Anonymous Referee #2

General comments

1. My central concern with the paper is its relationship with the EC data at PPSF. The paper describes very little about the EC measurements and the methodology, including how the data were gap filled. I realize that much of this information is explained in the Hirano et al paper, but since the EC data are central to this paper, a brief overview of how they were obtained and filled is critical.

Reply: EC methodology, quality control, gap-filling, flux partitioning and uncertainty estimation are now described in more detail (Sect. 2.2.2).

2. A better description of the EC data is especially important because there is a significant, systematic difference between the gap-filled and modeled GPP and R. Although the NEP numbers are close, the divergence in GPP and R is large enough to warrant further investigation. Have the authors tried different gap-filling methods to see if similar differences between model and measurements arise?

Reply: Modelled R_e was systematically larger than EC-derived R_e predominantly in the rainy seasons (November-April) which was consistent throughout the study period (Fig. 1) (Table 2). However, modelled CO_2 fluxes for the same hydroperiods had better agreement with EC-measured fluxes (Fig. 1) (Table 2). Despite similar measured vs. modelled soil water contents and air-filled porosities, gap-filled CO_2 effluxes were much smaller than the modelled CO_2 effluxes during the rainy season (Fig. 1).

Systematic uncertainties embedded in EC methodology were also thought to contribute to larger modelled vs. EC-derived monthly and annual R_e estimates. Nighttime EC NEP decreased with u (friction velocity) in our study site indicating the dependence of nighttime CO_2 flux* *measurements on above-canopy turbulent mixing. However, biological production of CO_2 by plant and microbial respiration was independent of u* in the model. Thus low u* threshold can induce substantial underestimation of EC-derived R_e estimates particularly in tropical rainforest ecosystems which are not in the case of the modelled R_e estimates.*

Larger modelled vs. gap-filled R_e contributed to larger modelled vs. gap-filled annual GPP (Fig. 8) (Table 3). In EC datasets, GPP was derived from extrapolated daytime R_e (Sect. 2.2.2) and hence smaller gap-filled vs. modelled nighttime R_e would cause smaller EC-derived GPP. Unlike EC-derived R_e that is used to calculate EC-derived GPP, modelled R_e was driven by modelled GPP through fixed C products and through root exudates and litterfall. A further cause of smaller EC-derived vs. modelled GPP could have been the incomplete (~80%) energy balance closure in EC measurements vs. complete energy balance closure in the model, which would reduce EC-derived ET and also possibly GPP (Table 3).

All of these above mentioned sources of larger modelled vs. EC-derived R_e and GPP estimates were related to EC methodology and gap-filling. These larger modelled vs. EC-derived R_e and GPP aggregates, however, could not be resolved in our modelling since, unlike EC datasets, every single mole of CO_2 that was modelled from fundamental ecosystem processes was counted in the modelled C budget (Please see Sect. 4.2 for further details).

3. Section 2.2.4 discusses how water table depth is modeled in ecosys. The drivers of vertical exchanges are clear, and the description of how lateral flows are calculated according to distance, hydraulic gradient, and external WTD makes sense. How this is applied in this paper needs to be better clarified. If the external WTD is 0.45m below the surface, how far away is that external WTD, and what sort of lateral flow arises as a result? And what sort of role does this play in the site's overall water balance?

Reply: A brief description of how WTD was simulated is now included (Sects. 2.2.6). The effects of interannual variations in WTD in ecosystem annual water balance (evapotranspiration (ET) and drainage (Q)) are now described briefly (Sect. 3.4) (Table 3). However, simulation of seasonal variation in hydrology and its effects on surface energy exchange that was a part of this modelling effort are described in detail in a concurrent paper which is currently under review. This paper is cited in the manuscript.

4. The drained vs. undrained simulation investigates a very important scientific problem with big policy implications. Why isn't the simulation in the results section? It seems that sections 4.5 and 4.6 should at least in part be in section 3.

Reply: Results from drained vs. undrained simulation are now introduced in the result section (Sect. 3.5) and then discussed in the discussion section (Sect. 4.3).

Specific comments

Figures: Figures 1-4 would benefit if the x-axis read "Day of year 2002", etc. as the year is buried in the long caption text.

Reply: Done (Figs. 2-5).

Abstract: you may wish to point out the source/sink directionality for NEP for those of us who usually work in NEE

Reply: Sign convention of NEP is now included.

13357 L27-13358 L2 This very long sentence needs to be broken up into more digestible chunks – all the ideas are important, but it's hard to pick apart. i.e. "Due to differences in dominant vegetation, the effects of WTD on productivity are very different in tropical peatlands than temperate and boreal peatlands. The mosses common in temperate and boreal peatlands have shallow rhizoids and no stomatal regulation, resulting in different water and nutrient uptake than a tropical peatland where trees have well-developed root systems."

Reply: Done.

13355 L16 – define RMSD

Reply: RMSD is now replaced by RMSE which is defined in the text.

13370 L9 and 13374L24 – there are only scant mentions of methane in this paper, and it isn't the focus. This could be removed.

Reply: Methane emission is now removed from the manuscript.