

1 **Supplemental Material**

2 **Tables**

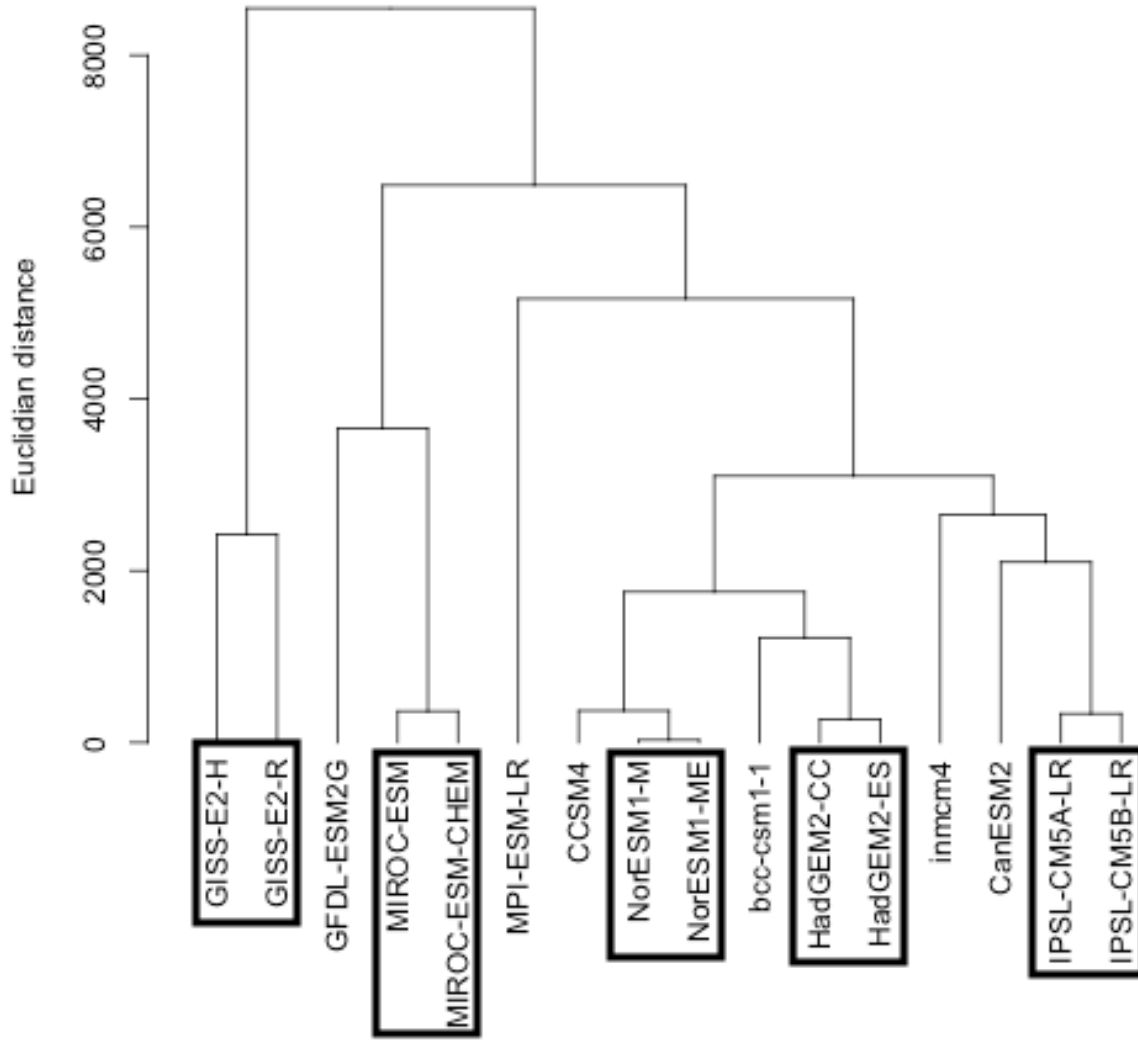
3 Table S1: Modeling groups and their contributed models.

