Supplement of

Representing high-latitude deep carbon in the pre-industrial state of the ORCHIDEE-MICT land surface model (r8704)

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Table S1: List of PFTs used in the old and new spin-up simulations.

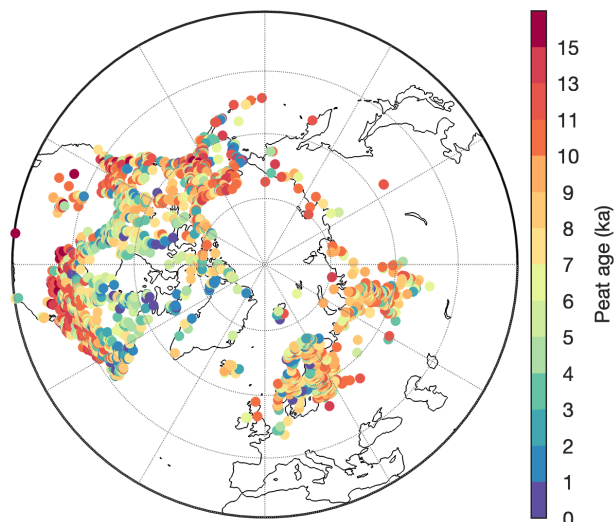
NO	Old spin-up simulation	New spin-up simulation
1	Bare soil	Bare soil
2	Tropical broad-leaved evergreen	Tropical broad-leaved evergreen
3	Tropical broad-leaved raingreen	Tropical broad-leaved raingreen
4	Temperate needleleaf evergreen	Temperate needleleaf evergreen
5	Temperate broad-leaved evergreen	Temperate broad-leaved evergreen
6	Temperate broad-leaved summergreen	Temperate broad-leaved summergreen
7	Boreal needleleaf evergreen	Boreal needleleaf evergreen
