Sediment geochemistry of Aeolian Material from the McMurdo Dry Valleys, Antarctica: Insights into Dust Sources

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Antarctica is an isolated continent where relatively minor changes in the overall dust flux, deposition, and chemical composition can drastically affect surface albedo and nutrient loadings for aquatic and soil ecosystems. As the largest ice free area on the Antarctic continent (approximately 4800 km^2), the McMurdo Dry Valleys (MDV) are a prominent local source of dust for the region, but little information exists on the bulk geochemistry. We analyzed 35 samples of aeolian material from Alatna Valley, Victoria Valley, Miers Valley, and Taylor Valley (Taylor Glacier, East Lake Bonney, F6 (Lake Fryxell), and Explorer's Cove) at five collection heights above the surface (5, 10, 20, 50, 100 cm) from 2013 through 2015. Major oxide, trace element, and rare earth element concentrations were determined through x-ray fluorescence and mineralogy was determined through x-ray diffraction. The aeolian material is highly unweathered (CIA values less than 60 %), but as seen in scanning electron microscope images, volcanic glass and dolerite show some alteration. Rare earth element concentrations normalized to the average upper continental crust suggest a difference in source lithology between high and low elevation sites. The mineralogy was reflective of local rocks, specifically the McMurdo Volcanics, Ferrar Dolerite, Beacon Sandstone and crystalline granite basement, but variations in major oxide percentages and rare earth element ratios could not be explained by mixing lines between these four rock types. This may suggest an additional, and possibly distant, source of aeolian material to the MDV that is not accounted for.