99850 Impacts of Hydrous Manganese Oxide and Goethite on Soil Organic Carbon Reactivity.

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Presentation Description:

Abstract:
Soils represent Earth's largest terrestrial carbon pool, which exchanges with atmospheric C and impacts our climate. Minerals constitute a primary ecosystem control on organic C decomposition in soils, and therefore on greenhouse gas fluxes to the atmosphere. Iron and Al oxides are known protectors of organic C against microbial decomposition through complexation reactions. However, the impacts of Mn oxides on organic C stability in soils are poorly understood. Here we show that hydrous Mn oxide (HMO) has a greater overall sorption capacity for dissolved natural organic matter (NOM) than does goethite under acidic conditions. However, goethite has a stronger affinity for NOM at low C:(Mn/Fe) molar ratios compared to HMO, likely due to ligand exchange with carboxylate. Natural organic matter sorbed to HMO is more susceptible to desorption than NOM sorbed to goethite. Both HMO and goethite show no detectable impact on the biodegradability of NOM remaining in solution after NOM sorption reaches steady state. Natural organic matter sorption onto HMO induces organic C oxidation and Mn reduction, whereas no redox transformations are evident in NOM-goethite complexes. The capacity of HMO to oxidize NOM may have implications for the chemical lability and biodegradability of organic C in soil, especially that which is sorbed to HMO.

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