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ABSTRACT TITLE: The vulnerability of subsurface soil organic carbon to in situ warming and altered root carbon inputs: a project of the LBNL TES SFA

ABSTRACT: Subsurface soils (>30 cm) store more than half of global soil organic carbon (SOC) and the processes governing soil C turnover vary with depth. However, most SOC research has focused on surface soil; thus controls on subsoil dynamics are poorly understood. We are developing a whole soil profile (to 1.5 m) warming experiment in an annual grassland to study the effects of warming and root inputs on SOC dynamics throughout the profile. In the prototype, we will insert resistance heaters to heat the soil profile to 4°C above ambient while maintaining its natural temperature gradient. Highly 13C-enriched *Avena fatua* grass root litter will be added to three depths within heated and unheated plots. A comprehensive suite of measurements—instrumented *in situ* and in the laboratory—will be used to quantify the effect of warming and carbon inputs on soil C cycling. To improve predictive understanding and model skill, the experiment is focused on hypotheses concerning: (1) temperature sensitivity of native SOC and added root litter (or DOC) decomposition with depth; (2) the priming effects of added root litter (or DOC) on native SOC decomposition with depth; and (3) interactions between warming and added root inputs. This study is one of the first to study responses of subsurface SOC to global change factors *in situ* and is designed to enhance our understanding of deep SOC stabilization mechanisms and improve predictions of SOC’s fate in a changing climate.

As a central part of the LBNL Terrestrial Ecosystem Science Scientific Focus Area, this experiment is being developed in concert with vertically resolved soil organic matter models (see Riley and Tang posters) to be integrated into CLM. The experiment is designed to produce new process level understanding and data to test and develop new model structures, parameters, and projections.