Geophysical Research Abstracts, Vol. 7, 09786, 2005
SRef-ID: 1607-7962/gra/EGU05-A-09786

Dynamics, nature and timing of Antarctic Peninsula Ice Sheet grounding events on the Pacific margin outer continental shelf during the late Miocene/early Pliocene

P. Bart (1), S. Warny (1,2) and D. Egan (1)

Louisiana State University Department of Geology and Geophysics, Louisiana, USA, (2) Louisiana State University Museum of Natural Science, Louisiana, USA **(**pbart@geol.lsu.edu / Fax: 225 578-2302 / Phone: 225 578-3109)

Recovery of glaciogenic sediments from the Antarctic Peninsula outer continental shelf during ODP Leg 178 confirmed that the peninsula's pacific margin experienced glacial conditions since at least the late Miocene (Barker and Carmelenghi, 1999). In light of this established antiquity of the region's glaciation, our goals are to evaluate the nature, dynamics and chronology of individual ice-sheet grounding events (i.e., advances and retreats of grounded ice sheets from the continent to the outer shelf). Documenting these details of the region's glacial history requires placing the ODP Leg 178 core-based observations within a regional stratigraphic framework. In this ongoing study, we critically evaluate an existing seismic-based interpretation of the sequence of glacial events proposed by Bart and Anderson (1995) in light of ODP Leg 78 results from the continental shelf sites and a new regional grid of single-channel seismic data. Seismic reflections from a deeply buried section on the Antarctic Peninsula's pacific margin (referred to as Package 3 by Bart and Anderson, 1995) were contour mapped using a new regional grid of single channel seismic data to evaluate a previous interpretation of these horizons as subglacially-eroded unconformities. Although the subsurface dimensions of these seismic reflections are too small and their distribution too far separated to conclusively demonstrate the existence of a grounded ice sheet on the outer continental shelf, the ubiquity of crosscutting at all stratigraphic levels strongly supports a glacial-unconformity interpretation of seismic reflections. On the basis of regional seismic correlations and our correlation to published age control from ODP Leg 178 sites on the continental shelf, we propose that there were

at least sixteen grounding events of the Antarctic Peninsula Ice Sheet, and that thirteen of these are constrained to have occurred during the late Miocene/early Pliocene. These seismic-based interpretations are bolstered by our correlation to detailed descriptions of glaciogenic sediments (Eyles et al. 2001) sampled at ODP Leg 178 sites on the continental shelf, which shows that seven of the eighteen previously-defined Package-3 glacial units are sampled at sites 1097 and 1103. Our detailed correlation to published core descriptions suggests significant aggradation of subglacial till (20 - 50 m) during at least five of these seven units (i.e., Units 3.10, 3.11, 3.12, 3.13, 3.14 from the lower part of Package 3 as defined by Bart and Anderson, 1995). These large accumulations of subglacial till within a single seismically-defined grounding-event unit is far in excess of that observed from piston-core based studies of the seismic units deposited during the Last-Glacial-Maximum (Shipp et al., 1999; Domack et al., 1999). It also exceeds the 2 to 4 m of subglacial till predicted by the Alley et al. (1989) till delta model. In contrasts, Eyles et al. (2001) find no subglacial till from those core segments that correspond to the two units sampled from the upper part of Package 3 (Units 3.2 and 3.9). The cause of this change in depositional styles from the lower and upper parts of Package 3 has an unknown origin. Detailed correlations to diatom biozones defined by Winter and Iwai (2001) indicate that at least two grounding events (unconformities 3.13 and 3.14) occurred between 6.27 and 7.94 Ma (i.e., within *Actinocyclus ingens* var. *ovalis* biozone) and one grounding event occurred between 5.55 and 6.27 Ma (i.e., within the *Thalassiosira oestrupii* and *Nitzschia reinholdii* diatom biozones). An increase in the frequency of grounding events is indicated with at least 9 Antarctic Peninsula Ice Sheet groundings constrained to have occurred in the late Messinian/early Zanclean between 5.12 and 5.55 Ma (i.e., within *Thalassiosira inura* subzone a).