GEOC: Division of Geochemistry

257 - Impact of calcium on the retention and stability of OM in Fe-(Ca)-OM adsorption complexes

View Session Detail

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Abstract: On a global scale, soil organic matter (OM) sequesters more carbon (C) than any other terrestrial sink. Soil OM acts a reservoir for C, making OM a vital component to ensuring soil health and productivity. Further, the sequestration of C as OM prevents additional C transfer to the atmosphere. Instability of OM may lead to increased atmospheric C inputs, a primary driving force of climate change. Recent research has suggested that the stability of OM is controlled by complex interactions with environmental constituents. In particular, minerals, such as iron (Fe) oxides, are thought to have a profound effect on soil OM stability. In addition, recent literature and work by our research group has shown the presence of C is highly correlated with calcium (Ca); however, current understanding of the impacts of Fe and Ca on OM stability in soil systems is limited. To begin to fully elucidate the mineral-controlled processes mediating soil OM stability and turnover, we investigated the formation and stability of Fe-Ca-organic matter adsorption complexes through laboratory batch experiments. Ferrihydrite was reacted with leaf litter-extracted dissolved OM and Ca at varying initial C:Fe:Ca ratios. Synthesized complexes and the remaining supernatant were analyzed for C, Fe, and Ca. Mineral structure of complexes were then characterized using X-ray diffraction. Stability of Fe-Ca-OM complexes were probed by conducting desorption experiments. X-ray absorption spectroscopy and thermogravimetric analysis will be performed in the future to probe the mechanism of Fe-Ca-OM binding and thermal stability of generated complexes. Research that reveals the mechanisms by which Fe-Ca-OM complexes control environmental OM stability and turnover will address major challenges that are currently faced when modeling and predicting C cycling.