

First Images from Envisat

With Two Extremes of Coastal Water - Ice Cold & Tropical

Since the last two issues of *Geoinformatics* have contained short articles, first introducing Envisat and then describing its successful launch, it would seem appropriate to round off the story of its introduction into service by reporting on the first images produced from the satellite. These were released by ESA on 28th March. They comprised (i) an image of part of the Antarctic Peninsula acquired by the ASAR radar imager and (ii) coloured images of coastal areas of West Africa acquired by the MERIS optical pushbroom scanner. These images had been recorded on board Envisat and subsequently downloaded when the satellite passed within range of ESA's ground receiving station located near Kiruna in Northern Sweden. The initial pre-processing took place at Kiruna, while the subsequent, more refined processing took place at ESA's research facility (ESRIN) located at Frascati, near Rome in Italy.

By Prof. Gordon Petrie

shelf - the Larsen ice shelf - which floats on the coastal sea water and is fed by the snow fields and glaciers of the Peninsula. Since the Peninsula stretches much further north (towards the southern tip of South America) than the rest of Antarctica, it is far more likely to be affected by climatic warming taking place in the region. In January 1995, the most northerly section of the ice shelf - called Larsen A - collapsed in spectacular fashion and disintegrated into an enormous plume of icebergs that floated off eastwards into the Weddell Sea. This event was recorded both by the American NOAA and Landsat satellites and by Envisat's predecessor ERS satellite. During February/March 2002, a similar catastrophic collapse of the central part of this huge ice shelf - termed Larsen B - took place over the five week period up till 7th March. This newly collapsed section had a surface area of 1,250 sq. miles (3,237 sq. km) and an estimated thickness of 650ft (200m). This spectacular event was in fact observed first by the MODIS optical imager mounted on NASA's Terra satellite. The resulting images were released on 20th March. But naturally ESA used the newly commissioned ASAR on Envisat to acquire further images of the break-up of Larsen B on 18th March. These were shown publicly on 28th March. NASA and ESA scientists warn that the remaining southerly part of this ice shelf - Larsen C - could suffer the same fate as its more northerly sections in the coming years.

Antarctic Peninsula

The area of the Antarctic Peninsula has been one of great interest to scientists over the last 50 years. The initial baseline topographic mapping of the area was carried out from aerial photographs during the 1950s by a commercial company, Hunting Surveys, under contract to the U.K. Directorate of Overseas Surveys. This work was described in the well known book "Wings Over Ice" written by the leader of the expeditions, Peter Mott, and published in 1986. Since then, with the advent of Earth orbiting satellites, the moni-

toring of this remote area with its glaciers and ice-shelves has been carried out with rather fewer difficulties using space images than those experienced by the original ground and aerial surveyors. In particular, various radar satellites (ERS, Radarsat) have been especially useful since they could acquire their images irrespective of the prevalent cloud, rain and snow and the long period of winter darkness that characterize the area.

• Larsen Ice Shelf

The Eastern coast of the Antarctic Peninsula has been fringed by a large ice



Figure 1: (a) ESA's Ground Station located near Kiruna in Northern Sweden. This can be used for command and telemetry operations besides receiving image and other data from Envisat. (b) The ESOC Control Centre located in Darmstadt, Germany. (c) The ESA data processing centre at ESRIN, Frascati, Italy.

Warm!

West Africa

As mentioned in the article in the March issue, MERIS is an optical pushbroom scanner configured as an imaging spectrometer that is intended to be used primarily for oceanographic research. It produces images in 15 spectral bands simultaneously. These enable scientists to monitor the surface

optical properties of large areas of the ocean. The images allow the scientists to assess the chemical constituents of oceanic areas. In particular, the green band images indicate the concentration of phytoplankton. For the coastal area of Mauritania, the MERIS image acquired from Envisat shows a huge area of phytoplankton that has been produced by the upwelling of deep water caused by the prevailing north-east trade winds that occur in this region. This upwelling brings nutrient rich water to the surface that is a vital factor in the production of the phytoplankton. In turn, this sustains large fish stocks on which the local economy depends. Another of the MERIS

images covers the coastal area of Senegal, Gambia and Guinea-Bissau and shows the heavy discharge of sediment brought down by the rivers flowing in the southern part of this region covered by tropical vegetation.

