Supplementary material

Disequilibrium of terrestrial ecosystem CO_2 budget caused by disturbance-induced emissions and non-CO_2 carbon export flows: a global model assessment

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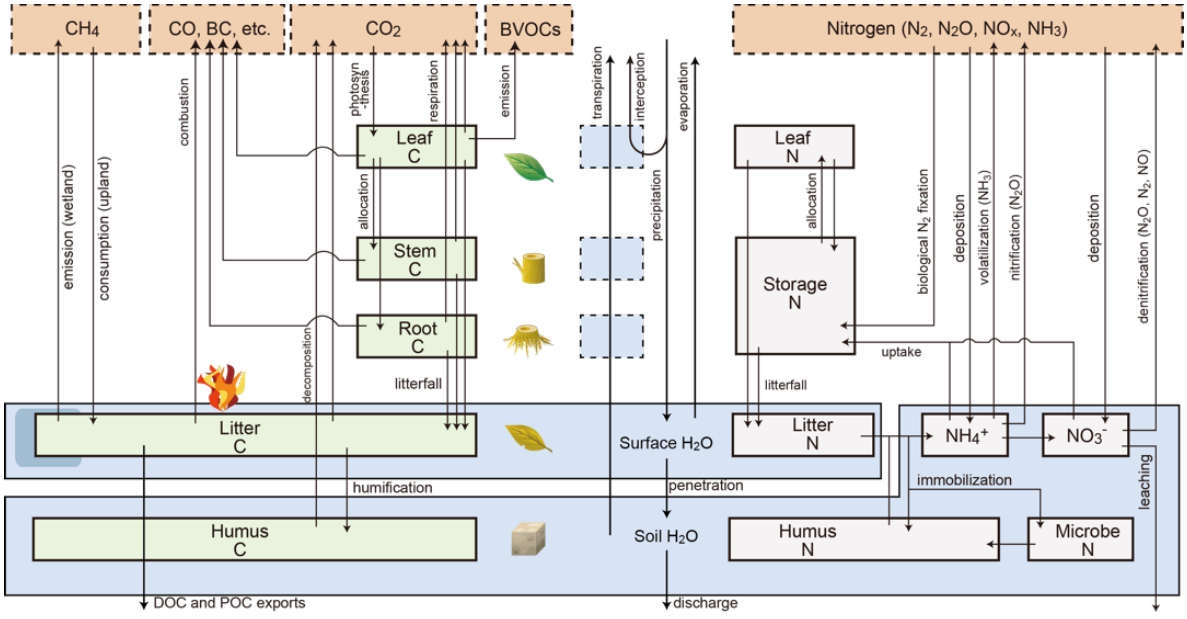

Figure S1. Schematic diagram of the VISIT model.

