6* (extended). Scale 1:250,000. 1970. Suvorov Glacier, Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962 and 1964. (2) i. Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 71/110 (E30928-20440, 18 Sept. 80), 72/110 (E1460-21103, 26 Oct. 73), 76/109 (E1212-21360, 20 Feb. 73). ii. Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and with formlines on the Australian 1:1 million scale map sheet SR 57-58.]

SR 57-58/10. Scale 1:250,000. 1970. Pomerantz Tableland, Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961-1962, 1964-1965. (2) i. Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 71/110 (E30928-20440-C, 18 Sept. 80) and 72/110 (E1460-21103, 26 Oct. 73). ii. Formlines merged inland with those taken from 1:3 million scale compilations for Sheet 2, Drewry (1983) and with formlines on the Australian 1:1 million scale map sheet SR 57-58.]

SR 57-58/11. Scale 1:250,000. 1970. Ob' Bay. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1965. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 70/110 (E30927-20382-B, -C, 17 Sept. 80).]

SR 57-58/12. Scale 1:250,000. 1970. Yule Bay. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)

[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961 and 1965. (2) Grounding line and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 68/110 (E1186-20501, 25 Jan. 73) and 70/110 (E30927-20382-D, 17 Sept. 80).]

SR 57-58/14. Scale 1:250,000. 1970. Daniels Range. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962, and 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SR 57-58/15. Scale 1:250,000. 1989. Mount Soza. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1964, revised 1988.]

SR 57-58/16. Scale 1:250,000. 1969. Ebbe Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1961-1965.]

SR 59-60

SR 59-60/13* (extended). Scale 1:250,000. 1970. Cape Adare. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 68°40'S, 71°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961, 1962 and 1965. (2) Grounding lines and coastline interpreted by C.W.M. Swithinbank from Landsat imagery 64/111 (E1128-20275, 28 Nov. 72).]

IMW Sheets SS 4-6 to SS 58-60

SS 4-6

[SS 4-6]. Scale 1:500,000. 1968. Saunders Coast - Marie Byrd Land. Antarctica Sketch Map Series. US Geological Survey. (Polar Stereographic, standard parallel 71°S)
[(4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 7-9

[SS 7-9]. See sub-sheets below for details of the source material used for the compilation of Version 1.0.
[(4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 7-9/10. Scale 1:250,000. 1974. Cape Burks. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using Landsat images E1175-16215 (Jan. 73) and E1175-16213 (Jan. 73). Reference also made to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 7-9/11. Scale 1:250,000. 1974. Grant Island. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Reference made to Landsat satellite imagery E1175-16213 (Jan. 73) and E1172-16042 (Jan. 73) by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992. Ice front updated using images between Grant

and Dean islands. Reference also made to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 7-9/12. Scale 1:250,000. 1976. Dean Island. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. Revised from ERTS-I imagery taken 1972-1973 provided by NASA under proposal SR-149. (2) Further reference made to Landsat image E1172-16042 (Jan. 73) by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 but no changes made to map except to ice front between Grant and Dean islands. Reference made to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 7-9/13. Scale 1:250,000. 1973. Mount McCoy. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amendments made using Landsat imagery E1144-16510 (Dec. 72) and E1175-16215 (Jan. 73) by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992. Reference also made to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 7-9/14. Scale 1:250,000. 1975. Hull Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Amendments by C.W.M. Swithinbank and S.R. Jordan, Feb. 1992, using Landsat satellite image E1175-16215 (Jan. 73), and reference to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 7-9/15. Scale 1:250,000. 1976. Mount Kosciusko. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. Revised from ERTS-1 imagery taken 1972-1973, provided by NASA under proposal SR-149. Landsat images used: E1172-16044 (Jan. 73), E1172-16042 (Jan. 73) and E1152-15533 (Dec. 72).]

SS 7-9/16. Scale 1:250,000. 1976. McCuddin Hills. Antarctica Reconnaissance Series. US Geological Survey.(Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965-1966. Revised from ERTS-1 imagery taken 1972-1973, provided by NASA under proposal SR-149. Landsat images used: E1172-16042 (Jan. 73), E1172-16044 (Jan. 73), E1152-15531 (Dec. 72), E1152-15533 (Dec. 72), E1146-15191 (Dec. 72), E1200-15194 (Feb. 73) and E1491-15340 (Nov. 73). (2) Formlines tied to fit with those from USSR 1:1 million map (ST 13-16) and to formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 7-9/16 & SS 10-12/13. Scale 1:250,000. 1963. Mount Galla. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography 1960. (2) Incorporated into sheet SS 7-9/16, McCuddin Hills.]

SS 9-10

SS 9,10. Scale 1:1,000,000. 1976. Getz Ice Shelf. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from: US Geological Survey 1:500,000 Antarctica sketch map "Bakutis Coast-Marie Byrd Land" (1968) and "Hobbs Coast-Marie Byrd Land" (1962). (2) Map considerably amended by S.R. Jordan with C.W.M. Swithinbank and J.W. Thomson, Feb. 1992 using satellite images E1160-14554 (Dec. 72), E1488-15160 (Nov. 73) (including enhanced version), E1172-16035 (Jan. 73) and E42050-16013 (Feb. 88). Reference made also to Swithinbank (1988), US 1:1 million scale Landsat image mosaic held at BAS and LeMasurier and Thomson (1990), Antarctic Research Series, **48**, American Geophysical Union, fig. B.5.2.

US Geological Survey 1:250,000 Reconnaissance Series maps incorporated; formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 10-12

Parts **SS 10-12 & SS 13-15**. Scale 1:500,000. 1968. Bakutis Coast-Marie Byrd Land. Antarctica Sketch Map Series. US Geological Survey. (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1959-1961; compiled in 1966 from US Navy tricamera aerial photography 1965-1966. (2) Only data between 106°-108°W have been used in the database. Grounding line in this section updated by C.W.M. Swithinbank, 1991 using satellite images E1174-14325 (1973), E1205-14044 (Feb. 73), E1191-14270 (Feb. 73) and E1157-14383 (Dec. 72). Further amendments to ice shelf front and iceberg tongue by J.W. Thomson and S.R. Jordan (1992) with reference to Swithinbank (1988). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 10-12/11* (extended). Scale 1:250,000. 1978. Martin Peninsula. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled from US Navy tricamera aerial photographs taken 1966-1967. Revised from ERTS-I imagery taken 1972-1973, provided by NASA under proposal SR-149; map edited 1978. Landsat images used are: E1488-15160 (Nov. 73), E1160-14554 (Dec. 72) and E1177-14500 (Jan. 73). (2) Grounding line amended by C.W.M. Swithinbank, 1991 using ERTS-I as above on western half of sheet and also E1488-15160 enhanced image (Nov. 73). Reference made also to US 1:1 million scale Landsat image mosaic held at BAS and to Swithinbank (1988).]

SS 10-12/12. Scale 1:250,000. 1978. Bear Peninsula. Antarctica Reconnaissance Series. US Geological Survey.(Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled from US Navy tricamera aerial photographs taken 1966. Revised from ERTS-I imagery taken 1972-1973, provided by NASA under proposal SR-149; map edited 1978. Images used: E1160-14554 (Dec. 72), E1174-14325 (Jan. 73) and E1157-14383 (Dec. 72). (2) Amended by C.W.M. Swithinbank and S.R. Jordan in Feb. 1992 using E1157-14383 (Nov. 90), E1174-14325 (Nov. 90) and E1191-14270 (Oct. 90).]

SS 10-12/15. Scale 1:250,000. 1977. Toney Mountain. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S.)
[(1) Control by US Geological Survey; compiled in 1971 from US Navy tricamera aerial photographs taken 1966-1967. Revised from ERTS-1 imagery taken 1973, provided by NASA under proposal SR-149. Landsat images used: E1177-14500 (Jan. 73), E1177-14503 (Jan. 73) and E1179-15014 (Jan. 73). (2) Formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983); formlines from USSR 1:1 million map (SS 11,12) incorporated at sheet boundary.]

