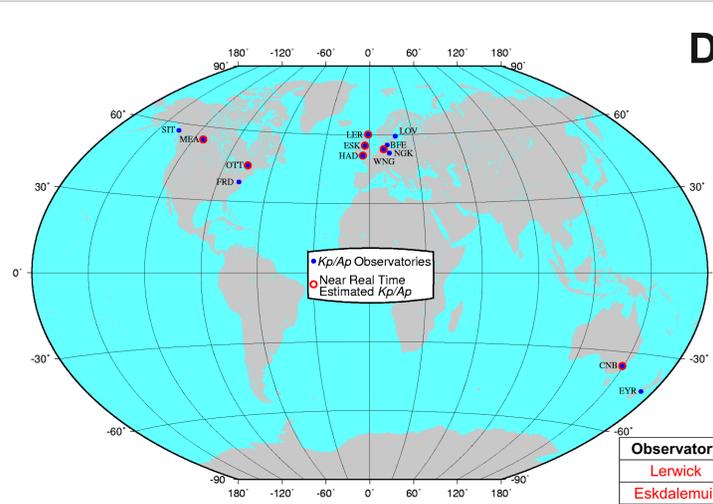


¹British Geological Survey, West Mains Road, Edinburgh EH9 3LA, UK E.Clarke@bgs.ac.uk, ²Adolf-Schmidt-Observatory, Lindenstr. 7, D-14823, Niemegk, Germany

IUGG- Sapporo, Japan. July 2003. Session GAV.02

The 3-hourly planetary indices Kp and ap and the daily planetary index, Ap , which are derived by GeoForschungsZentrum (GFZ), Potsdam, on behalf of the International Service of Geomagnetic Indices (ISGI), are made available twice per month. This time delay is inevitable because of the need for a high quality homogenous data set. However, the process may not be sufficiently responsive to the needs of the space weather community, in particular forecasters, where small discrepancies in the data are usually less important than their timely availability. An automated algorithm has been developed by the British Geological Survey (BGS) to derive real-time estimates of the ap and Ap indices, called ap_{est} and

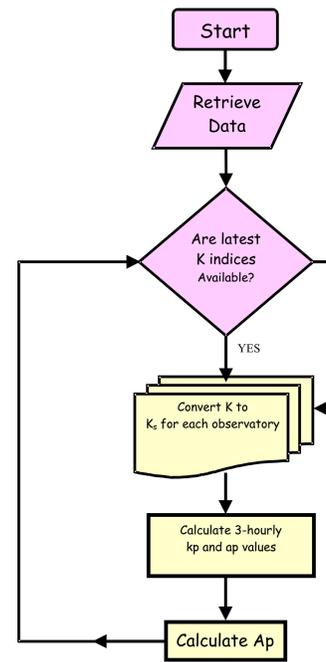
Ap_{est} respectively. These are available on-line at www.geomag.bgs.ac.uk/gifs/apindex.html. The derivation process of these indices is described, which has been designed to match that of the definitive indices as closely as possible. A comparison between the BGS values of ap_{est} , Ap_{est} and the corresponding definitive values is presented. Modifications to the derivation process are still on-going, taking advantage of the advances made by the INTERMAGNET programme in data delivery. The ultimate goal is for GFZ to take over the responsibility for derivation and delivery of the real time indices, which could be considered quick-look or provisional values.



Observatory	Location
Lerwick	Scotland
Eskdalemuir	Scotland
Hartland	England
Wingst	Germany
Niemegk	Germany
Brorfelde	Denmark
Lovö	Sweden
Meanook	Canada
Ottawa	Canada
Fredericksburg	USA
Sitka	Alaska (USA)
Canberra	Australia
Eyrewell	New Zealand

The map shows the global distribution of the magnetic observatories providing data. These are also listed in the table. The algorithm for ap_{est} and Ap_{est} derivation currently uses data from those listed in red. The aim is to include more of the definitive Kp observatories to improve the accuracy.

