Geophysical Research Abstracts,
Vol. 11, EGU2009-12786, 2009
EGU General Assembly 2009

Morphological and sedimentary characterization of changing glacial regimes on the eastern Wilkes Land margin

J. J. González (1), C. Escutia (1), L. De Santis (2), and F. Donda (2)

(1) Instituto Andaluz de Ciencias de la Tierra, CSIC-Universidad de Granada, Av. Fuentenueva s/n, Granada 18002, Spain, (jhonjairo@ugr.es, cescutia@ugr.es), (2) Istituto Nazionale di Oceanografia e di Geofisica Sperimentale (OGS), Borgo Grotta Gigante, Sgonico (TS) 34010, Italy, (ldesantis@ogs.trieste.it, fdonda@ogs.trieste.it)

An integration of all seismic reflection data sets available from the eastern Wilkes Land margin allow us to: (1) define five regionally preserved shelf erosional unconformities when the East Antarctic Ice Sheet (EAIS) extended to the outer continental shelf, and (2) redefine some of the unconformities previously interpreted on the continental rise. Morphological characterization of the five unconformities on the shelf shows an evolution of the ice sheet drainage paths with time. Widespread large erosive U-shaped channels (channel widths of 1-4 km, maximum widths between walls of up to 25 km, and up to 500 m in relief) characterize the basal unconformity (WL-U3) that is interpreted to mark the first glacial advance in this margin. Above WL-U3, the drainage channels become localized and increasily wider and shallower as we move up-section. The youngest valley, eroded during the last glacial maximum (LGM), is broad (25 km) and has the trapezoidal cross-section profile characteristic of glacial troughs elsewhere around Antarctica. The variation in the spatial distribution and morphological character of the drainage systems in the Wilkes Land with time, we believe is related to evolution of the East Antarctic Ice Sheet glacial regime that changed from a temperate wet-based ice sheet during the development of WL-U3 to a cold-based and persistent ice sheet (Pliocene?). This hypothesis is supported by the variations of sedimentary depocenters and sedimentary processes the base of the slope and continental rise.

On the continental rise, our isopach maps of the nine glacial sequences (named WL-S3B-WL-S9, from the deepest to the shallowest) show three main sedimentary depocenter shifts with time. During deposition of sequences WL-S3B to WL-S4 sedimentation is focused on the base of the slope and the uppermost continental rise with thicknesses that vary between 0.55 and 0.75 ms (TWTT). Glacial sequences at the base of the slope are dominated by extensive glacigenic mass transport deposits (MTDs) that are characterized by lens or wedge-shaped external geometries and internal chaotic seismic facies. Minimum runout lengths from the base of slope are between 15 and 50 km with widths between 5 and 13 km. Seaward the WL-S3A to WL-S4 sequences are mainly characterized by horizontally stratified reflectors. During deposition of sequences WL-S5 to WL-S7, sedimentary depocenters are located deeper on the continental rise with thicknesses that vary between 0.35 and 0.525 ms (TWTT). Deposition on the base of the slope continuous to be dominated by MTDs. Seaward from the base of slope, Unit WL-S6 is characterized by the initiation of widespread development of channel-levee complexes and sediment waves and WL-S7 (which shows maximum thickness of 0.525 ms (TWTT)) is characterized by the development of large channel-levee complexes. After the erosional event that truncated 350-700 m of previous shelf strata and formed unconformity WL-U7 with the creation of a large amount of accommodation space on the outer shelf, depositional depocenters during deposition of Units WL-S8 and WL-S9 shift landward to the outer shelf and the base of the slope. Deposition on the outer shelf is characterized by very steep foresets (10º). A trough-mouth fan develops on the slope and sedimentation at the base of the slope is dominated by turbidite systems with some mixed MTDs in contrast with the prior dominance of MTDs.

The above observations suggest that glacial sequences (early Oligocene to middle-late Miocene times?), which are dominated by extensive glacigenic MTDs, result from deposition under a glacial regime with large volumes of melt-water production by a dynamic East Antarctic Ice Sheet (EAIS). In contrast, the turbidite with mixed MTD deposition would develop under a glacial regime with decreased rates of glacial erosion and production of melt-water (Pliocene?).

This contribution results from work funded by Projects: REN2003-09622-C02-01 IPY-POL2006-07266/CGL (Spanish Ministry of Science and Education and FEDER funds).