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Interactive comment on "Leaf nitrogen from first principles: field evidence for adaptive variation with climate" *by* Ning Dong et al.

Anonymous Referee #1

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This paper presents an analysis of how leaf N per area (Na) varies with climate in terms of its structural and functional (photosynthetic) components. The effects are attributed to inter-specific variation and within species adaptation, and the results are interpreted in a leaf optimization framework.

I find this study to be extraordinary in going all the way from leaf sampling to modeling, producing empirical evidence, theoretical progress, and new components for predictive models in one paper. It is a rarely seen example of how to combine observations and theory to make real quantitative progress, beyond the usual "significant or not" testing of ecological hypotheses. In conclusion, I find this an very useful contribution to the research area.

I only have some minor questions/suggestions: In the discussion, p.10 l. 19, the least

cost hypothesis is explained as reducing ci/ca in drier environment due to the need for increased water transport capacity for a given rate of assimilation. Why this happens is not obvious to me. I would have thought that in drier environments water limitation would force the plants to increase water use efficiency by increasing assimilation capacity (Amax) per water use? Maybe an additional line of explanation could help here.

Then in the final comments it is suggested that Vcmax should be plotted on the X axis against leaf N instead of the usual opposite way. I think I get the point of this, but at the same time, isn't N in proteins a key part of the machinery or structure that performs the "function Vcmax". I think both ways of plotting could be equally valid also from an plant centered perspective.

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