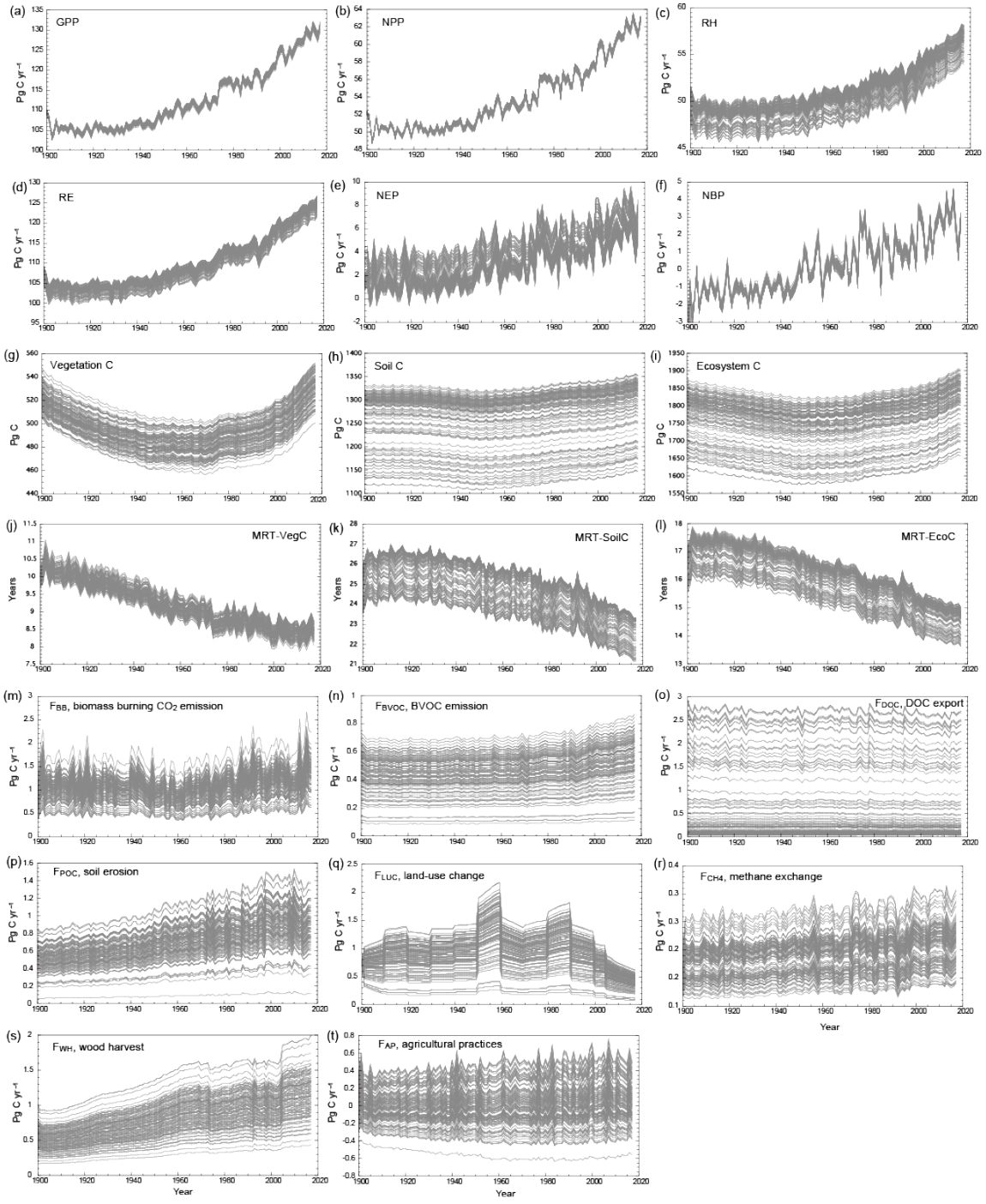

Figure S2. Results of 128 ensemble simulations using perturbed parameter values for MCFs.

