Poster #48

Soil Moisture Drives Microbial Controls on Carbon Decomposition in Two Subtropical Forests

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Soil microbes play an important role in soil carbon (C) cycling. However, microbial dynamics influenced by environmental conditions are not adequately understood owing to limited available microbial observations and the lack of model parameterization against data beyond laboratory scale. Here we incorporated soil temperature and moisture responses into the Microbial-ENzyme Decomposition (MEND) model. We parameterized MEND against observed heterotrophic respiration (RH) and microbial biomass C (MBC) from a three-year field experiment in two subtropical forests. The observed variability in RH and MBC were well simulated by MEND. Using long-term site trends, we employed the calibrated model to project the responses of soil organic C (SOC) to gradual changes in litterfall inputs, soil temperature and moisture. We show that, in these subtropical forests, (1) microbes appear to be much more sensitive to decreasing moisture than to increasing temperature or litterfall inputs; (2) temperature increase could have small positive or negative effects on SOC stocks; and (3) increasing labile fraction of litterfall inputs to SOC appears to cause a priming effect and thereby accelerate decomposition. Our results imply that current emphasis in the literature on temperature response of microbial models may be missing the importance of soil moisture.