Constraining biospheric carbon dioxide fluxes by combined top-down and bottom-up approaches

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Response to reviewers

REPORT 1)

No additional notes from reviewer.

REPORT 2)

It seems the authors have largely improved the description of methods by combining both bottom-up and top-down methods. Minor revision is needed before it can be accepted for publication.

Thank you for the feedback. We're happy that our changes have improved and clarified the description of our methods.

Line 2 in abstract "there are still large uncertainties its attribution to specific regions and diverse anthropogenic and natural sources and sinks", please revise this sentence. there are some similar typos in recent version, which I do not point out, please carefully check the grammar throughout this MS.

Corrected.

In figure 8, although the scatters seem to around 1:1 line, the high density data center seems overestimated than EC based NEE, which seem systematically overestimated, please explain the reason.

Thanks for pointing out this confusing figure. The apparent overestimation is an artifact of inconsistent visual representation of the x=y line and line of best fit. The high density data center is located on the x=y line, but not on the line of best fit. Both figures (below, Figs 1, 2) have been updated, along with their captions, to have consistent color and line styles. We believe that this should remove the ambiguity.

it's good to make your dataset public to all readers, which can benefit the community by comparing different sources of global NEE especially produced in different approaches.

The ensemble mean of the EC-ATM data is now available on Zenodo (https://doi.org/10.5281/zenodo.10454297)

FIGURES:

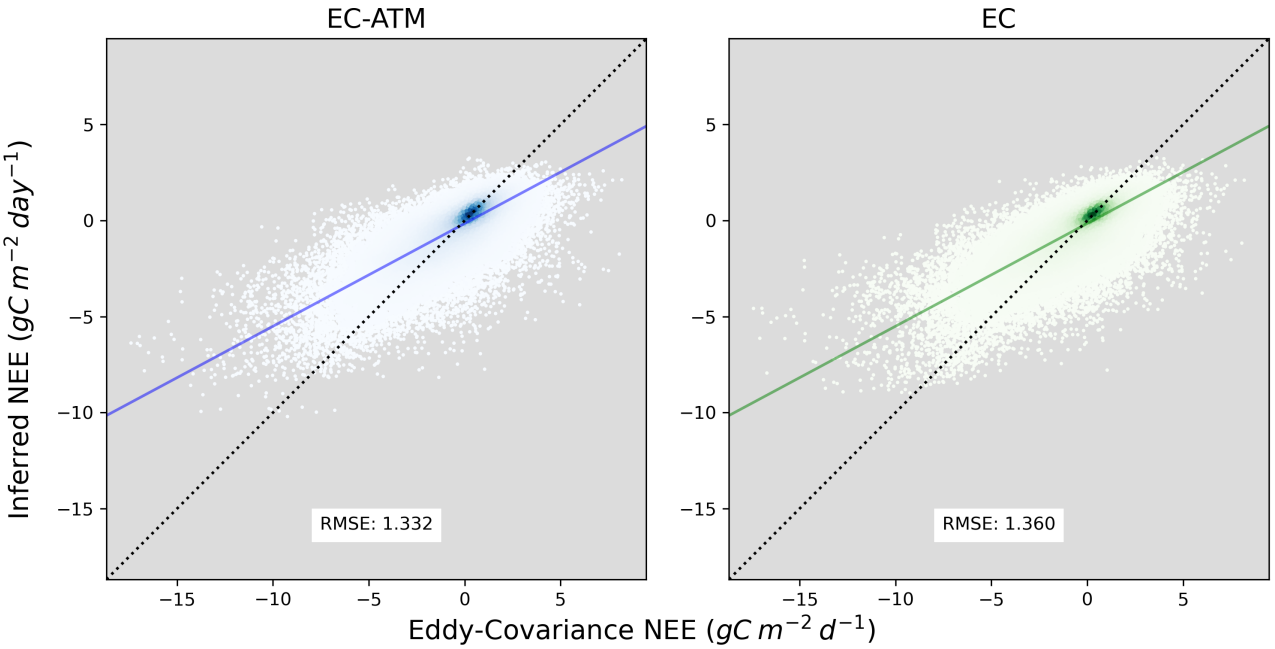

Figure 1. Comparison of inference of daily NEE from the EC-ATM and EC models with corresponding tower observations, across the whole set of available eddy-covariance observations. The X axes show the eddy-covariance observations in gC m-2 day-1, the Y axes show the NEE EC-ATM and NEE EC in gC m-2 day-1. The blue and green lines are the line of best fit for the EC-ATM and EC results respectively, and the dotted line is the x = y line.

