

The terrestrial phosphorus cycle in JSBACH

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Carbon (C) storage by many terrestrial ecosystems can be limited by nutrients, predominantly nitrogen (N) and phosphorus (P). The availability of nutrients has been affected by human alteration of the C cycle as well as human land use for at least the last 200 years. Only very few studies consider both N and P availability to evaluate terrestrial C cycling. To evaluate the influence of P and N availability on the C cycle from the year 800 to 2100 a scheme for terrestrial P cycling is introduced to ECHAM6's land surface scheme JSBACH.

This extended JSBACH version has, in addition to the already existing N and C cycles, 8 organic and 3 inorganic P pools to represent terrestrial P storage. The P pools are connected by fluxes, which are calculated according to the known C/N/P stoichiometry of the organic pools. Soil inorganic P dynamics are based on the work of Wang et al. (2009). The nutrient cycles are able to slow down the C cycle by nutrient limitation determined by availability of N and P. External inorganic P losses, namely leaching and erosion, are computed dynamically assuming a dependency on removable material and runoff. P deposition (Mahowald et al. 2008) as well as land use change reconstructions (Pongratz et al. 2009) are used as an input. The model is in the final phase of development.

References:

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