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## THE ROLE OF AEOLIAN DUST IN NUTRIENT AND SOLUTE TRANSPORT IN THE MCMURDO DRY VALLEYS, ANTARCTICA

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## 2009 Portland GSA Annual Meeting (18-21 October 2009)

Paper No. 4

Presentation Time: 2:40 PM

### THE ROLE OF AEOLIAN DUST IN NUTRIENT AND SOLUTE TRANSPORT IN THE MCMURDO DRY VALLEYS, ANTARCTICA

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The McMurdo Dry Valleys (MDV), the largest ice-free expanse in Antarctica, are considered a polar desert with an average annual temperature of  $-20^{\circ}\text{C}$  and annual precipitation of  $<10\text{cm}$ . Despite the extremely arid climate, a hydrologic continuum exists during the austral summer when ephemeral streams formed from glacial meltwater flow into endorheic lakes. Dust is deposited by strong seasonal winds onto the glacier and lake surfaces, as well as in widespread aeolian landforms throughout the MDV. Katabatic winds from the west, probably responsible for the majority of lithogenic dust deposition, dominate during the winter months. Easterly winds from the coast, prominent during the summer, contribute to the dust budget through the addition of salts and marine aerosols. When considered in the context of the unique hydrologic continuum and the climate-sensitivity of the environment, the dissolution of deposited dust may have an impact on salt and nutrient transfer and thus the ecosystem of the MDV. We have simulated this dissolution by conducting a two-step  $\text{H}_2\text{O}$  leaching experiment on aeolian sediments collected from select glaciers, lakes, aeolian landforms, and elevated sediment traps. Resulting leachates representing the interaction of  $50\text{mL}$   $\text{H}_2\text{O}$  with  $25\text{g}$  of dust sample were analyzed for major ions.  $\text{NO}_3^-$  concentrations (leach 1:  $<1.0\text{-}240\ \mu\text{M}$ ; leach 2:  $<1.0\text{-}94\ \mu\text{M}$ ) generally increase to the west and imply that aeolian deposition is potentially important to the nitrogen cycle in the MDV. Total dissolved solid concentrations (leach 1:  $9\text{-}544\ \text{mg/L}$ ; leach 2:  $6\text{-}150\ \text{mg/L}$ ), however, do not show any geographic/spatial correlation which is not consistent with previous work and suggests the significance of dust dissolution to the environment. Aliquots of the total dust were also analyzed for total C and N values. All but two samples, Lake Fryxell ( $0.12\% \text{ N}$ ) and the eastern side of the Commonwealth Glacier ( $0.09\% \text{ N}$ ), were below detection limit with respect to N ( $<0.08\% \text{ N}$ ). Both samples are from the Fryxell basin, the youngest of the basins, that is nitrogen limited. C values ranged from below detection ( $<0.04\% \text{ C}$ ) to  $1.27\% \text{ C}$ . These results attest to the importance of dust as an addition to the ecosystem of the MDV. Further investigation of the dust is planned to constrain its chemical and mineralogical composition.

Session No. 212

[T133. Geochemistry of Atmospheric Particulates: From Sources to Impacts on the Environment and Health](#)

Tuesday, 20 October 2009: 1:30 PM-5:30 PM

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