SS 10-12/16. Scale 1:250,000. 1977. Mount Murphy. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1966. Revised from ERTS-1 imagery taken 1973, provided by NASA under proposal SR-149. Landsat images used: E1177-14500 (Jan. 73) and E1174-14325 (Jan. 73). (2) Amendments by C.W.M. Swithinbank and S.R. Jordan (Feb. 1973) using E1174-14325 (Jan. 73) and E1157-14383 (Dec. 72), E1205-14044 (Feb. 73), E1191-14270 (Feb. 73); reference also made to Swithinbank (1988).]

SS 11,12. Scale 1:1,000,000. 1976. Smith Glacier. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from US Geological Survey 1:500,000 Antarctica sketch map "Bakutis Coast-Marie Byrd Land" (1968). (2) Major amendments by S.R. Jordan, Jan. 1992 incorporated US Geological Survey 1:250,000 Reconnaissance Series maps,and ice fronts, coastlines and grounding lines interpreted from Landsat images E1172-16035 (Jan. 73) and E42050-16013 (Feb. 88) and US 1:1 million scale Landsat image mosaic held at BAS. Reference also made to Swithinbank (1988).]

SS 13-15

Parts **SR 13-14 & SS 13-15**. Scale 1:500,000. 1968. Antarctica sketch map, Thurston Island-Jones Mountains. US Geological Survey. (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1960-1961; compiled in 1967 from US Navy tricamera aerial photography 1966. (2) i. Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Further adjustments to formlines by C.W.M. Swithinbank, 1990, S.R. Jordan and J.W. Thomson, 1991. ii. Coastline adjustments by C.W.M. Swithinbank, 1990 using Landsat images 001/112 (E1191-14264, 30 Jan. 73), 249/111 (E1134-14091, 4 Dec. 72), 243/112 (E1182-13345, 21 Jan. 73), 247/112 (E1168-13574, 7 Jan. 73), 002/111 (E1174-14314, 13 Jan. 73), 247/111 (E1168-13572, 7 Jan. 73), 246/114 (E1185-13530, 24 Jan. 73) and 248/114 (E1205-14044, 13 Feb. 73). iii. Thurston Island coastline prepared by A.J. Fox in 1990 using Landsat images E1174-14314 (13 Jan. 73), E1191-14264 (30 Jan. 73), E1134-14091 (4 Dec. 72) and E1168-13572 (7 Jan 73), as used in the compilation of Thurston Island-Thwaites Glacier area, Antarctica, satellite image map, 1:1,000,000, US Geological Survey 1972-1974; formlines compiled by S.R. Jordan, 1991. iv. Adjustment of formlines in the Jones Mountains area by J.W. Thomson and S.R. Jordan, 1991; amendments to outcrops and formlines by B.C. Storey (BAS), 1992, from local field knowledge. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 16-18

SS 16-18. Scale 1:500,000. 1968. Bryan Coast-Ellsworth Land. Antarctica Sketch Map Series. US Geological Survey. (Polar Stereographic, standard parallel 71°S)
[(1) Control by US Geological Survey 1961-62; compiled in 1967 from US Navy tricamera aerial photography 1965-1966. (2) i. Coastline adjustments by S.R. Jordan, 1990 using Landsat satellite imagery: E1190-12380 (Jan. 73), E1182-13345 (Jan. 73), E1173-12433 (Jan. 73), E1176-13004 (Jan. 73), E1537-13022 (Jan. 74), E1139-12550 (Dec. 72), E1536-12570 (Jan. 74), E1190-12374 (Jan. 73), E1170-12262 (Jan. 73) and E1170-12260 (Jan. 73). Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983); further adjustments to formlines by S.R. Jordan and J.W. Thomson, Nov. 1991. ii. B.A.T. 1:250,000 unpublished map series, Sheets 43a, 50, 55, 60 incorporated and edge-matching adjustments made. Reference also made to USGS 1:250,000 Reconnaissance Series, Sky-Hi Nunataks and Lyon Nunataks sheets, and to unpublished coastline compilation by P.D. Marsh, BAS, 1987. (4) Bach Ice Front and George VI Ice Front between DeAtley and Alexander islands updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 16-18/3,4. Scale 1:250,000. 1978. Sheet 43a, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Compiled from BAS 250P, Sheet SS 16-18/4. (2) Coastline and ice front amendments by C.W.M. Swithinbank (1991) using Landsat images E42706-12514 and E42436-12390.]

Parts **SS 16-18/4 & SS 19-21/1**. Scale 1:250,000. 1978. Sheet 43, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Detail and plan from BAS 250P, Sheets SS 16-18/4 and SS 19-21/1 (amended after A.H.W. Woodruff and image E30299-12261 (Dec. 78). Height from EW 1000A/204 (BAS Archives Map). (2) Spaatz Island coastline adjusted using E42706-12514 (Dec. 89) and ice front adjusted using Landsat E42436-12390 by C.W.M. Swithinbank, June 1991.]

SS 16-18/8. Scale 1:500 000. 1990. Sheet 50, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure from images E1170-12260, E1170-12262, E42436-12390 and E42386-12511 supplemented by TMA photos 1733 and by enlargement of data abstracted from US Geological Survey 1:500,000 sketch map "Ellsworth Land - Palmer Land" by J.S. Harris. (2) Parts of coastline and ice front adjusted by C.W.M. Swithinbank, 1991 with ref to Landsat images E1190-12380 (Jan. 73), E1173-12433 (Jan. 73), E1190-12374 (Jan. 73), E1170-12262 (Jan. 73), E1170-12260 (Jan. 73), E1139-12543 (Dec. 72).]

Parts **SS 16-18/12 & SS 19-21/9**. Scale 1:500,000. 1990. Sheet 55, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposure detail from USGS 1:250,000 Reconnaissance Series, Sheet SS 16-18/12 and BAS 500P, SS 17-20/SE and Landsat images E1562-11593, E1563-12045, supplemented by TMA photos 1645 and enlargement of data abstraction by BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land".]

SS 19-21

[SS 19-21]. See sub-sheets below for details of the source material used for the compilation of Version 1.0.
[(4) Larsen Ice Front and Ronne Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999

SS 19-21/1,2. Scale 1:250,000.1978. Sheet 44, unpublished BAS sketch map by Fleming, E.A. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Alexander Island: plan and detail from BAS 250P, Sheet SS 19-21/1, height from EW 1000A/204 and DOS 610. Palmer Land: detail from US Geological Survey 1:500,000 scale sketch map "Northern Palmer Land" fitted to WGS 72 control. Height from EW 1000A/180 and sketched from USGS sketch map using heights of intersected points.]

SS 19-21/2,3. Scale 1:250,000. 1979. Sheet 45 and Sheet 45a, unpublished BAS sketch map by Harris, J.S. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Sheets 45 and 45a considered as 1 sheet. Positioning by geoceiver stations. a) in western half of sheet, Landsat image E30288-11233, b) in north-east of sheet image E30291-11401-D (a + b - exposure detail from TMAs), c) in south-east of sheet US Geological Survey sketch map (1966), adjusted using TMAs. Ice front from US Geological Survey 1:500,000 sketch map "Northern Palmer Land", formlines sketched from TMA photographs. (2) Edgematched after adjustments were made to Sheets 45, 45a and 53, S.R. Jordan, April 1991.]

SS 19-21/5. Scale 1:500,000. 1990. Sheet 51, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure from Landsat images E1170-12260, E1525-11541, E1563-12045, E42436-12045, E42390-12263, supplemented by TMA photos 1749, 1731. Incorporates enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land".]

SS 19-21/6. Scale 1:500,000. 1990. Sheet 52, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposure detail from Landsat image E1181-11461 and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map, "Ellsworth Land-Palmer Land".]

SS 19-21/7. Scale 1:500 000. 1990. Sheet 53, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure details from images E30288-11233, E2284-11265 and E1538-11253 supplemented by TMA photos 1745, 1746, 1747, 1748 and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land".]

SS 19-21/9,10. Scale 1:500,000. 1990. Sheet 56, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposure detail from BAS 500P, Sheet SS 17-20/SE and Landsat image E1563-12045 and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land"; also from US Geological Survey 1:250,000 Reconnaissance series, Sheet SS 19-21/9.]