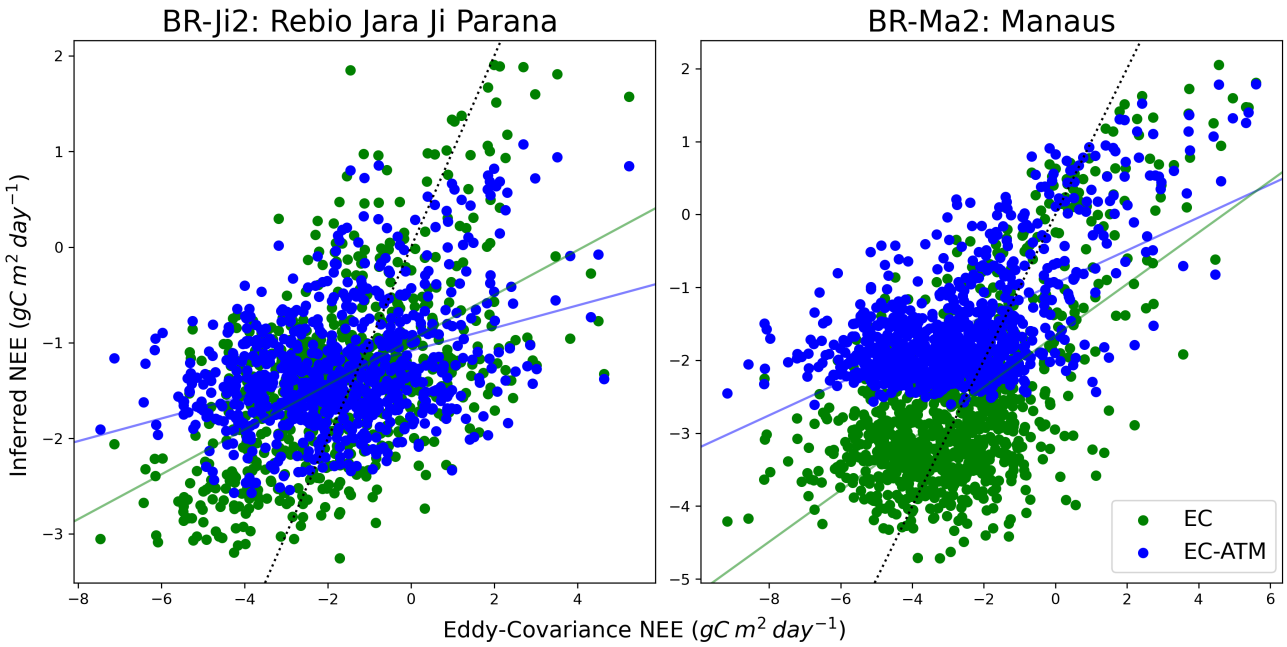

Figure 2. Comparison of EC and EC-ATM model output at two Brazilian eddy-covariance sites. The Y axes are the NEE EC-ATM and NEE EC in gC m-2 day-1, the X axes are the eddy-covariance observations in gC m-2 day-1. The black dotted line is the x = y line. The blue and green lines are the line of best fit for the EC-ATM and EC results respectively. This figure shows the different learned response in the EC-ATM model (blue) from the atmospheric constraint at a tower location compared with the EC model and the tower observations. The left-hand panel show where the learned response is similar. The right-hand panel shows where the atmospheric constraint was not complementary with the eddy-covariance constraint, and the model has a larger bias than the EC model when compared with tower observations.