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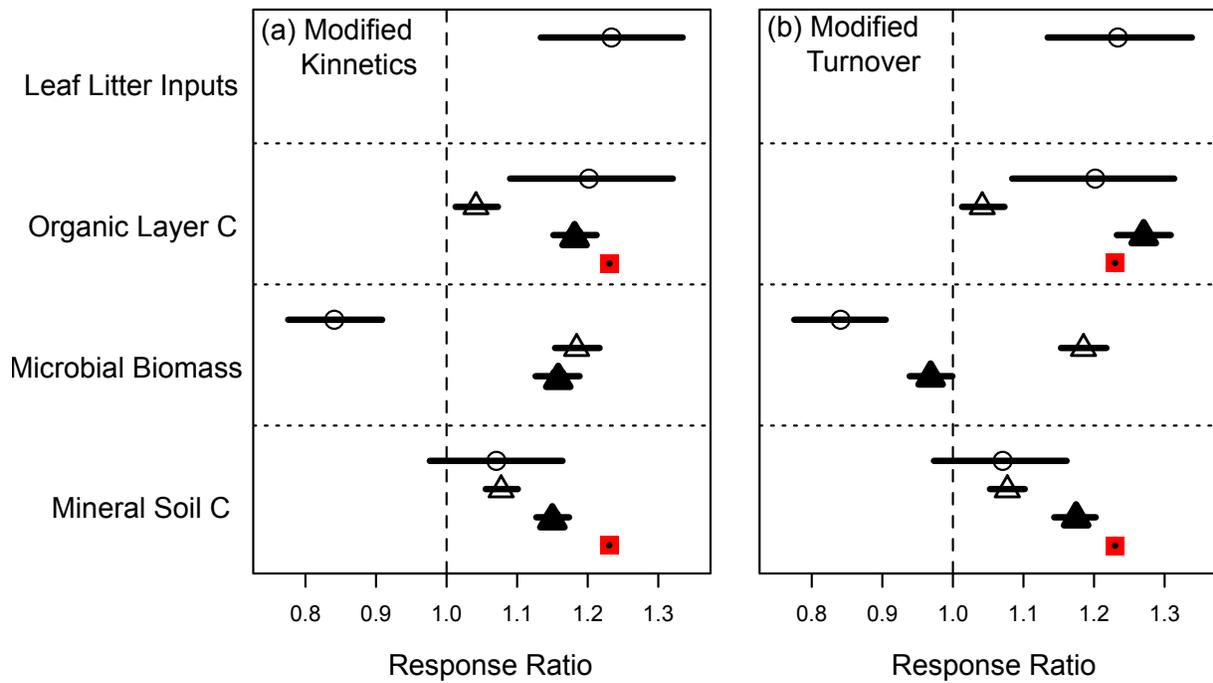


Supplement of

Representing life in the Earth system with soil microbial functional traits in the MIMICS model

