Supporting Information

Observational benchmarks inform representation of soil organic carbon dynamics in land surface models

Kamal Nyaupane[1], Umakant Mishra[2*], Feng Tao[3], Kyongmin Yeo[4], William J. Riley[5], Forrest M. Hoffman[6] and Sagar Gautam[2]

[*]Corresponding author, email: umishra@sandia.gov

Table S1: Environmental variables used as predictors of global soil organic carbon stocks

	Variable	Resolution	Sources
1	Longitude		WoSIS
2	Latitude		WoSIS
3	Rmean (Soil Respiration)	Originally 0.5 deg, resampled to 1km	http://cse.ffpri.affrc.go.jp/shojih/data/index.html
4	ESA land cover	1 km	https://www.esa-landcover-cci.org
5	Evapotranspiration	Originally 1 deg, resampled to 1km	https://www.ntsg.umt.edu/project/global-et.php
6	IGBP types	Originally 0.5 deg, resampled to 1km	IGBP website
7	Soil types	Originally 0.083 deg, resampled to 1km	FAO-UNESCO
8	NPP mean	1km	(Zhao et al. 2005)
9	NPP max	1km	(Zhao et al. 2005)
10	NPP min	1km	(Zhao et al. 2005)
11	Vegetation cover types	Originally 0.5 deg, resampled to 1km	(Channan et al. 2014)
12	Annual Mean Temperature	1km	(Fick and Hijmans 2017)
13	Mean Diurnal Range Temperature	1km	(Fick and Hijmans 2017)
14	Isothermality	1km	(Fick and Hijmans 2017)
15	Temperature Seasonality	1km	(Fick and Hijmans 2017)
16	Max Temperature of Warmest Month	1km	(Fick and Hijmans 2017)
17	Min Temperature of Coldest Month	1km	(Fick and Hijmans 2017)
18	Temperature Annual Range	1km	(Fick and Hijmans 2017)
19	Mean Temperature of Wettest Quarter	1km	(Fick and Hijmans 2017)
20	Mean Temperature of Driest Quarter	1km	(Fick and Hijmans 2017)
21	Mean Temperature of Warmest Quarter	1km	(Fick and Hijmans 2017)
22	Mean Temperature of Coldest Quarter	1km	(Fick and Hijmans 2017)
23	Annual Precipitation	1km	(Fick and Hijmans 2017)
24	Precipitation of Wettest Month	1km	(Fick and Hijmans 2017)
25	Precipitation of Driest Month	1km	(Fick and Hijmans 2017)
26	Precipitation Seasonality	1km	(Fick and Hijmans 2017)
27	Precipitation of Wettest Quarter	1km	(Fick and Hijmans 2017)
28	Precipitation of Driest Quarter	1km	(Fick and Hijmans 2017)
29	Precipitation of Warmest Quarter	1km	(Fick and Hijmans 2017)

30	Precipitation of Coldest Quarter	1km	(Fick and Hijmans 2017)
31	Absolute Depth to Bedrock	Originally 250m, resampled to 1km	(Hengl et al. 2017)
32	Cation exchange capacity	Originally 250m, resampled to 1km	(Hengl et al. 2017)
33	Clay content	Originally 250m, resampled to 1km	(Hengl et al. 2017)
34	Coarse fragment fraction	Originally 250m, resampled to 1km	(Hengl et al. 2017)
35	Bedrock depth	Originally 250m, resampled to 1km	(Hengl et al. 2017)
36	Grade acid	Originally 250m, resampled to 1km	(Hengl et al. 2017)
37	Occurrence R horizon	Originally 250m, resampled to 1km	(Hengl et al. 2017)
38	pH water	Originally 250m, resampled to 1km	(Hengl et al. 2017)
39	Sand content	Originally 250m, resampled to 1km	(Hengl et al. 2017)
40	Silt content	Originally 250m, resampled to 1km	(Hengl et al. 2017)
41	SWC v wilting point	Originally 250m, resampled to 1km	(Hengl et al. 2017)
42	Texture	Originally 250m, resampled to 1km	(Hengl et al. 2017)
43	USDA suborder	Originally 250m, resampled to 1km	(Hengl et al. 2017)
44	WRB subgroup	Originally 250m, resampled to 1km	(Hengl et al. 2017)
45	Drought	Originally 2.50 deg, resampled to 1km	(Dai et al. 2004)
46	Elevation	Originally 1arc min, resampled to 1km	NOAA, https://www.ngdc.noaa.gov/mgg/global/

References

Channan, S., Collins, K., and Emanuel W.: Global mosaics of the standard MODIS land cover type data. University of Maryland and the Pacific Northwest National Laboratory, College Park, Maryland, USA, 30, 2014..

Dai, A., K. Trenberth, E., and Qian, T.: A global dataset of Palmer Drought Severity Index for 1870–2002: Relationship with soil moisture and effects of surface warming. J. Hydrometeorol., 5, 1117-1130, 2004.

Fick, S. E., and Hijmans, R. J.: WorldClim 2: new 1-km spatial resolution climate surfaces for global land areas. Int. J. Climatol., 37, 4302-4315, 2017.

Hengl, T., de Jesus, J. M., Heuvelink, G. B., Gonzalez, M. R., Kilibarda, M., Blagotić, A., Shangguan,W., Wright, M. N., Geng, X. and Bauer-Marschallinger, B.: SoilGrids250m: Global gridded soil information based on machine learning. PLoS One 12, e0169748, 2017.

Zhao, M., Heinsch, F. A., Nemani, R. R., and Running S. W.: Improvements of the MODIS terrestrial gross and net primary production global data set. Remote Sens. Environ. 95, 164-176, 2005.