SS 19-21/10,11. Scale 1:500,000. 1990. Sheet 57, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)

[(1) Coastline and exposure from BAS 500P, Sheet SS 17-20/SE and Landsat images E1212-11183, E1538-11260 and TMA photos 1739, 1745, 1746, 1747 and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land". (2) Coastline and grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

SS 19-21/13,14. Scale 1:500,000. 1990. Sheet 60, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Exposures from BAS 500P, Sheet SS 17-20/SE, supplemented by Landsat images E1562-11593, E1563-12051, El505-11440 and E1538-11260. Includes abstraction of data at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land", supplemented by TMA photos 1737, 1745, 1746.]

SS 19-21/14,15. Scale 1:500,000. 1991. Sheet 61, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure details from BAS 500P, Sheet SS 17-20/SE and Landst images E1212-11183, E1212-11185, E1538-11260, TMA photos 1737, 1745, 1746 and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land". (3) Parts of coastline, grounding line, ice fronts and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996.]

SS 25-27

SS 25-27. Scale 1:1,000,000. 1990. Brunt Ice Shelf. Satellite image map. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Prepared from eight Landsat MSS images forming part of a large geocoded image mosaic. Interpretation of grounding line and ice shelf features supplied to database by Institut für Angewandte Geodäsie, 1991. (2) Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new grounding line. (4) Brunt Ice Front and Riiser-Larsenisen front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 28-30

SS 28-30. Scale 1:1,000,000 1988. Ritscherhochland. Satellite image map. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Prepared from 15 Landsat MSS images forming part of a large geocoded image mosaic. Interpretation of grounding line and ice shelf features supplied to database by Institut für Angewandte Geodäsie, 1991. (2) Rock outcrop detail and formlines taken from Norwegian 1:250,000 scale maps, Sheets B7, C7, D8, D9, F6, F7, G6 and G7. Formlines for rest of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new coastline and merged to formlines on Norwegian maps. (4) Riiser-Larsenisen front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SS 28-30/3,4. Scale 1:250,000.. 1962. Borgmassivet, Maudheimvidda. Dronning Maud Land, Map F6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-1952. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/4. Scale 1:250,000. 1961. Jutulstraumen, Maudheimvidda. Dronning Maud Land, Map G6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/5. Scale 1:250,000. 1972. Vestfjella Vest, Maudheimvidda. Dronning Maud Land, Map B7. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1968-69. Map compilation from oblique aerial photography, 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line, glacier margins and flow lines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/5,6. Scale 1:250,000.. 1972. Vestfjella-Aust, Maudheimvidda. Dronning Maud Land, Map C7. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1968-69. Map compilation from oblique aerial photography 1950-51 and 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line, glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/7,8. Scale 1:250,000. 1961. Kirwanveggen, Maudheimvidda. Dronning Maud Land, Map F7. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique air photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 28-30/8. Scale 1:250,000. 1961. Neumayerskarvet, Maudheimvidda. Dronning Maud Land,Map G7. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition, 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/10. Scale 1:250,000. 1988. Heimefrontfjella Nord (Maudheimvidda). Dronning Maud Land, Map D8. Norsk Polarinstitutt.
[(1) Triangulation: British Antarctic Expeditions. Map compilation from oblique air photography 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flowlines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/11. Scale 1:250,000. 1988. Heimefrontfjella Sør (Maudheimvidda). Dronning Maud Land, Map D9. Norsk Polarinstitutt.
[(1) Triangulation: British Antarctic Expeditions. Map compilation from oblique aerial photography 1951-52. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Glacier margins and flow lines supplied by Institut für Angewandte Geodäsie.]

SS 28-30/11. Scale 1:250,000. 1990. Amelangplatte. Satellite image map series. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S).
[(1) Part of satellite image mosaic prepared from 15 Landsat scenes at 1:1,000,000 scale, transformed geometrically into the map projection. Heights above sea level determined barometrically. This map sheet derived from Landsat MSS images E1227-07342 (Mar. 73), E1227-07345 (Mar. 73), E1230-07514 (Mar. 73) and E1467-08055 (Nov. 73). (2) Rock outcrop detail and formlines north of 74°45'S interpreted by A.J. Fox in October 1992.]

SS 31-33

[**SS 31-33**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets J6, K6, L6, M6 and N6. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 31-33/1. Scale 1:250,000. 1961. H.V. Sverdrupfjella, Fimbulheimen. Dronning Maud Land, Map H6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian-British-Swedish Antarctic Expedition 1949-52. Map compilation from oblique aerial photography 1951-52 and 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 31-33/1,2. Scale 1:250,000. 1962. Mühlig-Hofmannfjella Sör, Fimbulheimen. Dronning Maud Land, Map J6 . Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 31-33/2. Scale 1:250,000. 1962. Filchnerfjella Sör, Fimbulheimen. Dronning Maud Land, Map K6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 31-33/3. Scale 1:250,000. 1964. Glopeflya, Fimbulheimen. Dronning Maud Land, Map L6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 31-33/3,4. Scale 1:250,000. 1964. Hoelfjella Sör, Fimbulheimen. Dronning Maud Land, Map M6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 31-33/4. Scale 1:250,000. 1975. Sarkofagen, Fimbulheimen. Dronning Maud Land, Map N6. Norsk Polarinstitutt.
[(1) Triangulation and other field work: Norwegian Antarctic Expedition 1956-60. Map compilation from oblique aerial photography 1958-59. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 34-36

[**SS 34-36**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with amendments to merge formlines with those on adjacent Norwegian 1:250,000 scale maps, Sheets Q6, R6 and S6. Amendments made also to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 34-36/1. Scale 1:250,000. 1988. Tussebreen, Sør-Rondane. Dronning Maud Land, Map P6. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 34-36/1,2. Scale 1:250,000. 1988. Widerøefjellet, Sør-Rondane. Dronning Maud Land, Map Q6. Norsk Polarinstitutt.

[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

SS 34-36/2. Scale 1:250,000. 1988. Mefjell, Sør-Rondane. Dronning Maud Land, Map R6. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

SS 34-36/3. Scale 1:250,000. 1988. Balchenfjella Sør, Sør-Rondane. Dronning Maud Land, Map S6. Norsk Polarinstitutt.
[(1) Triangulation: Belgian Antarctic Expeditions. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from 1:2 million scale East Queen Maud Land - Enderby Land map (1988), National Institute of Polar Research, Japan.]

SS 37-39

[**SS 37-39**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(1) 1:3 million compilation used for database with amendments to merge formlines with those on 1:2 million scale map of East Queen Maud Land-Enderby Land (1988), National Institute of Polar Research, Japan. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999]

SS 40-42

SS 40-42. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Coastline amended by C.W.M. Swithinbank, 1992 using Landsat image E1236-03153 (Mar. 73). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 43-45

SS 43-45. Scale 1:1,000,000. 1971. Australian Antarctic Territory, base compilation series. Australian Division of National Mapping. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SS 46-48

[**SS 46-48**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; source map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999]

SS 49-51

[**SS 49-51**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; source map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999]

SS 52-54

[**SS 52-54**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database with minor amendments to merge formlines with those on adjacent Australian map; source map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999]

SS 55-57

SS 55-57. Scale 1:1,000,000. 1989. Australian Antarctic Territory - Ross Dependency, base compilation series. Australian Surveying and Land Information Group. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most of formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) Except in mountainous parts, where original mapped contours are used, ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 55-57/4. Scale 1:250,000. 1970. Welcome Mountain. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1960-1962, and 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 55-57/8. Scale 1:250,000. 1969. Sequence Hills. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1961, 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 55-57/12. Scale 1:250,000. 1968. Reeves Névé. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 55-57/16. Scale 1:250,000. 1968. Mount Joyce. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1956-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SS 58-60

[**SS 58-60**]. See sub-sheets below for details of the source material used for the compilation of Version 1.0.

[(4) Except in mountainous parts, where original mapped contours are used, ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SS 58-60/1. Scale 1:250,000. 1989. Freyberg Mountains. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1964, revised 1988.]

SS 58-60/2. Scale 1:250,000. 1989. Cape Hallett. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1961-1964, revised 1988. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/111 E1128-20275 (28 Nov. 72).]

SS 58-60/5. Scale 1:250,000. 1970. Mount Murchison. Antarctica Reconnaissance Series. US Geological Survey.(Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1960-1964. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/113 E1163-20224 (2 Jan. 73).]