Derivation of Ap_{est} and ap_{est}



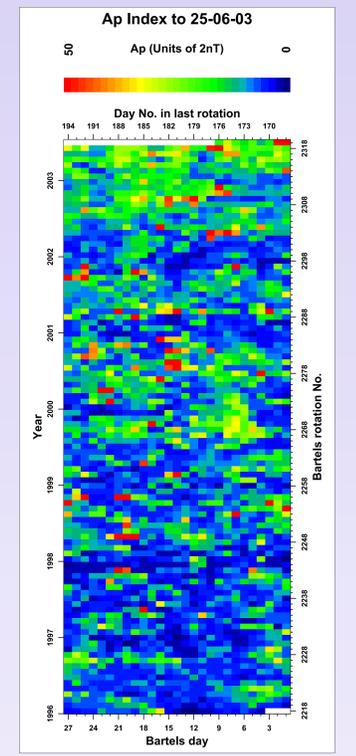
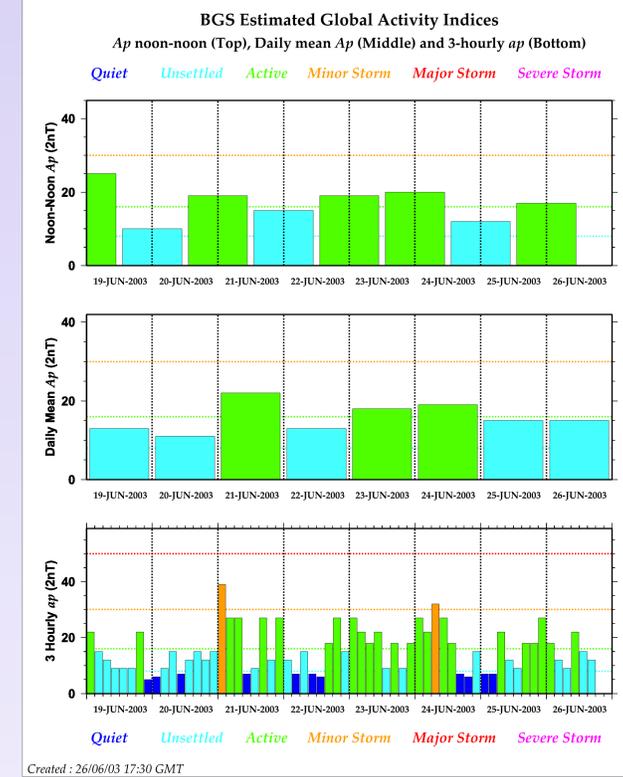
Currently the required input data are collected automatically from various locations and by various means :

INTERMAGNET GIN;
Anonymous ftp site;
Daily emails of SIDC URSIGRAM bulletins and IPS reports

An individual algorithm has been developed for estimating the K indices from each observatory. These depend on the input data available and the method of data collection. As soon as the definitive K indices are available they are used to replace the estimated values in the calculations of Kp . The flow diagram summarises the real time production process.

Depends on what data are available from observatory
Same process as definitive kp/ap calculations

This is controlled by scripts running automatically every hour on a Unix Sun workstation



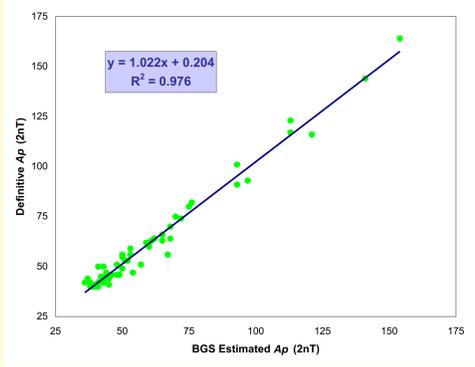
An example of the real time display available on-line is shown above. The web address is :

www.geomag.bgs.ac.uk/gifs/apindex.html

Derived from all the available K and estimated K indices in the network, the 3-hourly ap_{est} are up-dated every hour. Ap_{est} for today is determined from all available ap_{est} . These real time values are a valuable aid to BGS staff when forecasting geomagnetic activity levels in the short-term. Noon-noon (local to UK time) Ap values are plotted in the top left panel to give a better representation of activity levels over the local night time. The values are also used to determine the accuracy of the most recently made predictions. The plot on the right shows Ap , colour coded and plotted by Bartels 27-day rotation, which can help forecasters by highlighting recurrent activity patterns.

Future Plans

- 1. Incorporate data from the remaining observatories**
These are Niemegk, Brorfelde, Lovö, Fredericksburg, Sitka and Eyrewell. Although real time data availability is not necessarily possible for all of these at present, it should be possible for those observatories currently sending preliminary data to an INTERMAGNET Geomagnetic Information Node (GIN) in near real time. If these preliminary data were reliable and of reasonable quality, then including them in the algorithm would improve the accuracy of the estimated indices.
- 2. Software upgrade**
The software, originally written for personal use, has been developed over time to meet the growing requirements. However, a complete overhaul is now required to create a package that is both robust and portable, whilst remaining flexible enough to allow future improvements when more real time input data become available.
- 3. Transfer from BGS, Edinburgh to GFZ, Potsdam**
Several organisations are now making their own estimated indices, some of which are publicly available. There is some potential for confusion. As GFZ are the official IAGA appointed providers of Kp and Ap indices it would be sensible for the real time estimated values to also be derived and disseminated by GFZ.



Daily Ap_{est} Accuracy

The real time Ap_{est} accuracy is considered with respect to the definitive Ap values published 2 weeks in arrears. The Space Environment Center (SEC) also issue estimated Ap in near real-time. An analysis has been carried out on the accuracy of both estimates by comparing each against definitive Ap for the period 1997 to 2000. In the regression analysis (top left and right) only values of definitive $Ap >=40$ are shown. The residual analysis (bottom left and right) shows all values during the 4 years. The SEC Ap are the values that were made available by 02:45 UT. Our estimates have been derived retrospectively using the data that is most likely to have been available at this same time. This implies that these results are not conclusive. The SEC values were true real-time and any real-time data retrieval/processing problems that may have occurred are not included in the derivation of our estimates. Ap_{est} is continually updated as new input data become available. Thus the match to definitive Ap is even closer later in the day. The residuals show no clear bias or periodicity. The same comparison for the SEC values highlights a small annual variation in the residuals. This result is most likely related to the restricted longitudinal coverage of the observatories used.