8	Boreal broad-leaved summergreen	Boreal broad-leaved summergreen
9	Boreal needleleaf summergreen	Boreal needleleaf summergreen
10	Temperate C3 grass	Temperate C3 grass
11	C4 grass	C4 grass
12	Wheat	Wheat
13	Maize	Maize
14	Tropical C3 grass	Tropical C3 grass
15	Boreal C3 grass	Boreal C3 grass
16	Peat C3 grass	Peat C3 grass
17		Yedoma C3 grass

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Figure S1: Spatial distribution of peat initiation age over 2,860 peat cores obtained from Loisel et al. (2017).

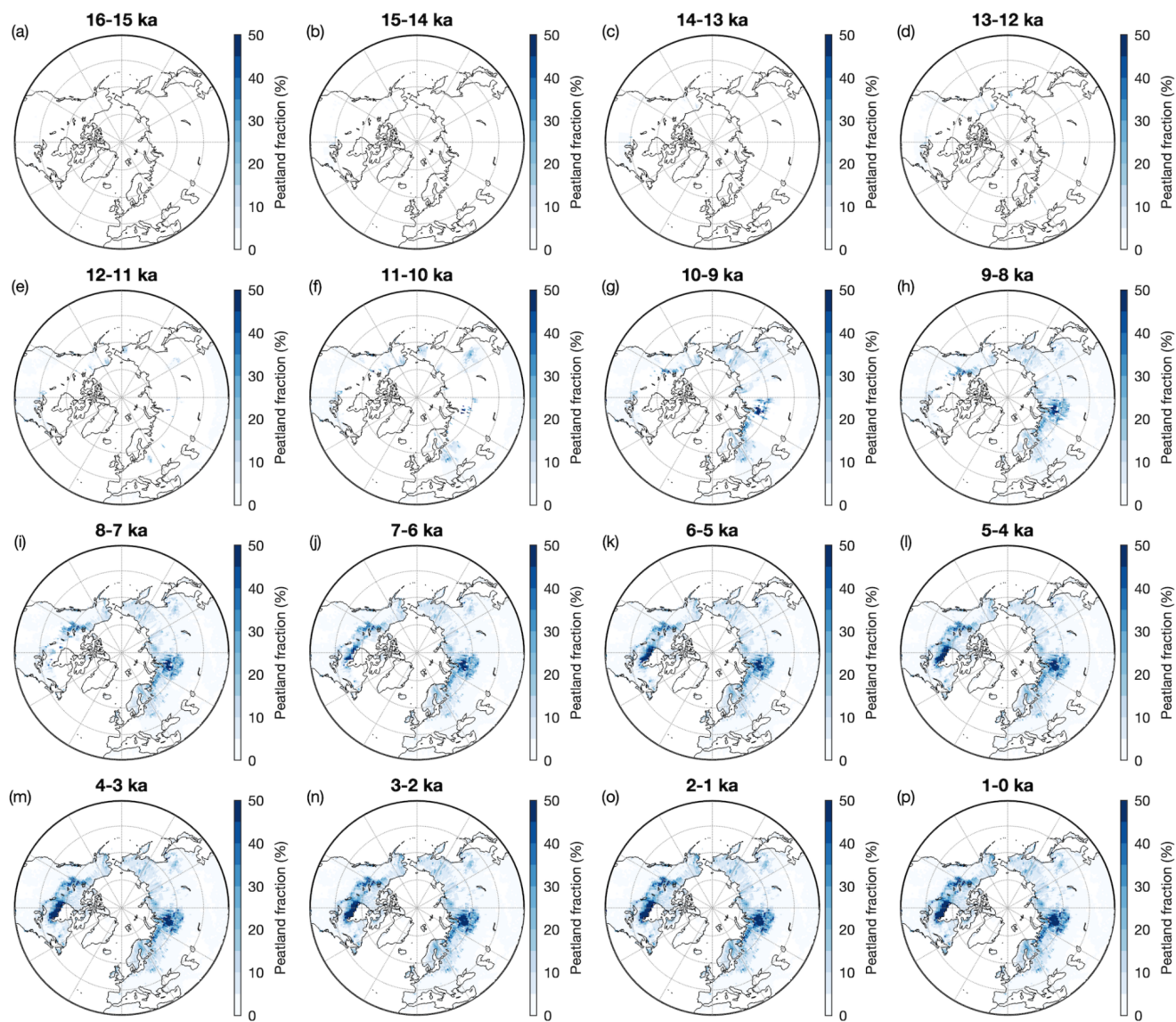



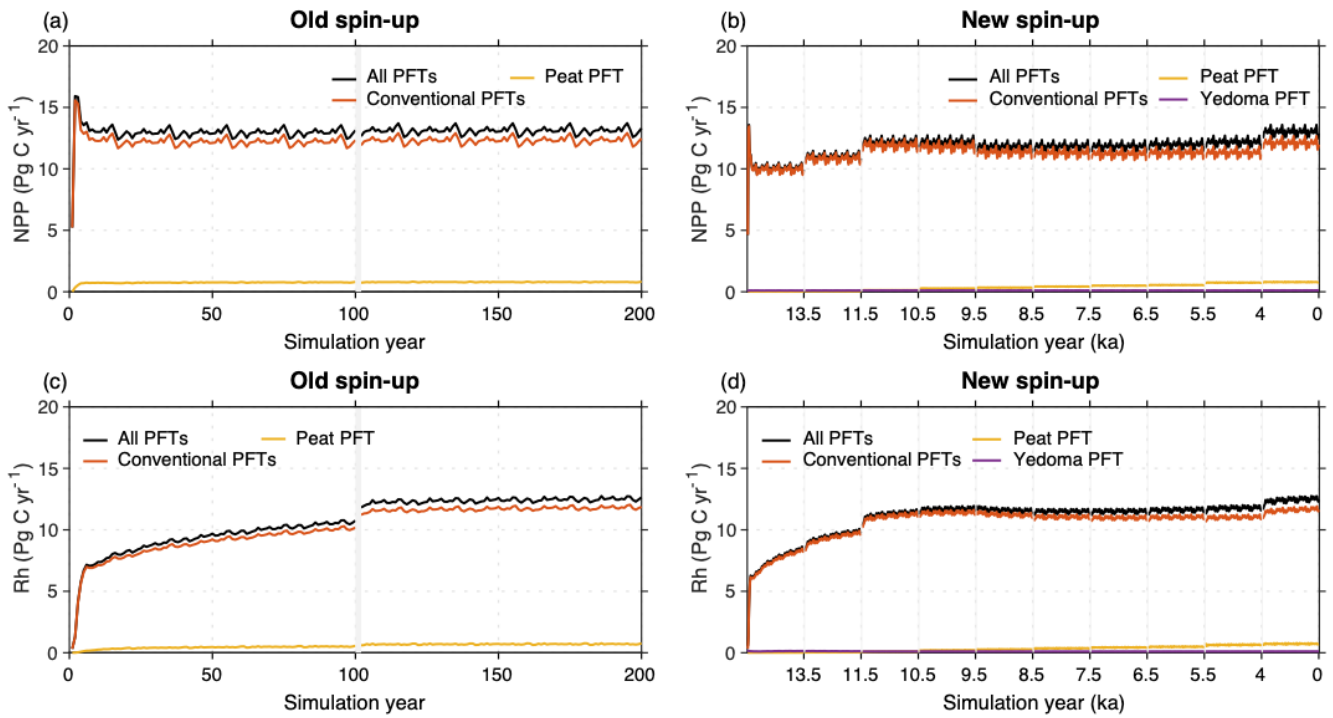
Figure S2: Spatial distribution of northern peatlands (> 30°N) during each thousand-year from 16 ka to present. The spatial resolution is at 1° × 1°.

