Earth's Future

Supporting Information for

Multi-model Analysis of Future Land-use and Climate Change Impacts on Ecosystem Functioning

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Table S1: Present-day values of different variables from the three DGVMs (2006-2025 mean from SSP1xRCP26) compared to observational estimates.

	LPJ-GUESS	LPJ	CABLE	Observational estimates
Vegetation carbon	336 Gt C	520 Gt C	431 Gt C	450 Gt C (Erb et al., 2018)
Tree cover	3315 Mha	5635 Mha	4386 Mha	3387 Mha (Song et al., 2018)
LUC emissions	0.9 Gt C yr^{-1}	0.5 Gt C yr^{-1}	4.5 Gt C yr^{-1}	1.5±0.7 Gt C yr^{-1} (bookkeeping method; Le Quere et al., 2018)
Net Biome Productivity	1.9±1.2 Gt C yr^{-1}	0.8 Gt C yr^{-1}	4.7 Gt C yr^{-1}	3.5±1.0 Gt C yr^{-1} (residual sink; Le Quere et al., 2018)

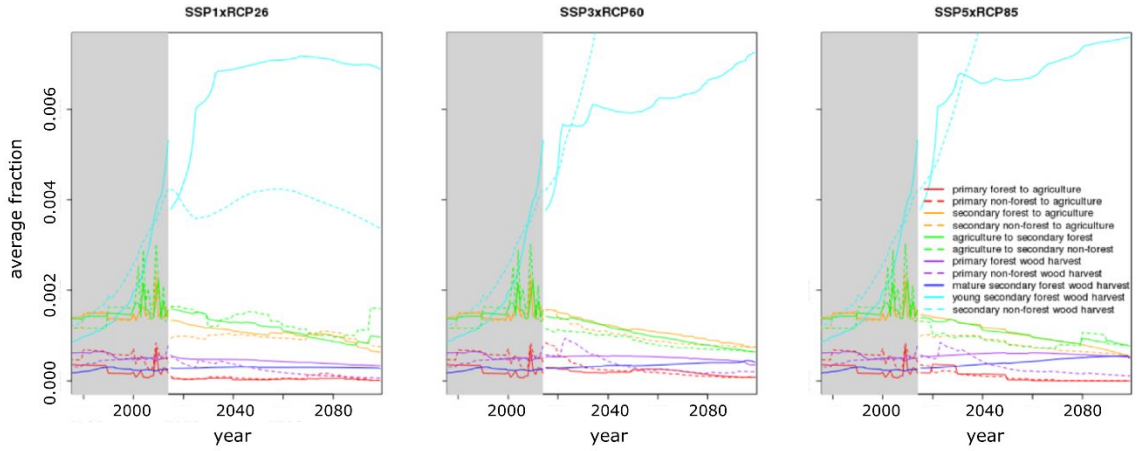


Figure S1. Time-series (1980-2100) of major land-use transitions in the three LUC scenarios. Table 1 shows how transitions were interpreted by the DGVMs. Grey background corresponds to the historic period.

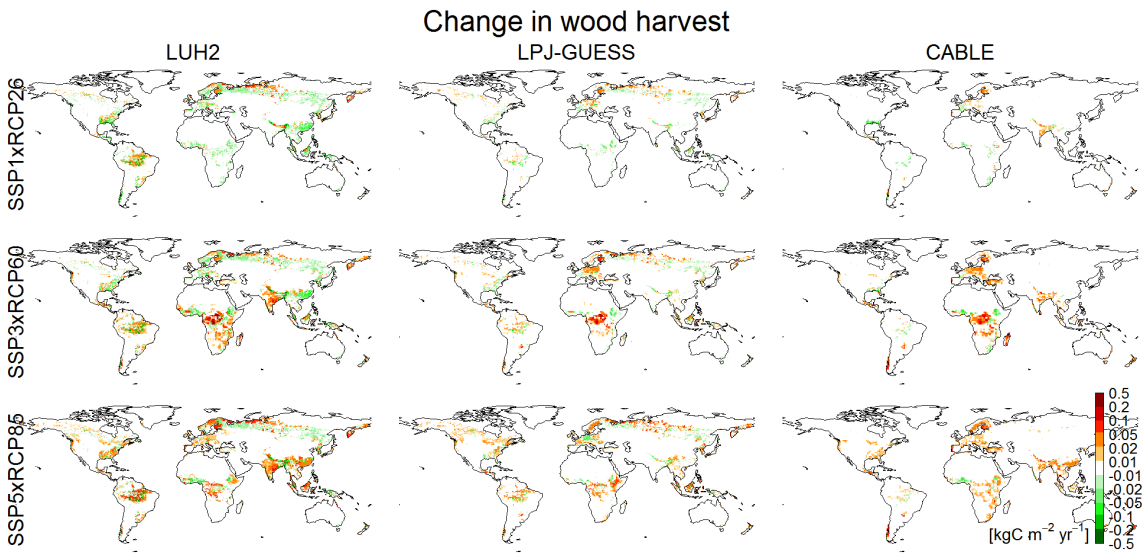


Figure S2. Maps of changes (2006-2025 to 2080-2099) in wood harvest in LUH2, LPJ-GUESS, and CABLE for the three scenarios. Note that wood harvest in LPJ-GUESS and CABLE was prescribed by harvested area from LUH2, not by extracted biomass. LPJ did not represent wood harvest.

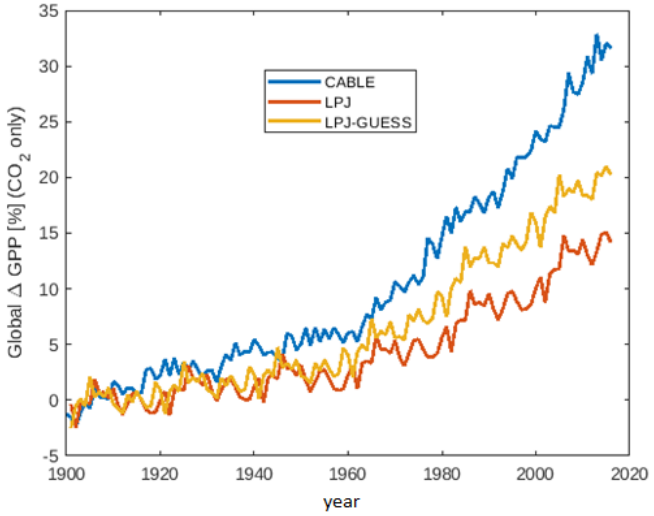


Figure S3. Effect of observed increasing atmospheric CO_2 on gross primary productivity (GPP) in LPJ-GUESS, LPJ, and CABLE as simulated in the TRENDYv6 CO_2-only simulations with fixed 1860 land use and re-cycled climate forcing.