<b>Modeling center or group</b>	<b>Model name</b>
Beijing Climate Center, China Meteorological Administration	BCC-CSM1.1
Canadian Centre For Climate Modeling and Analysis	CanESM2
National Center for Atmospheric Research	CCSM4
NOAA Geophysical Fluid Dynamics Laboratory	GFDL-ESM2G
NASA Goddard Institute for Space Sciences	GISS-E2-H, GISS-E2-R
Met Office Hadley Centre	HadGEM2-CC, HadGEM2-ES
Institute for Numerical Mathematics	INM-CM4
Institut Pierre-Simon Laplace	IPSL-CM5A-LR, IPSL-CM5B-LR
Japan Agency for Marine-Earth Science and Technology, Atmosphere and Ocean Research Institute (The University of Tokyo), and National Institute for Environmental Sciences	MIROC-ESM, MIROC-ESM-CHEM
Max Planck Institute for Meteorology	MPI-ESM-LR
Norwegian Climate Centre	NorESM1-M, NorESM1-ME

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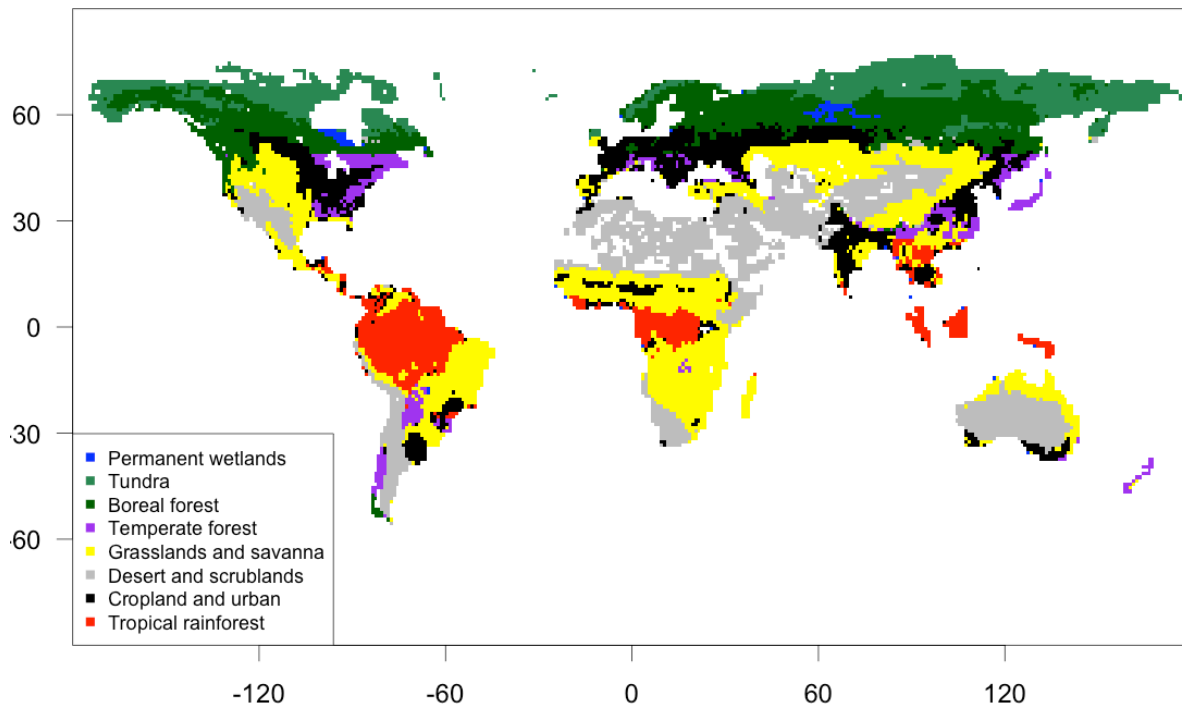
6 **Figures**



