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Nd and Sr Isotope Fingerprinting of Mineral Dust Accumulating in the Alpine Zone of the Uinta Mountains, Utah, USA

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A network of eight passive dust collectors provides information about the deposition of eolian dust in the alpine zone (>3400 m asl) of the Uinta Mountains, USA. Ratios of 87Sr/86Sr and 143Nd/144Nd were measured with TIMS on samples collected during the winter of 2015–16, and during the summer 2016. Samples representing dust deposition at a single collector during two previous winters were also analyzed. All samples are very well sorted with a dominant grain size of very fine silt ($\sim$10-20 μm). Strontium and Nd concentrations vary from 163 to 290 ppm and 12 to 26 ppm, respectively. εNd values range from -9.1 to-14.7 with an average of -11.3. Notably these εNd values are significantly higher than εNd values measured for Uinta Mountain bedrock ($\sim$-25), confirming an exotic eolian origin for the sediment accumulating in these collectors. 87Sr/86Sr ratios range from 0.71300 to 0.72555 with an average of 0.71736. On a plot of 87Sr/86Sr vs. εNd , samples of dust from the summer of 2016 cluster tightly around an 87Sr/86Sr ratio of 0.71418 $\pm$ 0.00063, and an εNd value of -10.6 $\pm$ 0.27. These isotopic compositions are similar to published Sr and Nd isotope compositions of dust sources on the arid Colorado Plateau, located to the south of the mountain range. In contrast, 87Sr/86Sr ratios of winter dust samples are more radiogenic (0.71757 $\pm$ 0.00427) and εNd values exhibit a wider range (-11.5 $\pm$ 1.41). These contrasts in Sr and Nd isotope compositions indicate that dust sources in winter and summer are different. The contrast between winter and summer dust is greatest at the eastern end of the range, and decreases westward. All but one collector exhibits a shift to lower 87Sr/86Sr and less negative εNd in summer dust vs. winter. The exception is the sampler at the extreme eastern end of the range.