How Does P Cycling Affect Carbon Uptake in the Amazon?

Objective:

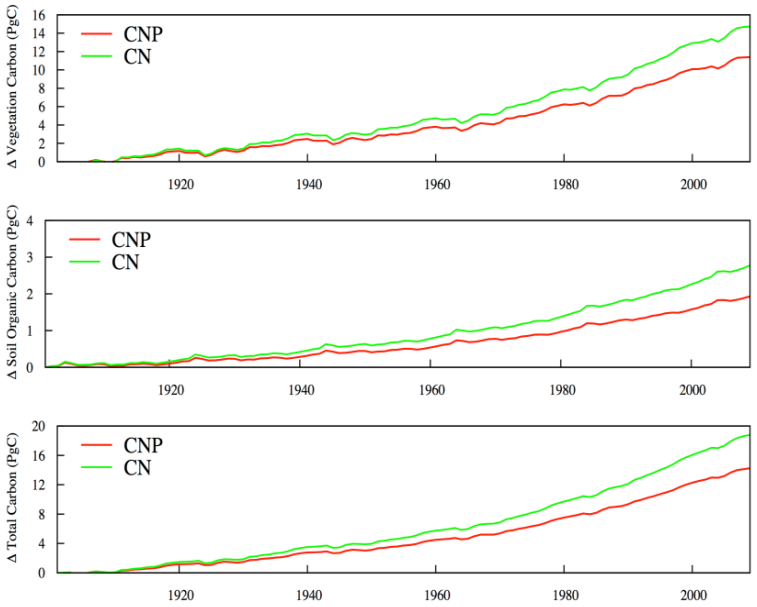
Explore how phosphorus (P) cycling interacts with changes in atmospheric CO_2 and climate to affect historical and future carbon uptake in the Amazon region.

Approach:

Exploratory land model simulations for the Amazon region were performed with and without P dynamics coupling under increasing atmospheric CO_2 conditions.

Results/Impacts:

- Model simulations showed that coupling of P dynamics reduced the simulated historical terrestrial carbon sink by about 26%.
- Results highlight the need for new observations on the effects of elevated CO_2 on P dynamics, and the need for more tropical leaf-scale measurements under different temperature and humidity conditions and different levels of soil P availability.



These graphs show the trajectories of vegetation, soil, and total (vegetation plus soil) carbon stocks for the period 1900–2009 associated with historical changes in atmospheric CO_2. CNP simulated carbon accumulation is about 26% lower than that simulated by the CN model, which is due mainly to low soil P availability in most of the Amazon region, which causes a weaker response of plant growth to increasing atmospheric CO_2.

Yang, Xiaojuan, Peter E. Thornton, Daniel M. Ricciuto, and Forrest M. Hoffman (2016), Phosphorus feedbacks may constrain tropical ecosystem responses to changes in atmospheric CO_2 and climate, *Geophys. Res. Lett.*, doi:10.1002/2016GL069241.