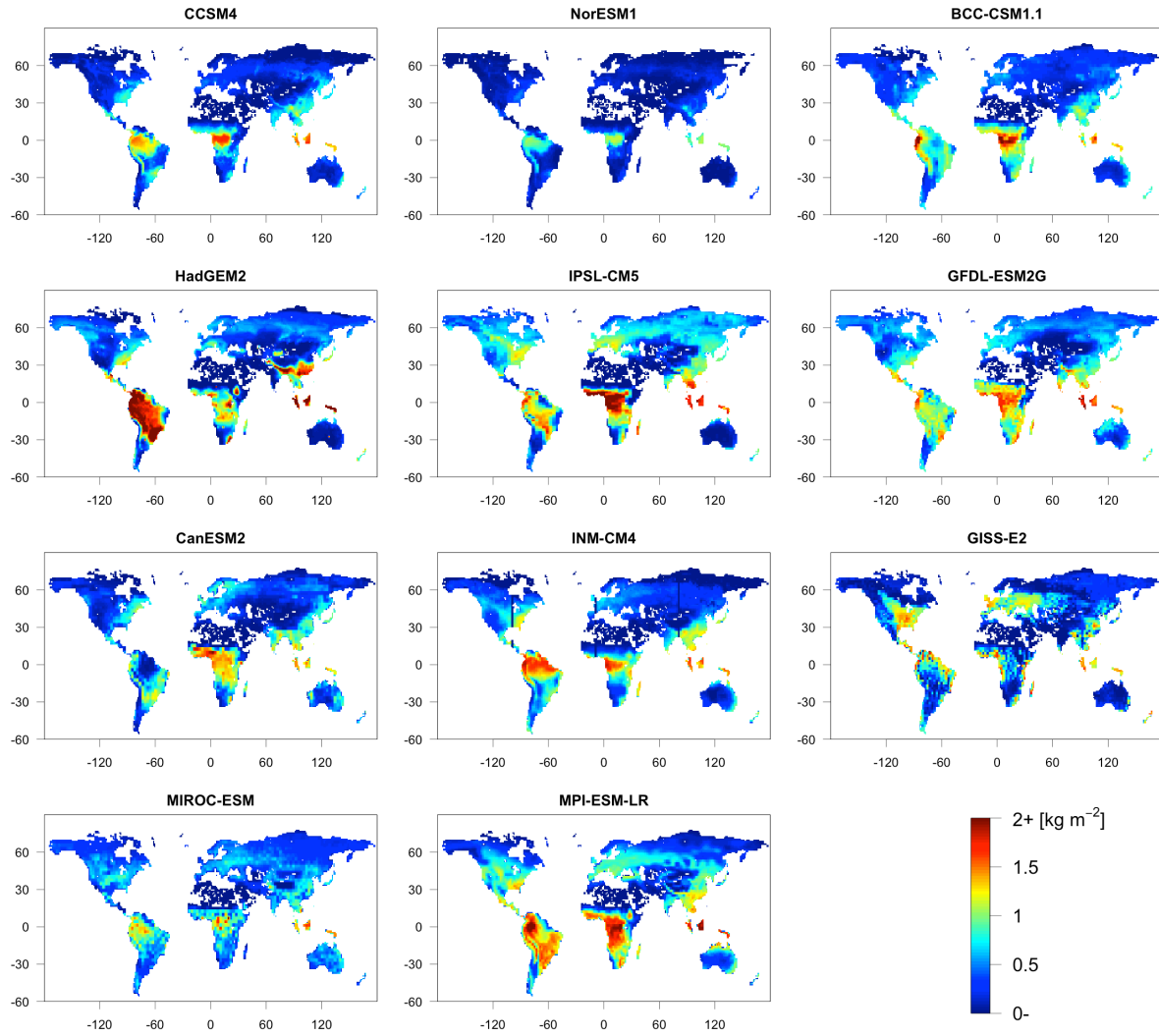
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8 Figure S1: Hierarchical clustering of soil carbon densities between Earth system models. Model  
 9 outputs from the same climate center always showed >90% relative similarity and were therefore  
 10 averaged together for analysis. Relative similarity is defined as  $1 - (\text{branch length in a}$   
 11  $\text{cluster})/(\text{total branch length in tree})$ .