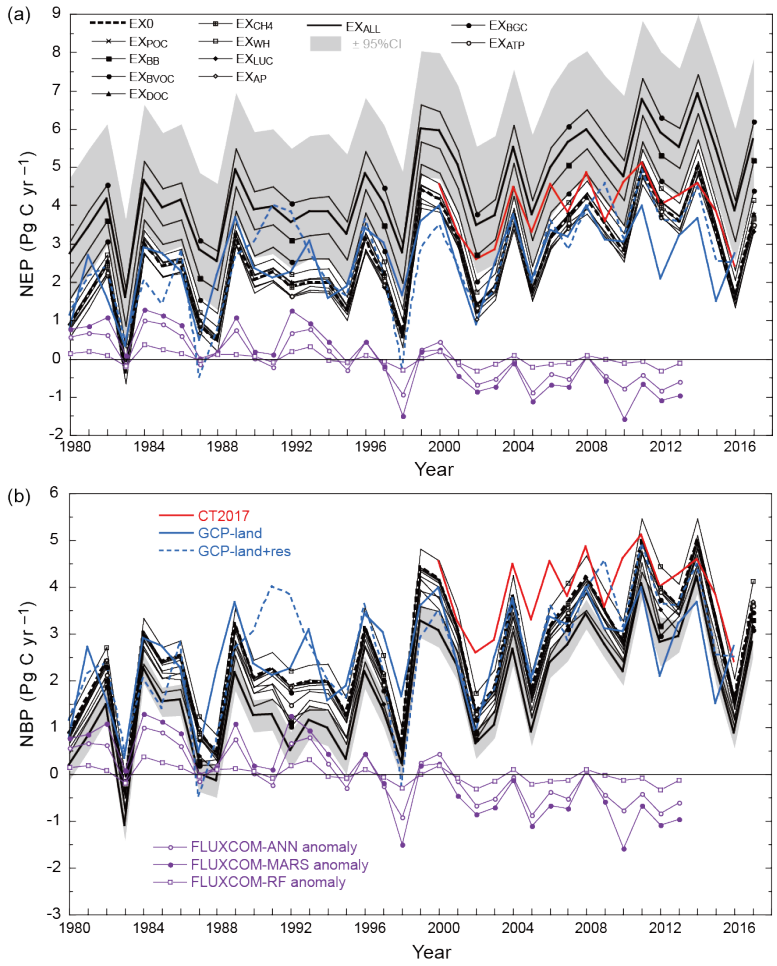

Figure S3. Time series of simulated terrestrial carbon budget in late decades. (**a**) NEP and (**b**) NBP, simulated in various experiments. Shaded areas show the 95% confidence interval for EX_{ALL}. Also shown are estimates from CarbonTracker 2017 (CT2017), Global Carbon Project (GCP) syntheses (land and land + residual), and FLUXCOM data (anomalies from the mean) as rendered by three upscaling methods.

