


T51D-3177 Multichronometer dating of dropstones and ice-rafted debris (latest Miocene through Pliocene) recovered from IODP drill cores offshore West Antarctica, to extend knowledge of bedrock geology and past ice sheet extent

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 Hall B-C (Poster Hall) (Convention Center)

Abstract

In 2019, International Ocean Discovery Program (IODP) expeditions to offshore West Antarctica recovered deep ocean sediment cores in the outer Amundsen Sea (Exp. 379) and Dove Basin (Exp. 382). These cores are characterized by numerous ice-rafted detritus (IRD) intervals, including dropstone cobbles released by icebergs calved from past glaciers/ice streams that incised the subglacial bedrock of West Antarctica. We selected nine dropstones from latest Miocene through mid-Pliocene sediment from IODP Sites U1532C, U1533B (Exp. 379) and U1536E (Exp. 382), comprising sandstone, diorite, granitoid, basalt, and rhyolite, for petrologic characterization and multi-method geo-thermochronology. Dating methods applied include U-Pb zircon (UPbZ) geochronology, and apatite fission-track (AFT) and (U-Th)/He (AHe) low-temperature thermochronology, to reveal dates and rates of geologic events with bearing on their crustal provenance and source region bedrock thermal history.

Comparison to published data reveal dropstones to be of both local and distant origin. Notable discoveries are: 1) From U1536E, a ~1200 Ma [U-PbZ] diorite cobble, with ca. 130 Ma AFT and 65-50 Ma AHe ages that most resembles cratonic crust of Queen Maud Land (East Antarctica). 2) Three granitoid rocks from U1533B with ca. 174-179 Ma (UPbZ) ages. The only known rocks of similar age and lithology in West Antarctica are described in the Whitmore Mountains (WM). AFT ages of 114 Ma, 91 Ma, and 81 Ma may thus provide the first thermochronology data from the WM. 3) A 27 ± 1 Ma (UPbZ) diorite of from U1533B records 25.6 Ma AFT and 10.6 Ma AHe ages, suggesting origins in the western Antarctic Peninsula. 4) Two very similar distinctive green quartz arenite dropstones were recovered from latest Miocene core at U1533B and U1536E, locations separated by 3270 km. Multivariate statistical comparison of their UPbZ age populations with published data indicates a common provenance in the Ellsworth Mountains (Antarctic interior). When placed within geotectonic and paleoclimate context, discoveries from IRD-dropstones promise to advance understanding of crustal and landscape evolution of evolution of glaciated continents, variations in icesheet extent during warm periods, and ocean/atmospheric current circulation.

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