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Figure S3: Time series of net primary productivity (NPP) and heterotrophic respiration (Rh) over the Northern Hemisphere (> 30°N) from the old ((a) and (c)) and the new spin-up ((b) and (d)) simulations. Conventional PFTs indicate the 15 non-yedoma and non-peat PFTs including bare soil, 8 tree PFTs, 4 grass PFTs, and 2 crop PFTs.
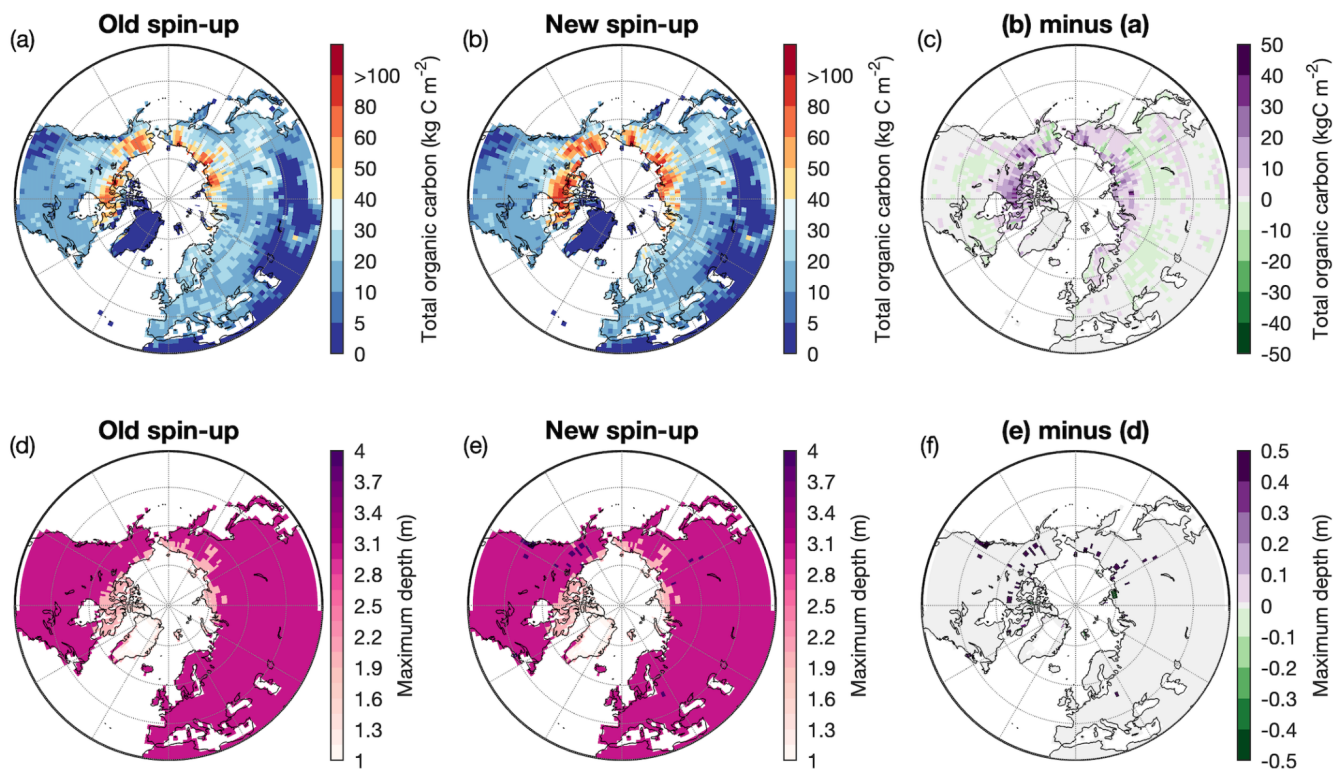
Figure S4: Same as Fig. 7, but for the total organic carbon and the maximum depth of soil organic carbon for 15 conventional PFTs. To compare with Fig. 7, the unit for total organic carbon uses per m^2 grid cell. Please note that the scale for the maximum depth of soil organic carbon in this figure is different from Fig. 7 and Fig. S5.
