Climatic Controls on Deep Soil Organic Matter in the Critical Zone

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Globally, soils store more carbon (C) than the vegetation and the atmosphere combined. Up to 60-80% of the C stored in soils is found deep soil (below 30cm in depth)[1]. Deep soil organic matter (SOM) can be a mixture of new and old SOM[2]; that is rendered relatively stable due to burial, aggregation, its disconnection from decomposers, and chemical association that organic matter forms with soil minerals[3,4]. Limited data available on deep SOM dynamics suggests that stock, distribution, and composition of deep SOM are strongly correlated to climate[5]. The overall objective of this research is to investigate how climate and topography regulate OM storage, composition, stability, and stabilization mechanisms. Specifically, this research will present on our understanding of deep SOM dynamics by testing our hypothesis: there is a positive, linear association between climate (MAP/MAT) and deep SOM storage/stability until a zone of maximum soil production is reached. Beyond that range there is an inverse relationship. Expecting that the amount of OM stored in deep soil and the stability are a function of soil thickness and availability of weathering products (i.e. reactive minerals), the stock and stability of deep SOM is expected to follow a similar relationship with climate, as does intensity of weathering. This research is conducted in the NSF funded Southern Sierra and the Santa-Catalina Jimez Critical Zone Observatories that are located along a climosequence that allow us to conduct a space for time substitution approach to study climate change effects. To address this hypothesis, soils are characterized using elemental and stable isotope elemental analysis, Fourier Transformed Infrared to determine OM concentration, functional group level description of bulk SOM composition.

[1]Jobbágy, E. et al. 2000. *Ecological Applications* **10**, 423[2] Chabbi, A. et al. 2011. *Journal of Geophysical Reseach* **116**, G03011[3] Marin-Spiotta, E. et al. 2014. *Nature Geoscience* **7**, 428-432 [4] Rumpel, C. et al. 2002. *Org Geochem* **33**, 1131[5] Doetterl, S. et al. *Global Change Biology* **18(7)**, 2218-223