G. Brancolini (1), L. De Santis (1), F. Donda (1) e P. T. Harris (2)

(1) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale – OGS, Trieste
(2) Antarctic CRC and Geoscience Australia, GPO Box 252-80, Hobart TAS 7001, Australia

RECENT INVESTIGATIONS OF THE GEORGE VTH LAND CONTINENTAL MARGIN, EAST ANTARCTICA – WEGA (WILKES BASIN GLACIAL HISTORY) PROJECT

A geophysical and geological expedition was carried out in the George Vth Land continental margin (East Antarctica; Fig. 1) in the Austral Summer 2000 in the frame of the WEGA (Wilkes Basin Glacial history) project, funded by the Australian National Antarctic Research Expeditions (ANARE) and the Italian Programma Nazionale Ricerche in Antartide (PNRA; Brancolini and Harris, 2000). The results of this successful expedition, which involved Australian, Italian and USA scientists provide new and interesting insights regarding the tectonic and stratigraphic evolution of this key sector of the East Antarctic margin. The George Vth Land continental margin is located at the seaward termination of a large subglacial basin (Wilkes Basin). It is presently covered by more than 3000 m of ice (Drewry, 1983), which base lies mostly below the sea level, then making it particularly sensitive to eustatic fluctuations. The thick sedimentary sequence deposited after the separation between the East Antarctic and the Australian continent (Cande and Mutter, 1982; Veevers, 1987) therefore register the progressive emplacement and the glacial dynamics of the East Antarctic ice sheet since the early Cenozoic, providing therefore a record of global climate changes. High resolution multichannel seismic profiles data collected off the George V Land continental margin (Brancolini and Harris, 2000) reveal a wide spatial and temporal variability in the dominant depositional processes. Asymmetric, high relief (up to 600 m) sediment ridges, mostly orthogonal to the margin, formed on the continental rise as a consequence of prevalent downslope, turbiditic processes (Fig. 2; Escutia et al., 1997 and 2000; De Santis et al., 2003; Donda et al., 2003). Internally the ridges are characterized by channel-levee and sediment waves, which deposited since the early Cenozoic (?Oligocene-?Early Miocene) and contributed to the growth of these giant deposits until the ?Late Miocene. Then the relief of these features progressively decreased, indicating reduced sediment supply from the continent and possibly bottom current activity and/or sedimentation rate decreasing through time. The main development stage of the sediment ridges on the continental rise pre-dates the most significant glacially-driven shelf prograding wedge, that pinches out at the base of the slope. In fact most of the Late Neogene glacial sediments deposited in these more proximal areas and did not reach the rise area, where sediment rates are interpreted to have been low.

It has been suggested (De Santis et al., 2003, Donda et al., 2003) that the sediment ridges main growth phase formed mainly under polythermal glacial conditions, when a wet based ice led to the production of high amounts of meltwater. The progressive upward attenuation of wavy geometries, with widespread filling and draping of the preexisting morphologies, would be related to a change in the Eastern Antarctic Ice Sheet thermal conditions. Starting from the ?Late Miocene dominant polar regimes led to the present starvation condition of the continental margin.

As far as the most recent evolutionary stages of the George V Land margin, sediment cores collected on the continental rise reveal an alternation of massive mud
and laminated facies, interpreted as reflecting a glacial-interglacial ciclicity (Busetti et al., 2003; Escutia et al., 2003). Coarse to fine IRD and well preserved open-ocean diatoms have been identified in the massive mud facies, which represent hemipelagic sedimentation. This indicate that deposition occurred during a period of retreat of sea ice and of good conditions for life, i.e. during an interglacial time (Busetti et al., 2003). Silty laminae identified in the laminated mud facies are associated with traction currents and/or distal turbidities. The absence or few poorly preserved diatoms and the rare IRD clasts suggest deposition conditions during stable ice covering and sporadic iceberg formation, related to glacial periods (Busetti et al., 2003).

Fig. 1 - Bathymetric map of the WEGA area. During the 2000 cruise, 562 km of sub bottom Chirp profiles, 1827 km of multichannel seismic data, 11 gravity cores and 8 piston cores have been acquired on the George V Land shelf, slope and rise. Red dots indicate the positions of the sediment cores collected during the WEGA cruise, while yellow stars represent the proposed IODP drilling sites.

The George Vth basin is also an important source of high salinity shelf water (HSSW; Bindoff et al., 2000; Williams and Bindoff., 2003), which contributes to the Antarctic bottom water formation, driving the earth’s thermohaline circulation system. The analysis of 3.5 kHz seismic data and sediment cores collected in this area
indicates that sub ice-shelf and open marine conditions persisted for more than one glacial stage, up to the present time (Harris and Beaman, 2003; Presti et al., 2003). Bottom currents, which nowadays are related to the formation and the flow of HSSW, played an important role in building and shaping the 35 m thick Mertz sediment drift, which record the progressive changing of the bottom current regimes through the Holocene (Harris and Beaman, 2003; Presti et al., 2003).

The close spaced grid of the high resolution seismic data and the sediment cores revealed also that the most extensive ice grounding event over the George V Basin up to the shelf edge occurred earlier than the Last Glacial Maximum.

**Fig. 2 -** Part of the seismic profile W32 collected on the George V Land continental rise, showing the high variability of the depositional setting geometries and some of seismic sequences identified by De Santis et al. (2003). An example of a channel-levee system is also highlighted.

**BIBLIOGRAFIA**


Harris P.T., Beaman R.J.; 2003, Processes controlling the formation of the Mertz Drift, George Vth continental shelf, East Antarctica: evidence from 3.5 kHz sub-bottom profiling and sediment cores, Deep Sea Research II, 50, 1463-1480.

