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Multi-channel seismic reflection study in the Eastern Basin (Ross Sea), Antarctica

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A detailed geophysical study was performed in a specific area of the Eastern Basin (Ross Sea), Antarctica to investigate the evolution of Western ice sheet (WIS) in this region. Previous multi-channel seismic studies, carried out at a regional scale in the whole Ross Sea, showed that Lower Pliocene is identified by an erosional surface, called RSU2 and dated 4 million year. RSU2 corresponds to a sharp change in the structure and lithology of sediments, which may be interpreted as a major increase of the glacial influence. Thus, it probably identifies a major unique event in the depositional history at the Ross Sea.

To find the explanation of these events, we focused on the reconstructing of the morphology of RSU2 unconformity and overlying sequences, due to the Plio-Pleistocene in detail. Thus, we collected pseudo-3D multi-channel high resolution seismic reflection data and a detailed morpho-bathymetric data aboard the Italian vessel *'OGS-Explora'* in the 2006 austral summer of Antarctica. The acquisition field (placed at south of DSDP 271) covers a rectangular area (90 km x 60 km) with 7 NW-SE lines and 10 NE-SW lines (total of 1230 km). Data acquisition parameters, which are well enough to penetrate to a depth of hundred of meters, are given as 2 gun, 48, 25 m or 50 m, 12.5 m, 50 m and 650 m corresponding to energy source, the number of channels, shot interval, group interval, near offset and far offset respectively.

Processing of the seismic data was carried out at OGS using Disco-Focus software. A

conventional data processing stream was applied to the data as follows: data transcription, editing, notch filtering, band-pass filtering, in-line geometry definition, source-receiver datum correction, CDP sorting, velocity analysis, normal-move-out correction, muting, stacking, band-pass filtering, automatic gain correction, weighted trace mixing and muting. Strong multiple reflections due to the seafloor were observed in the seismic data. These multiples were eliminated as much as possible by predictive and spiking deconvolution techniques.

Stratigraphically, we defined five seismic sequences (Units 1-5) separated by four unconformities on the seismic sections. The deepest seismic sequence (Unit 1) has subparallel and partly chaotic reflections. Unit 2 unconformably overlies Unit 1. It has continuous uniform strata. This surface constitutes a major erosional unconformity in the study area. Reflectors of Unit 3 terminate with onlaps onto the Unit 2. The upper boundary of this sequence (Unit 3) is indicated by a reverse polarity reflection which means that the overlying sediments of this unconformity (Unit 4) have higher velocity than the sediments of Unit 3. This unconformity surface probably corresponds to Late-Miocene-Early Pliocene aged RSU2 horizon in the study area. RSU2 is overlain by strata of the Units 4 and 5. The upper boundary of the Unit 5, which constitutes the present seafloor, is almost flat in the study area, and however, it is partly deformed by some active faults. The NE-SW oriented active faults generally have strike-slip character.