Rock-derived N influx and distribution on mediterranean climate hillslopes

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Much is still unknown about the significance of rock-derived nitrogen to ecosystems – particularly at the hillslope scale. In this study we examine the input of rock-derived nitrogen to soil and the distribution of rock-derived nitrogen across two adjacent hillslope catenae. Our study takes place in central California, in a mediterranean grassland underlain by fluvial deposits and patches of reworked marine shale. Since the Holocene, climate drying has decreased the incision power of local streams: long-term catchment average erosion rates for the area are ~0.1 mm/year and smooth, convex hillslopes grade into largely unchannelized valleys. Preliminary calculations suggest N flux from rock to soil ranges from 0.25 to 0.40 kg ha^{-1} yr^{-1} at our ridgecrest sites. This is lower than the range of fluxes in wetter, forested regions of Northern California (1-10 kg ha^{-1} yr^{-1}): higher rock-N concentrations and average erosion rates account for the differences between the fluxes. Preliminary flux estimates are derived from C/N ratio mixing models between surface soil and rock C/N ratios, in combination with measurements of rock-N concentration, rock density, and catchment average erosion rates derived from ^{10}Be. Continued work will extend ridgecrest rock-N flux rates across hillslope catenae using geochemical mass balances in addition to modeling of the breakdown between rock weathering supplied and colluvially transported rock-N across the hillslopes. Ridgecrest flux rates combined with hillslope sediment transport rates from previous work will inform the model and soil rock-N extractions will be used to validate model findings. Increased pools of total C and N at the base of the hillslopes, suggest that aggredation of soil at the toeslopes provides a sink for rock-N eroded from the ridgecrests. Estimated atmospheric N deposition rates for the region are between 2-12 kg ha^{-1} yr^{-1}, making the N influx from the rock at the ridgecrest only a small fraction of the total N budget. We consider these findings valuable for constraining rock-N flux in low erosion/drier climate regions where rock weathers at slower rates.