

Response to Editorial Comments

Dear editor:

Thank you very much for handling our manuscript, and we really appreciate the insightful comments from you. Below, we address the comments point-by-point, and the comments are italicized and our response follow in blue.

Minor comments:

L121: check english language: use combine instead of compiles from?

L168: remove, "Ecologically"

L180: define what "a specific ecosystem" means

L193ff: check grammar

L198: define "explanation". Is that explained variance?

L199: North America

L204: add "in this network".

L259: reword "which validates the discovery" to "which confirms / agrees with" or similar

Response: Thanks, and we have made revisions according to the comments.

L261: explain why the difference in U/R across ecosystem types indicates spatial convergence. The SD for individual ecosystem types is for some at least larger than for the total - this does not suggest that the variance across ecosystems is generally larger than within ecosystems.

Response: We feel sorry for the confusion. We have removed the comparison between ecosystems and rephrased this sentence by emphasizing the convergent $\frac{\bar{U}}{\bar{R}}$ across

Fluxnet sites (Lines 255-258): "In this study, we found the $\frac{\bar{U}}{\bar{R}}$ across the 72 sites is 2.71 ± 1.61 , which confirms with the findings of Churkina *et al.* This spatial convergence of $\frac{\bar{U}}{\bar{R}}$ at site level provides important constraints for global models that simulate large spatial variation in physiological processes (Peng *et al.*, 2015; Xia *et al.*, 2017).".

L295: I am not convinced that the lack of a correlation for boreal ecosystems based on one atmospheric inversion is necessarily an indication of the inversions incapacity to reproduce observed carbon fluxes at regional scales. It is also possible, that the correlation does simply not exist (fluxnet is not well constrained for these regions. It is also unclear what "experiencing serious disturbance" refers to. Please be more specific.

Response: Thanks for this suggestion. We have revised the explanation for the lower correlation in boreal ecosystems by considering the editorial suggestion (Lines 291-294): "In this study, the atmospheric inversion product shows low correlation between NEP and $\ln\left(\frac{U}{R}\right)$ in some boreal ecosystems, which might due to that the terrestrial NEP

is not well constrained for these regions or these boreal ecosystems are experiencing state transition.”.

Data availability statement. Add a statement referring to FLUXCOM and inversion data availability

Response: Thanks, and we have added data availability for FLUXCOM and inversion product (Lines 315-319).