

**A robust continental estimate of carbon sinks using GOSAT XCO<sub>2</sub> retrievals**

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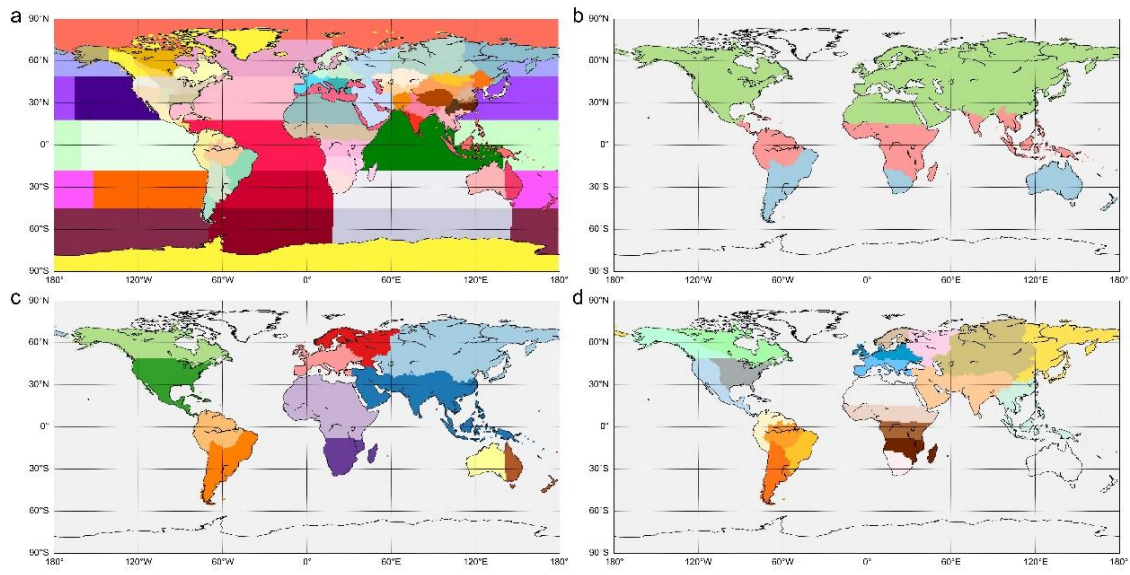
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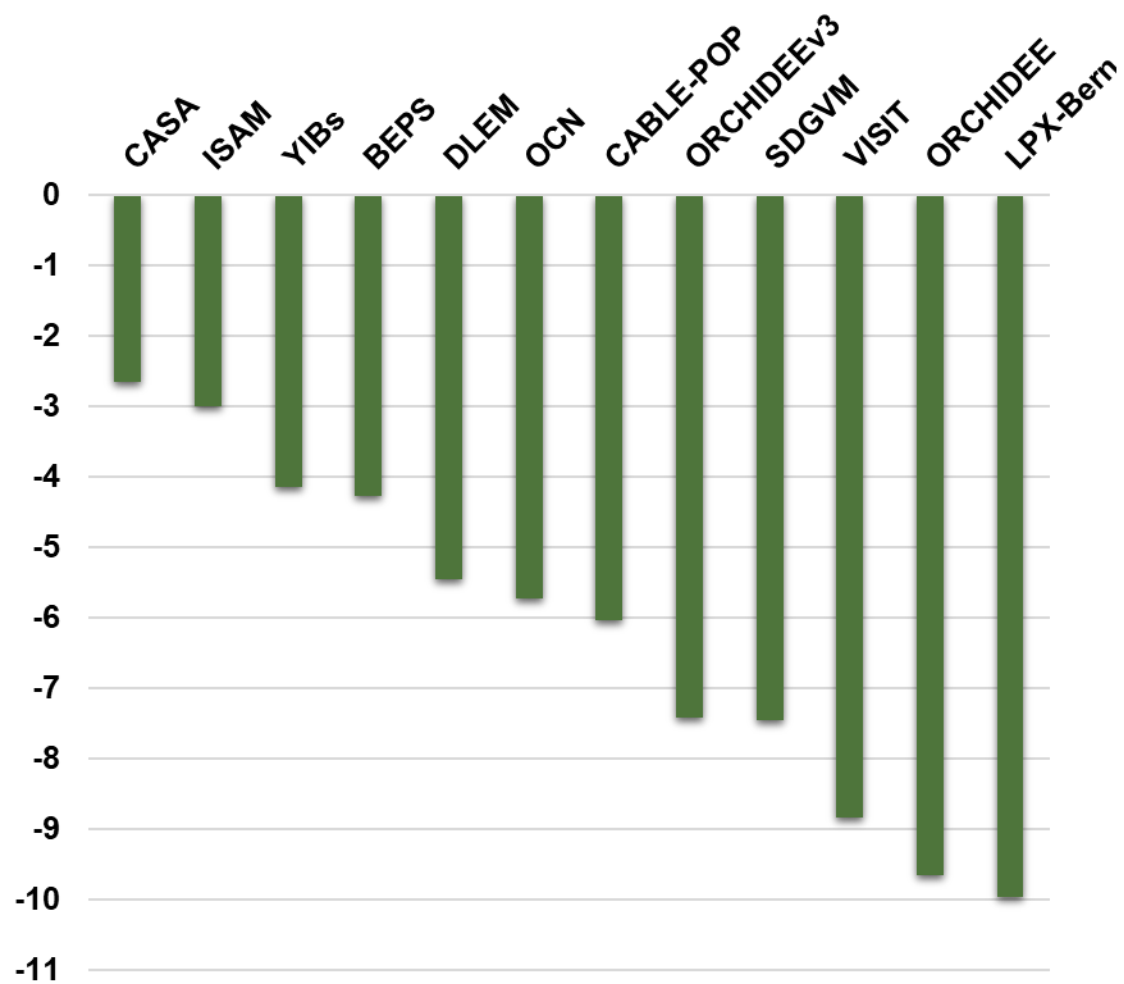
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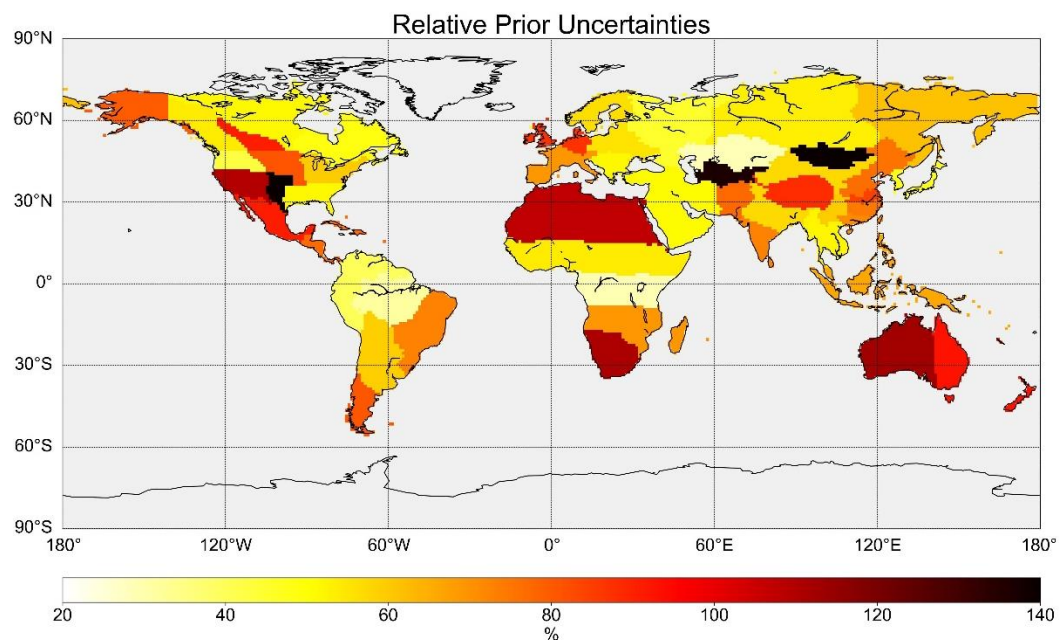
Figures S1 to S12