SS 58-60/6. Scale 1:250,000. 1969. Coulman Island. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1962-1964. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised by C.W.M. Swithinbank from Landsat imagery 64/112 E1128-20281 (28 Nov. 72).]

SS 58-60/9. Scale 1:250,000. 1968. Mount Melbourne. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1955-1957 and 1960-1963. (2) Grounding line interpreted from map by K.G. Newport in July 1991; ice fronts revised and extra flow-lines added by C.W.M. Swithinbank from Landsat imagery 64/03 E1128-20284 (28 Nov. 72).]

SS 58-60/13. Scale 1:250,000. 1968. Relief Inlet. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 72°40'S, 75°20'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy tricamera aerial photographs taken 1957-1960. (2) Grounding line interpreted from map by K.G. Newport in June 1991; amendments to ice fronts made by C.W.M. Swithinbank from Landsat imagery 64/114 (E1200-20290, 8 Feb. 73), 60/114 (E1214-20062, 22 Feb. 73) and 62/114 (E1540-20134, 14 Jan. 73).]

IMW Sheets ST 1-4 to ST 57-60

ST 1-4

[**ST 1-4**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) Grounding line for mainland and Roosevelt Island, and position of ice front amended after reference to NOAA AVHRR satellite image (28 Oct. 87) in Keys and others (1990). Formlines taken from 1:3 million scale compilation for Sheet 2, amended to merge with US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet ST 5-8/5. (4) Ross Ice Shelf front updated from Keys *et al.*, 1998, *Annals of Glaciology*, **27**, p. 93, by O.J. Cottray, 1999. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 5-8

[ST 5-8]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) Formlines taken from 1:3 million scale compilation for Sheet 2, with amendments to merge data to formlines on adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets ST 5-8/3, 4, 5 and 6. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999. Some modifications in the area of Edward VII Peninsula were interpreted from USSR 1:200 000 scale Mount Nilsen (ST5-XIX,XX,XXI), published 1991 using space images.]

ST 5-8/1[ST 5-X,XI,XII]. Scale 1:200,000. 1990. Vollmer Island. Photomap Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Equal-angle cylindrical transverse Gauss projection)
[(1) Planimetric and elevation control developed in 1983 by analytical photo-triangulation method. Map compiled in 1990 using 1984 space images. (2) Incorporated into US Geological Survey 1:250,000 Reconnaissance Series maps [Alexandra Mountains, Boyd Glacier and Guest Peninsula].]

ST 5-8/2*(extended). Scale 1:250,000. 1989. Guest Peninsula. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965, revised 1988. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using E51015-16513 (Dec. 86), E2391-16304 (Feb. 76) and E2391-16311 (Feb. 76). Between 150°W and 153°W, and 76°40'S and 77°20'S detail taken from USSR 1:200,000 Vollmer Island (ST 5-X,XI,XII), published 1990 using 1984 space images. Amended to fit formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 5-8/3. Scale 1:250,000. 1973. Gutenko Nunataks. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amendments made at map boundaries to tie with formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 5-8/4. Scale 1:250,000. 1974. Mount Berlin. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1965. (2) Formlines at sheet boundary tied to those taken from USSR 1:1 million map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 5-8/5. Scale 1:250,000. 1972. Alexandra Mountains. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S and 79°20'S)
[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1964-1966. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using Landsat image E2391-16311 (Feb. 76). Between 150°W and 153°W detail taken from USSR 1:200,000 Vollmer Island (ST 5-X,XI,XII) and Howard Heights (ST 5-XVI,XVII,XVIII), published in 1990 using 1984 space images. Amendments to formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 5-8/5[ST 5-XVI,XVII,XVIII]. Scale 1:200,000. 1990. Howard Heights. Photomap Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Equal-angle cyclindrical transverse Gauss projection)
[(1) Planimetric and elevation control developed in 1983 by analytical photo-triangulation method. Map compiled in 1989 using 1984 space images. (2) Incorporated into US Geological Survey 1:250,000 Reconnaissance Series maps [Alexandra Mountains, Boyd Glacier and Guest Peninsula].]

ST 5-8/6. Scale 1:250,000. 1973. Boyd Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)

[(1) Control by US Geological Survey; compiled in 1969 from US Navy tricamera aerial photographs taken 1965. (2) Amended by C.W.M. Swithinbank and S.R. Jordan, Jan. 1992 using E2391-16311 (Feb. 76) and E2391-16304 (Feb. 76). Detail incorporated from USSR 1:200,000 Howard Heights (ST 5-XVI, XVII, XVIII) and Vollmer Island (ST 5-X,XI,XII), published 1990 using 1984 space images, between 150°-153°W and between 74°40' and 76°S. Amendments made to tie with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 9-12

ST 9-12. Scale 1:1,000,000. 1972. Executive Committee Range. Topographic Series, Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled using 1:250,000 US Geological Survey Reconnaissance Series map (1963), 1:500,000 US Geological Survey sketch map series (1968) and 1:3,000,000 USSR Topographic map (1968). (2) US Geological Survey 1:250,000 Reconnaissance Series maps [Crary Mountains, Mount Takahe, Mount Sidley, Mount Hampton] have replaced USSR map (ST 9,10,11,12) where relevant. Formlines at sheet boundaries merged with those from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 9-12/1,2. Scale 1:250,000. 1963. Mount Hampton. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography 1960. (2) Formlines at sheet boundary tied to fit formlines from 1:1 million USSR map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 9-12/3. Scale 1:250,000. 1976. Crary Mountains. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1964-1966. Revised from ERTS-I imagery taken 1972-73 and provided by NASA under proposal SR-149: E1177-14503 (Jan. 73) and E1119-14280 (Nov. 72). (2) Amendments made to tie with formlines from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 9-12/4. Scale 1:250,000. 1989. Mount Takahe. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1972 from US Navy tricamera aerial photographs taken 1966, revised 1988. Revised from ERTS-I imagery taken 1972, provided by NASA under proposal SR-149: E1119-14280 (Nov. 72) and E1119-14273 (Nov. 72). (2) Amendments made to formlines to tie with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 9-12/5,6. Scale 1:250,000. 1963. Mount Sidley. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photograph 1960. (2) Formlines at sheet boundaries tied to those taken from USSR 1:1 million map (ST 13-16) and from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 13-16

ST 13-16. Scale 1:1,000,000. 1972. Ellsworth Mountains. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from USSR 1:3 million topographic map (1968) and 1:400,000 map (1966), US Geological Survey 1:250,000 Reconnaissance Series map, "Union Glacier" (1967) and American Geographical Society 1:5,000,000 map of Antarctica (1970). (2) Formlines for Ellsworth Mountains merged with those in adjacent parts of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line and flow lines amended from data supplied by Institut für Angewandte Geodäsie. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999. Shift in location of all

features derived from the US Geological Survey map (Ellsworth Mountains) corrected by A.P.R. Cooper, 1999 and integrated by O.J. Cottray, 1999.]

ST 17-20

ST 17-20. Scale 1:1,000,000. 1991. Ronne Ice Shelf. Topographic map, preliminary edition digital data. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) i. Rock outcrop detail and formlines for northern part of map taken from unpublished BAS 1:250,000 map, Sheet 63, and for Ellsworth Mountains area from USSR 1:1,000,000 Topographic map, Sheet ST 17-20 (1972) and US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Union Glacier (1967). Formlines for remaining part of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). ii. Additional grounding line detail derived from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991); rock outcrop at Haag Nunataks taken from 1:3,000,000 British Antarctic Territory map, BAS (Misc) 2 (1981). (3) Parts of coastline, grounding line, rock outcrop and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996. Merging new grounding line to existing database interpreted by J.W. Thomson, 1998. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999; grounding line at the head of Rutford Ice Stream derived from SAR interferometry by C.S.M. Doake (BAS unpublished data) and incorporated by A.P.R. Cooper, 2000.]

