

Soil organic C storage under elevated CO₂ is dependent on plant species: A role for C quality?

ELISE PENDALL¹, JEFF BALDOCK², YUI OSANAI^{1,3}
AND MARK HOVENDEN³

¹Hawkesbury Institute for the Environment, University of Western Sydney, Penrith NSW 2751, Australia

²CSIRO, Adelaide, Australia

³School of Plant Sciences, University of Tasmania, Hobart, TAS, Australia

Increasing atmospheric CO₂ may stimulate C uptake in plants and C movement into soils, but the long-term stability of soil C is uncertain. In a climate manipulation experiment in native Australian grassland, elevated CO₂ increased C storage under C₃ vegetation but decreased it under C₄ vegetation. C quality of vegetation, particulate and mineral soil organic pools was determined by ¹³C-NMR. Vegetation C composition was unaffected by climate change treatment but differed significantly between C₃ and C₄ species. Organic matter pools exhibited a decay continuum, from fresh aboveground biomass to dead litter to roots to particulate organic matter to mineral associated organic matter. The continuum was correlated positively with alkyl-C and negatively with O-alkyl-C. This work suggests that changes in plant species composition are more likely to alter soil C composition and stability than changes in C quality induced by climate change.