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Characterizing the source of mineral dust in Ice from the Allan Hills, East Antarctica during the Last Interglacial Period

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Variations in the source of mineral dust entrained in ice provide insight into past Earth surface conditions and atmospheric transport pathways. The concentration, composition, and transport of mineral dust is dependent on the climate-regime, with markedly higher dust fluxes during glacial periods compared to interglacial periods. Dust deposited on the East Antarctic Ice Sheet during glacial periods uniformly points to sources in southern South America; however, characterizing dust provenance during the last interglacial period (~129-115 ka) is analytically challenging due to low quantities of material in the ice. Previous work using high-volume, peripheral East Antarctic ice from Taylor Glacier has indicated that dust deposition during the last interglacial period was distinct with a young volcanic composition characteristic of the West Antarctic Rift System. To further constrain source region, this study probes the mineral dust record contained within high-volume and high-temporally sampled ice from the Allan Hills Blue Ice Area, another peripheral East Antarctic site. Samples span the end of the penultimate glacial period (~145-136 ka), subsequent deglaciation (~136-129 ka), and the last interglacial period with a temporal resolution of ~one thousand years per sample. This peripheral ice from the Ross Sea sector may reflect a unique climate history due to its proximity to both the Southern Ocean and the West Antarctic Ice Sheet. Here we present initial (1) trace and major element concentrations, (2) grain size distribution and concentrations, and (3) particle morphology and elemental mapping using an inductively coupled plasma mass spectrometer, a Coulter Counter, and a scanning electron microscope, respectively. Future work will include measuring the strontium, neodymium, and lead isotopic compositions of the dust and conducting Earth System model simulations to probe the sensitivity of dust transport to ice sheet extent. This study helps provide insight into the source and transport mechanism of dust to the peripheral portion of the East Antarctic Ice Sheet across the transition from the penultimate glacial maximum to the last interglacial period.

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