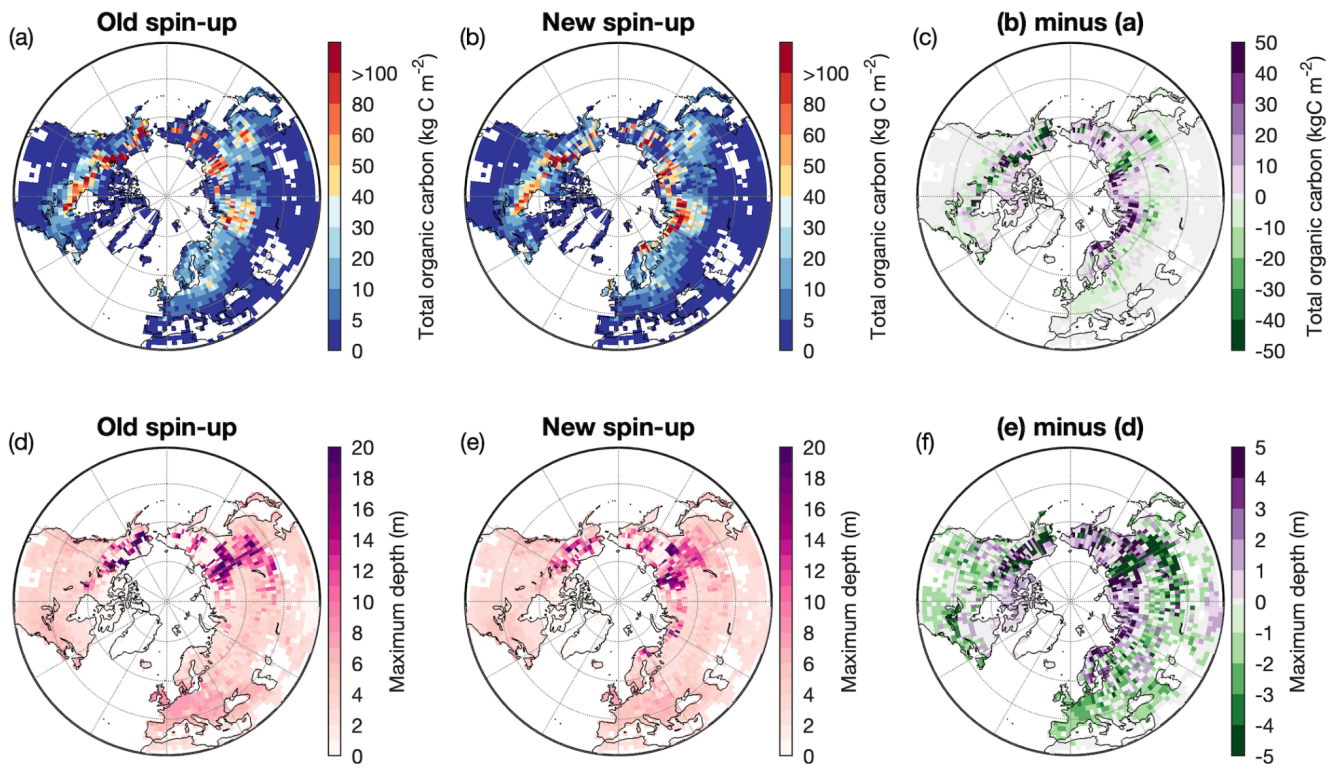
Figure S5: Same as Fig. 7, but for the total organic carbon and the maximum depth of soil organic carbon for peat PFT. To compare with Fig. 7, the unit for total organic carbon uses per m² grid cell.