ST 17-20/3,4. Scale 1:500,000. 1990. Sheet 63, unpublished BAS sketch map by Willan, C.F.H. (Lambert Conformal Conic, standard parallels 63°20'S, 76°40'S)
[(1) Coastline and exposure detail from 1:250,000 enlargement of BAS 500P, Sheet SS 17-20/SE, Landsat image E1212-11185, and enlargement of data abstracted at BAS from US Geological Survey 1:500,000 sketch map "Ellsworth Land-Palmer Land". (2) Grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

ST 21-24

ST 21-24. Scale 1:1,000,000. 1991. Berkner Island. Topographic map, preliminary edition digital data. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (3) Parts of coastline, grounding line, ice front and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996 (4) Ronne Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999..]

ST 25-28

ST 25-28. Scale 1:1,000,000. 1991. Coats Land. Topographic map, preliminary edition digital data. Institut für Angewandte Geodäsie. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) Formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983), adjusted to new grounding line. (3) Parts of coastline, grounding line, ice front and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996. (4) Brunt Ice Front updated from 1:3,000,000 BAS (Misc) 8, Antarctic Peninsula and Weddell Sea (2000) by O.J. Cottray. ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by J.W. Thomson and O.J. Cottray, 1999. Some modifications were interpreted from Institut für Angewandte Geodäsie 1:2 000 000 scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, published 1996 .]

ST 25-28/9,10. Scale 1:200,000. 1963. British Antarctic Territory, Sheet W79 24/26 with part of W78 24/26. Directorate of Overseas Surveys. (Polar Stereographic Projection)
[(1) Planimetry: Sledge wheel and compass traverse controlled by astrofixes. Detail sketched from oblique photographs taken on Trans-Antarctic Expedition flights, Jan. 1957. (3) Contours interpolated in metres from original source by S.D. Evans, 1998 and tied in with existing database, Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 1996, and with contours generated from ERS-1 spot height data using ARC/INFO software. Rock outcrop detail taken from 1:250,000 scale unpublished BAS sketch map by J.S. Harris, Sheet 70, 1978.]

ST 25-28/13,14. Scale 1:200,000. 1963. British Antarctic Territory, Sheet W79 28/30 with part of W78 28/30. Directorate of Overseas Surveys. (Polar Stereographic Projection)
[(1) Planimetry: Sledge wheel and compass traverse controlled by astrofixes. Detail sketched from oblique photographs taken on Trans-Antarctic Expedition flights, Jan. 1957. (3) Contours interpolated in metres from original source by S.D. Evans, 1998 and tied in with existing database, Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 1996, and with contours generated from ERS-1 data. Rock outcrop detail taken from 1:250,000 scale unpublished BAS sketch map by J.S. Harris, Sheet 70, 1978.]

ST 29-32

[**ST 29-32**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 33-36

[**ST 33-36**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation with minor amendments to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 37-40

[**ST 37-40**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) 1:3 million scale compilation with minor amendments to incorporate formlines from 1:2 million scale map of East Queen Maud Land - Enderby Land (1988), National Institute of Polar Research, Japan. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 41-44

[**ST 41-44**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) 1:3 million scale compilation with minor amendments to merge formlines with those on adjacent Australian map. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 45-48

[**ST 45-48**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)

(2) 1:3 million scale compilation with minor amendments to merge formlines with those on adjacent Australian map. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 49-52

[**ST 49-52**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) 1:3 million scale compilation with minor amendments to merge formlines with those on adjacent Australian map. (4) Now replaced by contours generated from BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

ST 53-56

ST 53-56/16. Scale 1:250,000. 1989. Turnstile Ridge. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1960-1961, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

ST 54-57

ST 54-57. Scale 1:1,000,000. 1989. Australian Antarctic Territory - Ross Dependency, base compilation series. Australian Surveying and Land Information Group. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Part of map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet ST 53-56/16. Most of formline data for entire sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 57-60

[**ST 57-60**]. See sub-sheets below for details of the source material used for the compilation of Version 1.0. (4) Ross Ice Shelf front west of Ross Island updated from Keys *et al.*, 1998, *Annals of Glaciology*, **27**, p. 93, by O.J. Cottray, 1999. Except for Transantarctic Mountains, ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999

ST 57-60/1. Scale 1:250,000. 1989. Convoy Range. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1947-1960, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 57-60/2* (extended). Scale 1:250,000. 1965. Franklin Island. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey and US Naval Oceanographic Office; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1957-1961. (2) Grounding line interpreted from US map by K.G. Newport in June 1991.]

ST 57-60/5. Scale 1:250,000. 1989. Taylor Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)

[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1947-1959, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 57-60/6* (extended). Scale 1:250,000. 1972. Ross Island. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey and US Naval Oceanographic Office; compiled in 1962 from US Navy tricamera aerial photographs taken 1956-1960. Revised from US Navy tricamera photographs taken 1967-1970. (2) Grounding line interpreted from US map by K.G. Newport in June 1991.]

ST 57-60/9. Scale 1:250,000. 1989. Mount Harmsworth. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by the US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1956-1961, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

ST 57-60/10. Scale 1:250,000. 1989. Mount Discovery. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°40'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1962 from US Navy trimetrogon aerial photographs taken 1956-1959, revised 1988. (2) Grounding line interpreted from map by K.G. Newport in May 1991; revised by C.W.M. Swithinbank from local knowledge.]

ST 57-60/13* (extended). Scale 1:250,000. 1966. Carlyon Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Lambert Conformal Conic, standard parallels 76°41'S, 79°20'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1959-1963. (2) Grounding line interpreted from map by K.G. Newport in May 1991; revised by C.W.M. Swithinbank from Landsat imagery 46/119 (E1562-18435, 16 Jan. 74).]

IMW Sheets SU 1-5 to SU 56-60

SU 1-5

[**SU 1-5**]. 1988. Shabtaie, S. and Bentley, C.R., Figs. 1 and 3, Annals of Glaciology. International Glaciological Society.
[(2) Formlines from compilation at 1:1 million scale amended to incorporate data from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SU 6-10

[**SU 6-10**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) Formlines in northern part of sheet taken from 1:3 million scale compilation for Sheet 2, adjusted to merge with formlines in south taken from Shabtaie and Bentley (1988, Figs 1 and 3). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K Derbyshire, 1999.]

SU 11-15

[**SU 11-15**] Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) Formlines in northern part of sheet taken from 1:3 million scale compilation for Sheet 2, adjusted to merge with formlines in south taken from Shabtaie and Bentley (1988, Figs 1 and 3). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K Derbyshire, 1999.]

SU 16-20

[**SU 16-20**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) i. Formlines on 1:3 million scale compilation for Sheet 2 merged to new data where map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 16-20/2*, 13 and 16. ii. Grounding line, flow lines and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see German topographic map, preliminary edition digital data, sheet SU 16-20). (3) Parts of grounding line, rock outcrop and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SU 16-20/2* (extended). Scale 1:250,000. 1967. Liberty Hills. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14's)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1961, 1962, and 1964. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and from USSR 1:1,000,000 scale map, Sheet ST-17, 18, 19, 20. Grounding line and flow lines amended from data supplied by Institut für Angewandte Geodäsie.]

SU 16-20/13. Scale 1:250,000. 1963. Pagano Nunatak. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14's)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogon photography taken in 1959. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 16-20/16. Scale 1:250,000. 1968. Blackburn Nunatak. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). Grounding line and flow lines amended using data supplied by Institut für Angewandte Geodäsie and from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991).]

SU 21-25

[**SU 21-25**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) i. Formlines on 1:3 million scale compilation for Sheet 2 used for database except where map replaced by US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 21-25/9, 10, 11, 13 and 14. ii. Grounding line, flow lines and ice shelf features taken from data supplied by Institut für Angewandte Geodäsie (see German topographic map, preliminary edition digital data, Sheet SU 21-25). Additional grounding line data taken from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991). (3) Parts of grounding line and contours updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SU 21-25/9. Scale 1:250,000. 1969. Cordiner Peaks. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1964. (2) Grounding line and flow lines amended using data supplied by Institut für Angewandte Geodäsie and from US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991).]

SU 21-25/10. Scale 1:250,000. 1989. Davis Valley. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1968 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Grounding line amended using data supplied by Institut für Angewandte Geodäsie.]

SU 21-25/11. Scale 1:250,000. 1968. Argentina Range. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1967. (2) Formlines merged to north and east with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and with USSR 1:1,000,000 scale map, Sheet SU 21-24. Grounding line, glacier margins and flow lines amended using data supplied by the Institut für Angewandte Geodäsie.]