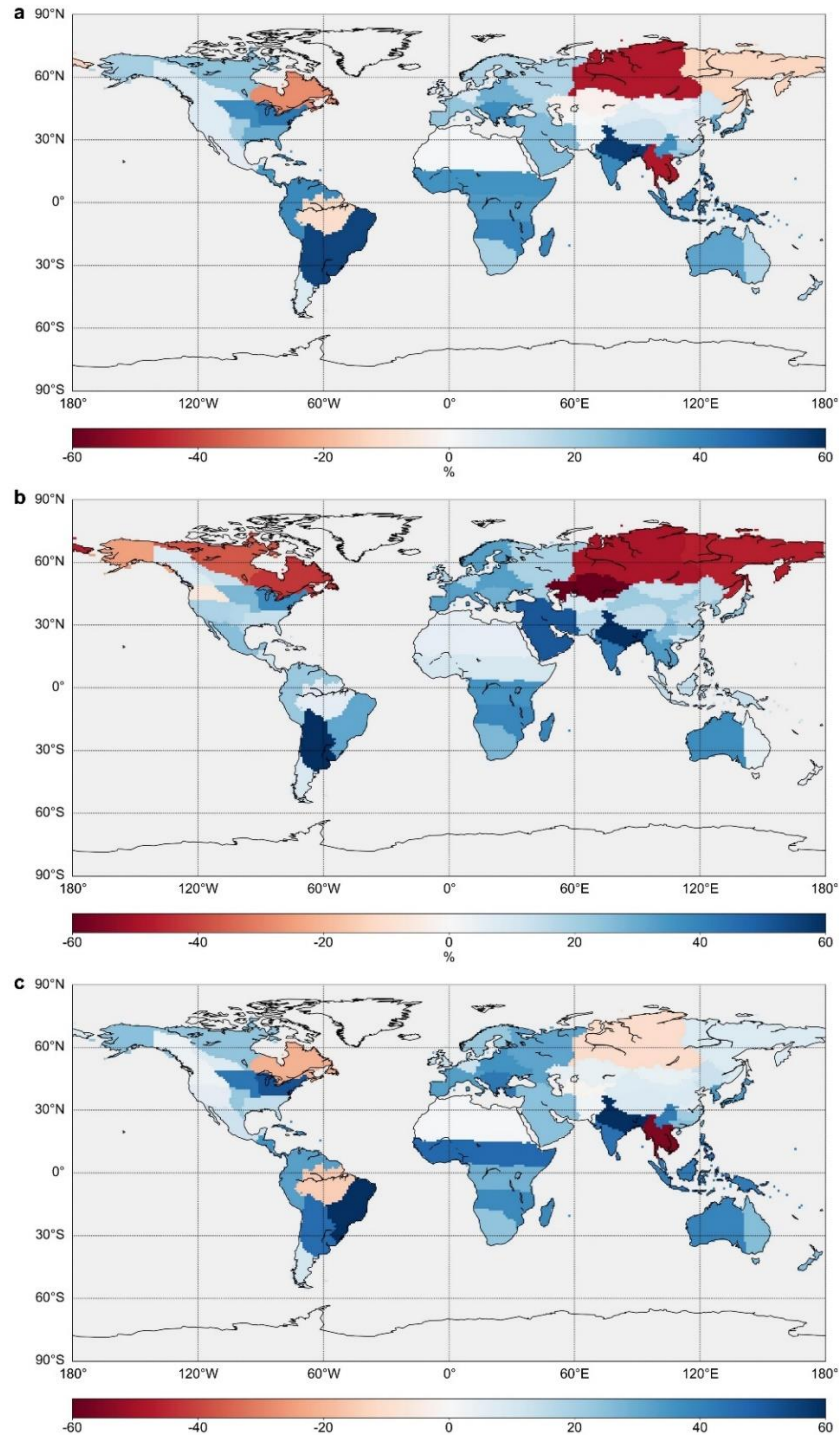
**Figure S1.** Zoning map at different scales. **(a)** The global land and ocean are divided into 51 and 18 regions, respectively. **(b)** Three global latitudinal zones. **(c)** 1/2 continental scale zoning map. **(d)** 1/4 continental scale zoning map.



