

UNCERTAINTIES IN TERRESTRIAL CARBON CYCLE INTERACTION WITH A WARMER CLIMATE

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ABSTRACT

Results from recent models in the coupled carbon cycle climate model intercomparison project (C4MIP) indicate a positive feedback to global warming from the interactive carbon cycle, but the magnitude varies widely. A typical model simulates an additional increase of 90 ppmv in the atmospheric CO₂, and 0.6 degree additional warming due to this feedback, but some model can be as large as 250ppm. Using a linear perturbation framework, we analyze what might have caused such large discrepancy in the models, with a focus on land where the largest uncertainties lie. Change in NPP such as different sensitivity to the CO₂ fertilization effect is one where in some models it is modest largely due to the multiple limiting factors constraining terrestrial productivity and carbon loss. The large differences among the models are also manifestations of other poorly constrained processes such as the turnover time and rates of soil decomposition.