SU 21-25/13. Scale 1:250,000. 1989. Schmidt Hills. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Grounding line amended using US Geological Survey 1:5,000,000 Satellite Image Map of Antarctica (1991). Formlines and outcrop detail merged southward with USSR 1:1,000,000 scale map, Sheet SV 21-30 and with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 21-25/14. Scale 1:250,000. 1989. Saratoga Table. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey with additional elevation data from Pensacola Mountains Gravimetric Survey; compiled in 1967 from US Navy tricamera aerial photographs taken 1964, revised 1988. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 26-30. Scale 1:1,000,000. 1991. Shackleton Range. Topographic map, preliminary edition digital data. Institut für Angewandte Geodäsie. (Polar Stereographic, standard parallel 80°14'S)
[(1) Topographic interpretation prepared from geocoded mosaic of Landsat MSS images. (2) Rock outcrop and formline detail for Shackleton Range taken from British Antarctic Survey BAS GEOMAP Series, Sheet 4 [published in 1995]. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (3) Parts of grounding line updated by S.D. Evans, 1998 using Institut für Angewandte Geodäsie 1:2 million scale Topographic map (satellite image map) of Filchner-Ronne Shelfeis, 2nd edition, 1996. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SU 26-30/1 (extended). Scale 1:250,000. 1995. Shackleton Range. BAS GEOMAP Series, Sheet 4 (topographic base map by A.J. Fox, 1992). (Polar Stereographic, standard parallel 80°14'S)
[(1) i. Planimetry from geocoded Landsat images E50714-07391 (Feb. 86), E50714-07385 (Feb. 86), E41955-06504 (Nov. 87) supplied by Institut für Angewandte Geodäsie (IfAG), Frankfurt. ii. Exposure detail compiled from US Navy TMA photography (1967), vertical photography (1986) supplied by IfAG, and from field maps and local knowledge of P.D. Clarkson, BAS. Grounding line and flowlines amended from data supplied by Institut für Angewandte Geodäsie.iii. Formlines compiled from digital data supplied by USSR and from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet SU 26-30/1*. (2) These data merged with formlines taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 31-35

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SU 36-40

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SU 41-45

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SU 46-50

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SU 51-55

[**SU 51-55**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) 1:3 million scale compilation with minor amendments to merge formlines with those on Australian map (Sheet SU 53-57) and adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 56-60/1, 5, 9 and 14*. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SU 53-57

SU 53-57. Scale 1:1,000,000. 1989. Australian Antarctic Territory - Ross Dependency, base compilation series. Australian Surveying and Land Information Group. (Lambert Conformal Conic, standard parallels 80°40'S, 83°20'S)
[(1) Compiled from ANARE photography and ground control 1954-71, US Navy aerial photography 1947 and miscellaneous sources. (2) Most of formline data taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 56-60

[**SU 56-60**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
(2) 1:3 million scale compilation with minor amendments to merge formlines with those on Australian map (Sheet SU 53-57) and adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SU 56-60/1, 5, 9 and 14*. (4) ADD Version 2.0 contours unchanged over Transantarctic Mountains and combined in the rest of the tile with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SU 56-60/1. Scale 1:250,000. 1966. Mount Olympus. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 56-60/2. Scale 1:250,000. 1966. Cape Selborne. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1963 from US Navy trimetrogon aerial photographs taken 1960-1961. (2) Grounding line interpreted from map by K.G. Newport in May 1991.]

SU 56-60/5. Scale 1:250,000. 1966. Wilhoite Nunataks. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 56-60/6. Scale 1:250,000. 1966. Mount Nares. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960. (2) Grounding line interpreted from US map by K.G. Newport in May 1991; partly revised by C.W.M. Swithinbank from Landsat imagery 45/119 (E40495-18544, 23 Nov. 83).]

SU 56-60/9. Scale 1:250,000. 1966. Geologists Range. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 56-60/10. Scale 1:250,000. 1966. Nimrod Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962. (2) Grounding line interpreted from US map by E.M.R. Edwards, June 1991; partly revised by C.W.M. Swithinbank Oct. 1991, from local knowledge.]

SU 56-60/11. Scale 1:250,000. 1966. Holland Range. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960. (2) Grounding line interpreted from US map by E.M.R. Edwards, May 1991.]

SU 56-60/14* (extended). Scale 1:250,000. 1989. Mount Rabot. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey and New Zealand Department of Lands and Survey; compiled in 1964 from US Navy trimetrogon aerial photographs taken 1960-1962, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SU 56-60/15. Scale 1:250,000. 1989. Mount Elizabeth. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1958-1962, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards in May 1991; partly revised by C.W.M. Swithinbank Oct. 1991, from local knowledge.]

SU 56-60/16. Scale 1:250,000. 1989. Mount Kathleen. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogen aerial photographs taken 1958-1963, revised 1988. (2) Grounding line interpreted from US map by E.M.R. Edwards, May 1991.]

IMW Sheets SV 1-10 to SV 51-60

SV 1-10

SV 1-10. Scale 1:1,000,000. 1976. Amundsen Coast. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1967 and 1968), American Geographical Society 1:5,000,000 map (1970) and USSR 1:3,000,000 map (1968). (2) Data from eastern part of this map used for database. Detail for western part of sheet taken from US Geological Survey, Antarctica 1:250,00 Reconnaissance Series, Sheets SV 1-10/1, 5, 6, 7, 10, 11 and 15*; formlines merged to those on 1:3 million scale compilation for Sheet 2, Drewry (1983) in south-east and south-west part of sheet. Grounding line and formlines in northern part of sheet taken from Shabtaie and Bentley (1988, figs 1 and 3), amended to merge with US 1:250,000 maps.(4) Except in mountainous parts, where original mapped contours are used, ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SV 1-10/1. Scale 1:250,000 1967. Shackleton Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1960-1964. (2) Grounding line interpreted from US map by E.M.R. Edwards, December 1991; amended by C.W.M. Swithinbank in 1991, from local knowledge.]

SV 1-10/5. Scale 1:250,000. 1968. Liv Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon photographs taken 1960-1964.]
SV 1-10/6. Scale 1:250,000. 1989. Mount Goodale. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964, revised 1988. (2) Grounding line interpreted from US map by E.M.R. Edwards, December 1991; amended by C.W.M. Swithinbank in 1992, from local knowledge.]

SV 1-10/7. Scale 1:250,000. 1968. Leverett Glacier. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Grounding line interpreted from map by E.M.R. Edwards, December 1991 and amended to merge with that taken from Shabtaie and Bentley (1988). Contours merged with those taken from Shabtaie and Bentley (1988, Figs 1 and 3).]

SV 1-10/9. Scale 1:250,000. 1961. Mount Wisting. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1963. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SV 1-10/10. Scale 1:250,000. 1967. Nilsen Plateau. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SV 1-10/11. Scale 1:250,000. 1989. Mount Blackburn. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)

[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1960-1964, revised 1988. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SV 1-10/15* (extended). Scale 1:250,000. 1968. D'Angelo Bluff. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1966 from US Navy trimetrogon aerial photographs taken 1961-1963. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SV 11-20

SV 11-20. Scale 1:1,000,000. 1976. Thiel Mountains. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1963, 1968) and American Geographical Society 1:5,000,000 map (1970). (2) Detail for small part of sheet taken from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheet SV 11-20/3. Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) away from areas of exposed rock. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SV 11-20/3. Scale 1:250,000. 1963. Stewart Hills. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1961 from US Navy trimetrogen photography taken in 1959. (2) Formlines merged with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983) and USSR 1:1,000,000 Topographic map, Sheet SV 11-20.]

SV 21-30

SV 21-30. Scale 1:1,000,000. 1972. Mount Feldkotter. Topographic Series. Main Administration of Geodesy and Cartography, Council of Ministers of USSR. (Modified Polyconic)
[(1) Compiled from US Geological Survey, Antarctica 1:250,000 Reconnaissance Series maps (1968) and American Geographical Society 1:5,000,000 map (1970). (2) Russian data used between 52° and 60°W, 84° and 85°S, and Russian traverse and spot elevation data for entire sheet. Formlines for rest of sheet taken from 1:3 million scale compilation for Sheet 2, Drewry (1983). (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999]

SV 31-40

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SV 41-50

Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) 1:3 million scale compilation used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

SV 51-60

[**SV 51-60**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)

[(2) 1:3 million scale compilation with minor amendments to merge formlines with those on adjacent US Geological Survey, Antarctica 1:250,000 Reconnaissance Series, Sheets SV 51-60/3 and 8*, and SV 1-10/9. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by O.J. Cottray, 1999.]

