Poster# 102

Otherwise Decomposable Substrates Exhibit Apparent Recalcitrance When Sorbed to Minerals: A Study of Glucose and Organo-Mineral Complexes in Soil

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Soils are a globally important reservoir of soil organic carbon (SOC). It is well established that interactions with minerals, rather than inherent recalcitrance, is a primary mechanism by which otherwise degradable organic matter accumulates and is retained in soils and sediments. However, the bioavailability of organic compounds in mineral-organic-associations (MOA) under varying conditions—including climate conditions—is not well known. To assess the impact of mineral association and warming on decomposition of an easily respirable carbon substrate (glucose), we conducted a series of laboratory incubations at different temperatures with field-collected soils from 10-20 cm, 50-60 cm, and 80-90 cm depth. We added ^{13}C-labeled glucose either free or associated with one of two synthetic iron (hydr)oxide phases (goethite and ferrihydrite) differing with respect to crystallinity and to affinity for the glucose sorbate. Our results demonstrate the following: (1) association with Fe (hydr)oxide minerals reduced the decomposition rate of glucose by more than 99.5% relative to glucose added directly to soil; (2) although total (native soil) respiration was much lower in the deeper soils, when normalized by total C the respiration rates did not differ significantly, implying that total carbon availability limits respiration at depth; (3) application of free glucose suppressed respiration of native carbon at 10-20 cm, but enhanced it in the deeper soils; (4) temperature sensitivity of total (native) respiration was greater in the deep soils than in shallow soils; and (5) respiration of the organomineral complex (glucose and iron-(hydr)oxide) was less temperature sensitive than was respiration of native carbon.