Abiotic versus Biotic Influences on Chemical Weathering and Solute Generation in the East River Watershed

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Project Abstract: Precipitation is subject to a variety of bio-physical transformations before leaving watersheds as streamflow. One key transformation is chemical weathering, which is driven by interactions among rock, water, and biota. Globally, mountain watersheds are hotspots for solute generation, but our process-level understanding regarding the mechanisms and drivers of chemical weathering in steep, high elevation landscapes is incomplete. By employing a multi-scale approach, the project aims to address the following questions in the Rocky Mountains at the East River community watershed: 1) Does landscape-scale heterogeneity in vegetation, climate, and geology impart unique, spatially-variable signatures on soil production and chemical weathering rates? 2) What roles do the legacies of Pleistocene glaciation and Holocene geomorphic processes play in determining modern-day solute concentrations in surface waters? 3) Are physical erosion and chemical weathering rates linked at the watershed scale, and can these rates be predicted from watershed characteristics? At the soil profile scale, soil production and chemical weathering rates will be quantified with cosmogenic nuclides, specifically *in situ*-produced and meteoric ^{10}Be, and geochemical mass balance at sites that span biotic, climatic, and geologic gradients in order to isolate the key drivers of chemical weathering. At the landform scale, solute concentrations in surface waters will be used to assess whether surficial deposits generated by different geomorphic processes impart unique weathering signatures. At the watershed-scale, ^{10}Be will be used to measure erosion rates. A series of reactive transport models will be constructed to place the field-based findings into a framework for making predictions regarding the roles that vegetation, climate, and geomorphology play in solute generation.