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Tracking Late Quaternary ice sheet dynamics by multi-proxy detrital mineral U-Pb analysis: A case study from the Odyssea contourite, Ross Sea, Antarctica

Roland Neofitu[1], Chris Mark[1], Michele Rebesco[2], Renata Giulia Lucchi[2], Nessim Douss[2], Caterina Morigi[3], Sam Kelley[1], and J. Stephen Daly[1]

[1]University College Dublin, School of Earth Sciences, Dublin, Ireland (roland.neofitu@ucdconnect.ie)

[2]Istituto Nazionale di Oceanografia e di Geofisica Sperimentale, Sgonico, Italy

[3]Department of Earth Sciences, University of Pisa, Pisa, Italy

Late Quaternary Antarctic ice-sheet instability is recorded by ice-rafted debris (IRD) in mid- to high-latitude marine sediment, especially during marine isotope stages (MIS) 2-3, but drivers of this instability remain enigmatic (Labeyrie et al., 1986). A key step in resolving this puzzle is to determine the location of iceberg calving sites, thus highlighting ice sheet sectors exhibiting repeated instability. Single-grain U-Pb provenance analysis applied to clastic IRD provides a suitable high-resolution tool for this task, and also permits discrimination of continental IRD from volcanic material. The application of multiple proxies (apatite, rutile, and zircon) is critical in order to reduce source area fertility biases: for example, the near exclusive occurrence of zircon in felsic-intermediate igneous rocks (e.g., Hietpas et al., 2010).

Here, we present detrital apatite, zircon, and rutile U-Pb data from samples taken from a gravity core from the Odyssea contourite drift system, located on the margin of the Ross Sea (Rebesco et al., 2018) and deposited during MIS2-3. Contourites are marine clastic sediment deposits forming by along-slope, bottom currents reworking of fine-grained (clay-silt) sediments delivered by down-slope sedimentary processes (e.g. meltwaters, turbidity currents, debris flows). Crucially, contourite targetting eliminates the challenge of distinguishing IRD from coarse (sand-gravel) turbidite material in basin deposits, as ice-sheet instability is also associated with turbidite production at glaciated shelf margins (e.g., Bart et al., 1999).

We couple our analysis with the multi-proxy sediment analyses previously performed by Lucchi et al. (2019). We consider the implications of our data for the advance and retreat of the Antarctic Ice Sheet during MIS 2-3, and discuss the further applicability of our multi-proxy approach around Antarctica.

Bart, P.J, et al., 1999, Journal of Sedimentary Research, v. 69, p. 1276–1289, doi:10.2110/jsr.69.1276.

Hietpas, J, et al., 2010, Geology, v. 38, p. 167–170, doi:10.1130/G30265.1.

Lucchi, R.G, et al., 2019. EGU General Assembly 2019, Vienna April 7th–12th, Geophysical Research Abstracts Vol. 21, EGU2019-10409-1

Rebesco, M, et al., 2018, preliminary results, in POLAR 2018 SCAR/IASC Open Science Conference, v. GG2 Arctic, p. 14133.

Labeyrie, L, et al., 1986, Nature, v. 322, p. 701–706.