RESPONSES TO THE REVIEW'S COMMENTS

Reviewer #1

This is such a useful study and I would hope that we could eventually expand the analysis to include more models. To make it even better I would like to suggest the following: I am unhappy with the emphasis on the uncorrected flux data (e.g. page 12, lines 264 to 267). Since we know the fluxes are generally (and variably) underestimated by the flux-observation system, I think it is more useful to consider the evaporative fraction (LE/(LE+H)) rather even than the 'corrected' fluxes which depends on yet more uncertain data (Rn and G). In my paper (Blyth et al, 2010, https://doi.org/10.1175/2009JHM1183.1) I scale the observed evaporation with the ratio of observed sum LE+H and modelled sum LE+H.

You state in the introduction that the greatest uncertainties of change between forest and open come from the flux partition rather than the total absorbed radiation. So a focus on that would be helpful - hence the reliance on the evaporative fraction makes sense. Then separately consider Rn and G.

We thank the reviewer for the insightful assessment of the FLUXNET data and our manuscript. We have added one figure about the change in evaporative fraction ($EF = LE/(LE+H)$) in the revised manuscript (Figure 7, below). *EF* has advantages as noted by the reviewer, but also disadvantages; particularly in a budget assessment as it is not itself a term in the energy or water budgets. During summer, there is little change in observed daytime EF (Figure 7a) because of the observed decreases in both *LE* and *H* (Figure 2,5). However, the models show increased daytime *EF* due to the decreased *H* and slightly increased *LE* after deforestation. Seasonally, the models suggest year-around increased *EF*, however, which is not shown in the observations during summer (P14, L295-307).

Secondly - I wonder if you can do the single-site simulations with the one-soil and two soils options. Give the single-site off-line run a 50% fraction of 'tree' and 'open' and compare them - even include a bit of modelled soil moisture to show how it is affecting it. I found that getting the PFT and PFTCOL into the analysis of this paper tends to confuse the issues especially when one is so wayward, while the point about whether or not to have separate soils for each PFT seems essential!

Sorry for the confusion and thank you for the suggestion. The single-site off-line run with 50% "tree" and 50% "open" is actually analogous to the PFT and PFTCOL runs.

No matter what percentage of a grid box (or single site) is covered by a tree (or grass) PFT, or if there are any other PFTs involved in the grid box, the PFT-level open-versus-tree comparisons in a single-site off-line run can be the same as our comparison from the global PFT runs. Within the same grid box, the two PFTs receive the exactly same meteorological forcings. In CLM, biogeophysical and biogeochemical processes are simulated for each PFT independently, and all fluxes to and from the land surface are calculated at the PFT level (Oleson et al. 2013).

The percentage of individual PFTs only matters when aggregating the PFT level properties to the column/grid level, however, which is beyond the scope of this study. We have added more

explanation about the PFT-level comparison in the revised manuscript (P8, L168-171).

Oleson, K. W., and co-authors, 2013: Technical Description of version 4.5 of the Community Land Model (CLM), NCAR Technical Note, TN-503+STR, National Center for Atmospheric Research, Boulder, CO, USA, 434pp., [Available at http://www.cesm.ucar.edu/models/cesm1.2/clm/CLM45_Tech_ Note.pdf].

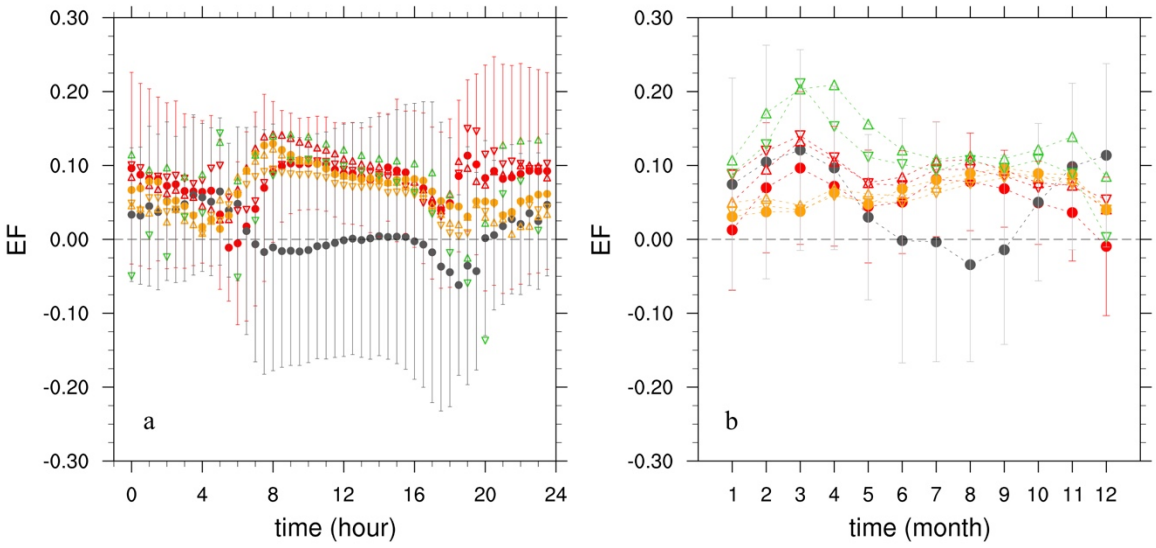

Figure R1. Change in the summer diurnal (a) and seasonal (b) cycle of *EF* (unitless) due to LULCC from forest to open land (open – forest).