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Interactive comment on **"Spatial distribution and functional significance of leaf lamina shape in Amazonian forest trees"** *by* **A. C. M. Malhado et al.**

A. C. M. Malhado et al.

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11. Anonymous Referee #2 (comments) I found the topic of the paper very interesting, the analysis extremely thorough, and the conclusions soundly-based. I have just a few comments which the authors should address.

Malhado et al. (response) Thank you!

12. Anonymous Referee #2 (comments) Support for Givnish s work verged on the sycophantic, and those papers might have been viewed in a more critical light.

Malhado et al. (response) Yes, we do like Givnish s work and feel it provides a robust conceptual context for our study. However, we have now toned down the text to avoid any more accusations of sycophancy!

13. Anonymous Referee #2 (comments) There is no analysis of possible taxonomic re-

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lationships, merely a passing comment on this matter. Evolution works on a taxonomic foundation, and so one might reasonably expect that certain traits are associated with certain groups.

Malhado et al. (response) This is certainly true for many traits and it is a huge analytical challenge to simultaneously control for both spatial autocorrelation and phylogeny - indeed, there are no published procedures to do this. However, in the case of leaf shape there is a remarkable degree of variation both within and between families and even genera, and for this reason we feel our analysis was suitably robust.

14. Anonymous Referee #2 (comments) It was not clear how compound leaves are treated. If the tree has compound leaves do the leaflets count as leaves?

Malhado et al. (response) Yes, leaflets are treated as individual leaves for the shape categorization. A phrase has been added to the methods.

15. Anonymous Referee #2 (comments) Where did samples come from, top or bottom of canopy or unknown. Botanical collectors do not always have climber-assistants, slingshots etc. In some cases there are differences between leaves at the top and bottom of the canopy.

Malhado et al. (response) We do not know precisely from where many of the samples come from in the canopy. The major source of data used for this study is the online Neotropical Herbarium Specimens of the Field Museum of the State of Illinois, United States of America. The Field Museum team provides a desktop reference set of high-quality images of dried herbarium specimens for comparison. These will represent a broad range of Neotropical genera and common species. The underlying strategy is to have just a few examples of each species, specimens that are typical or illustrative of that species. Preference is given to specimens that have a good set of leaves as well as flowers or fruit, and to specimens with an authoritative identification. Our assumption is that the environment-trait signal will be strong enough to be detected despite variation in sampling procedures for leaves.

16. Anonymous Referee #2 (comments) The authors pre-suppose we have an evolutionary steady-state, i.e. leaf shape is adapted to the environment the tree finds itself in. Presumably this is far from the truth.

Malhado et al. (response) Yes, the paper takes an adaptationist approach assuming that the traits are tracking the environment, albeit with a slight time-lag. Moreover, the Amazon has been relatively stable climatically, at least since the end of the last ice age. Generally, the rate of adaptation will be dependent on the availability of genetic variation, the strength of selection, the generation time of the species, and whatever evolutionary trade-offs are involved in changes in leaf morphology. However, the referee raises an important point and we have inserted a paragraph to clarify our position: It should also be recognised that the 7 years climate series represents a small sample of current climate, but that this may not necessarily represent the historical environments within which the tree species evolved. Here, we make the assumption that current climate provides a sufficient approximation of historical climate to pick up any strong environment-trait correlation. However, due to this assumption we would still advise a cautious approach to interpreting these results.

Interactive comment on Biogeosciences Discuss., 6, 1837, 2009.

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