American Geophysical Union Fall 2020 – oral presentation

PP028-05 - Eolian sand dispersal via sea ice on the Antarctic continental margin during Pliocene deglaciation

Abstract

In far-field records, the response of the East Antarctic Ice Sheet during the Pliocene shows great variability under stable greenhouse gas forcing. However, the extent, mechanisms, and feedbacks related to Pliocene Antarctic ice-sheet dynamics are poorly known from near-field archives. Here we investigate the sediment dispersal path of coarse sediment deposited as ice-rafted debris (IRD) at IODP Site U1359 on the Antarctic Wilkes Land continental rise to assess the relative importance of iceberg and sea ice rafting during the Pliocene. We analyze terrigenous particle size distributions and suites of quartz grain microtextures in ice-rafted sand in comparison to Antarctic ice-contact diamict from the Ross Sea as a baseline for glacial sediment. Using images acquired through Scanning Electron Microscopy (SEM), and following a quantitative approach, we find a smaller number of glacially weathered grains in Pliocene IRD than in ice-contact sediments, which suggests that 30-50% of the IRD is not of primary glacial or iceberg origin. Larger numbers of abraded and chemically altered grains in the IRD, along with microtextures that are diagnostic of periglacial environments, suggest a role for eolian sediment transport onto the sea ice during periods of deglaciation and then transfer to the seafloor as sea ice breaks up. Our findings are entirely consistent with modeling of the land surface exposure and surface wind field during Pliocene ice retreat. These results have implications for the interpretation of sand-dominated IRD records as proxies for ice-sheet dynamics, as well as atmospheric and oceanographic feedbacks in the high-latitude climate system.

Plain Language Summary

Sand grains blown onto the frozen ocean from land surfaces that were exposed when ice retreated can be found in deepwater off Antarctica.

Authors

Sandra Passchier

Montclair State University

Melissa Hansen

Montclair State University

Jessica Rosenberg

Montclair State University