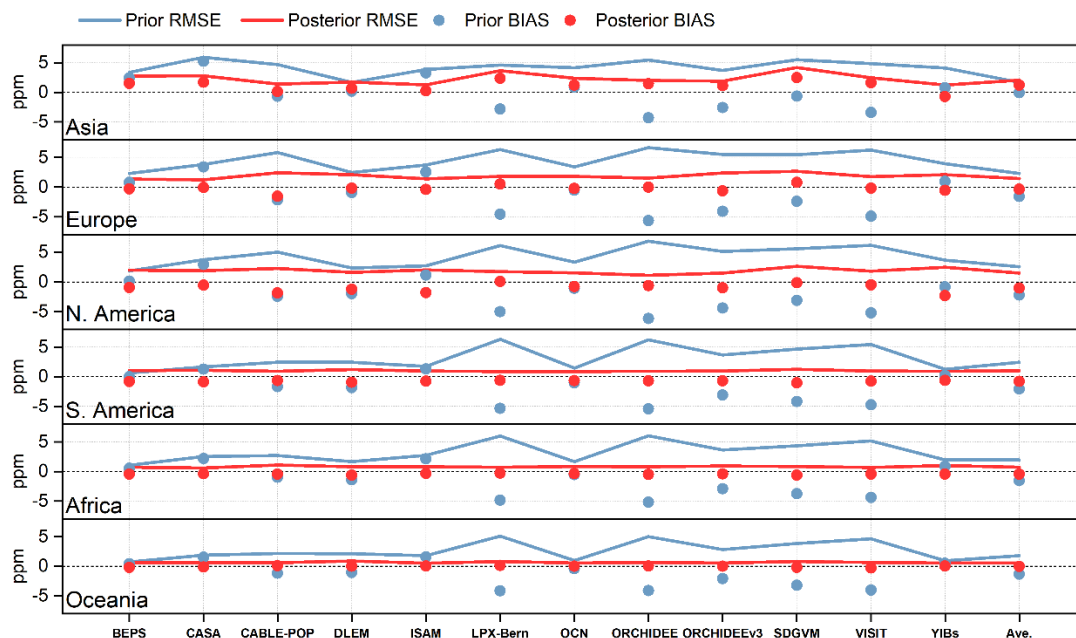
**Figure S2.** The global land NEE of the terrestrial biosphere models (TBMs) used in this paper.