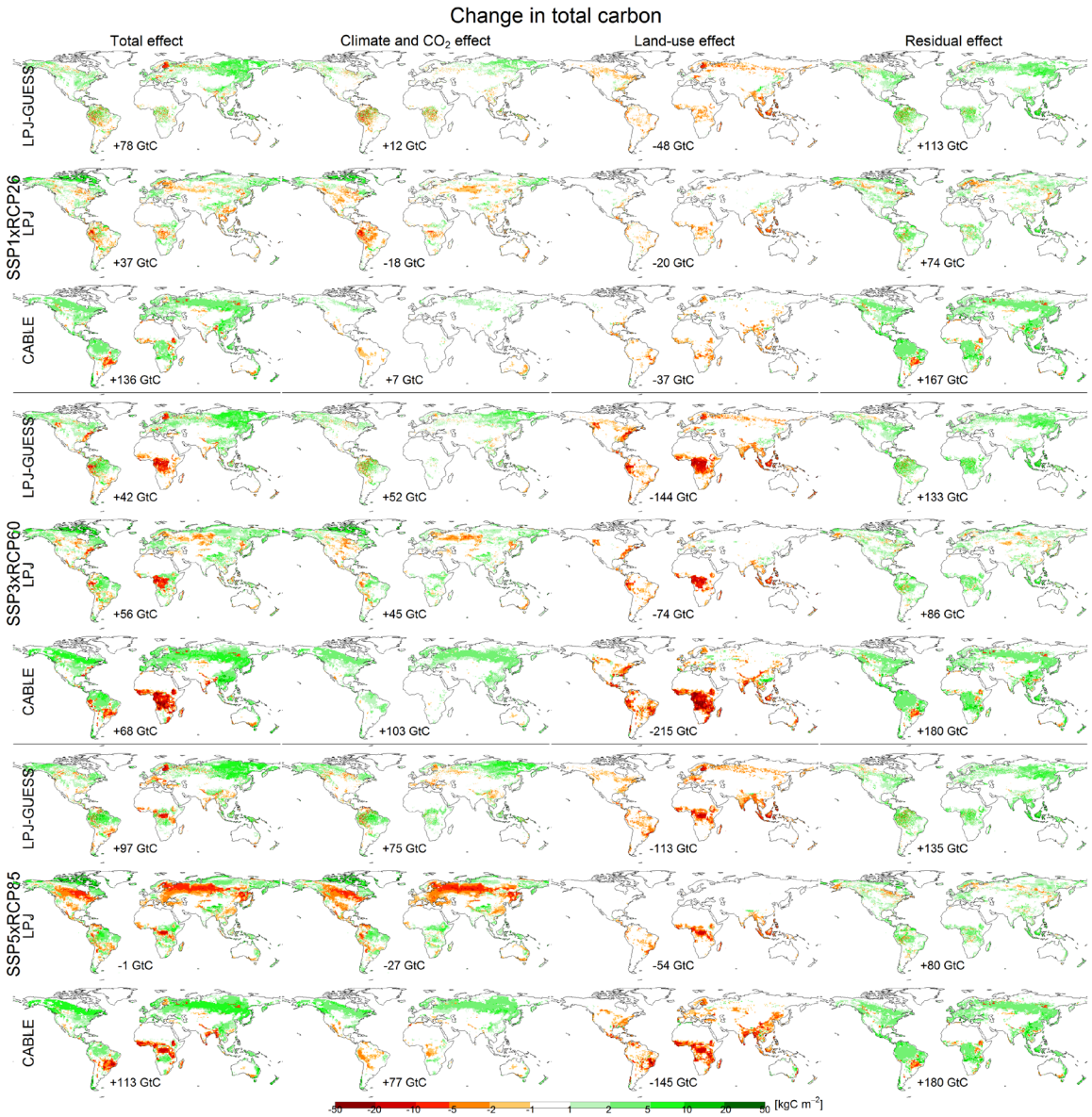


Figure S4. Maps of changes (2006-2025 to 2080-2099) in total carbon pools for the three scenarios and three DGVMs (different rows), for the total effect (1st column), climate effect (2nd column), land-use effect (3rd column), and residual effect (4th column). Numbers are global totals.

