

Supporting Information

Soil organic carbon distribution for 0-3 m soils at 1 km² scale of the frozen ground in the Third Pole Regions

Dong Wang^{1,2}, Tonghua Wu^{1,3*}, Xiaodong Wu¹, Xianhua Wei⁴, Cuicui Mu⁵, Ren Li¹, Guojie Hu¹, Defu Zou¹, Xiaofan Zhu¹, Jie Chen¹, Junmin Hao⁶, Jie Ni^{1,2}, Xiangfei Li^{1,2}, Wensi Ma^{1,2}, Amin Wen^{1,2}, Chenpeng Shang^{1,2}, Yune La^{1,2}, Xin Ma^{1,2}

¹ Cryosphere Research Station on the Qinghai-Tibetan Plateau, State Key Laboratory of Cryospheric Science, Northwest Institute of Eco-Environment and Resource, Chinese Academy of Sciences, Lanzhou, Gansu 730000, China

² University of Chinese Academy Sciences, Beijing, 100049, China.

³ Southern Marine Science and Engineering Guangdong Laboratory, Guangzhou 511458, China.

⁴ College of geography and environmental science, Northwest Normal University, Lanzhou 730070, China.

⁵ Key Laboratory of Western China's Environmental Systems (Ministry of Education), College of Earth and Environmental Sciences, Lanzhou University, Lanzhou, 730000, China.

⁶ School of civil engineering, Lanzhou University of Technology, Lanzhou, 730050, China.

*Correspondence: Tonghua Wu (thuawu@lzb.ac.cn)

This file includes:

Tables S1 and S2

Fig S1

Table S1 Environmental indicators for SOCS mapping in this study

Type	Indicators	Abbreviation	Resolution
Topography	Elevation	H	1 km × 1 km
	Slope	S	1 km × 1 km
	Aspect	A	1 km × 1 km
	Plan curvature	PlanC	1 km × 1 km
	Profile curvature	ProC	1 km × 1 km
	Topographic wetness index	TWI	1 km × 1 km
	Total catchment area	TCA	1 km × 1 km
	Relative slope position	RSP	1 km × 1 km
	Slope length and steepness factor	LS	1 km × 1 km
	Convergence index	CI	1 km × 1 km
	Channel network base level	CNB	1 km × 1 km
	Channel network distance	CND	1 km × 1 km
	Valley depth	VD	1 km × 1 km
	Closed depressions	CD	1 km × 1 km
Vegetation	Normalized difference vegetation index	NDVI	1 km × 1 km
	Net primary productivity	NPP	1 km × 1 km
	Leaf area index	LAI	1 km × 1 km
Climate	Mean annual precipitation	MAP	1 km × 1 km
	Mean annual temperature	MAT	1 km × 1 km
Soil	Sand content	Sand	1 km × 1 km
	Silt content	Silt	1 km × 1 km
	Clay content	Clay	1 km × 1 km

Table S2 Correlation coefficient of each environmental factor and SOCS

	<i>SOCS</i>	<i>H</i>	<i>S</i>	<i>A</i>	<i>PlanC</i>	<i>ProC</i>	<i>TWI</i>	<i>TCA</i>	<i>RSP</i>	<i>LS</i>	<i>CI</i>	<i>CNB</i>	<i>CND</i>	<i>VD</i>	<i>CD</i>	<i>NDVI</i>	<i>NPP</i>	<i>LAI</i>	<i>MAP</i>	<i>MAT</i>	<i>Sand</i>	<i>Silt</i>	
<i>SOCS</i>	1																						
<i>H</i>	-0.23**	1																					
<i>S</i>	0.15**	-0.15**	1																				
<i>A</i>	-0.01	-0.03	-0.07	1																			
<i>PlanC</i>	0.01	0.14**	-0.09*	-0.10*	1																		
<i>ProC</i>	0.04	0.12**	-1.34**	-0.05	-0.27**	1																	
<i>TWI</i>	-0.26**	0.14**	-0.48**	0.10*	-0.08*	-0.12**	1																
<i>TCA</i>	-0.14**	0.09*	-0.02	0.06	-0.05	-0.07	0.40**	1															
<i>RSP</i>	-0.30**	0.12**	0.30	0.08*	0.08*	0.30**	-0.54**	-0.13**	1														
<i>LS</i>	0.05	-0.12**	0.72**	0.01	-0.24**	-0.14**	-0.17**	0.12**	0.10*	1													
<i>CI</i>	0.03	0.03	0.09*	0.09*	0.57**	0.18**	-0.26**	-0.11**	0.20**	-0.03	1												
<i>CNB</i>	-0.21**	0.18**	-0.22**	0.06	0.03	-0.07	0.64**	0.21**	-0.32**	-0.20**	-0.05	1											
<i>CND</i>	-0.28**	0.96**	-0.28**	-0.03	0.12**	0.01	0.28**	0.12**	-0.11*	-0.19**	-0.01	0.28**	1										
<i>VD</i>	-0.21**	-0.04	0.48**	0.03	0.03	0.40**	-0.46**	-0.10*	0.77**	-0.19**	0.13**	-0.24**	-0.32**	1									
<i>CD</i>	-0.07	-0.73**	0.37**	0.01	-0.23**	-0.18**	-0.03	0.02	-0.29**	0.26**	-0.07	-0.01	-0.71**	0.09	1								
<i>NDVI</i>	0.73**	-0.44**	0.24**	0.09*	-0.12**	-0.08	-0.25**	-0.18**	0.20**	0.38**	-0.08	-0.25**	-0.47**	0.19**	0.21**	1							
<i>NPP</i>	0.69**	-0.40**	0.21**	0.07	-0.09*	-0.01	-0.25**	-0.19**	0.24**	0.16**	-0.08	-0.26**	-0.45**	0.24**	0.11*	0.92**	1						
<i>LAI</i>	0.64**	-0.41**	0.32**	0.06	-0.16**	-0.09*	-0.19**	-0.13**	0.11*	0.14**	-0.11*	-0.14**	-0.47**	0.20**	0.30**	0.90**	0.81**	1					
<i>MAP</i>	0.41**	-0.35**	0.42**	0.09*	-0.17**	-0.02	-0.25**	-0.15**	0.18**	0.23**	-0.02	-0.20**	-0.43**	0.35**	0.43**	0.67**	0.62**	0.69**	1				
<i>MAT</i>	0.22**	-0.79**	0.22**	0.08*	-0.18**	-0.15**	-0.01	-0.02	-0.34**	0.32**	-0.03	0.12**	-0.68**	-0.03	0.85**	0.24**	0.17**	0.32**	0.39**	1			
<i>Sand</i>	-0.14**	-0.41**	-0.12**	0.07	-0.01	-0.11**	0.12**	0.04	-0.14**	0.18**	0.04	0.15**	0.44**	-0.20**	-0.19**	-0.15**	-0.16**	-0.22**	-0.02	-0.12**	1		
<i>Silt</i>	0.20**	-0.34**	0.04	-0.03	0.02	-0.21**	-0.07	-0.02	-0.05	-0.06	-0.06	-0.17**	-0.28**	-0.15**	0.16**	0.27**	0.20**	0.30**	0.04	0.04	-0.65**	1	
<i>Clay</i>	0.02	-0.53**	-1.12**	0.04	0.02	-0.10**	0.02	-0.04	-0.15**	-0.13**	-0.03	-0.01	-0.44**	-0.20**	0.31**	0.09	0.05	0.11*	-0.06	0.32**	-0.61**	0.52**	1