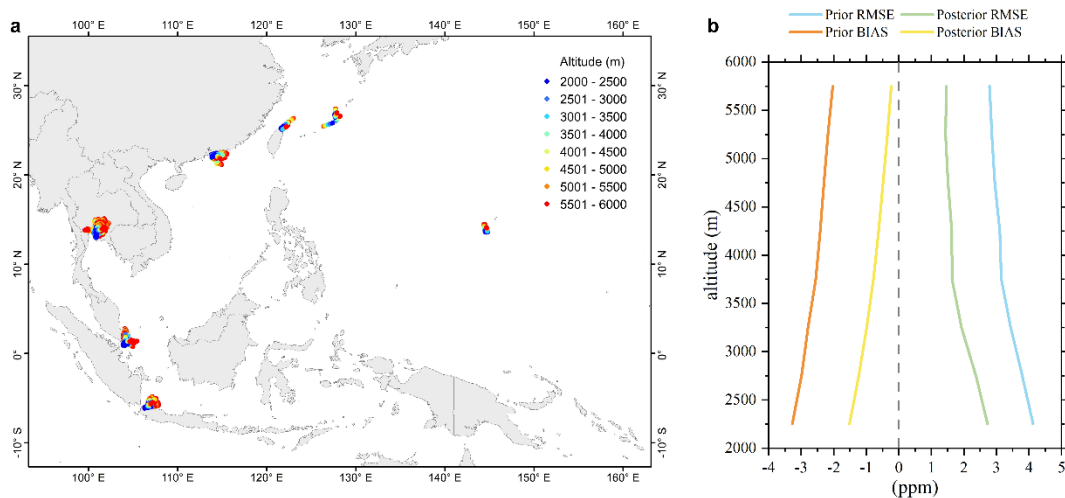
**Figure S3.** Distribution of relative prior uncertainty of the 51 terrestrial regions. Relative prior uncertainty is equal to the standard deviation of 12 TBMs NEE divided by the mean of 12 TBMs NEE.



**Figure S4.** Distribution of relative uncertainty reduction ratios ( $[\text{prior uncertainty} - \text{posterior uncertainty}] / \text{prior uncertainty}$ ). **(a)** Base Case, **(b)** Case Q, based on Base Case, but its prior flux uncertainties were set using the standard deviation of the 12 prior NEEs, and **(c)** Case R, based on Base Case, but the distribution of observation error was ignored.