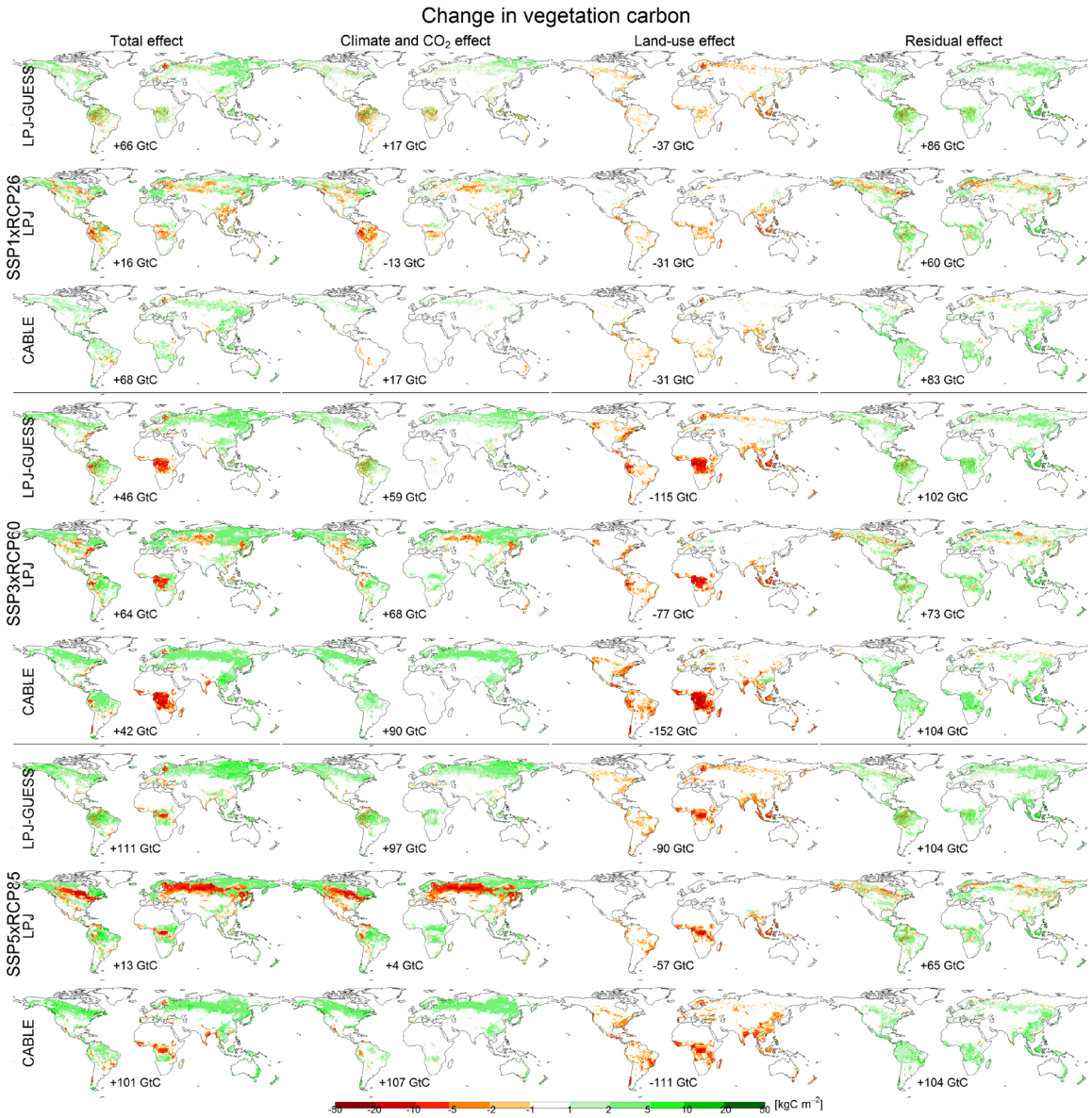


Figure S5. Same as Figure S4 but for vegetation carbon.

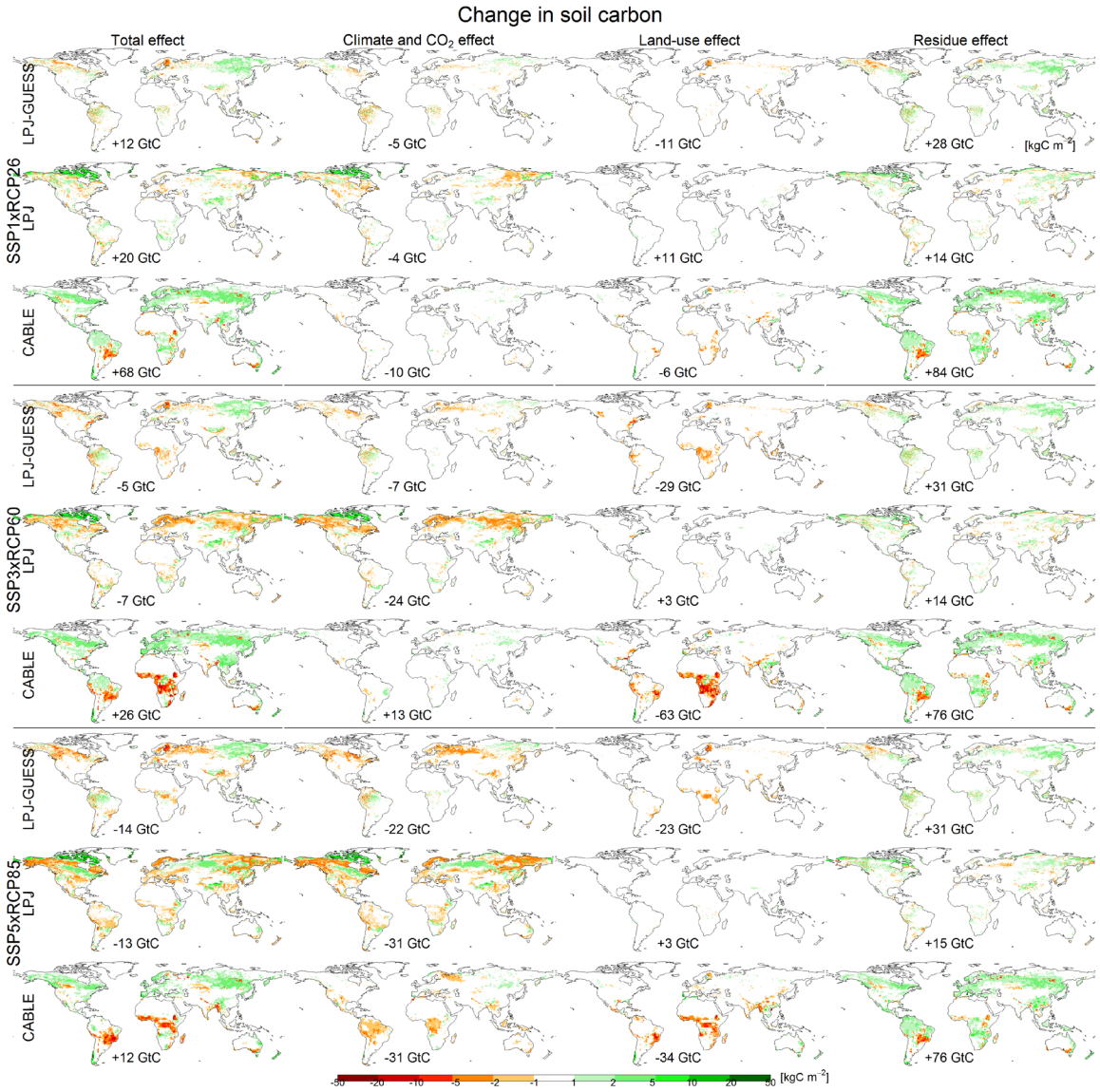


Figure S6. Same as Figure S4 but for soil carbon.

