Effects of altered rainfall regime on carbon and nitrogen mineralization in annual grasslands

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Most of California’s valley and foothill grasslands are influenced strongly by seasonal drought. How will alterations in rainfall regime resulting from climate change affect carbon (C) dynamics in these Mediterranean grassland soils? Both uncertainties in future CO$_2$ emissions and the coarse resolution of climate models limit our ability to forecast changes in rainfall over California grasslands. We are experimentally altering rainfall regimes over annual grasslands and measuring responses in soil respiration, methane uptake in soils, net primary production, litter decomposition rates, and soil C pools. Currently we are maintaining plots with ambient rainfall regime, increasing rainfall amount and wet season length via microsprinklers, and initiating a drought extension experiment using rainout shelters. To complement ongoing research, I propose a laboratory study to look in depth at the process of microbial mineralization of soil organic matter (SOM) following wetting of dry soils. Because nitrogen (N) is a limiting nutrient in annual grassland soils, I also wish to explore potential implications for N retention and loss resulting from wetting-induced SOM mineralization. Finally, I propose a separate field experiment to investigate the impact of repeated wetting and drying on soil respiration and progressive depletion of labile soil C.