

# Sat nav

Pack ice and icebergs are two of the biggest hazards to shipping around Antarctica. **Andrew Fleming** and **Paul Bowyer** demonstrate how a new satellite system is protecting ships in the Southern Ocean.

**T**he cruise ship *MV Explorer* struck ice and sank off the coast of Antarctica in November 2007. All 154 passengers and crew escaped alive, but the incident raised serious questions about safety in the region.

Antarctica is becoming a popular tourist destination. Year on year for over a decade cruise ship numbers have increased. With sea traffic burgeoning at both poles – from tourists, freight, fishing and research – inevitably there is a rising risk to ships from icebergs and pack ice in these remote areas. At the very least, the ever-changing sea ice can hinder navigation. This lengthens journey times as ships deviate from planned courses, and costs money because they burn more fuel. Accurate, up-to-date sea ice forecasts would benefit many people, but until recently this goal has proved elusive.

A new service – Antarctic Polar View – uses satellite imagery to provide ships in the Southern Ocean with timely information about sea-ice extent and concentration. The British Antarctic Survey manages the service,

which has been operating for two years, and it is delivered by an international consortium of research organisations, universities and private companies. Already it is expanding and building links with other groups in Europe, the US and Australia.

The service is part of a much wider project, the Polar View programme, funded by the European Space Agency (ESA). This, in turn, is part of the larger Global Monitoring for Environment and Security (GMES) programme (see box). Polar View services in the northern hemisphere include sea-ice information in the Arctic and Baltic Seas, glacier monitoring, and river-ice break-up for flood-risk analysis.

Due to the vast and inaccessible nature of the Southern Ocean, satellite remote-sensing often provides the only practical means of obtaining frequently updated sea-ice information on the time and space scales necessary for navigation. The satellite instruments used by Antarctic Polar View can see straight through clouds to observe sea-ice conditions and map sea-surface roughness.



Detailed satellite images create large computer files, potentially making them slow to download to shipboard computer systems with low data-rate networks. Polar View has circumvented this problem by using new image-format technologies (JPEG2000 and JPIP) which allow users to visualise full-resolution imagery without having to wait an eternity for them to download. (JPEG2000 is a scalable format, and JPIP can request the area and resolution required without having to download all the bytes in between.) We're already discussing applications beyond the Polar View services.

Cruise ships and research ships regularly use the service. It has already improved the efficiency of some research expeditions, in particular programmes looking at sea ice, and it has aided ships supplying Antarctic bases. The Australian Antarctic Program's research ship *Aurora Australis* now routinely uses Polar View imagery. The information reduces the time the ship spends navigating through ice and saves on the number of helicopter flights needed to alert the ship about ice conditions ahead. Looking to the future, fishing vessels and commercial shipping operators could also benefit.

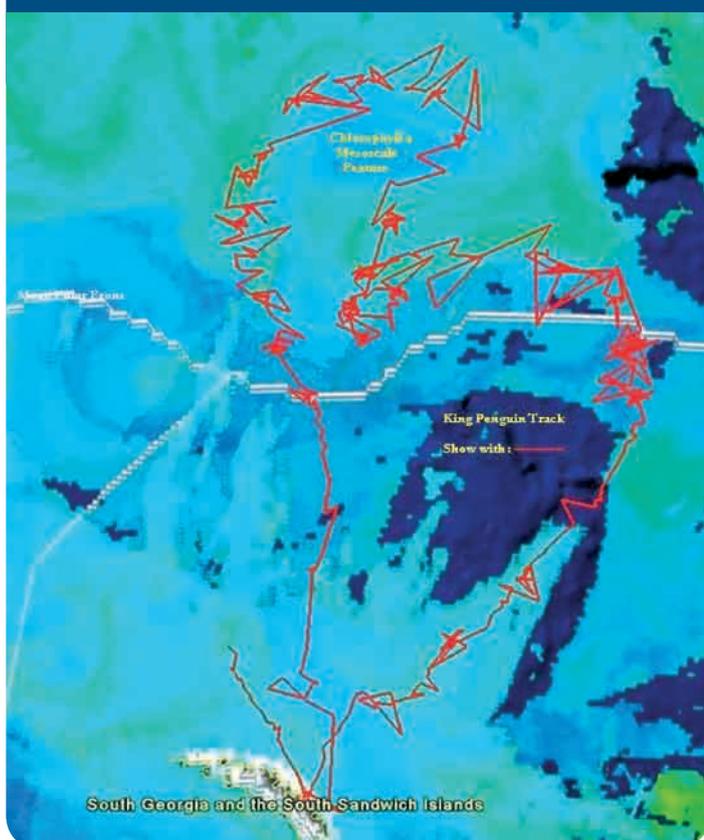
The intention over the next two years is to develop other products such as detailed regional ice charts and potentially sea-ice forecasts. Eventually, we hope to have an operational international ice-charting service for the Southern Ocean which will aid shipping and help minimise its impact on the Antarctic environment. ❁

The *MV Explorer* tourist ship which sank in the Antarctic in November 2007.





A screenshot of penguin tracks overlaid onto chlorophyll data using Google Earth.



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**Further information:** [www.polarview.aq](http://www.polarview.aq)

**Editor's note:** The cruise ship *MV Explorer* was not using the Polar View navigation aid.

## Monitoring the planet from space

There is a large initiative afoot across Europe that could substantially alter the way people look at the environment. This will have a major bearing on scientific and policy decisions in the future.

The Global Monitoring for Environment and Security (GMES) programme is already providing a new range of services to policy-makers, humanitarian aid organisations, the research community and industry, amongst others. These services include monitoring the marine and coastal environment, polar pack ice and icebergs, changes in land use and cover, forests, food security, floods, fires, geological risks and atmospheric pollution, as well as providing humanitarian aid information.

For example, when it is fully operational, a marine service will monitor, forecast and report on the ocean state to:

- better exploit and manage ocean resources;
- improve shipping safety and efficiency;
- anticipate and mitigate environmental hazards and pollution crisis, for example, oil spills or harmful algal blooms;
- marine research;
- seasonal climate prediction;
- implement specific services for coastal management and planning (for example, coastal flooding and erosion).

The backbone of GMES is data drawn from a combination of Earth Observation satellites and ground-based monitoring stations. Many of these new services are the result of satellite technologies developed for the environmental research community.

The service, a joint initiative between the European Commission and the European Space Agency\* (ESA), plans to launch five new satellites in the next two decades. GMES, funded in the UK by the Department for Environment, Food and Rural Affairs (Defra) and NERC, will give scientists an unprecedented long-term coordinated view of the changing Earth. The challenge is to be prepared to exploit these new data streams.

[www.gmes.info](http://www.gmes.info)

[www.esa.int/esaLP/LPgmes.html](http://www.esa.int/esaLP/LPgmes.html)

JPEG2000: [www.jpeg.org/jpeg2000/index.html](http://www.jpeg.org/jpeg2000/index.html)

Polar View Antarctic Node: [www.polarview.aq](http://www.polarview.aq)

\*NERC contributes about £40 million a year to European Space Agency programmes.