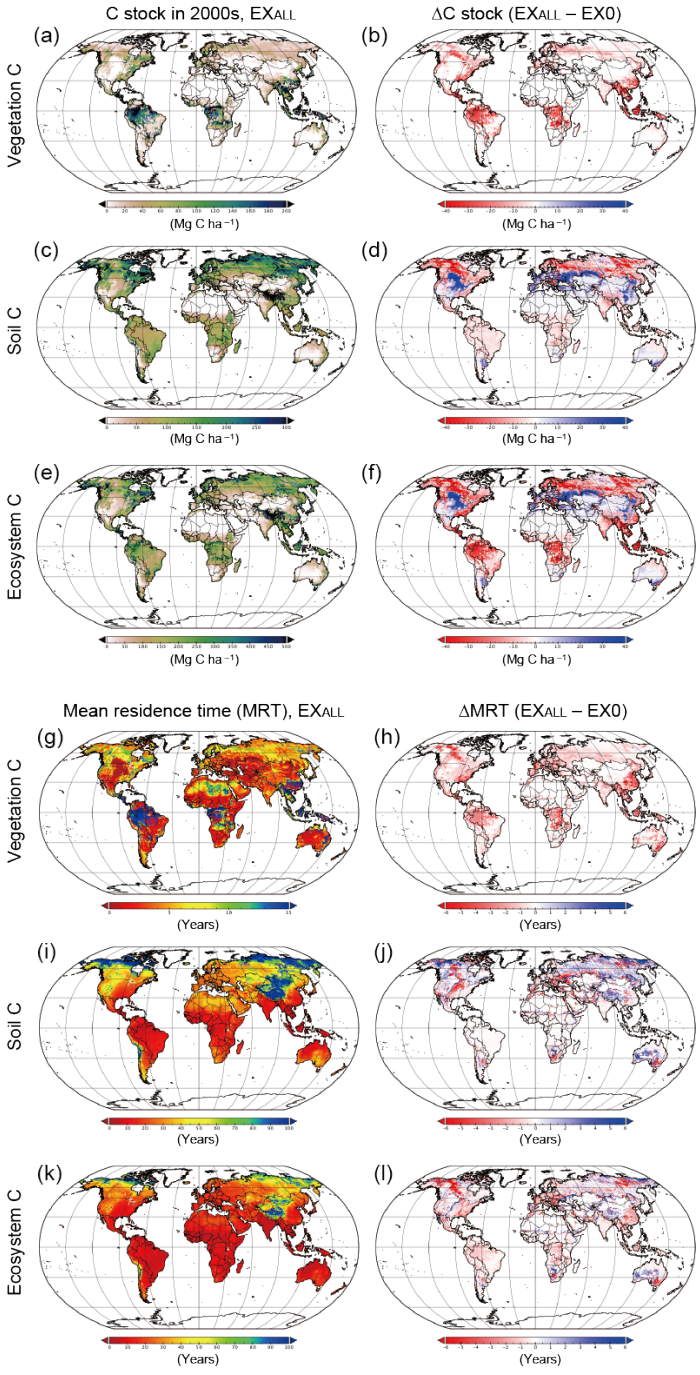

Figure S4. Maps of vegetation carbon, soil organic carbon, and ecosystem carbon in 2000–2009 showing their distributions (top, left column) and mean residence times (bottom, left column) from EX_{ALL} and the differences from EX0 estimates (right column).

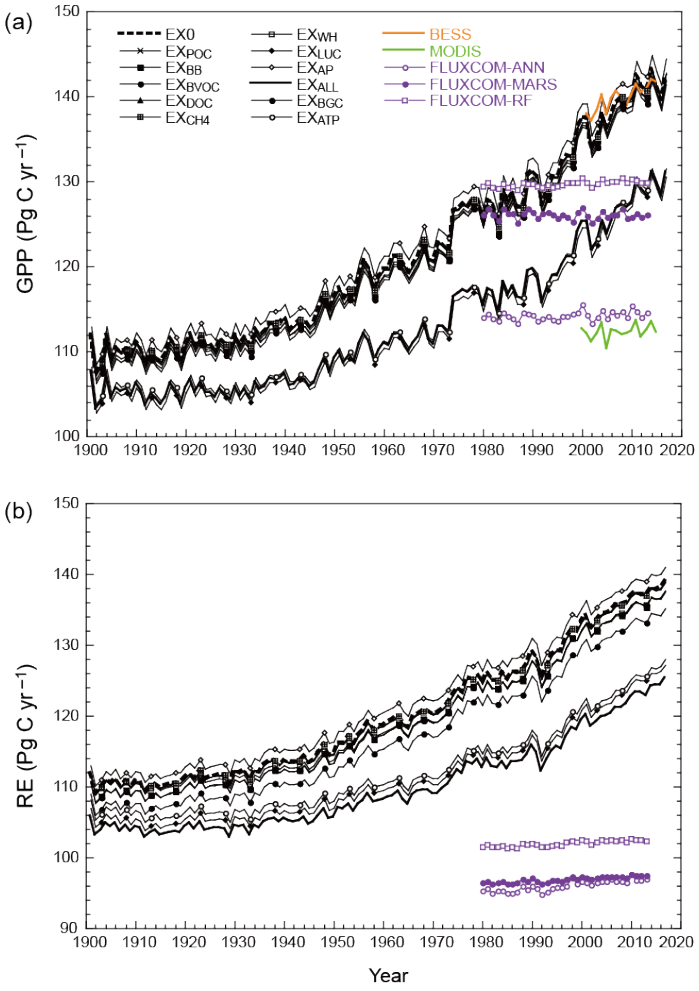

Figure S5. Time series of (**a**) GPP and (**b**) RE, simulated by VISIT in various experiments plus estimates from BESS (Jiang and Ryu, 2016), MODIS (Zhao et al., 2006), and FLUXCOM data as rendered by three upscaling methods (Tramontana et al., 2016).