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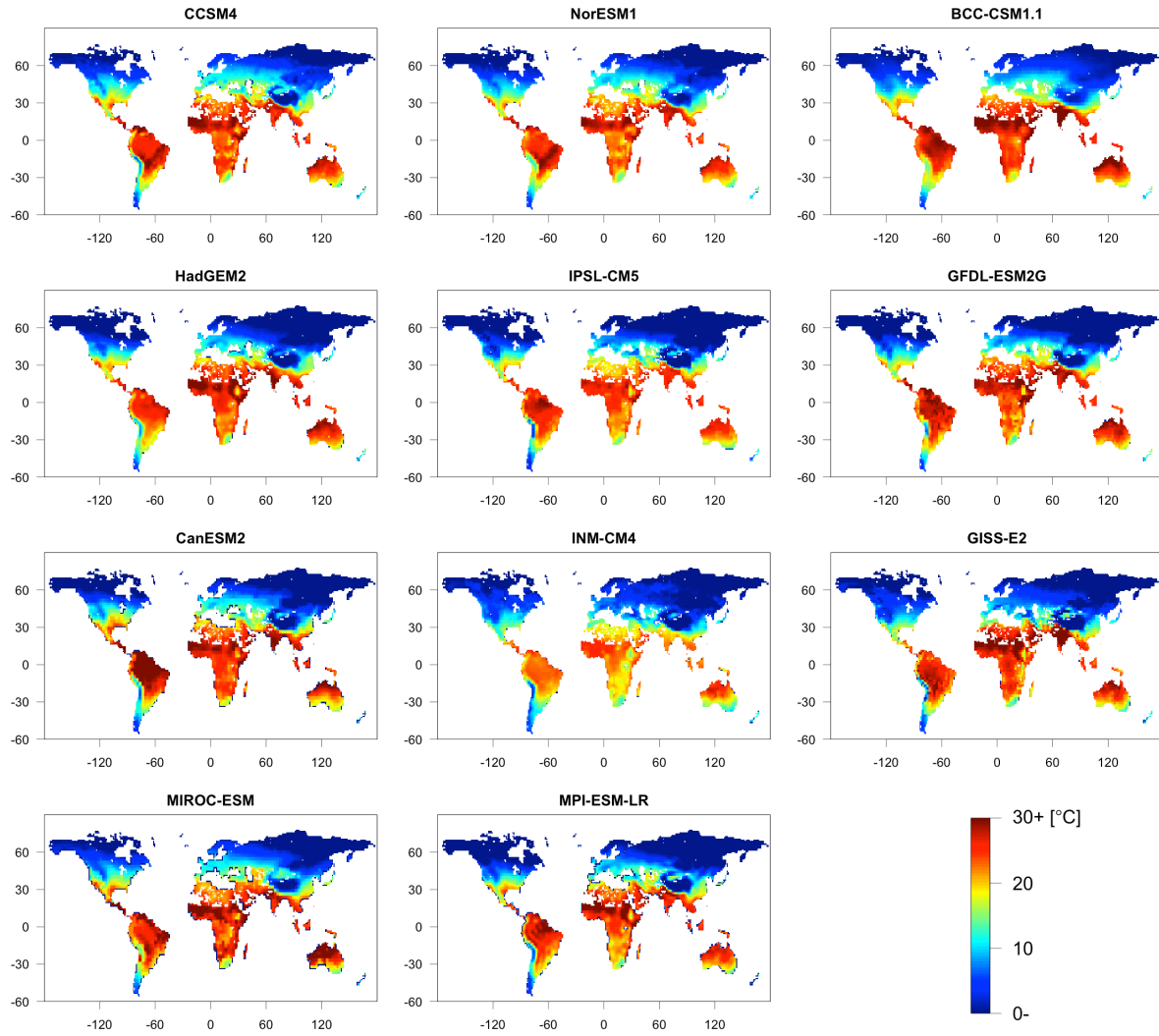
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- 14 Figure S2: Biome maps constructed from the MODIS/TERRA-AQUA land cover product,
- 15 where:
- 16 1. **Tundra** is a combination of grassland and open shrubland north of 55°N.
  - 17 2. **Boreal forest** includes evergreen needleleaf forest, deciduous needleleaf forest, woody
  - 18 savanna north of 50°N, mixed forest north of 50°N, and closed shrub-lands north of 50°N.
  - 19 3. **Tropical rainforest** includes evergreen broadleaf between 25°N and 25°S.
  - 20 4. **Temperate forest** includes deciduous broadleaf, evergreen broadleaf outside of 25°N-25°S,
  - 21 and mixed forest south of 50°N.
  - 22 5. **Desert and scrubland** includes barren or sparsely vegetated, open scrubland south of 55°N,
  - 23 and closed scrubland south of 50°N.
  - 24 6. **Grassland and savanna** includes woody savanna south of 50°N, savanna, and grasslands
  - 25 south of 55°N.
  - 26 7. **Cropland and urban** includes cropland, urban, and mosaic land cover.
  - 27 8-9. **Permanent wetlands** and **snow and ice** are both preserved unmodified.