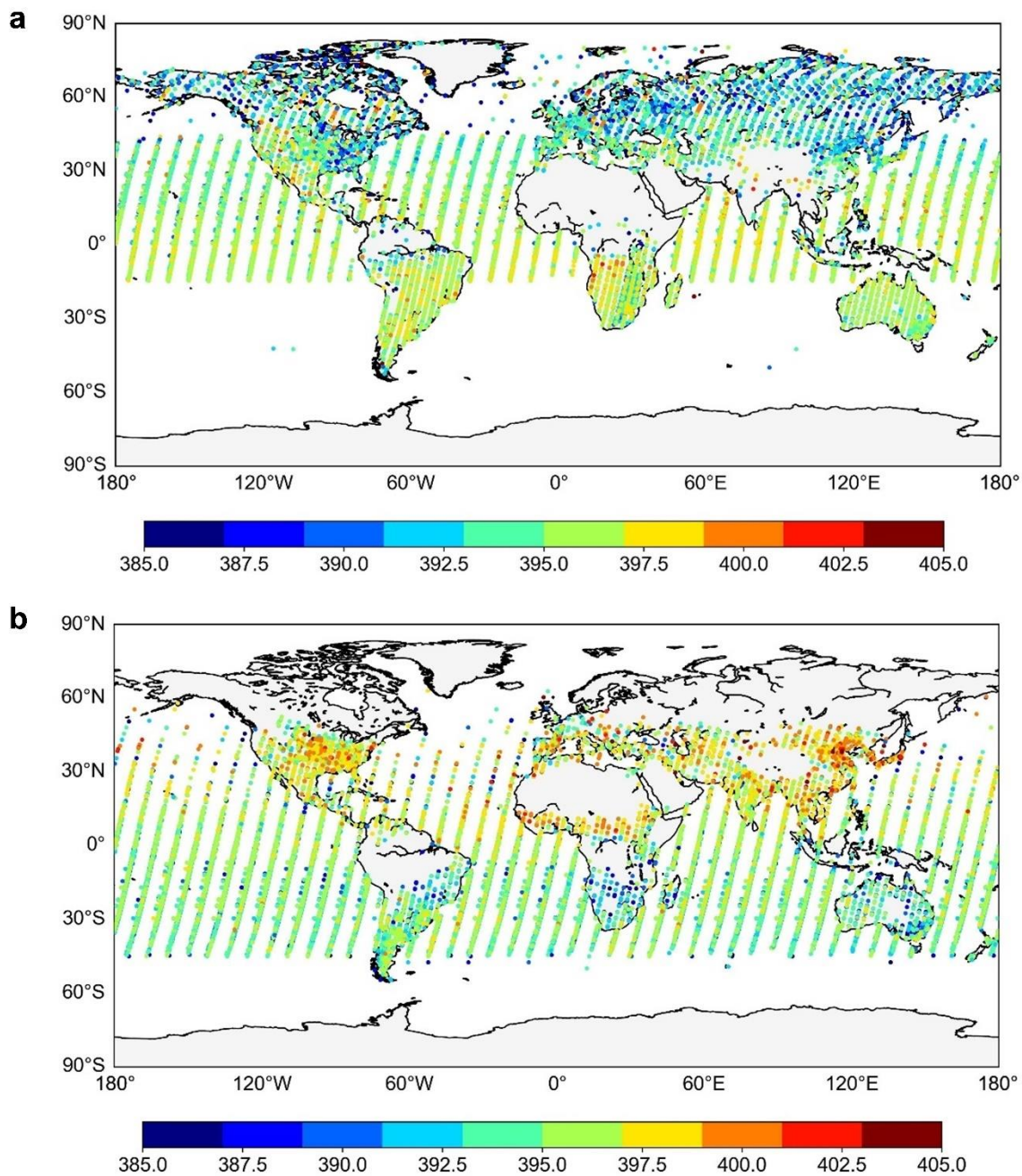


**Figure S5.** Comparison of simulated and observed concentrations for multiple models. The horizontal coordinates show individual model and multi-model averages.

