Thermochronology of Antarctic-Derived Pebbles for Ice Sheet and Geologic History

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The continent of Antarctica is approximately 98% covered by the Antarctic Ice Sheet, representing almost 90% of the glacier ice on Earth and an equivalent sea level rise of about 60 meters. Glaciers have covered much of the continent since at least the end of the Eocene. The ice-rafted detritus deposited by icebergs around Antarctica preserves information about the past configuration of the ice sheet as it responded to changes in climate and ocean circulation. In addition to sand- and silt-sized sediments, these deposits contain abundant pebbles with lithologies that contain many minerals that can be dated using the $^{40}Ar/^{39}Ar$ (hornblende, K-feldspar and micas), U-Pb, (U-Th)/He, and fission track techniques (apatite and zircon). Previous work shows that both the age and abundance of these pebbles in core samples varies through time in the sedimentary record, reflecting changes in ice sheet configuration during events such as the Mid-Miocene Climate Transition [1].

In addition to probing the history of the ice sheet, ice-rafted pebbles provide a glimpse into the geology of Antarctica as currently obscured by glacier ice. Thermochronology of glacigenic pebbles and sediments from around Antarctica provides information about the formation age of bedrock and the thermal history of the rocks [e.g. 2, 3]. The thermochronology of detrital pebbles paired with information about the age and provenance of the source rocks illuminates the erosion history of Antarctica before and during its long glaciation history. We will show new thermochronology data for pebbles from DSDP Site 270, in the Ross Sea, IODP Sites 1356, 1358 and 1360 near Wilkes Land, and Site 1165, in Prydz Bay. These sites provide pebbles that were deposited through time and under different ice sheet configurations, thermal conditions, and subglacial landscapes. They thereby provide a window into the subglacial geology and the landscape evolution of the Antarctic continent since the Eocene-Oligocene glaciation.

[1] Pierce, E.L., et al. (2017), Evidence for a dynamic East Antarctic ice sheet during the mid-Miocene climate transition, *EPSL* **478**, 1-13.
[2] Thomson, S.N., et al. (2013) The contribution of glacial erosion to shaping the hidden landscape of East Antarctica, *Nature Geoscience* **6**, 203-207.
[3] Cook, C.P., et al. (2017), Glacial erosion of East Antarctica in the Pliocene: A comparative study of multiple marine sediment provenance tracers, *Chemical Geology* **466**, 199-218.