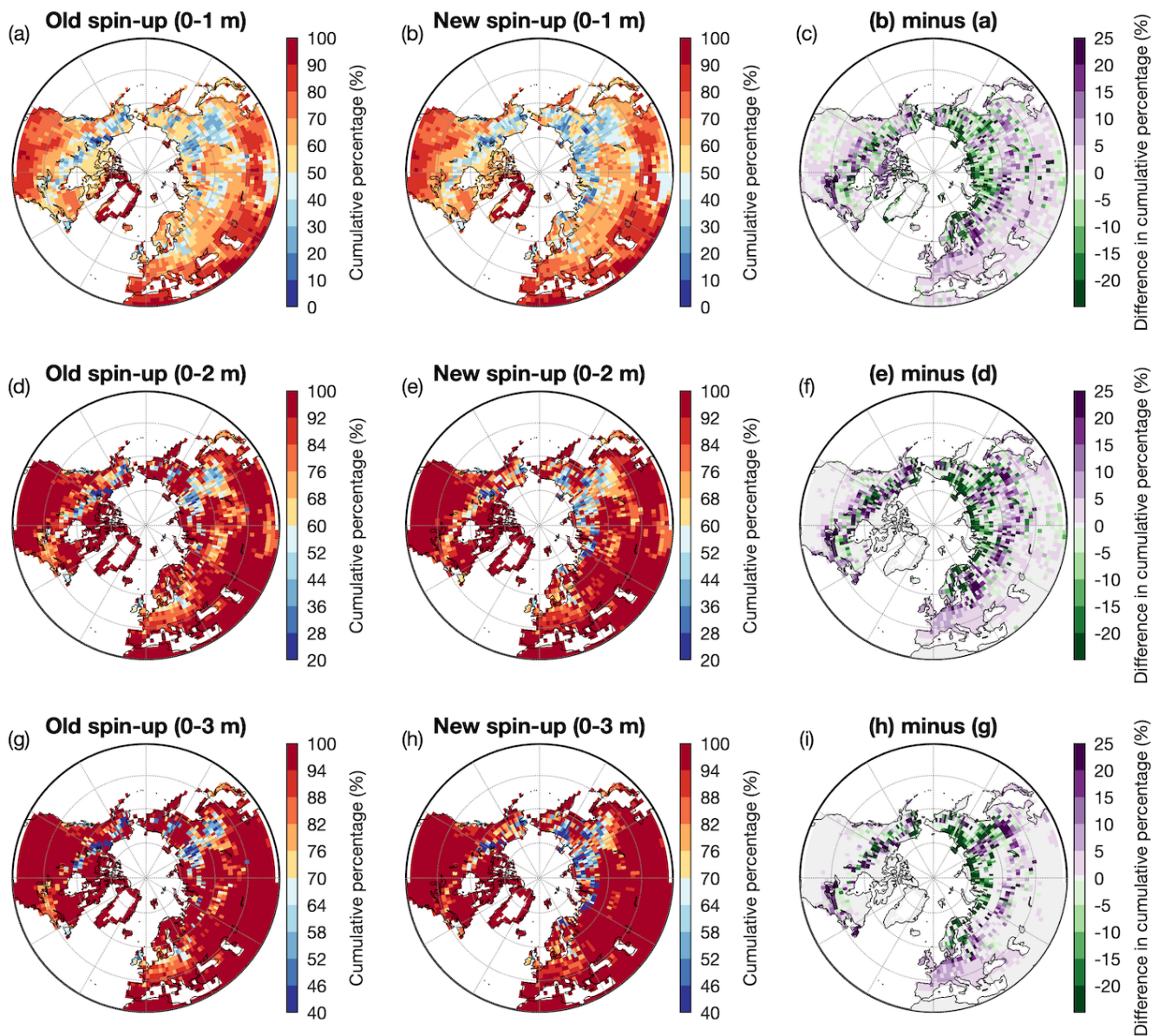
Figure S6: Spatial distribution of cumulative percentage of soil organic carbon (SOC) for 0-1 m, 0-2 m, and 0-3 m over the Northern Hemisphere (> 30°N) from the old and new spin-up simulations. The first two columns show the cumulative percentage of SOC from the old ((a), (d), and (g)) and new ((b), (e), and (i)) spin-up simulations and the third column for the difference between the two simulations.
