

The Near-real Time High-resolution Ice Map Service for the Ships of the Italian Antarctic Program

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ABSTRACT

The service of Near-Real Time (NRT) high-resolution ice map delivery, set up to assist the vessels of the Italian Antarctic Program (PNRA) operating in the Ross Sea, is presented. The procedure developed to produce the ice maps is described and some examples of the final products delivered to the ships are shown.

1 INTRODUCTION

Beginning with the austral summer 2003-2004, a service of Near-Real Time (NRT) high-resolution ice map delivery was set up to assist the vessels of the Italian Antarctic Program (PNRA) operating in the Ross Sea. From the campaign 2005-2006, the service has become part of Polar View Project (www.polarview.org).

Two ships of the Italian Antarctic Program usually carry out field operations in the Ross Sea during the austral summer: 1) “Italica” which is the main ship of the Antarctic Program; and 2) RV “OGS Explora”. “Italica” leaves New Zealand at the beginning of December to reach the Italian Base “Mario Zucchelli Station” (MZS) at Terra Nova Bay (74°S 165°E); at the onset of the melting season, the ship usually encounters ice fields around 68°S and, depending on ice conditions, its journey can last from 12 to 20 days. After the download of logistic and scientific material at the Base, the ship becomes an oceanographic research vessel and operates for more than one month in the Ross Sea. “OGS Explora”, on the contrary, is a typical oceanographic vessel whose task is to carry out fieldwork in Antarctica during the entire summer season.

2 METHODS

The high-resolution NRT ice maps provided to the ships are based on Envisat/ASAR Wide Swath (WS) images and are produced by means of a procedure which consists of the following steps:

1. plan of acquisition over the area of operations notified to ESA with 2 weeks of advance notice (compulsory request by ESA);
2. ASAR WS data are acquired over Antarctica and downloaded at Kiruna Station (Sweden);
3. ASAR WS data in the standard format are available for downloading on the rolling archive of either Kiruna or ESRIN server, from 2 to 4 hours after acquisition;
4. ASAR WS data are transferred to ISAC and processed as geo-coded jpeg images;
5. processed images are transferred to the server of the Italian Antarctic Program in Rome and an “alert” is sent to the ships by e-mail;
6. processed images are available on the ship within 3 to 5 hours from acquisition time.

Basic ASAR image processing was performed by means of specific commands of the commercial software package TeraScan [1].

3 RESULTS

Figures 1, 2 and 3 show only few examples of the kind of products provided in NRT to the two ships of PNRA. The basic processing of the raw ASAR data consists of: i) ingestion of the raw data into TeraScan software; ii) display of the full scene with its geo-references; iii) extraction of full resolution geo-referenced images; iv) contrast stretching. In a first instance, a more complex analysis [2,3] was applied to the full resolution images but the modest betterment of the results did not justify the high computation load required by these methods.

4 CONCLUSIONS

The availability of ASAR WS data from Envisat satellite led to a great improvement in the quality and usefulness of high-resolution sea-ice maps. As the first maps based on ASAR data were delivered to “Italica”, the head of the cruise confirmed his satisfaction and their utility for navigation. Of the whole procedure described above, the weakest point is the first one, *i.e.* the two-week advance notice required by ESA to plan acquisition. Indeed, during the field campaign, it may happen that the scientists, depending on sea or ice or weather conditions, decide to change the planned route, thus nullifying the acquisition plan.

It is worth noting that the high-resolution sea-ice map service described in this note is complemented by the daily delivery to the ships of low-resolution sea-ice maps derived from AMSR-E data [4].

ACKNOWLEDGMENTS

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REFERENCES

- [1] SEASPACE CORPORATION, 2004: Terascan Users Manual. Poway, CA.
- [2] BARALDI, A., and PARMIGGIANI, F., 1995: A refined Gamma MAP SAR speckle filter with improved geometrical adaptivity. *IEEE Trans. Geosci. Remote Sensing* 33, No. 5, pp. 1245-1257.
- [3] BARALDI, A., and PARMIGGIANI, F., 2001: Classification of sea-ice types in SAR imagery. *Il Nuovo Cimento C* 24, pp. 113-121.
- [4] PARMIGGIANI, F., 2006: Fluctuations of Terra Nova Bay polynya as observed by active (ASAR) and passive (AMSR-E) microwave radiometers, *Int. J. Remote Sensing* 27, pp. 2459-2467.