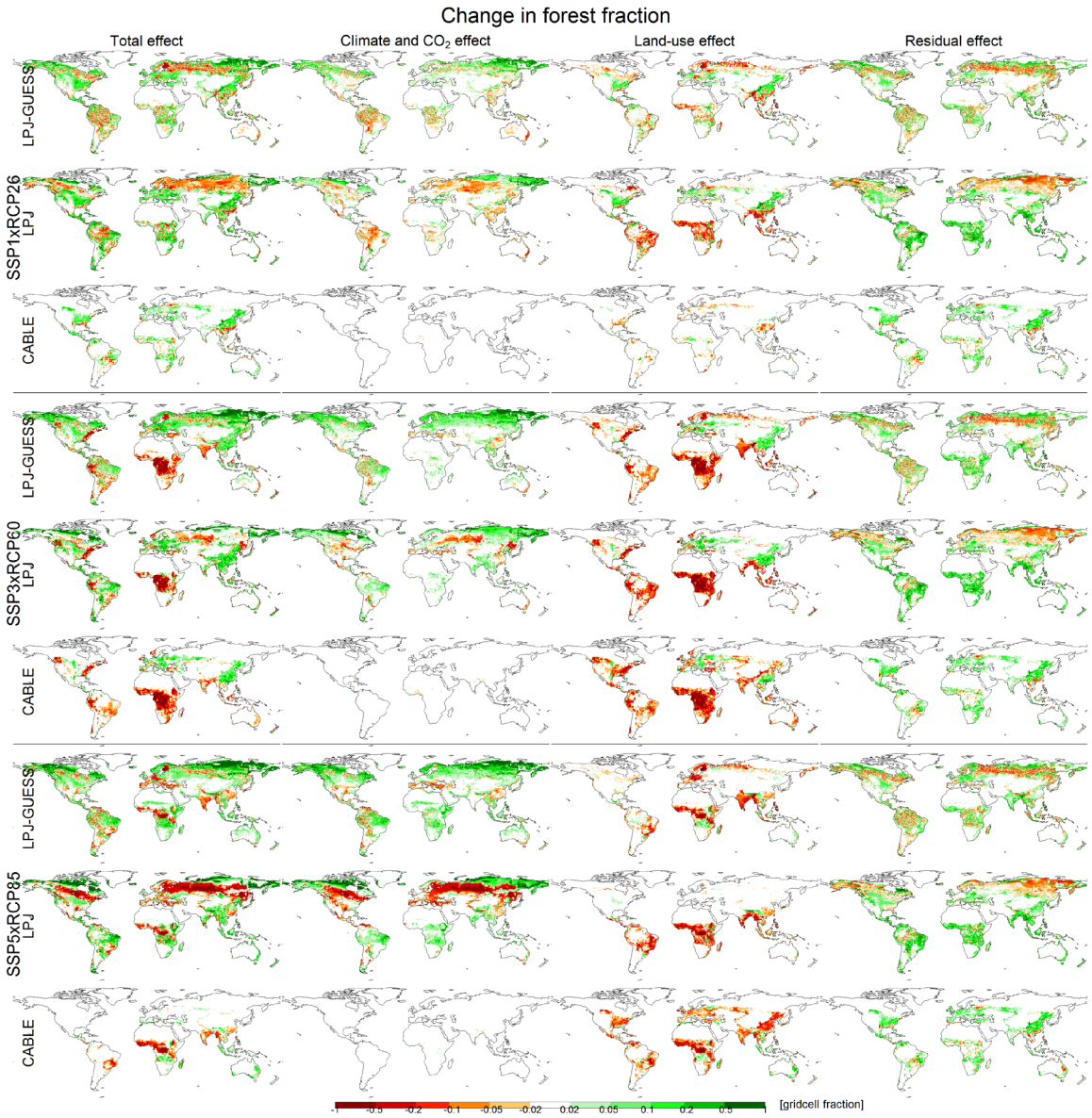


Figure S7. Same as Figure S4 but for forest fraction (sum of all woody PFTs).

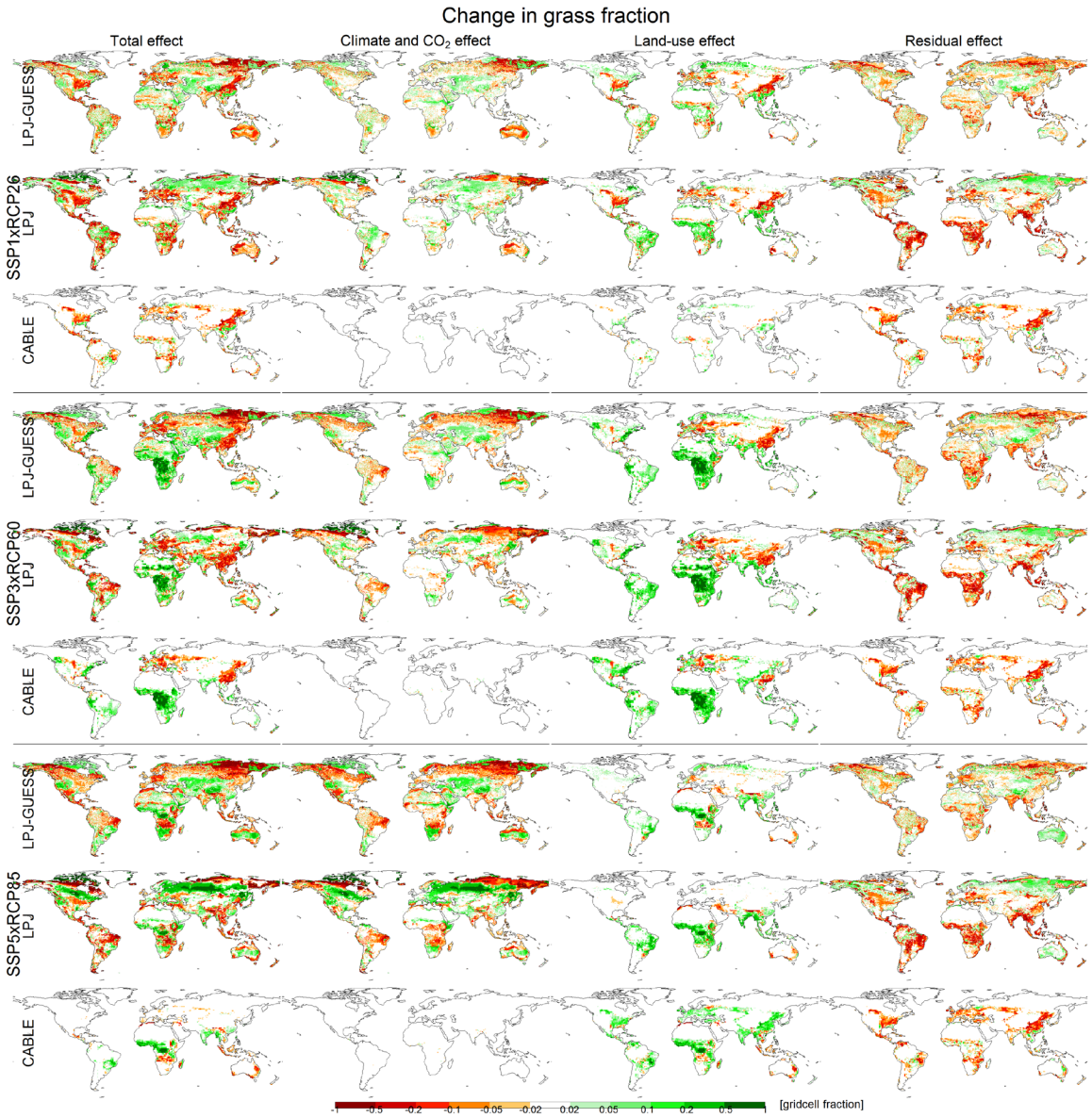


Figure S8. Same as Figure S4 but for grass fraction (the sum of natural grasslands, pastures, and croplands).

