THE COUPLING OF MOUNTAINS AND DESERTS: BIOGEOCHEMICAL INFLUENCE OF EOLIAN DEPOSITION IN THE SAN JUAN MOUNTAINS, CO USA

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ABSTRACT: Several studies have indicated that eolian material can be an ecologically significant source of calcium (Ca) in Rocky Mountain ecosystems. However, the effects of eolian deposition on biogeochemical cycling in high elevation ecosystems have not been well quantified. High elevation environments can be coupled to downwind arid regions through the transport of wind eroded desert soils that are deposited by orographic precipitation. The goal of this research is to better quantify the contribution of eolian material to biogeochemical cycling of essential elements in snowmelt-dominated ecosystems of the San Juan Mountains, Colorado USA.

The flux of eolian material to the San Juan Mountain ecosystems is substantial and primarily originates in the deserts of the southwestern, USA during the snow ablation season of March-June. The rate of eolian deposition has been estimated between 5-26 g m^{-2} in areas influenced by southwestern deserts. Strontium and neodymium isotopic values and atmospheric backtrajectory analyses suggest eolian material, deposited in the San Juan Range, is primarily composed of material originating in arid regions of the southwestern USA.

Deposition of eolian material influences terrestrial and aquatic biogeochemical cycling in high elevation ecosystems of the San Juan Mountains. High concentrations of base cations and phosphorus, often observed in eolian material, could provide an easily accessible source of nutrients for high elevation vegetation. However, the effects of eolian deposition on biogeochemical cycling in the San Juan Mountains are likely to vary across a range of geologic substrates. Our findings show that base cation concentrations of streams draining our study sites are relatively uniform despite large variations in bedrock geochemistry. Additional isotopic and elemental analysis of stream, soil, bedrock, vegetation and eolian samples from the San Juan Mountains will help determine the importance eolian deposition to the biogeochemical cycling of calcium and other nutrients in these high elevation ecosystems.

KEYWORDS: Snow chemistry, dust, nutrient loading, eolian

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