SV 51-60/3. Scale 1:250,000. 1989. Buckley Island. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1960-1962, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

SV 51-60/4. Scale 1:250,000. 1989. The Cloudmaker. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1958-1963, revised 1988. (2) Grounding line interpreted from map by E.M.R. Edwards, May 1991.]

SV 51-60/8* (extended). Scale 1:250,000. 1989. Plunket Point. Antarctica Reconnaissance Series. US Geological Survey. (Polar Stereographic, standard parallel 80°14'S)
[(1) Control by US Geological Survey; compiled in 1965 from US Navy trimetrogon aerial photographs taken 1959-1963, revised 1988. (2) Formlines merged inland with those taken from 1:3 million scale compilation for Sheet 2, Drewry (1983).]

IMW Sheet SW 1-60

[**SW 1-60**]. Scale 1:6,000,000. 1983. Sheet 2. Antarctica: Glaciological and Geophysical Folio, ed. Drewry, D.J. Scott Polar Research Institute. (Polar Stereographic)
[(2) Formlines on 1:3 million scale compilation for Sheet 2 used for database; map published at 1:6 million. (4) ADD Version 2.0 contours combined with BPRC DEM: 0.2–5 km horizontal resolution; 2–130 m vertical resolution (Liu *et al.*, 1999, *Journal of Geophysical Research*, **104** (B10), p. 23,199) by P.K. Derbyshire, 1999.]

Appendix 1

UK production team

ADD Version 1.0

The consortium of institutes involved in the production of ADD Version 1.0 consisted of the British Antarctic Survey (BAS), the Scott Polar Research Institute (SPRI) and the World Conservation Monitoring Centre (WCMC) (now UNEP World Conservation Monitoring Centre). All are located in Cambridge, England. The different roles that the three institutes played in the project are indicated in Tables A1.1–3. In essence, data research, data capture and editing were co-ordinated by BAS and SPRI, whereas the bulk of the digitizing in the UK, the financial management and also general organization of the project were undertaken by WCMC. BAS and WCMC shared the responsibility for managing the digital data and for the development of the CD-ROM product. A steering committee, which included representatives of BAS, BP, Petroconsultants, SCAR, SPRI and WCMC, provided overall guidance to the project.

Table A1.1. BAS production team, ADD Version 1.0

Personnel	*Responsibility*
A.J. Fox	Digitizer and editor of digital files during final preparation of the seamless map.
S.R. Jordan	Principal editor of digital files; data research and interpretation of satellite imagery; digitizing from source material; quality assuraance (QA); contributed to Chapters 8 and 9 of the manual.
A. Roberts	Research and preparation of hierarchical Antarctic place-names database; wrote Chapter 5 of the manual.
J.W. Thomson*	Principal editor of source material and co-ordinator of data acquisition in UK and by other SCAR nations; data research and quality assurance; prepared Chapters 1, 4, 7, 8 and 9 and all appendices and was responsible for final editing and preparation of the manual.
A.P.R. Cooper*	Management of BAS digital files; incorporation of digital data from other nations; R&D of techniques; some digitizing of satellite imagery; development of CD-ROM product and user interface; wrote Chapters 2 and 3 and contributed to Chapters 4, 5 and 7 of the manual.

* Final preparation of the database on CD, and finalization of the manual, were undertaken in consultation with ESRI, partly at ESRI headquarters in Redlands, California.

Table A1.2. SPRI production team, ADD Version 1.0

Personnel	*Responsibility*
K.G. Newport	Digitizer of source material in UK.
Dr C. Swithinbank	Principal interpreter of satellite imagery; preparation of linework overlays to images. Prepared Chapter 6 and contributed to Chapter 8 of the manual.

Table A1.3. WCMC production team, ADD Version 1.0

Personnel	*Responsibility*
E.M.R.Edwards, BAS/WCMC	Principal digitizer of source material in UK; editor of digital files; contributed to Chapter 3 of the manual.
M. Adam/J. Rhind*	Management of WCMC digital files; R&D of techniques; development of CD-ROM product and user interface; contributed to Chapters 2 and 3 of the manual.

* Worked on final preparation of the database on CD at ESRI headquarters in Redlands, California.

ADD Version 2.0

Work on the ADD has continued at BAS since 1994 under the auspices of the SCAR Working Group on Geodesy and Geographic Information (WG-GGI), and the supervision of J.W. Thomson, convenor of the WG-GGI's ADD programme. A.P.R. Cooper managed the database during its revision programme and masterminded its conversion to the UNIX environment. He was also responsible for designing the web pages and releasing the data on the web. S.D. Evans carried out the bulk of the conversion to ArcInfo LIBRARIAN format and was responsible for correcting errors in the database, and for inserting new data. J.W. Thomson co-ordinated and edited the revision of the ADD Version 2.0 manual, available on-line.

ADD Version 3.0

With the continuing support of the SCAR WG-GGI and funding by SCAR, BAS was able to make substantial revisions and enhancements to the ADD during 1999. P.K. Derbyshire and O.J. Cottray undertook the conversion and integration of new contour data derived from the BPRC DEM, under the guidance of A.P.R. Cooper, and O.J. Cottray was responsible for correcting errors and omissions reported from earlier versions of the ADD. A.P.R. Cooper continued as ADD Database Manager and he was responsible for preparing the new version for release on the web. O.J. Cottray and A.P.R. Cooper developed new procedures for generalizing the Scale0 dataset to 1:1 000 000 scale. J.W. Thomson, as convenor of the SCAR ADD project, provided overall management of the project and she edited a new version of the manual for publication. The organizations that have either contributed data to the ADD project or collaborated in the preparation of the evolving database since 1990, referred to here as the ADD Consortium, are listed in Table A1.4.

Table A1.4. The ADD Consortium

Nationality	*Organization*
International	Scientific Committee on Antarctic Research (Working Group on Geodesy and Geographic Information)
Argentina	Servicio de Hidrografía Naval, Buenos Aires
Australia	Australian Antarctic Division, Hobart; Australian Surveying and Land Information Group, Canberra
China	Wuhan Technical University of Surveying and Mapping, Wuhan
Germany	Bundesamt für Kartographic und Geodäsie (formerly Institut für Angewandte Geodäsie), Frankfurt am Main; Alfred-Wegener-Institut, Bremerhaven
Japan	Geographical Survey Institute, Ibaraki-ken
New Zealand	Land Information New Zealand (formerly Department of Survey and Land Information), Wellington
Norway	Norsk Polarinstitutt, Tromsø
Poland	Instytut Geodeszji i Kartografii, Warszawa
Russia	Main Administration of Geodesy and Cartography, Moscow
UK	British Antarctic Survey, Cambridge; Scott Polar Research Institute, Cambridge; UNEP World Conservation Monitoring Centre, Cambridge
USA	Byrd Polar Research Center, Columbus; US Geological Survey, Reston

Appendix 2

Data quality information

Source maps

The reliability of the original maps used for the construction of the database can be assessed by reference to the bibliography in Chapter 5 of this manual. Each source map is listed according to the IMW tile classification (see Chapter 2, Fig. 2.2), and the method used to prepare the published maps is described. Any amendments made to the published maps by project staff during the preparation of the database, after reference to other source material (aerial photographs, satellite images, etc), are noted at the end of each source map description.

No relative reliability codes have been assigned to the source maps. An alphabetical code in the **source** attribute table indicates either the national map series used or the person providing data to the project. This information, coupled with the map sheet data, allows the source of each feature to be identified in the database.

Feature reliability

Many of the features included in the ADD versions 1.0, 2.0 and 3.0 have been depicted on published maps in different ways according to the known reliability of their position during the original topographic field survey. Thus features are described as either definite or approximate in the map legends and these variations have been translated into different codes in the **ADD code** attribute (see Chapter 2, Table 2.2).