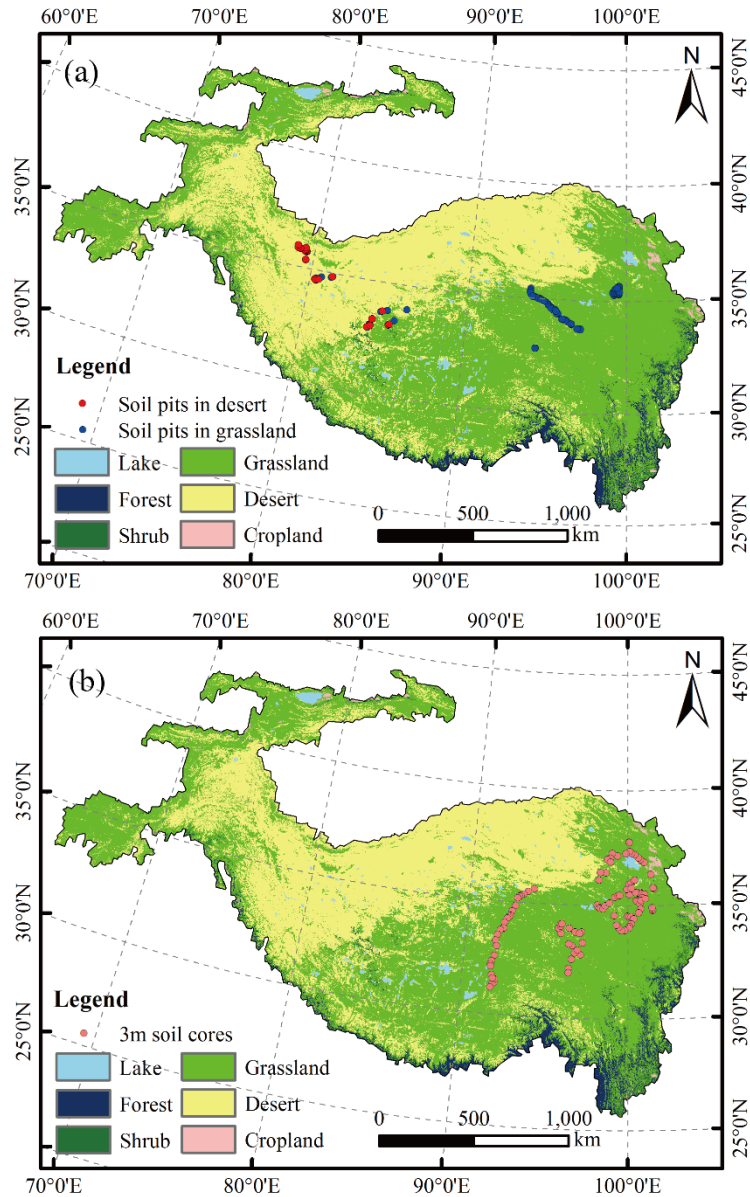


Figure S1. Spatial distribution of (a) soil pits (0–2 m), and (b) soil cores (0–3 m) in different vegetation types. The vegetation map is derived from the Land Cover Type Climate Modelling Grid (CMG) product (MCD12C1) in 2010 (<https://lpdaac.usgs.gov>).