

Multiple soil nutrient competition between plants, microbes, and mineral surfaces

Objective:

- Develop, calibrate, and test a nutrient competition model that accounts for multiple soil nutrients and abiotic consumers.
- Calibrate and test model against N and P fertilization experiments.
- Predict dynamic competitive regimes.

Approach:

- Model includes three primary soil nutrients (NH_4^+ , NO_3^- , PO_x) and five competitors (plant roots, decomposing microbes, nitrifiers, denitrifiers, and mineral surfaces).
- Competition modeled with the Equilibrium Chemistry Approximation (ECA).
- Calibrated at a tropical forest site (Tapajos) and tested at two other tropical forest sites (Hawaii and Puerto Rico).

Results/Impacts:

- Model accurately replicated the experimentally manipulated forest responses that were not used in model calibration.
- Relative competitiveness of consumers was dynamic. For NH_4 , nitrifiers and decomposers were comparably competitive and out-competed roots.
- These mechanisms are being integrated in ALM and tested against >80 field studies.

Zhu, Q., W. J. Riley, J. Y. Tang, and C. D. Koven (2016), Multiple soil nutrient competition between plants, microbes, and mineral surfaces: Model development, parameterization, and example applications in several tropical forests, *Biogeosci.*, 13(1):341–363, doi:[10.5194/bg-13-341-2016](https://doi.org/10.5194/bg-13-341-2016).