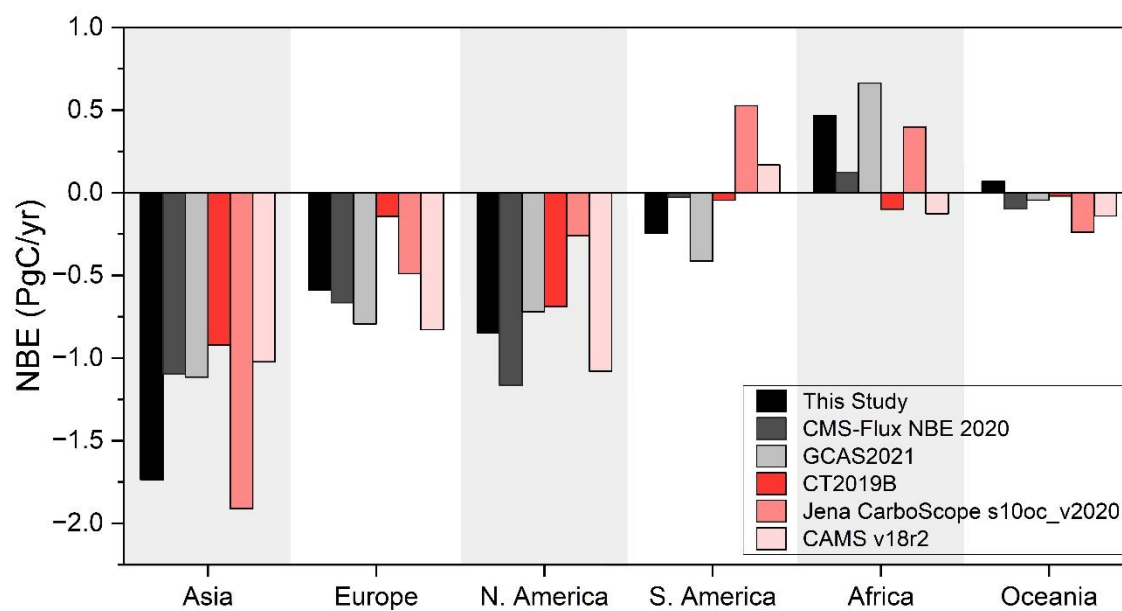


**Figure S6.** Comparison of tropical Asia simulated concentrations with CONTRAIL observations. The left panel a shows the distribution of COTRAIL observations, and the right panel b shows the evaluation results.