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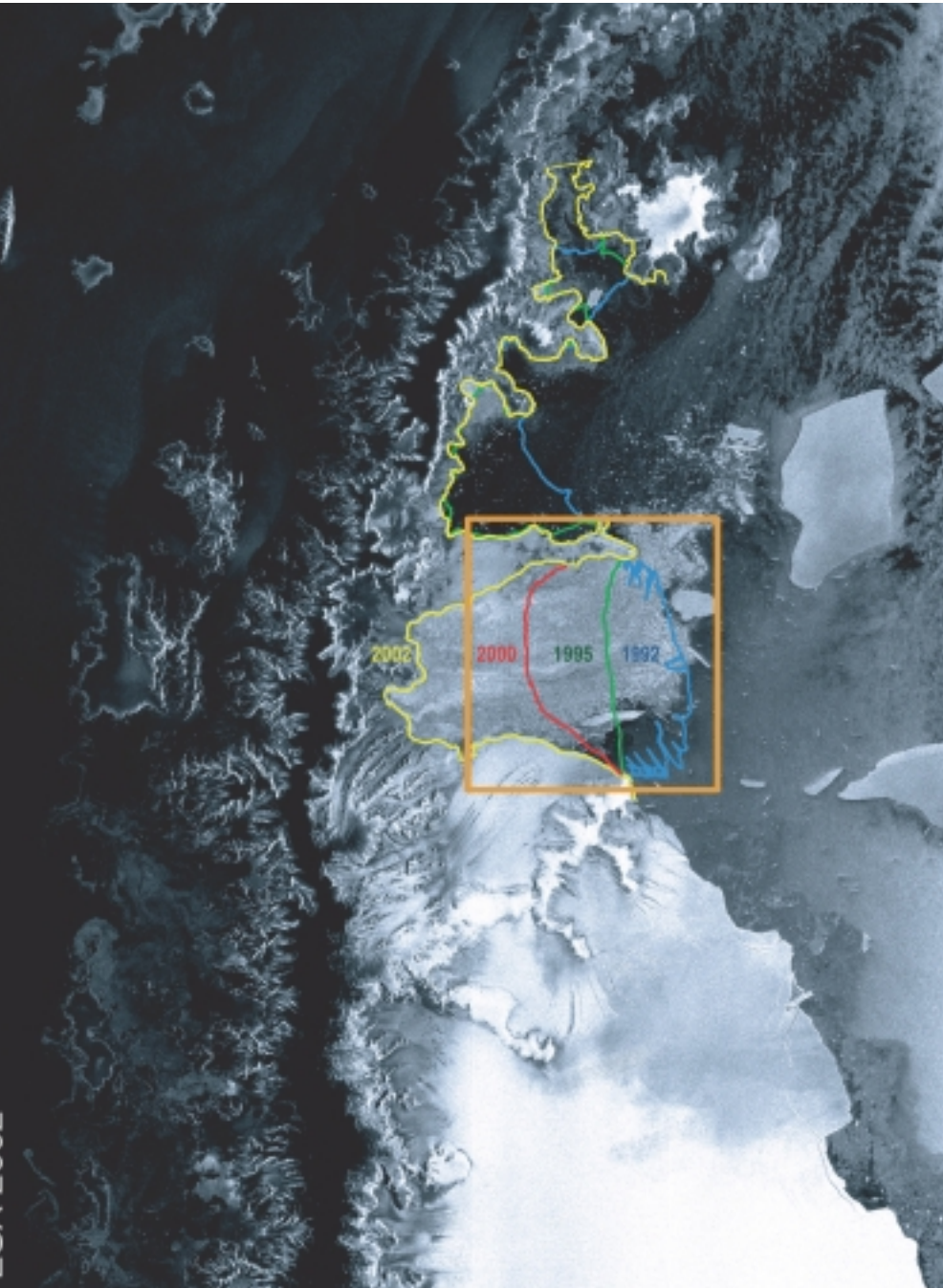


Figure 2: Data acquired by the SAR imagers on the new Envisat and the previous ERS satellites has been compiled and brought together to show the retreat of the Larsen B ice shelf attached to the Antarctic Peninsula that has taken place over the last ten years. (Source: ESA)

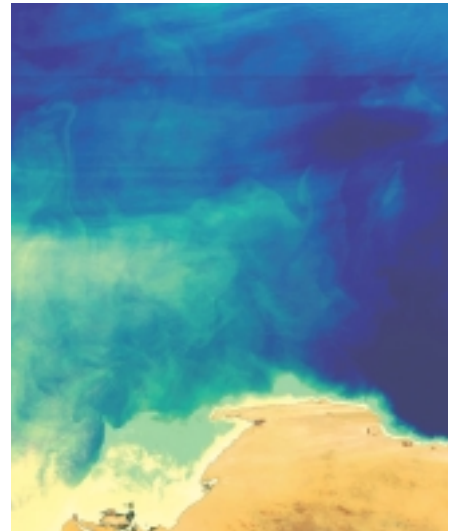


Figure 3: The coastal area of Mauritania, West Africa as recorded by the MERIS optical pushbroom scanner. The image shows the huge plankton patch formed where the nutrient-rich water from the deeper parts of the ocean is upwelling under the action of the prevailing north-east trade winds. (Source: ESA)

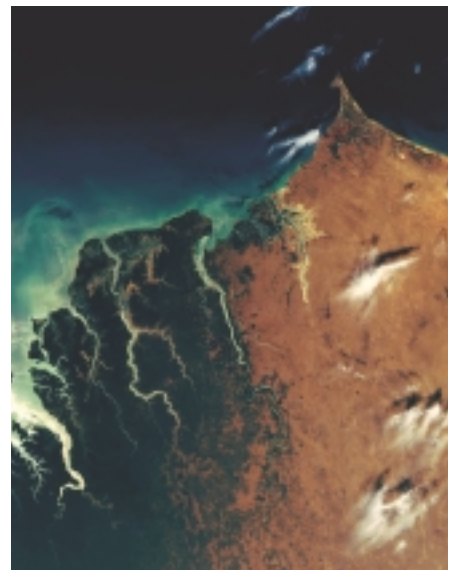


Figure 4: This MERIS image shows the coastal area between Dakar (Senegal) and Bissau (Guinea-Bissau). The rivers and their estuaries show up clearly, as do the plumes of sediment being discharged into the sea. (Source: ESA)