Interactive comment on "Technical note: 3-hourly temporal downscaling of monthly global terrestrial biosphere model net ecosystem exchange" *by* Joshua B. Fisher et al.

Anonymous Referee #2

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In the technical note '3-hourly temporal downscaling of monthly global terrestrial biosphere model net ecosystem exchange' Fisher and co-authors describe the methodology employed to downscale monthly output from 15 comprehensive land-surface model and 4 ensemble products. Results and methodology are of interest for atmospheric forward and inverse modeling as well as land-surface model evaluation. The manuscript summarizes the approach and reads well. Nevertheless, I think this paper needs some clarification that have to be addressed first, and which prevent me of accepting this paper in its present form. Therefore, I recommend acceptance of this manuscript after some minor revisions.

General Comments: 1- The authors have developed an approach on two major as-

sumptions: (1) one forcing set, CRU-NCEP, which is downscaled at 3-hour timestep while other forcing set are available at 3-hour timestep over the time-window (2004-2010) like the Princeton Global Forcing set, WFEI, WATCH and so on. . . (2) they use monthly output from various land-surface models that are downscaled independently from their skill. These models are able to produce daily output which can also be exploited. I wonder if a higher output frequency could improve 3-hour NEE estimates ?

2- At the end of the manuscript, the authors state "A full uncertainty analysis of the approach is beyond the scope of this technical note intended to describe the methodological detail of the downscaling.". I first would mention that this statement should appear earlier in the manuscript. Then, while I agree with the authors, I think the authors miss at indicating how they assess the uncertainty in their methodology or clearly state caveats and potential sources of errors. I think this kind of information is fundamental in technical note because this manuscript will support a dataset, software and the companion test case (described herein). For example, the quantile-quantile plot (Figure 4) can be extended to GPP ad Re (available in most of the FluxNet stations). Readers will also need to see how the mean diurnal cycle for GPP, Re and NEE derived from 3-hourly downscaled estimates of these fluxes (the distribution can be accurate but with the wrong timing).

3- While I understand the approach to use TRENDY / MST-MIP model output, I think the authors have to clearly mention the limits of these models, especially for the Re which aggregate processes that are not well simulated by the current generation models (errors in Ra and Rh often compensates). Details on models that compose the dataset are required to my point of view.

Specific comments:

L41: please detail what means 'ecosystem respiration' L58-79: please provide further details on the methodology of Olsen and Randerson (2004). It is unclear whether the

same scaling is applied to the various model results or for each individual model (with simulated surface temperature or leaves temperature instead of air temperature).

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