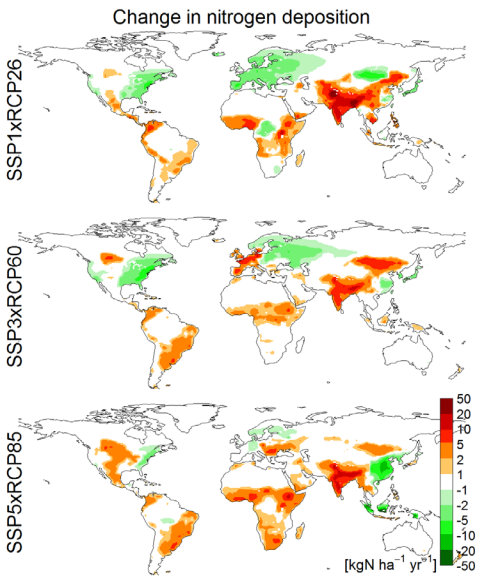


Figure S9. Change in nitrogen deposition between 2006-2025 and 2080-2099 used in LPJ-GUESS and CABLE for the three scenarios (derived from Lamarque et al. (2010)).

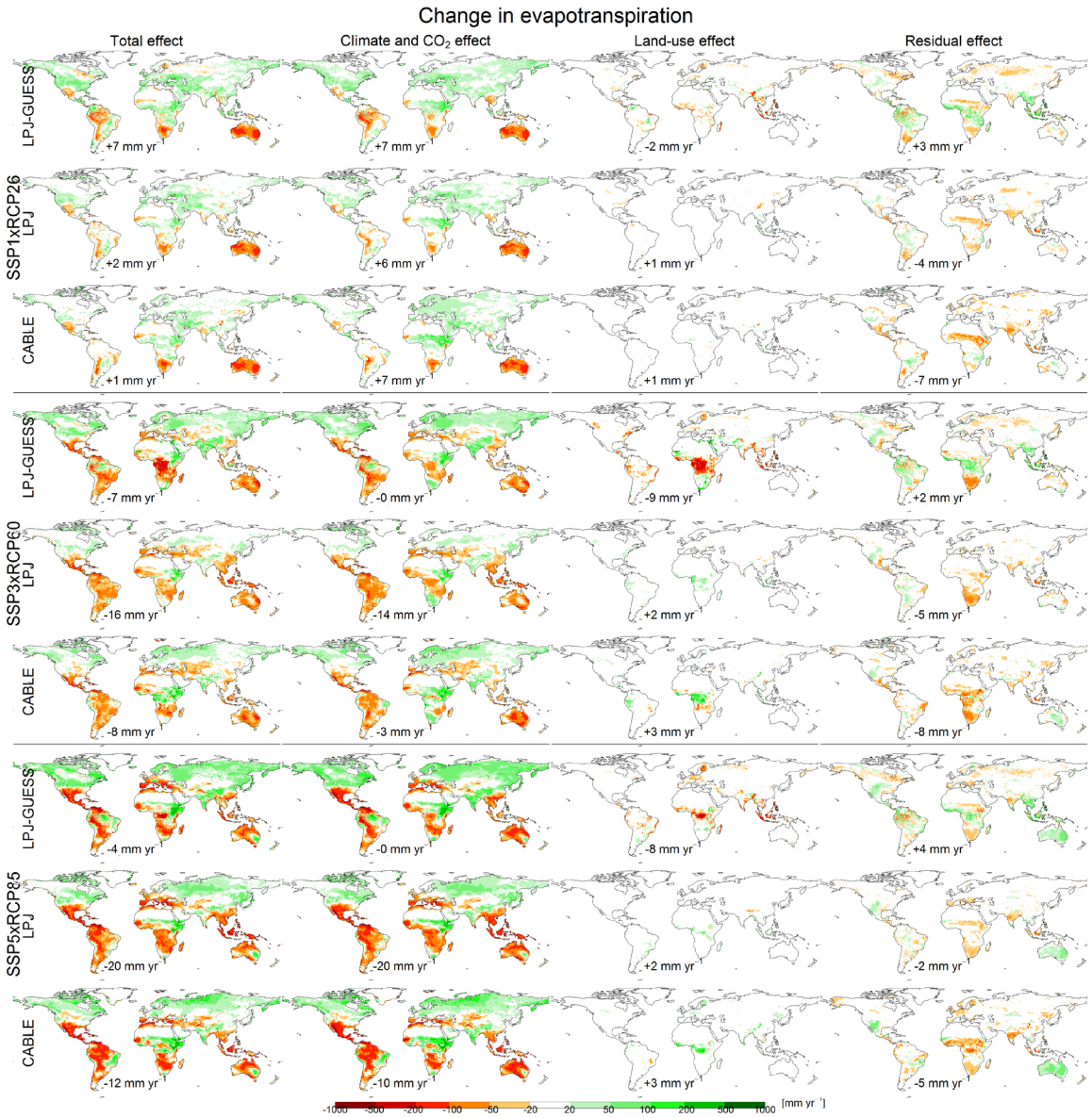


Figure S10: Same as Figure S4 but for evapotranspiration.