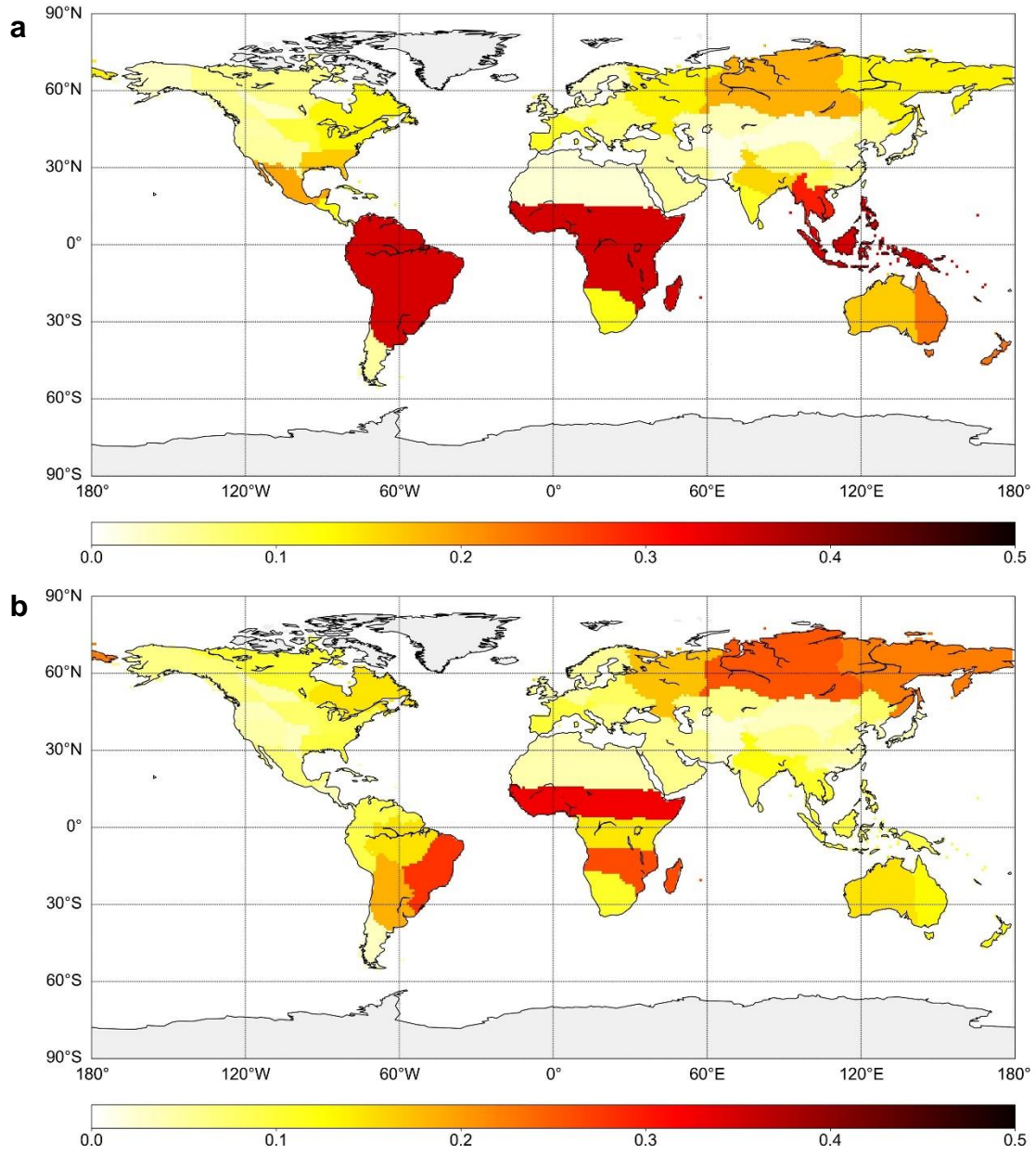


**Figure S7.** Seasonal distribution of GOSAT XCO<sub>2</sub> observations between 2011-2014. a for MAM and b for DJF.

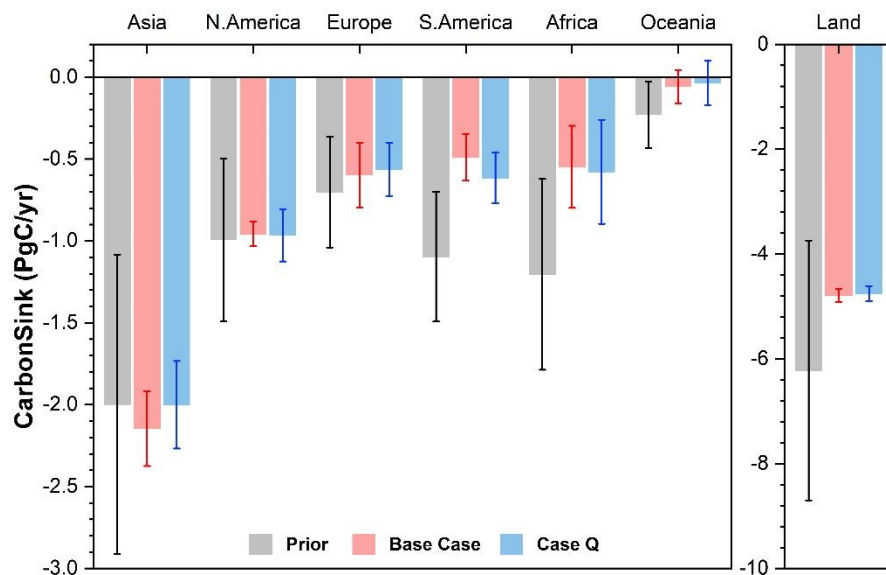


**Figure S8.** Net biosphere exchanges (NBE) derived on the continental scale from 2011 to 2014. Each atmospheric inversion is represented by bars showing the NBE averaged between 2011 and 2014 in each continent.

