



Analysis of CO₂, climate and land use effects in twentieth century terrestrial carbon balance simulated using Met Office Surface Exchange Scheme

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The MOSES (Met Office Surface Exchange Scheme) model was used to simulate the sinks and sources of carbon over the global land surface. Taking observed and reconstructed changes in climate, CO₂ concentration and land use as inputs, MOSES simulated biological process in the vegetation across the different continents and produces estimates of local uptake and release of carbon in response to the imposed environmental changes. Year-to-year fluctuations in the simulated global land carbon uptake show good anticorrelation in the patterns of year-to-year fluctuations in the rate of rise of atmospheric CO₂, which suggests that the fluctuations in the rate of CO₂ rise are largely due to fluctuations in the land carbon uptake. Over the long-term (1920-2002), the simulations yielded a time history of terrestrial uptake that is consistent (within the uncertainty) with a long-term analysis based on ice core and atmospheric CO₂ data. After 1960, all analyses indicate a net uptake of carbon by terrestrial ecosystems, primarily because of the physiological effects of rapidly rising atmospheric CO₂. The simulations of 1990s indicate that terrestrial ecosystems stored between 1.3 and 1.8 Pg C yr⁻¹, which is within the uncertainty of analysis based on CO₂ and O₂ budgets.