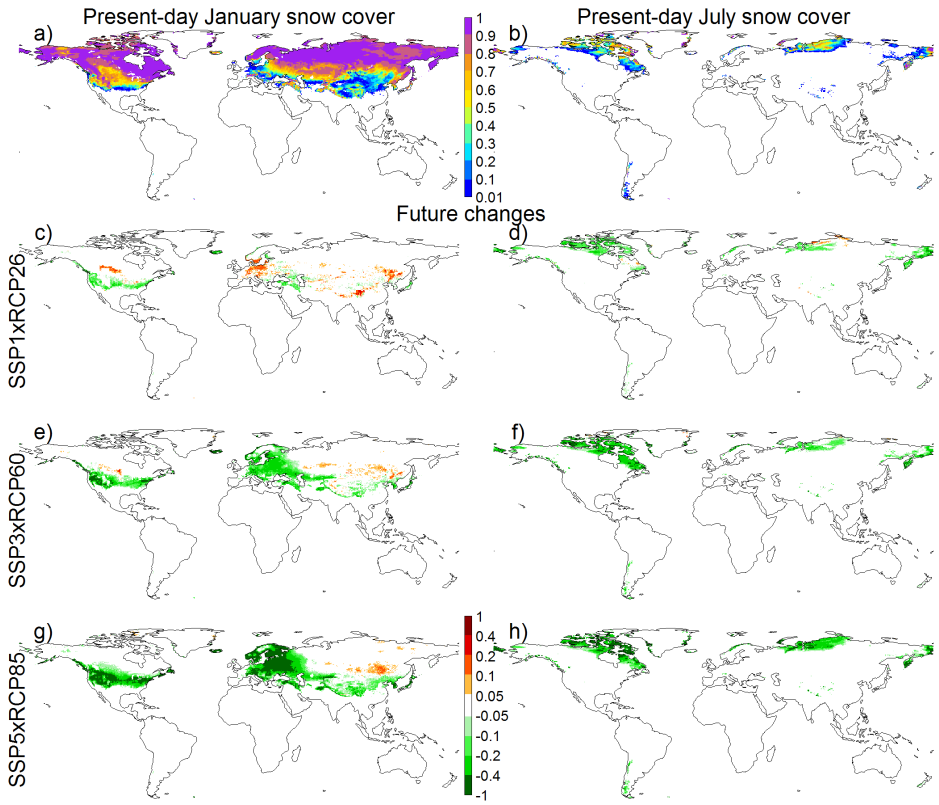


Figure S11. Present-day (2006-2025 average) LPJ snow cover [gridcell fraction] for January (a) and July (b). Change in snow cover between 2006-2025 and 2080-2099 for SSP1xRCP26 January (c), SSP1xRCP25 July (d), SSP3xRCP60 January (e), SSP3xRCP60 July (f), SSP5xRCP85 January (g), SSP5xRCP85 July (h).

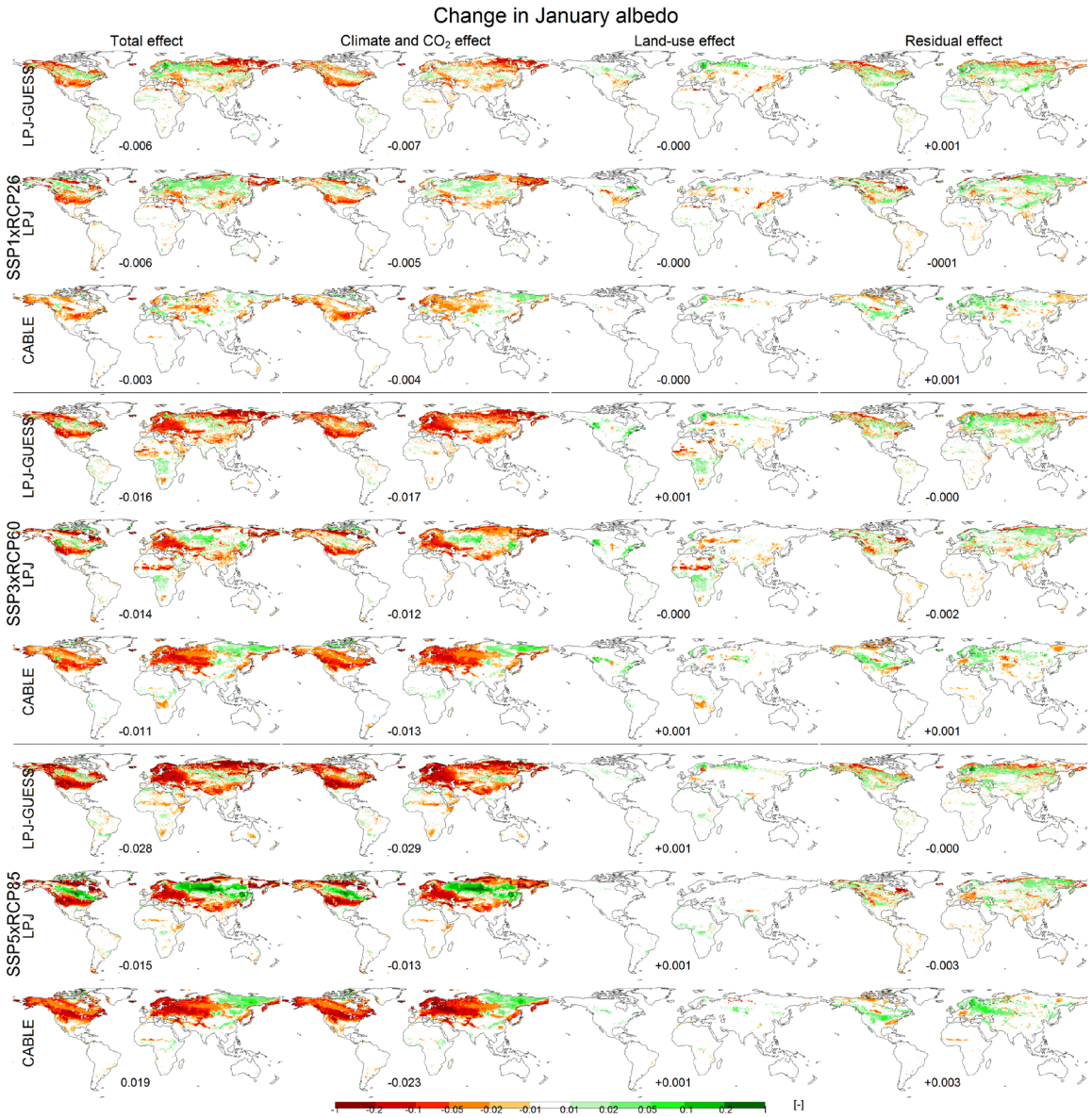


Figure S12. Same as Figure S4 but for January albedo.

