Interactive comment on "Uncertainty analysis of gross primary production partitioned from net ecosystem exchange measurements" *by* R. Raj et al.

Anonymous Referee #2

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Using the Bayesian approach, this study assesses the uncertainty GPP derived from eddy covariance measured NEE. This approach was applied for use to estimating uncertainty of derived GPP in a Douglas fir forest site. The authors employed a daytime-based flux partitioning method (i.e., non-rectangular hyperbola model (NRH) for photosynthesis and a temperature depend equation for respiration) and the Bayesian approach for parameters of the combined equation. In the end, the authors concluded that this Bayesian approach could be used to estimate the uncertainty of GPP, NEE, and other variable (e.g., particular photosynthetic photon flux density and air temperature), and informative and non-informative prior distribution of model parameters led to similar posterior prediction of NEE and GPP. Generally, the topic of this study is within

the scope of Biogeosciences and the methods used are sound. However, there are some limitations that need to be addressed before publication.

Major comments:

1. The residual term in equation 6 is not the uncertainty for measured NEE (P15L9-10). The so-called uncertainty for NEE is from the NRH model used in this study. Some statistical flux-partitioning methods (like NRH used in this study) could be used to either estimate GPP and ER or fill missing data. The authors have to carefully state the usage of their approach. Don't go too far and away from parameter uncertainty analysis.

2. The authors have to acknowledge that the uncertainty quantified in this study is just a part of GPP uncertainty sources, since some factors (such as water and nutrient limitations) were missing in the photosynthesis model. The authors only quantified the GPP uncertainty based on a photosynthesis model.

3. Content: The verification of the approach is important, but could go to supplementary.

4. Structure: Introduction could be more concise. For example, NEE = ER–GPP or NEP = GPP-ER. One sentence might be enough. The section 3 could be included in section 2 (Methods). The results should not include discussion. Anyway, the authors have to re-structure the manuscript.

Specific comments:

P3 L8-9: remove ",which is partitioned from NEE,"

P3 L9-11: Not only measured NEE but also derived GPP and ER are used to test the process-based models.

P3 L12: after component fluxes, add (GPP and Reco).

P4 L5: Better to cite the original reference for NRH photosynthesis model. Rabinowitch 1951 could be better.

P4 L9-12: Move after P4 L3, it was still talking about RH model.

P4: L12: repeat?

P4 L24: "for the calibration of process-based models"

P6 L1: Rabinowithc 1951 might be better.

P8 L 22-P9 L7: It could go early. The authors suggested that the effects of VPD could be neglected, but I did not see any VPD term in equations 1-4 or 6.

P9 L16: RHS Represent?

P9 L23: I'm confused. Here the authors said a non-informative prior was selected and afterwards two methods (non-informative and informative prior distributions) were compared.

P17 L1-2: Remove ", so it is important to . . . means."

P17 L7: In the Results section? The authors might combine results and discussion as one section.

P18 L20 –P19 L18: the unrealistic estimates for parameters could attribute to the statistic method itself. It's not necessary to describe the results of non-informative prior distribution, as two methods may get similar results. Except that the authors would recommend using non-informative prior distribution, it will not change the story.

P21 L2-4: As I mentioned early, this study is not appreciate to estimate the uncertainty of NEE that has been measured through the eddy covariance technique.

Table 1: VPD related parameters just appeared in the text. I would suggest add to the equations.

Fig 2, 4, and 5: no difference I can detect for non-informative prior distributions and informative prior distributions. Again, to my opinion, there is no need to compare.

Fig.3: The distribution of simulated GPP in the morning or in the afternoon does not

give me expected information. The daily GPP distribution might be interesting, as it showed the uncertainty of estimated GPP.

Fig S4-5. The key results (Fig. S4) can be put in the main paper.

Reference:

Rabinowitch, E.I., 1951. Photosynthesis and Related Processes. Soil Science 72, 482.

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