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Manganese Does Not Control Soil Organic Carbon Stability on a Hawaiian Grassland Rainfall Gradient

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Manganese (Mn) is a possibly critical yet poorly understood element controlling soil carbon (C) stocks. In temperate forests, Mn availability correlates strongly with organic C decay, but we know little about its role in soil organic matter decomposition in most terrestrial environments. In this study, we evaluate Mn in grassland C dynamics along a rainfall gradient in Hawaii. We measured Mn, organic matter, and microbial enzyme activities along the rainfall gradient to evaluate relationships among Mn oxidation state and chemical/biological reactivity with soil C turnover. Neither Mn abundance nor its oxidation state are strong predictors of organic C instability along the grassland gradient. We also used an incubation experiment to investigate how dissolved organic C and CO_2 release from the grassland soil respond to increased Mn bioavailability. We found that Mn availability did not correlate with soil C instability; Mn availability corresponded with lower dissolved organic C and CO_2 fluxes from soils than deionized water did in a control group. Mn availability does not predict soil C stability in grasslands as well as it does in other ecosystems.