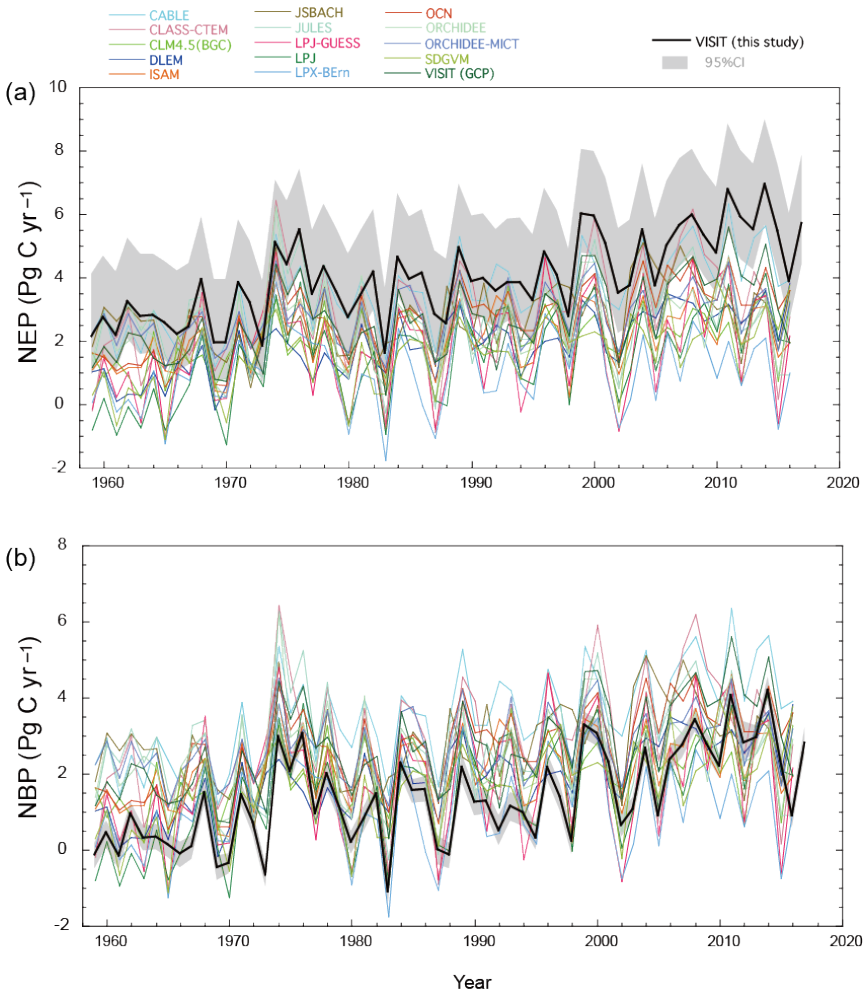

Figure S6. Comparison of (**a**) NEP and (**b**) NBP from simulations by VISIT and other models in the GCP synthesis (Le Quéré et al., 2018).

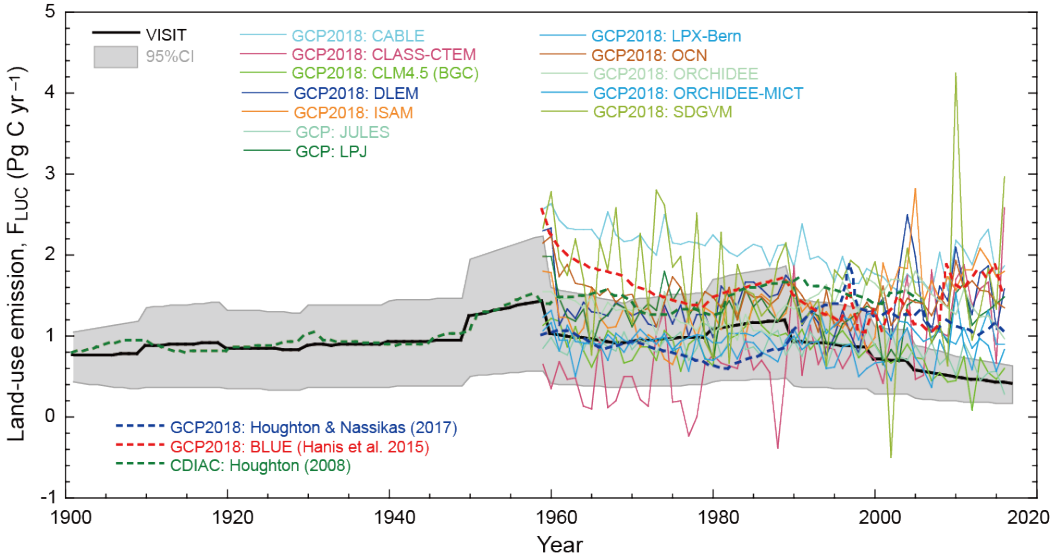

Figure S7. Comparison of simulated land-use emissions (F_{LUC}) from VISIT and other models in the GCP synthesis (Le Quéré et al., 2018).

