Geophysical Research Abstracts
Vol. 21, EGU2019-14041, 2019
EGU General Assembly 2019

Deep Soil Carbon in the Critical Zone: climatic controls on the amount, chemical composition, and persistence of carbon in weathered bedrock

Kimber Moreland (1), Asmeret Asefaw Berhe (1), Zhiyuan Tian (), Anthony O'Geen (), and Karis Mcfarlane ()

(1) University of California, Merced, United States (kmoreland@ucmerced.edu), (2) University of California, Davis, United States (atogeen@ucdavis.edu), (3) Lawrence Livermore National Labs (mcfarlane3@llnl.gov)

Deep Soil Carbon in the Critical Zone: climatic controls on the amount, chemical composition, and persistence of carbon in weathered bedrock

Kimber Moreland, Zhiyuan Tian, Anthony O'Geen, Asmeret Asefaw Berhe, Karis McFarlane

Up to 80% of the carbon (C) stored in soils is found below 30cm and deep carbon dioxide efflux changes seasonally, showing a direct connection between atmospheric conditions and deep soil C dynamics. Despite this link there is very little data on C storage and persistence below the solum, in weathered bedrock/saprock. The overall objective of this research is to investigate how climate regulates organic matter (OM) storage, chemical composition, persistence, and stabilization mechanisms. Our work suggests that the amount and persistence of OM in deep soil may be a function of soil thickness and availability of weathering products (i.e. reactive minerals). Therefore, we hypothesize that the amount and persistence of deep soil OM will follow a similar relationship with climate. This research was conducted in the NSF funded Southern Sierra Critical Zone Observatories that is located along a climosequence in the southern slopes of the Sierra Nevada Mountains of California. Here we will present results derived from characterization of soils and weathered bedrock using elemental and stable isotope elemental analysis, Fourier-transformed infrared spectroscopy derived proxies for decomposition of bulk OM, and 14C to determine the turnover time of C from the topsoil down to 10 meters deep for bulk samples and density fractions (free light fraction, occluded light fraction, and heavy fraction). Our findings show that including subsoil and weathered bedrock C stocks increases estimates of soil C stock by 23-29%, that weathered bedrock is an actively cycling pool of C, and that the turnover times vary with depth and climate regime.