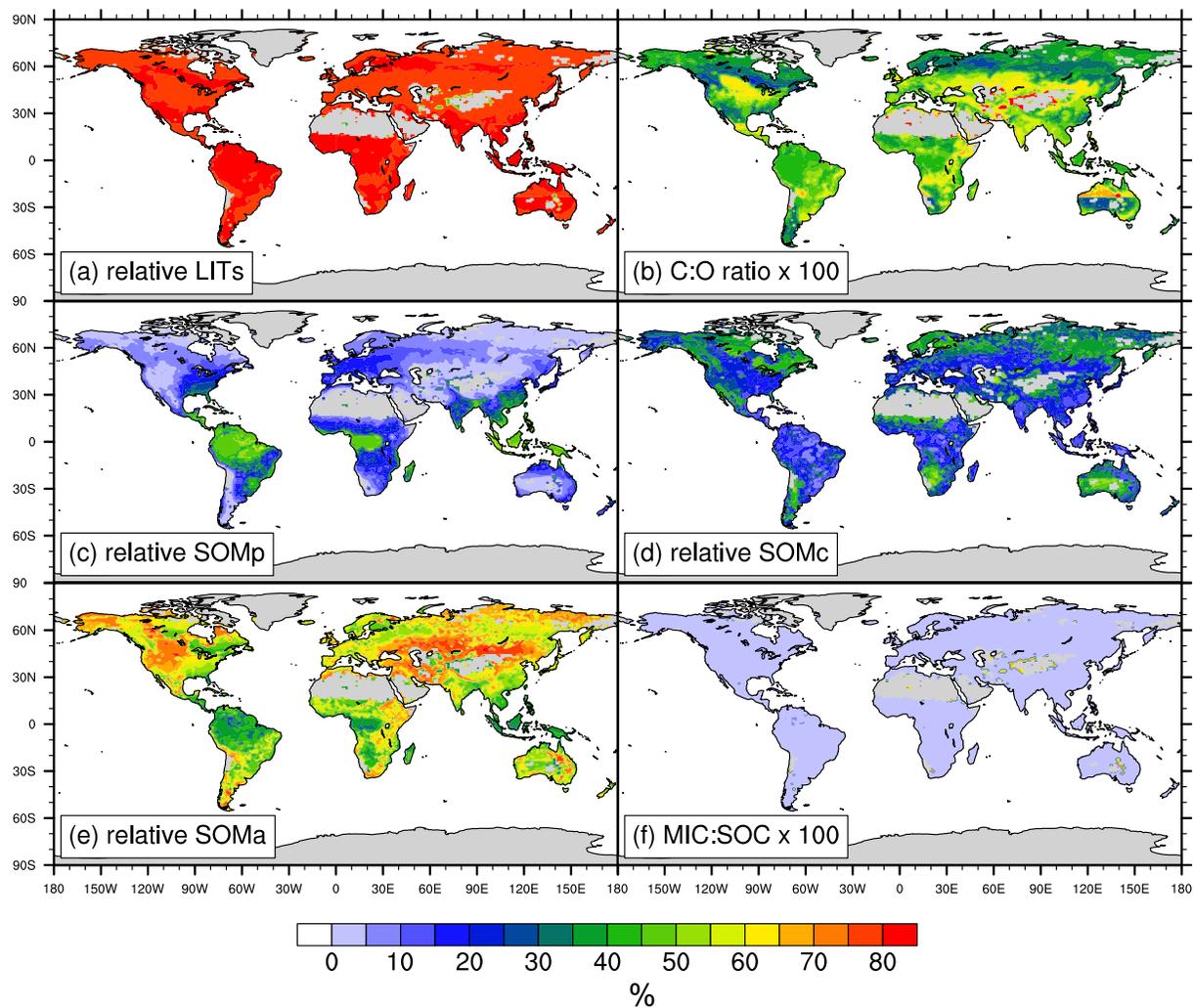
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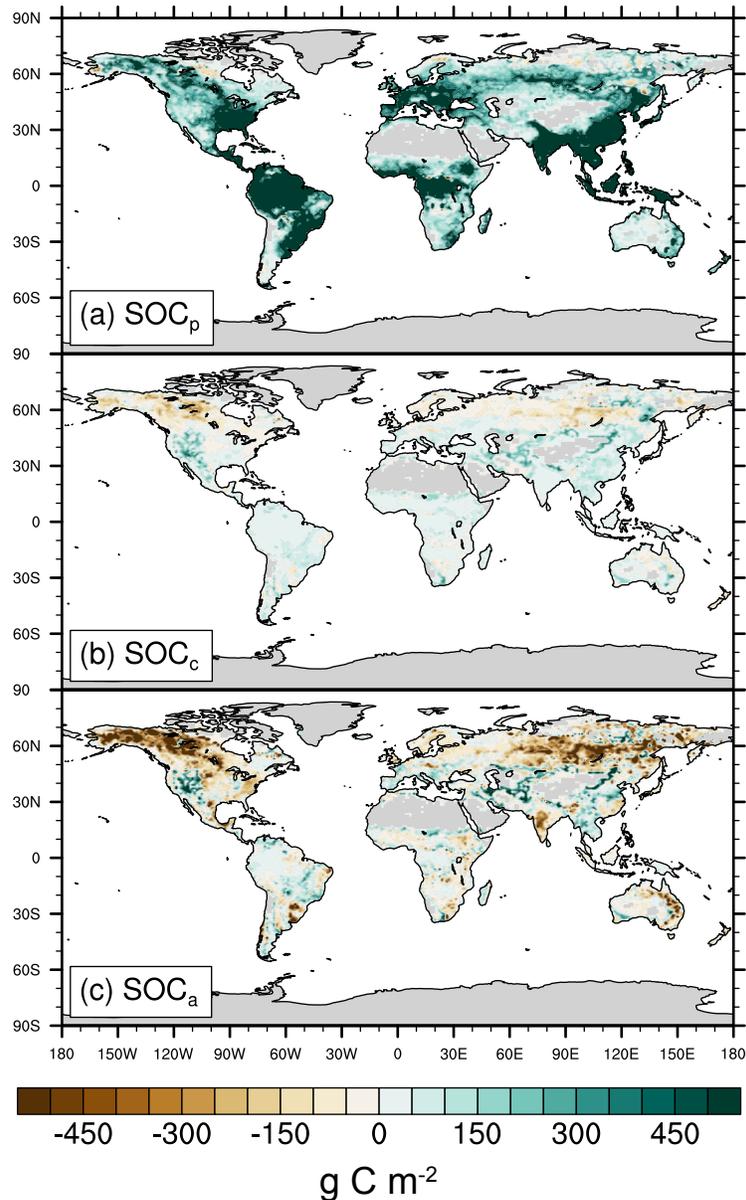


Supplementary Figure 1. Observed and modeled C response ratio (treatment / control) to experimental N enrichment with modifications to (a) V_{\max} and (b) τ (described in Appendix A).

As in Fig. 3, open circles show observational mean and 95% confidence interval reported by (Liu & Greaver, 2010). Modeled results show the steady-state changes in soil C projected by MIMICS (open triangles), modified MIMICS (filled triangles) and DAYCENT (filled squares).



Supplementary Figure 2. Spatial distribution of relative (a) litter, (b,f) microbial biomass, and (c-e) SOM pools sizes from steady-state MIMICS simulations. Results calculated by dividing individual pool sizes by the total pool size in each grid cell and multiplying by 100 (e.g., in Fig S2a structural litter / total litter * 100). The C:O ratio (b) represents the copiotrophic pool size divided by the oligotrophic pool size.



Supplementary Figure 3. Change in individual SOC pools simulated by MIMICS by the end of the 21st century following increases in NPP from elevated [CO₂]. Most of the soil C gains in MIMICS (Figs. 5 & 6) are driven by C accumulation in the (a) physically protected pool (53 Pg globally). Changes in the (b) chemically protected pool are much smaller (accumulating 2.3 Pg C globally), and show more spatial heterogeneity. Finally, increasing NPP builds more microbial biomass, which accelerates the decomposition of (c) microbial available SOC, especially at high latitudes, producing a net C loss from SOM_a pools to the atmosphere (totaling 5 Pg C globally).