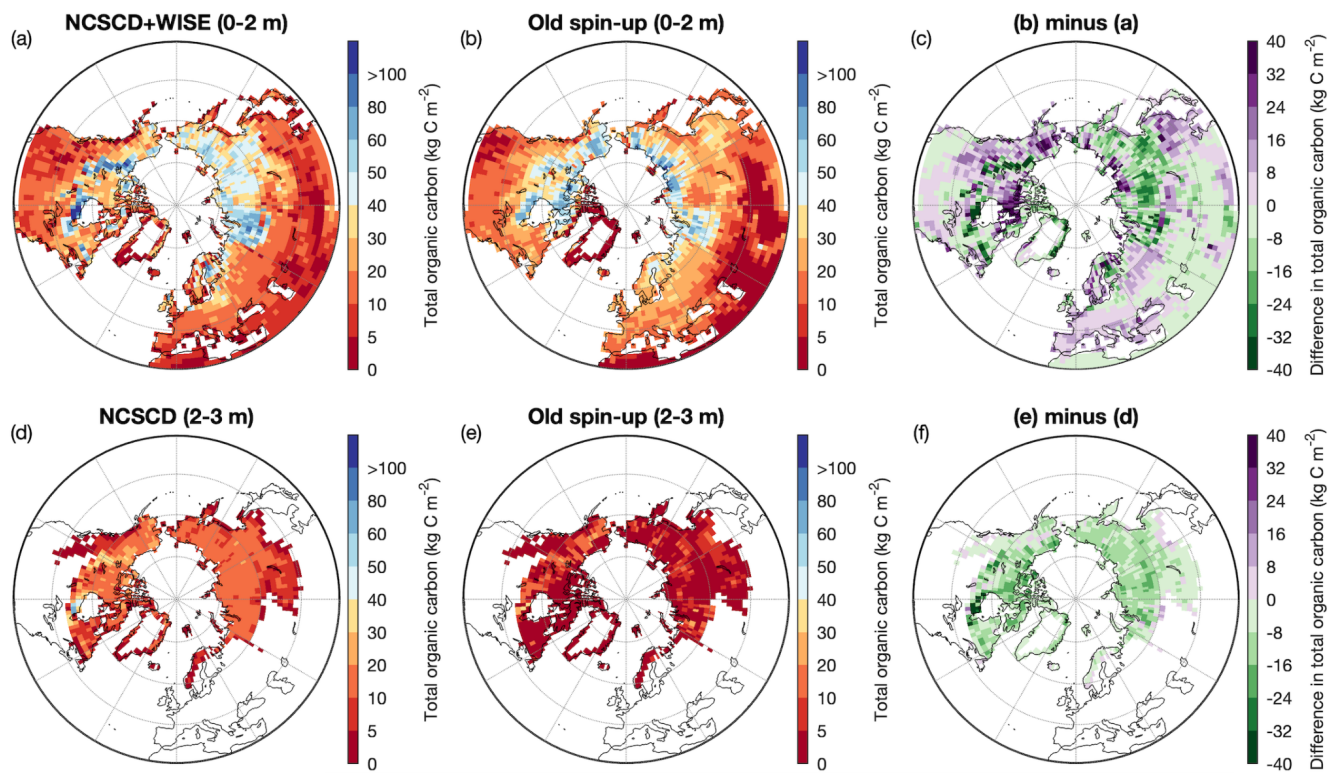
Figure S7: Same as Fig. 9, but for comparison of total organic carbon between the old spin up simulation and observation-based datasets.