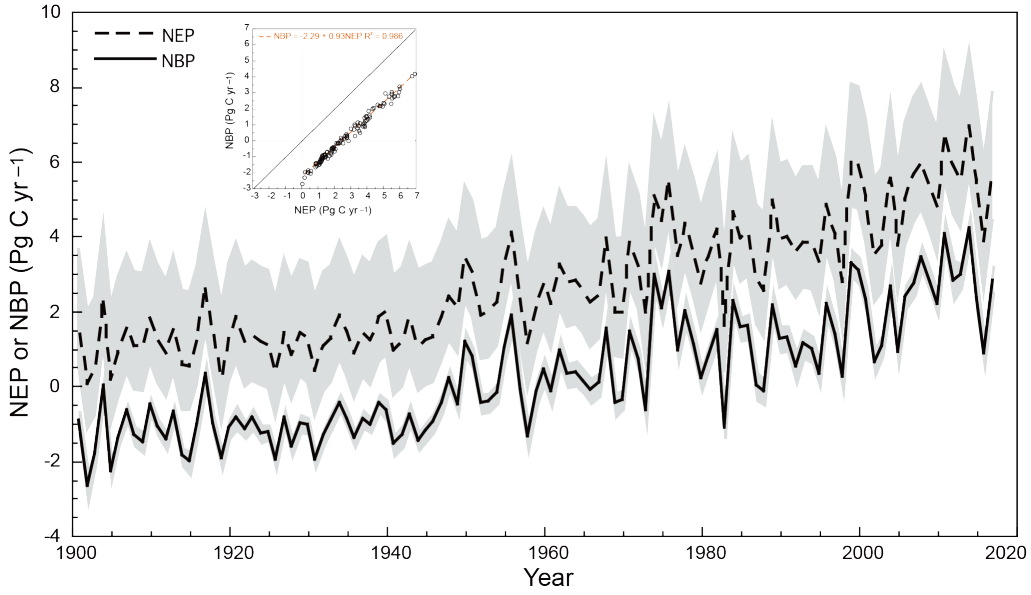

Figure S8. Time series of global terrestrial NEP and NBP simulated by VISIT. Gray area is the 95% confidence interval for NEP estimates. Inset ia a scatter diagram of annual NEP and NBP (linear regression, $R^2 = 0.986$).