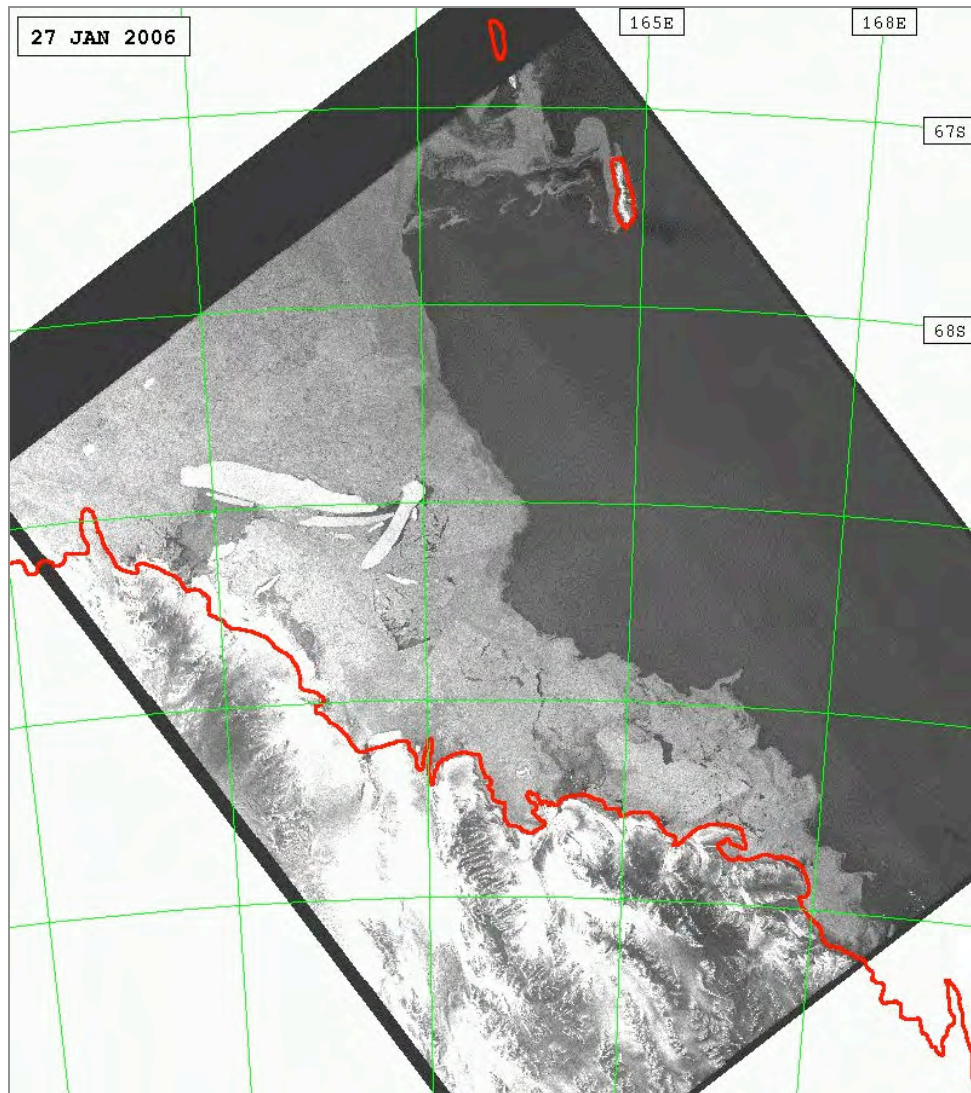


Figure 1. Full ASAR WS scene of Pennell Coast (Antarctica).

