Analysis of Marine sediments from ODP Site 696 and implications for the Onset of Antarctic Glaciation

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Abstract

The onset of Antarctic glaciation during the Eocene-Oligocene Transition (EOT) approximately 34 million years ago represents an incredibly large magnitude of change over a short period. Determining the time and conditions under which this glaciation occurred will allow us to better understand paleoclimate during this transition, and evaluate magnitude of glacial response to climactic change. Current (2016) research from Passchier et al. (1) and Galeotti et al. (2), however, provides conflicting chronologies for Antarctic glacial expansion. This poster will detail a high-resolution analysis of cores obtained from Integrated Ocean Drilling Project (IODP) Site 696, located on the northeast margin of the Weddell Sea, West Antarctica (3). Preliminary data includes Particle Size Analysis of core samples at varying depths; results indicate Site 696 was influenced by cyclical warming and cooling periods following the EOT-1 $\delta^{18}O$ precursor (34.4 Ma), as evidenced by regular fluctuations in mud percent. Individual grain size distributions for samples deposited between warming events are characteristic of glacially eroded sediments, featuring a majority silt fraction and small (<10%) <2μm fraction (1). Distributions associated with glacially rafted debris are also seen as early as ~34.3 Ma, which suggests an established East and West Antarctic Ice Sheet prior to the EOT. Additional proposed research includes scanning electron microscope (SEM) grain shape analysis to examine microtexture and determine erosional history through the EOT interval in Cores 55R and 56R. The use of Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) will be incorporated on samples with majority mud percent to distinguish the primary weathering mechanisms at the time of deposition. By combining these results with existing data of dinocyst assemblage at Site 696 from Houben et al. (4), as well as temporally similar data from Prydz Bay, we will offer a revised and holistic glacial chronology for the Antarctic Ice Sheet spanning the EOT (5,1).

Keywords: Eocene-Oligocene Transition, Weddell Sea, paleoclimate, sediment core

References

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