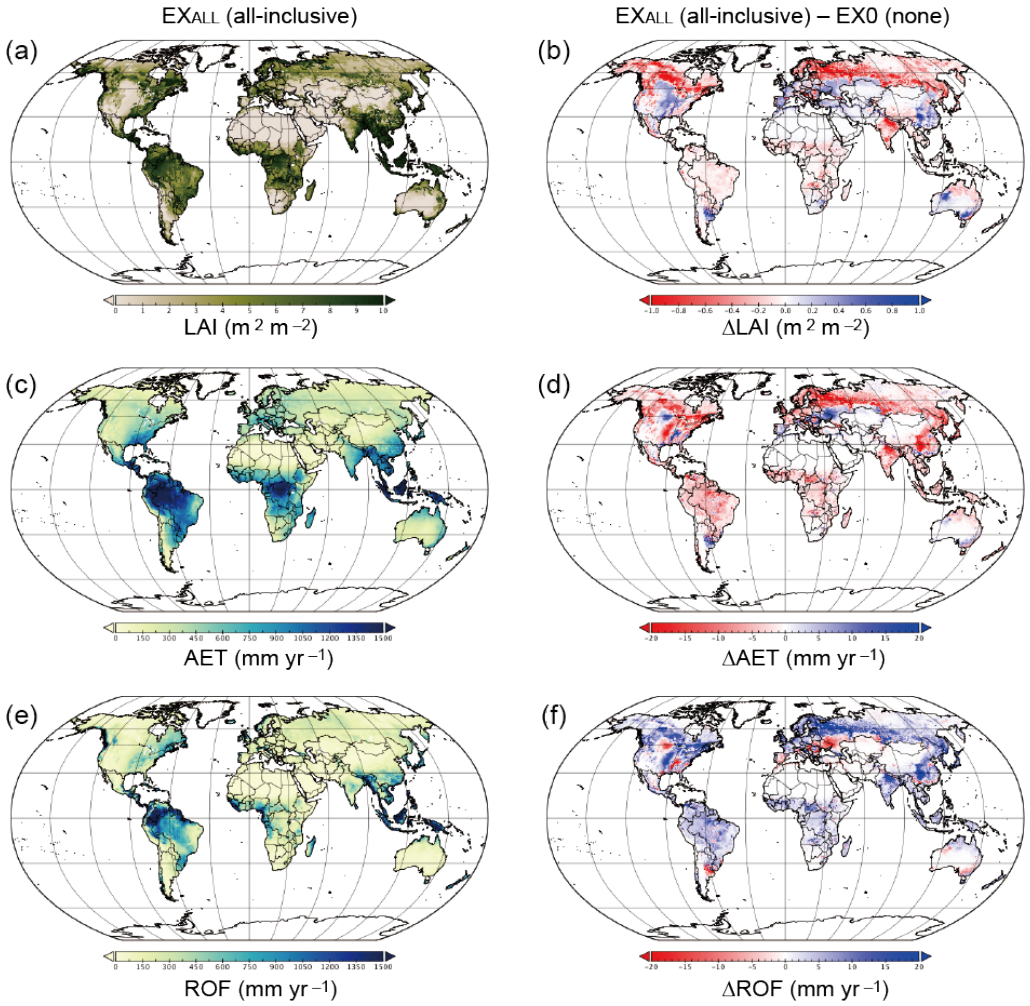

Figure S9. Global distribution of the simulated water budget from EXALL. (**a**) Mean annual leaf area index (LAI) and (**b**) its difference from EX0, (**c**) actual evapotranspiration (AET) and (**d**) its difference from EX0, and (**e**) runoff discharge (ROF) and (**f**) its difference from EX0.

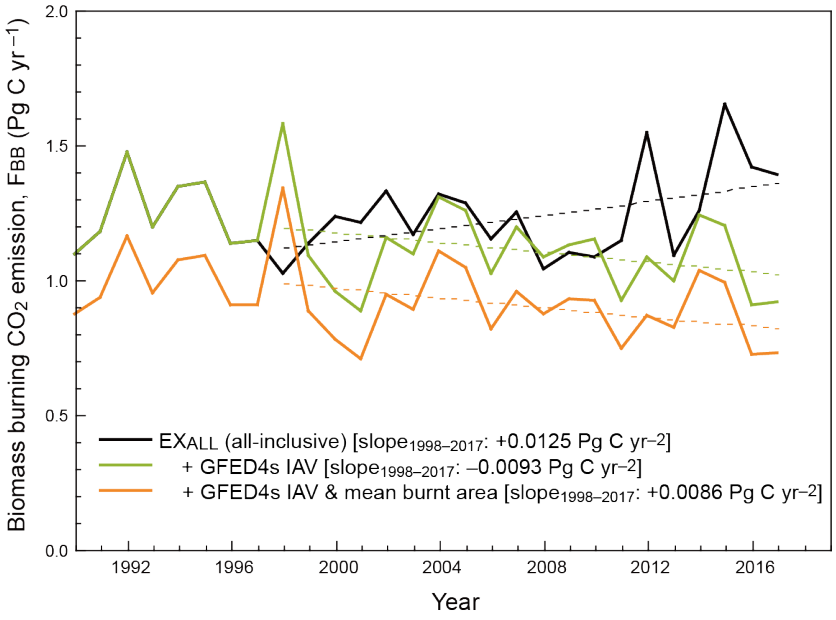

Figure S10. Time series of F_{BB} in the EX_{ALL} simulation, the interannual variability (IAV) constrained by satellite data (GFED4s), and the IAV and mean burnt area constrained by the data. Regression curves for 1998–2017 are shown by dashed lines.