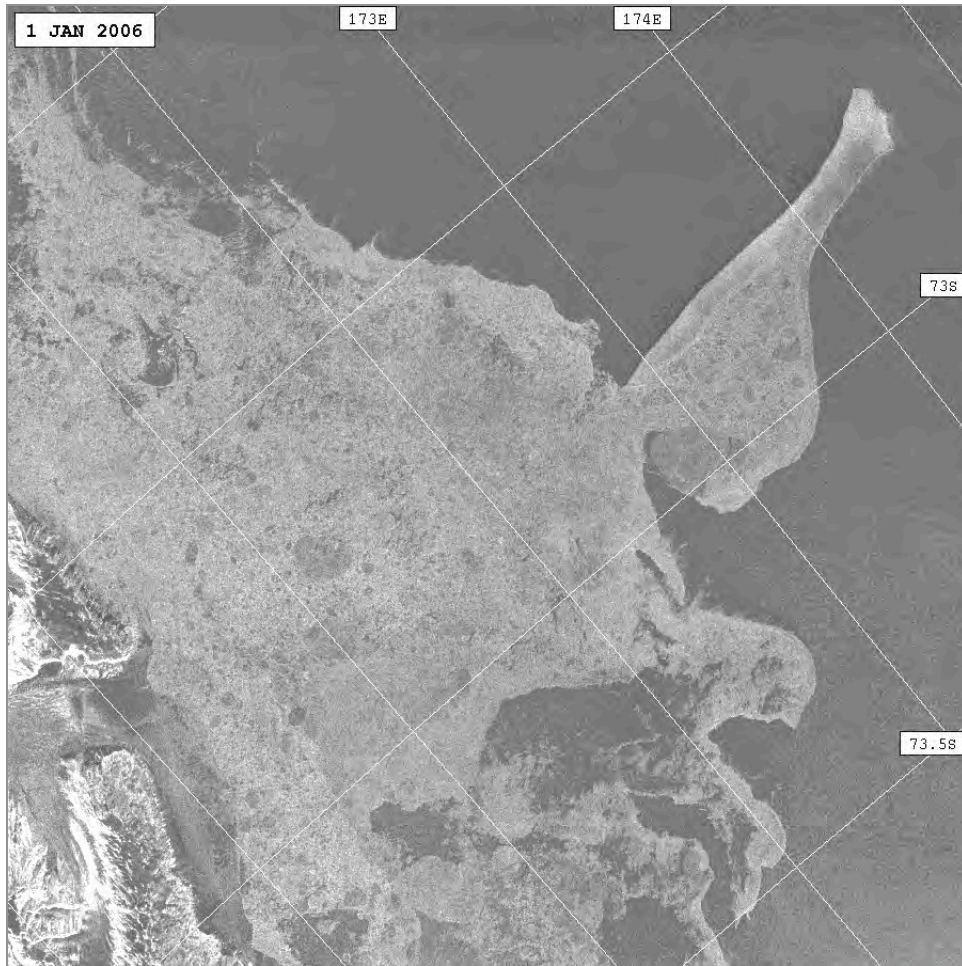


Figure 2. Example of full resolution ASAR image as delivered to the ship.

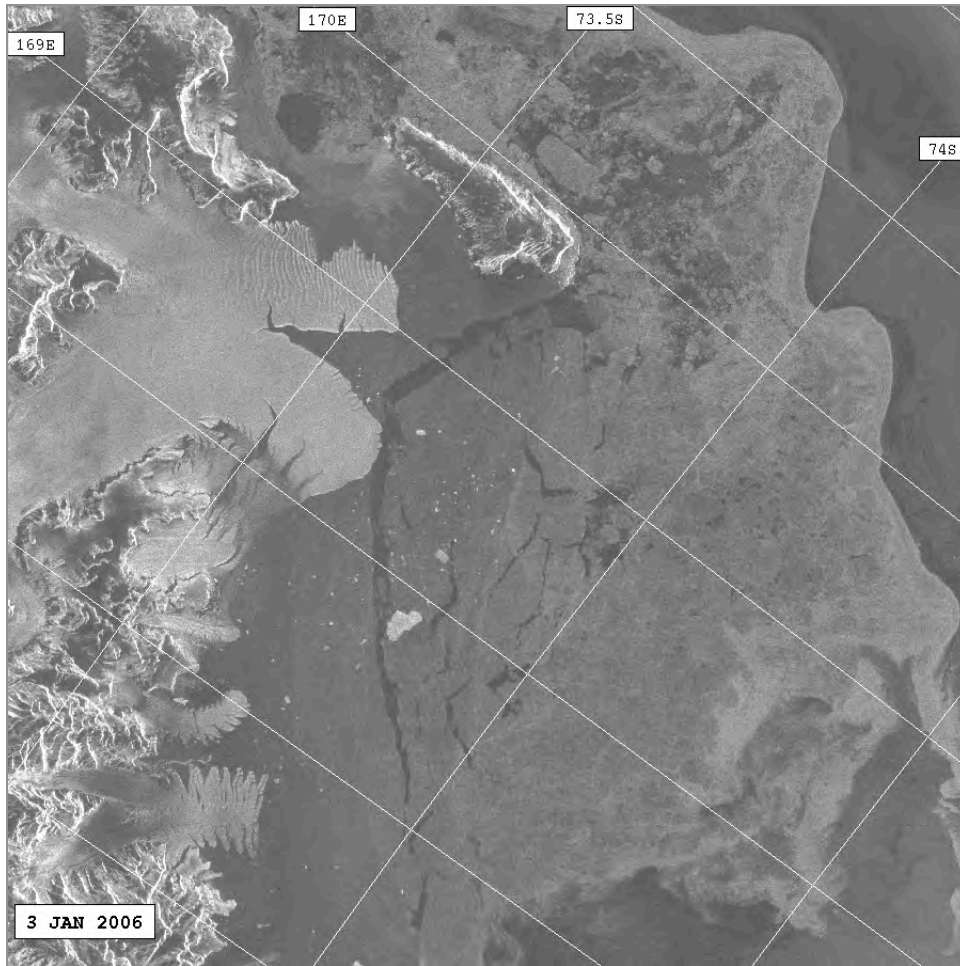


Figure 3. Example of full resolution ASAR image as delivered to the ship.