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29 Figure S3: Net primary production map for each Earth system model.

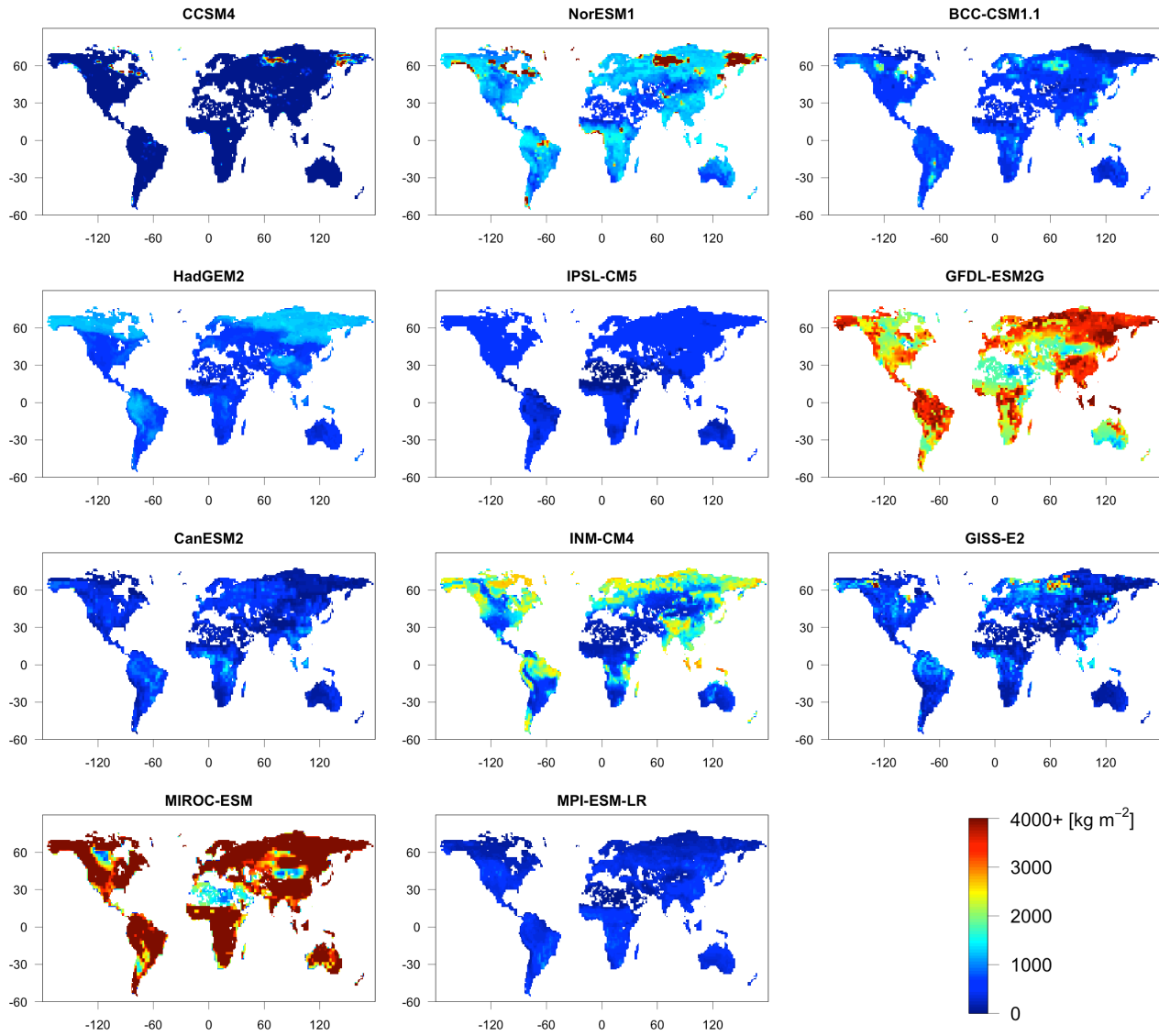
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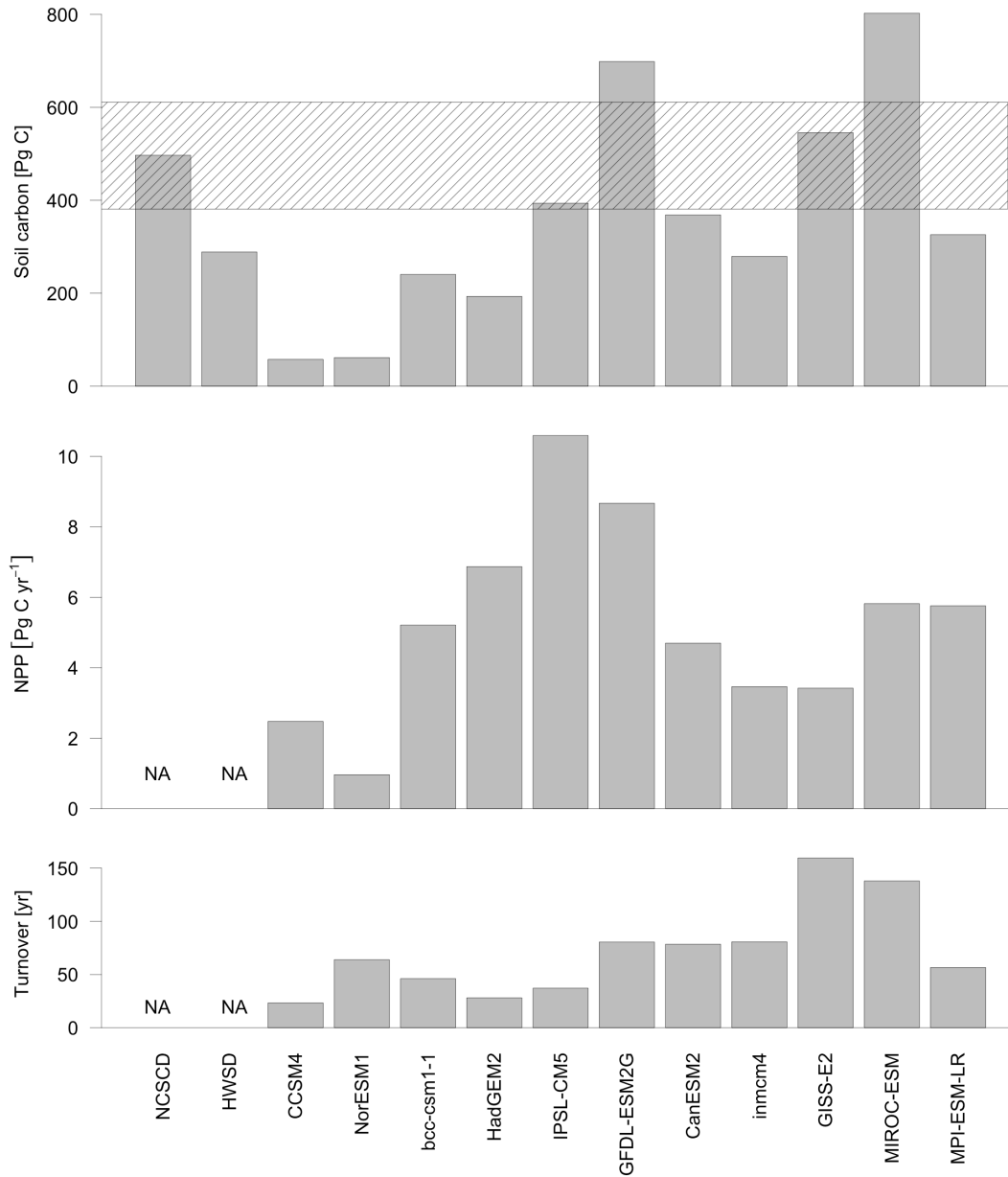
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32 Figure S4: Mean soil temperature for each Earth system model.

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35 Figure S5: Mean soil water content for each Earth system model. Total soil water content is  
 36 reported for the entire soil column for each model.



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38 Figure S6: Total below ground carbon (top), net primary productivity (middle), and calculated  
 39 global turnover times (bottom) for each Earth system model, Harmonized World Soil Database  
 40 (HWSD), and Northern Circumpolar Soil Carbon Database (NCSCD) for grid cells covered by  
 41 the NCSCD. The 95% confidence interval for soil carbon indicated by the hashed area is a  
 42 preliminary estimate based on expert opinion (see text).