**Data distributions of key pools**

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**Soil feedbacks to plant N**

*Plant relationships with total N* (site averages)

-Overall weak relationship between both % leaf and % root N with *total %* soil nitrogen. Including or removing high soil N values (above 1%) did not qualitatively change the results.

*Plant relationships with inorganic N* (site averages)

-no clear relationship of % inorganic soil N with % foliar N. However, there was a clear/significant relationship with total soil N and % root N; % inorganic soil N explained ~25% of cross-site variation in % root N. Similarly, the was a significant relationship between % root N and % plant N; % root N explained 26% of variation in % foliar N. This indicates plant available N is a better indicator of root N but not leaf N, however, leaf N is clearly integrated with root N. Thus, the relationship between inorganic soil N and leaf N is mediated by root N/acquisition (I think this is a fair interpretation…?).





*Does taking a stochiometric approach change things?*

Putting things in terms of C:N strengthens these relationships a lot! We can explain 66% of leaf C:N just with total soil C:N, and nearly 50% of root C:N with total soil C:N. This highlights the importance of putting these relationships in a stoichiometric framework.



Mixed effects models

Having established the importance of putting things in terms of C:N, I focus the mixed effects models on leaf and root C:N with total C:N. The main effects were total soil C:N, aridity (VPD), and vegetation type (woody versus herbaceous). Site was the random effect. Including soil texture seemed to cut the data down quite a bit, so I left it out, since these LMEs are data hungry. In both models, the majority of variance in leaf or root C:N could be attributed to site-based random effect (higher conditional R-squared). Thus, LMEs tended to have lower AICs than LMs (with no random effects). Qualitatively similar results were found for models that did not put pools in C:N and when considering inorganic soil N.

**Plant feedbacks to soil N**

*Litter and soil N*

Cross-site relationship of % litter N and % total soil N where significant (r-squared = 0.2). HOWEVER, this was driven mostly by one site (GUAN) with a very high value of litter and total soil N,. When we remove this very high point/site, there is no relationship (P = 0.92). Moreover, there was no clear relationship between % litter and % inorganic soil N.

*Resorption and total soil N*

No clear relationship between resorption and total soil N (P = 0.09) or inorganic N (0.96)





However, we again do a better job when we consider C:N stoichiometry (at least for litter)…



Relationship of % litter N and N resporption with % inorganic soil N.

*Mixed effects models*

For this part, I focused on C:N pools. The LME model had the form:

total soil C:N ~ litter C:N + vpd + veg.type + random=site

\*I didn’t consider resorption because it didn’t seem to have a relationship with soil N. This also conserved more data.

Similar to the other LMEs, most of the variance in soil C:N could be attributed to random site effects. The LME has a slightly lower AIC than a LM.

\*I do wonder if LMEs are too data hungry for the data we end up feeding them. For example, when we align more and more covariates we lose more and more data, the soil C:N model has ~9 sites with ~5 reps per site, with only two sites that have a herb veg type (8 total replicates).

**Overall, I think a message could be:**

-Cross-site relationships (or our understanding of) between nitrogen pools are strengthened when factoring in the C:N stoichiometry of these pools

-When factoring in more explanatory variables, such as vegetation type and climate, to explain variation in these pools, we consistently found that more variation in N pools was instead attributed to random site effects (what’s the ecological interpretation here?)