TriGgeR mechanisms of Antarctic ice sheet INStability across the Plio-pLeistocene trAnsitioN - GRAINSPLAIN project

Giulia Matilde Ferrante, Laura De Santis, Sergio Andò, Robert McKay, Denise Kulhanek, Jenny Gales, Matteo Perrotti, Luca Zurli, Satish Singh, Michele Rebesco, Renata Giulia Lucchi, Tina Van Der Flierdt, Tim Van Peer, and Caterina Morigi

1Istituto Nazionale di Oceanografia e Geofisica sperimentale, Trieste, Italia (gferrante@ogs.it)
2University of Milano-Bicocca, Milano, Italia
3Victoria University of Wellington, Antarctic Research Centre, Wellington, New Zealand
4Texas A&M University, College Station, USA
5University of Plymouth, Plymouth, UK
6University of Siena, Siena, Italia
7Université Paris Cité, IPGP, Paris, France
8London Imperial College, London, UK
9University of Southampton, Southampton, UK
10University of Pisa, Pisa, Italia

Growing evidence suggests that portions of the Antarctic Ice Sheet (AIS) could cross a tipping point over the next decades due to global warming. The Mid-Pliocene Warm Period (mPWP, 3.3-3 Ma, +2°C) is regarded as one possible geologic analog to the climate of the near future, and paleo-sea level during mPWP interglacials indicates that portions of the AIS were lost at that time. However, due to a lack of ice-proximal data, the timing, magnitude and trigger mechanisms of AIS retreats remain unconstrained. Here, we focus on the Ross Sea, where the IODP Exp. 374 Site U1523 recovered the first Antarctic Plio-Pleistocene record from a current-controlled sediment drift in an environment evolving from ice-proximal to open marine over time. U1523 is located where intrusions of warm deep water and outflows of cold water occur today, controlled mainly by the strength and route of the Antarctic Slope Current. To constrain the relative influence of oceanic currents and AIS dynamics on sediment erosion, transport and deposition across the Plio-Pleistocene transition (3.3-2.6 Ma), we integrate grain size, morpho-mineralogical, magnetic fabric analysis and geophysical logs from site U1523 with the multi-channel seismic line IT94-127A. We complement our dataset with a closeby box core (PNRA ODYSSEA exp., box core 08), that can be regarded as a present day analogue. Here, we present our morpho-mineralogical results on the box core and some specific intervals of the mPWP from site U1523. In particular, we perform single mineral Raman spectroscopy which, together with the entire suite of minerals and their relative abundance, highlight the different depositional environments and the source of the detritus, identifying local vs distant and magmatic vs metamorphic sources. Furthermore, we use the geophysical logs to perform rock physics correlation and we tie them to the seismic line, allowing the analysis to be extrapolated along the shelf.