



**TERRA ANTARTICA
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**The Italian-British Antarctic Geophysical and
Geological Survey in Northern Victoria Land
2005-06 –**

towards the International Polar Year 2007-08

Editors

Emanuele Bozzo & Fausto Ferraccioli

The Italian-British Antarctic Geophysical and Geological Survey in northern Victoria Land 2005-06 - towards the International Polar Year 2007-08

During the summer season 2005-06 a major scientific collaboration between the British Antarctic Survey (BAS) and the Italian *Programma Nazionale di Ricerche in Antartide* (PNRA) carried out airborne geophysical investigations in northern Victoria Land.

The survey was undertaken from the end of October 2005 to the end of January 2006 with equipped Twin Otters and enabled the largest aerogeophysical campaign flown so far over the Transantarctic Mountains and Wilkes Subglacial Basin. In total over 60 000 line km of new data were collected over an area 2.5 times the size of Italy, which will provide new constraints on regional crustal structure and East Antarctic Ice Sheet stability. A separate agreement between the French, Italian and British Antarctic programmes enabled 3 flights to be flown over the Dome C subglacial lake district. Ground geophysical stations were also installed to assist imaging crustal structure.

Geological investigations were carried out from two remote field camps deployed at Litell Rocks and Redcastle Ridge in order to study Cenozoic magmatism, tectonics and the Ross-age basement.

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Part of the ISODYN/WISE team in the field.

Foreword

As we enter the first year of the International Polar Year (2007-09) there is an increasing awareness of the importance of international collaboration and pooling of resources, in particular when exploring logistically challenging frontier regions of the Antarctic continent. One such region is the Wilkes Subglacial Basin in the hinterland of the Transantarctic Mountains, in East Antarctica. Here extreme environmental conditions (temperatures up to -40°C , even during the austral summer), coupled with remoteness from Antarctic stations (such as Mario Zucchelli or Concordia) has typically made geophysical exploration a harsh challenge.

The joint Italian-British Antarctic geophysical and geological survey 2005-06, planned and financially supported by the Italian *Programma Nazionale di Ricerche in Antartide* (PNRA) and the British Antarctic Survey (BAS) covered several interdisciplinary aspects in Earth Sciences in Antarctica and successfully raised to the challenge of exploring a segment of the Wilkes Subglacial Basin and of the adjacent Transantarctic Mountains, in northern Victoria Land.

The campaign included the most extensive airborne geophysical survey performed so far over the study region. It utilised a BAS Twin Otter, which was fully equipped with aeromagnetic, airborne gravity and airborne radar sensors. It also included a seismological experiment; a Geomagnetic Depth Sounding and magnetotelluric study; petrological and palaeoenvironmental studies over Cenozoic volcanic sequences; petrological and petromagnetic investigations over the Ross-age basement rocks and; structural geology and uplift history studies, using fission-track analysis.

Some of the major scientific goals for the expedition were to:

- i) re-address the highly contentious stability or dynamism of the East Antarctic Ice Sheet during warm periods in the Neogene, by providing new subglacial topography to input into coupled ice sheet/palaeoclimate models, and by assessing if there are sediments in the Wilkes Subglacial Basin;
- ii) provide new constraints to study the crustal architecture and tectonic development of the Transantarctic Mountains and Wilkes Subglacial Basin system;
- iii) deduce the Neogene environmental and geodynamic history by investigating coeval magmatic rocks;
- iv) gain new insight into the Ross-age basement of the Transantarctic Mountains and the transition to the Precambrian East Antarctic Craton;
- v) extend the study area for Cenozoic tectonics towards the enigmatic hinterland of the Transantarctic Mountains;
- vi) explore with airborne geophysics some of the subglacial lakes of the Dome C area, by means of a separate trilateral Italian-French and UK agreement.

Many of these scientific goals strongly complement each other, and fieldwork and logistics were tailored so as to maximise returns for all the scientific goals.

This issue of *Terra Antarctica Reports* contains the objectives, the field observations, the methodological background, several new technical aspects and some preliminary scientific results. The authors assume the responsibility of the scientific content of their report.

We express our gratitude to all the authors for their timely and relevant contributions, and to the scientific committee of the geophysical division of PNRA and the geological sciences division of the British Antarctic Survey for their support and funding.

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