Digitizing standards

For ADD Version 1.0 maps were manually digitized in the UK from stable film compilation sheets, film separates of published maps and paper copies of published maps. Hard copy output, on stable film, was then verified through independent quality control inspection. Digitized lines or points that deviated by more than 0.3 mm from the position on the source map were discarded, and amendments made were subjected to a second quality control.

Similar procedures were followed during the preparation of ADD Version 2.0, although some new data were derived from scanned material which was registered and then used as a backdrop for manual, on-screen digitizing. No automatic line-following software has been used during the preparation of the ADD.

The DEM incorporated into ADD Version 3.0 was generated with a cell size of 200 m. It has an effective horizontal resolution of 200 m over mountainous areas, 400 m in coastal regions, and approximately 5 km in the interior. The vertical accuracy of the DEM is estimated to be about 100–130 m over the rugged mountainous area, better than 2 m for the ice shelves, better than 15 m for the interior ice sheet, and about 35 m for the steeper ice sheet perimeter (Liu *et al.*, 1999).

Editing criteria

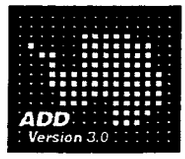
Data captured from small-scale map sources became redundant during the harmonization process if, for a given area, more detailed information from larger-scale maps was available to the project. Similarly, new sources of information have been given priority over older material: for example, remotely sensed data used for the interpretation and location of coastal features, and for the generation of improved contours over the ice sheet north of 80°S.

References

Liu, J., Jezek, K.C. and Li, B. 1999. Development of an Antarctic Digital Elevation Model by integrating cartographic and remotely sensed data: a GIS-based approach. *Journal of Geophysical Research*, **104** (B10), 23,199–23,213.

Appendix 3

List of acronyms used in the ADD Version 3.0 manual



Acronyms have usually been defined after the first reference to them in the text of this manual. However, the glossary provided below collates them all in one place and it also includes a few abbreviations commonly used in the English language. Note that abbreviations and codes devised for the naming conventions adopted in the database (for example CONT00, CNT00TYP, etc.) have not been included in the glossary; these are defined in Chapters 2 and 3.

Glossary

AAEE	Aircraft and Armament Experimental Establishment, UK
AAT	Arc attribute table
ADD	Antarctic digital database
AGSO	Australian Geological Survey Organization
ANARE	Australian National Antarctic Research Expedition
APC	Antarctic Place-names Committee, UK
ARC/INFO™	ESRI software package
ASCII	American Standard Code for Information Interchange
AVHRR	Advanced Very High Resolution Radiometer
BAS	British Antarctic Survey
BPRC	Byrd Polar Research Center
BEDMAP	Antarctic Bedrock Mapping Project
BP	The British Petroleum Company p.l.c.
CD	Compact Disc
CD-ROM	Compact Disc-Read Only Memory
CGA	Composite Gazetteer of Antarctica
dBASE™	Borland International (UK) Ltd software package
DCW	Digital Chart of the World
DEM	Digital elevation model
DOS	Directorate of Overseas Surveys (now Ordnance Survey International)
DRG	Digital Raster Graphic
EDM	Electronic distance meter
ERS-1	European Remote Sensing satellite
ERTS-1	Earth Resources Technology Satellite
ESRI	Environmental Systems Research Institute, Inc.
FID	Former Falkland Islands Dependencies
FIDASE	Falkland Islands and Dependencies Aerial Survey Expedition
GIS	Geographic Information Systems
HORIZON	Laser-Scan Ltd software package
HQ	Headquarters
ICSU	International Council for Science
ID	Identity code
IfAG	Institut für Angewandte Geodäsie (now Bundesamt für Kartographie und Geodäsie)
IMW	International Map of the World

IUCN	The World Conservation Union
JARE	Japanese Antarctic Research Expedition
kbyte	kilobytes
km	kilometre
LITES2	Laser-Scan Ltd software package
LIBRARIAN	ArcInfo subsystem for creating and maintaining map libraries
m	metre
m^2	square metres
MB/Mbyte	megabyte
MDMS	Meta Data Management System
MIME	Multi-purpose Internet Mail Extensions
MSS	Multi-spectral scanner
NASA	National Aeronautic and Space Administration, USA
NJUG	National Joint Utilities Group, UK
NOAA	National Oceanic and Atmospheric Administration, USA
PAT	Polygon attribute table/Point attribute table
PC	Personal computer
PLD	Print laydown (of aerial photography)
QA	Quality assurance
RAMP	Radarsat Antarctic Mapping Project
RARE	Ronne Antarctic Research Expedition
R&D	Research and development
RDFO	Research Department, Foreign Office, UK
SCAR	Scientific Committee on Antarctic Research
SPRI	Scott Polar Research Institute
TM	Thematic Mapper
TMA	Trimetrogon aerial photography, US Navy
TWERLE	Tropical Wind Energy Conversion and Reference Level Experiment
UK	United Kingdom
UNEP	United Nations Environment Programme
UNIX	Workstation operating system
US/USA	United States of America
USGS	US Geological Survey
USSR	Former Union of Soviet Socialist Republics
WCMC	UNEP World Conservation Monitoring Centre
WDDES	World Digital Database for Environmental Science
WG-GGI	Working Group on Geodesy and Geographic Information (of SCAR)
WGS	World Geodetic System
WWF	World Wide Fund for Nature
WWW	World Wide Web

Appendix 4

List of Antarctic scientific stations (winter 1999)

The scientific stations of SCAR nations listed in Table A4.1 are those that operated south of 60°S during the Antarctic winter of 1999. These details, reproduced from *SCAR Bulletin* No. 135 (October 1999), indicate the stations included in the HUMAN layer of ADD Version 3.0. The details shown in the table are updated annually by SCAR and the status of those stations listed should be checked against the current SCAR listings in October 2000 *et seq*.

Table A4.1. Antarctic scientific stations (winter 1999)

Country	*Name of station*	*Co-ordinates*
Argentina	Belgrano II	77°52′29″S, 34°37′37″W
	Esperanza	63°23′42″S, 56°59′46″W
	Jubany	62°14′16″S, 58°39′52″W
	Marambio	64°14′42″S, 56°39′25″W
	Orcadas	60°44′20″S, 44°44′17″W
	San Martin	68°07′47″S, 67°06′12″W
Australia	Casey	66°17′00″S, 110°31′11″E
	Davis	68°34′38″S, 77°58′21″E
	Mawson	67°36′17″S, 62°52′15″E
Brazil	Comandante Ferraz	62°05′00″S, 58°23′28″W
Chile	Capitan Arturo Prat	62°30′S, 59°41′W
	General Bernardo O'Higgins	63°19′S, 57°54′W
	Presidente Eduardo Frei	62°12′S, 58°58′W
	Escudero	62°11′57″S, 58°58′35″W
China	Great Wall	62°13′S, 58°58′W
	Zhongshan	69°22′S, 76°23′E
France	Dumont d'Urville	66°39′46″S, 140°00′05″E
Germany	Neumayer	70°38′S, 08°15′48″W
India	Maitri	70°45′57″S, 11°44′09″E
Japan	Syowa	69°00′25″S, 39°35′01″E
Korea	King Sejong	62°13′24″S, 58°47′21″W
New Zealand	Scott Base	77°51′00″S, 166°45′46″E
Poland	Arctowski	62°09′34″S, 58°28′15″W
Russia	Bellingshausen	62°12′S, 58°58′W
	Mirny	66°33′S, 93°01′E
	Molodezhnaya	67°40′S, 45°51′E
	Novolazarevskaya	70°46′S, 11°50′E
	Progress	69°23′S, 76°23′E
	Vostok	78°28′S, 106°48′E
South Africa	SANAE IV	71°41′S, 02°50′W
Ukraine	Vernadsky	65°14′43″S, 64°15′24″W
United Kingdom	Halley	75°35′S, 26°30′W
	Rothera	67°34′10″S, 68°07′12″W
United States of America	Amundsen-Scott	89°59′51″S, 139°16′22″E
	McMurdo	77°50′53″S, 166°40′06″E
	Palmer	64°46′30″S, 64°03′04″W
Uruguay	Artigas	62°11′04″S, 58°54′09″W