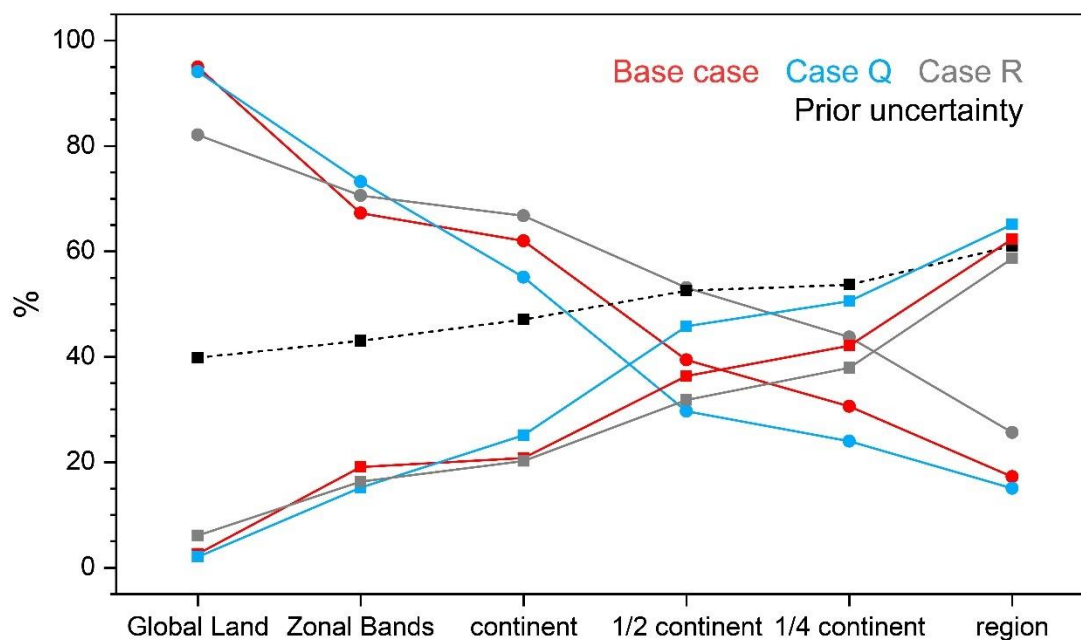




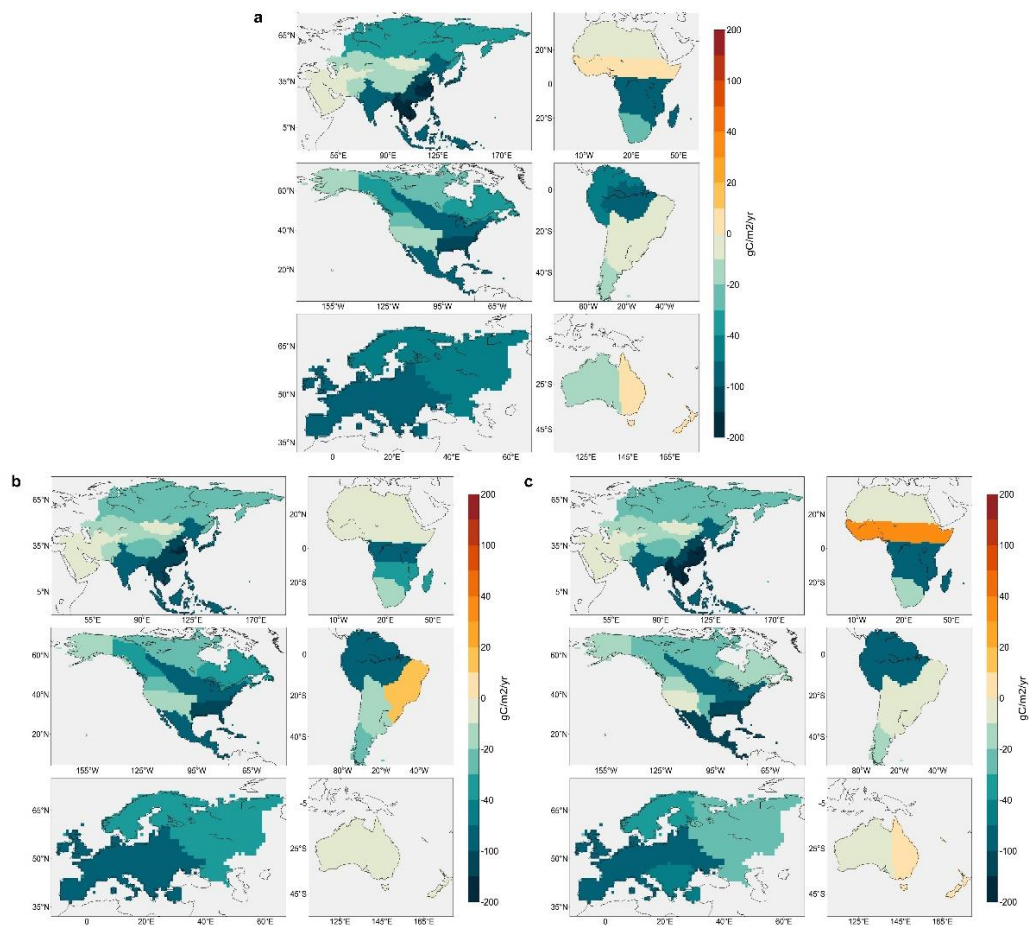
**Figure S9.** The setting of prior flux uncertainty used in the inversions with each NEE model ( $\text{PgC yr}^{-1}$ ). a and b correspond to Base Case and Case Q, respectively.



**Figure S10.** Annual prior and posterior NEEs on the global and continental scale (uncertainty is described using the standard deviation of the 12 TBMs).



**Figure S11.** The variation of the uncertainty reduction ratio and relative uncertainty with different scales. The solid line marked with a circle is the posterior uncertainty reduction ratio curve. The solid line marked with a square is the relative posterior uncertainty curve. The dashed line marked with a square is the relative prior uncertainty curve.



**Figure S12.** The distributions of the 12-model mean posterior NEE from 2011-2014. a is Base Case, b is Case Q, and c is Case R.