**Accepted Poster Presentation, AGU Fall Meeting 2012, San Francisco**

**Session: EP027: Rock to sediment: Biotic, lithologic, and climatic controls on regolith production, mixing and transport.**

**Abstract:**

Title: Effects of bedrock nutrient density on vegetation and topography in the Sierra Nevada Batholith, California

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Vegetation plays a fundamental role in landscape evolution, harnessing solar energy to promote both soil retention and regolith production. Vegetation encourages chemical weathering directly by releasing organic acids and indirectly by stabilizing soils and increasing their contact time with corrosive natural waters. Global compilations indicate that the presence of a soil mantle increases erosion rates by an order of magnitude on average when compared to bare, exposed-bedrock surfaces. Understanding the factors that regulate the distribution of vegetation and by extension the soil mantle is therefore a first-order landscape evolution problem. Our measurements of bedrock nutrient density show a strong correlation with tree canopy cover within narrow bands of elevation and climate across unglaciated granitic plutons in the western Sierra Nevada. Our measurements of cosmogenic nuclides indicate that exposed surfaces there are eroding three to ten times slower than surrounding soil-mantled terrain. Bedrock phosphorus concentrations vary by more than an order of magnitude and change abruptly at plutonic contacts. These same contacts frequently mark the transition between vegetated, soil-mantled terrain and exposed bedrock surfaces, similar to sharp vegetative contacts associated with ultramafic substrates elsewhere in California. Major and minor element enrichment indices of soil relative to bedrock point to dust as a probable source of nutrients in the sparsely distributed soils on at least one leucocratic pluton, sustaining small forest refugia in a landscape otherwise devoid of vegetation. This is consistent with an intrinsic nutrient deficiency that is partly offset by allocthonous nutrient inputs. Our observations are consistent with nutrient availability serving as a regulator that drives landscapes into two stable states. If nutrient availability is sufficient, vegetation takes hold, stabilizing soils against erosion. If nutrient availability is insufficient, such that it limits vegetation, physical erosion can overcome soil production and strip the landscape bare, ultimately slowing the rate of surface lowering. This implies that linkages between intrinsic bedrock nutrient density and vegetation could regulate relief at the pluton scale. The observation that nutrient density varies sharply among plutons cautions against unqualified use of granitoids as a uniform state factor in studies of weathering and pedogenesis.