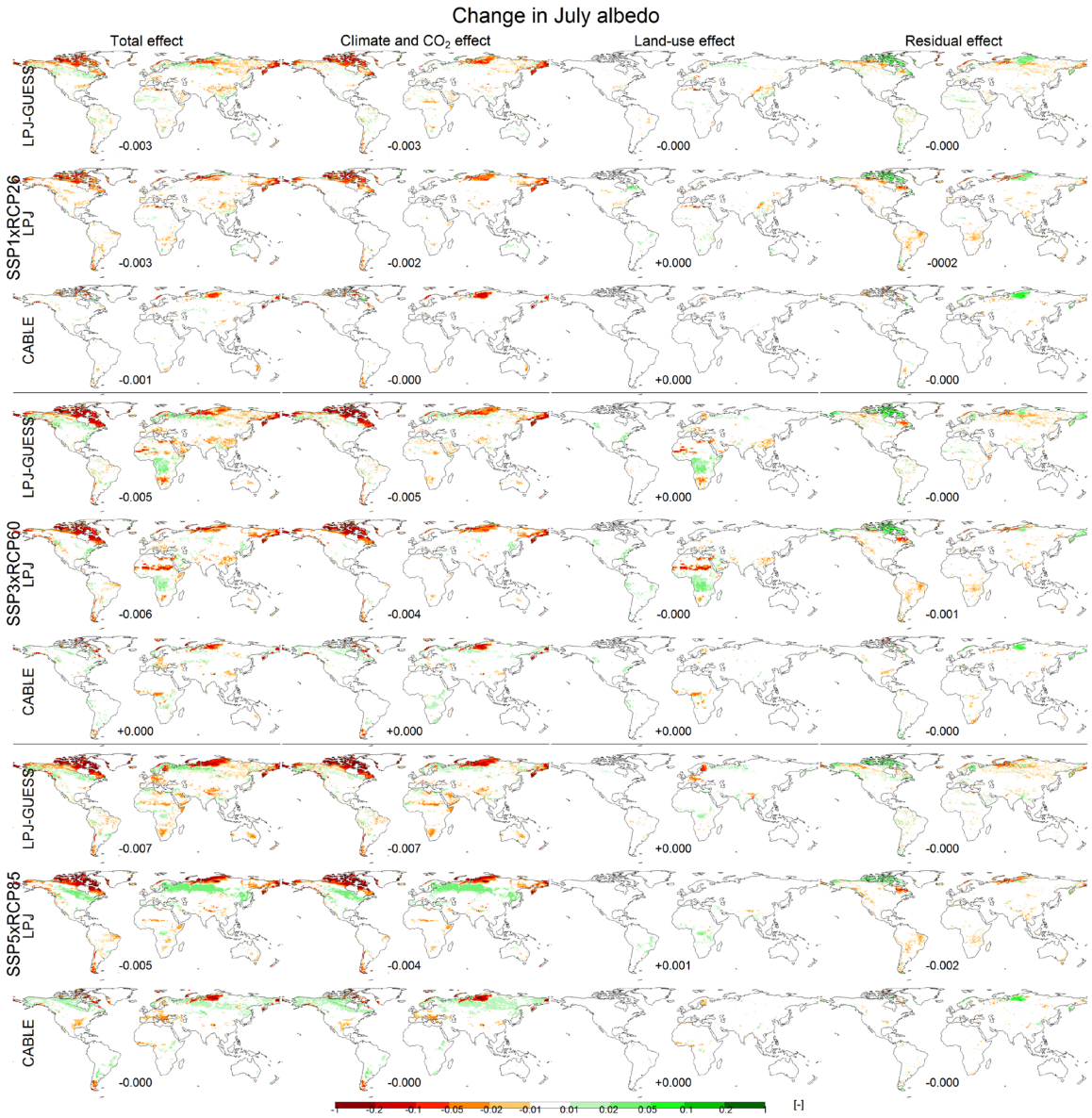


Figure S13. Same as Figure S4 but for July albedo.

