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Comment

## ***Interactive comment on “Implications of albedo changes following afforestation on the benefits of forests as carbon sinks” by M. U. F. Kirschbaum et al.***

### **Anonymous Referee #1**

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Kirschbaum and others explore the role of land management on radiative forcing via its impacts of albedo and carbon cycling, choosing a NZ *Pinus radiata* forest/pasture comparison.

The dataset is interesting and frankly there is very little to be contested if the parameters (e.g. in eq. 3) are robust for converting changes to carbon storage and albedo to radiative forcing terms. The scaling is somewhat adventurous from plantation/pasture transition to globe, but I found nothing contentious. The manuscript is well-written, although it could be written more succinctly as some statements are repeated (e.g. P. 8566 L. 20 and P. 8568 L. 11). I recommend that this manuscript be accepted to

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Biogeosciences after considering the following minor comments.

P. 8564 L. 5: the conversion need not be to pasture.

P. 8564 L. 25: I'd like to point out that the Juang et al. study focuses on surface (skin) temperature and is careful to distinguish surface from atmospheric temperatures, and the stand versus regional versus global context. Other papers by this team explore the impacts of land cover change on convective precipitation events (Juang et al., 2006a; Juang et al., 2006b). The important role of cloud albedo is not considered in these studies, nor is it in the present manuscript, but the authors are careful to note the importance of cloud albedo and the need for regional-scale climate modeling (e.g. P. 9569 L. 6).

P. 8567 L. 1: net radiation is zero in the steady state.

P. 8568 L. 6: Are there studies documenting similar evapotranspiration between *Pinus radiata* plantations (or similar) and pastures? If the former support greater leaf area, I'd expect to a first order greater total evapotranspiration.

P. 8575 L. 18: Are there studies on the carbon balance of this stand? The statements about growth/decay balance may hold, but I'd argue that the plantation trees grow faster (1.5 m/y!) than the wood is decaying.

P. 8579 L. 6: It was pointed out to me once that the plantation manager's job is to take all merchantable carbon off of a piece of land. What is the life cycle of the wood and might this contribute over time to the global atmospheric CO<sub>2</sub> increase?

Figure 3a: Are carbon stocks in the soil increasing appreciably? The full carbon balance should include the net ecosystem exchange of carbon rather than the stand biomass.

References Juang, J.-Y., Katul, G. G., Porporato, A., Stoy, P. C., Siqueira, M. B. S., Detto, M., Oishi, A. C., Kim, H.-S., and Oren, R., 2006a: Eco-hydrological controls on summertime convective rainfall triggers. *Proc. Natl. Acad. Sci. USA*, in review. Juang,

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**BGD**

8, C3669–C3671, 2011

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J.-Y., Porporato, A., Stoy, P. C., Siqueira, M. B. S., Oishi, A. C., Detto, M., Kim, H.-S., and Katul, G. G., 2006b: Hydrologic and atmospheric controls on convective precipitation events in a southeastern US mosaic landscape. *Water Resources Research*.

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Interactive comment on *Biogeosciences Discuss.*, 8, 8563, 2011.

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