

$^{87}\text{Sr}/^{86}\text{Sr}$ as a tracer of aeolian dust from snowpack to snowmelt runoff

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Aeolian (wind-blown) dust is an important physical and chemical flux to mountain snowpack, with potentially significant contributions of trace metals and solutes to mountain streams during snowmelt. However, it is difficult to differentiate dust contributions in runoff from soil and weathering inputs. Sr isotopes show promise as a tracer of the soluble fraction of dust through the hydrologic system. To test this, we analyzed $^{87}\text{Sr}/^{86}\text{Sr}$ ratios, Sr concentrations, and other parameters in bulk snowpack (wet and dry deposition), dust, and snowmelt runoff in the mountainous Provo River watershed (Utah, USA) over two years (2013-2014). $^{87}\text{Sr}/^{86}\text{Sr}$ ratios of isolated dust samples show that dust is the main contributor of Sr to snowpack. Preliminary results using a two end-member mixing model (end-members of bulk snowpack and river baseflow) indicate that dust contributed up to 40% of Sr riverine load during peak runoff in 2014 (Fig. 1). In contrast, in 2013 there were no visible dust layers in the snowpack and mixing models indicate a different Sr source (e.g., soil water). These results suggest that dust on snowpack is an important but variable source of soluble elements during snowmelt, and that dust should be considered when investigating solute loads in mountain streams. Additional work is underway to investigate transport of less soluble dust-borne metals during snowmelt by complexation with organic matter or other mechanisms.

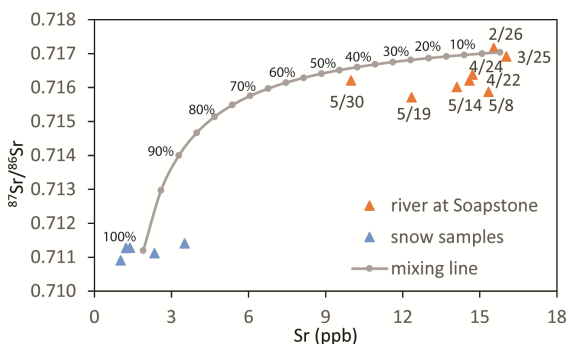


Figure 1: Plot of Sr concentrations versus $^{87}\text{Sr}/^{86}\text{Sr}$ ratios for snowpack samples and river samples (with dates) collected during spring 2014. Peak streamflow occurred on 5/30/2014.