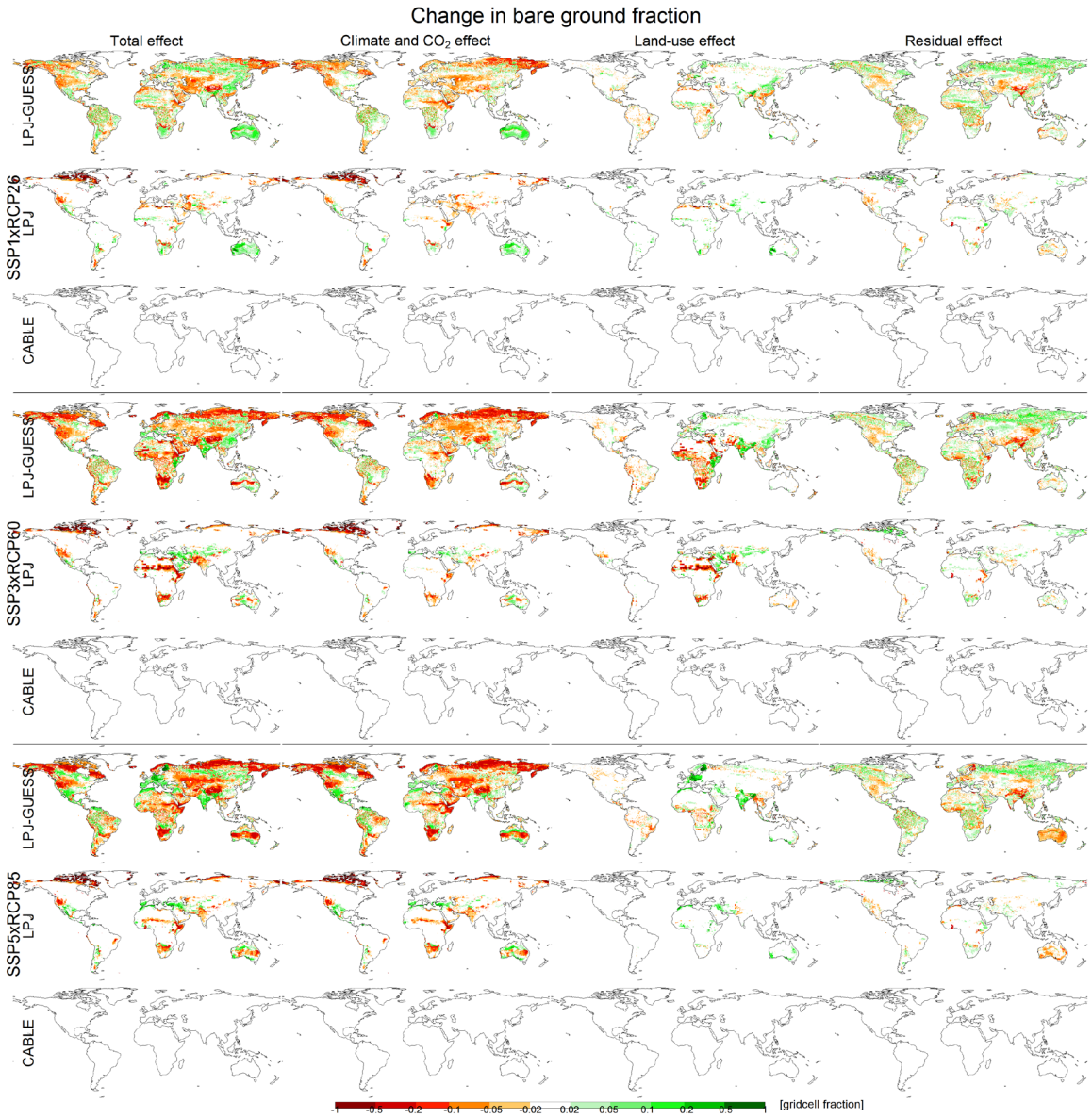


Figure S14. Same as Figure S4 but for bare ground fraction (1 minus the sum of forests, natural and managed grasslands, and croplands). The albedo of bare soil varies spatially (see Figure S11).

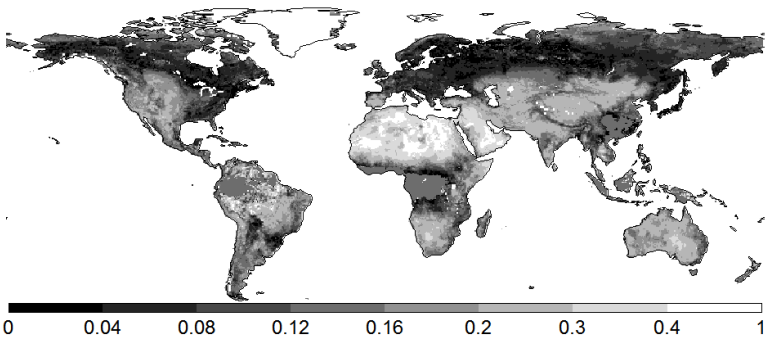


Figure S15. Soil albedo map used for the albedo calculation in LPJ-GUESS and LPJ with values derived from MODIS satellite by Houldcroft et al. (2009). We set soil albedo to 0.15 at locations where no measurements were available. We did not modify soil albedo with changing soil moisture.

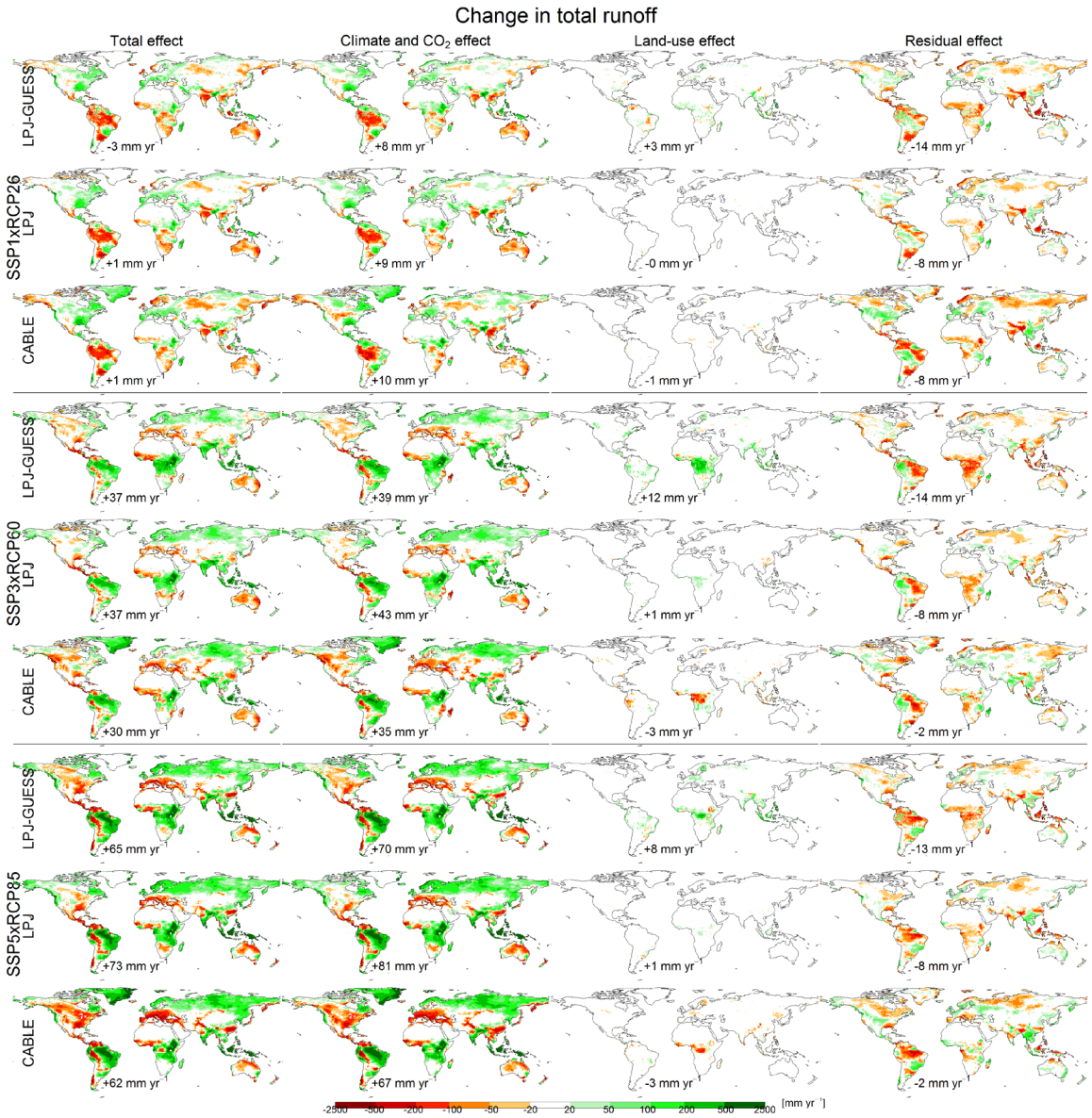


Figure S16: Same as Figure S4 but for total runoff.

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