The Northern Circumpolar Soil Carbon Database

Technical information

The Northern Circumpolar Soil Carbon Database version 2 (NCSCDv2) provides the spatial framework and the data needed to determine the organic carbon stocks in the soils of the permafrost region. The NCSCD contains many thousand of polygons, with each polygon containing one or more named soils or soil taxa that form the basis for determining the carbon stocks. For more detailed descriptions of the NCSCDv2 please refer to the publications on the NCSCDv2 start page (Hugelius et al., 2013a; 2013b).

Representative pedons for each soil taxa (Eurasia and Greenland) or named soil (Canada and United States) are selected. These pedons contain all the data needed to calculate soil carbon content. The data for the three layers that compose each soil (Canada and United States) are entered into the database and are used to calculate the carbon content of each named soil in the polygon while data from pedons of each soil taxa (Eurasia and Greenland) are used to calculate their carbon contents which are then entered into the database.

The soil organic carbon content (SOCC) was calculated for each of the three layers of each named soil (Canada and United States) and for the representative pedons for each soil taxa (Eurasia and Greenland) using the formula:

$$SOCC = C \times BD \times T \times (1 - CF)$$

where C=organic carbon (% weight), BD=bulk density (g cm^{-3}), T=depth of soil layer (0–300 cm) and CF=coarse fragments and/or ice content (% weight). The SOCC data are then stored in the database to be used for further calculations or to generate carbon content maps. In the vector database the SOCC is given in the unit kg C m^{-2} while it is given as hg C m^{-2} in the gridded datasets.

The soil organic carbon mass (SOCM) was then determined by multiplying the SOCC of the specific soil by the area of each such soil component in the polygon. These data provide information on the SOCM of each soil in each permafrost zone in the northern circumpolar region and for the production of SOCM maps. Please note: SOC and AREA Attributes were calculated by projecting each region into an Azimuthal equal area projection relevant to that region. For details regarding the parameters included in the polygon attribute tables of shape files and gridded datasets, please refer to tables in the publications on the NCSCDv2 start page (Hugelius et al., 2013a; 2013b).

Projection parameters

Lambert Azimuthal Equal Area Projection
Datum WGS84, Units METERS

Radius of Sphere of Reference	6370997.00000
Longitude of Center of Projection	0° 0' 0.00"
Latitude of Center of Projection	90° 0' 0.00"
False Easting	0.0000
False Northing	0.0000

Data format (Polygon attribute table)

SOCC (Soil Organic Carbon Content)
SOCM (Soil Organic Carbon Mass)

DESCRIPTION	ITEM NAME	IN	OUT	TYPE	DEC
Area of Polygon (m^2)	AREA	4	12	F	3
Permimeter (m)	PERIMETER	4	12	F	3
Internal ESRI #	MONGOLIAJAN07#	4	5	B	-
Internal ESRI ID	MONGOLIAJAN07-ID	4	5	B	-
Link to original source	Name found in original source i.e SMU/MUID				
Gelisol % of polygon	GELISOL_PCT	3	3	I	-
Histosol % of polygon	HISTOSOL_PCT	3	3	I	-
Mollisol % of polygon	MOLLISOL_PCT	3	3	I	-
Vertisol % of polygon	VERTISOL_PCT	3	3	I	-
Aridisol % of polygon	ARIDISOL_PCT	3	3	I	-
Andisol % of polygon	ANDISOL_PCT	3	3	I	-
Entisol % of polygon	ENTISOL_PCT	3	3	I	-
Ultisol % of polygon	ULTISOL_PCT	3	3	I	-
Spodosol % of polygon	SPODOSOL_PCT	3	3	I	-
Inceptisol % of polygon	INCEPTISOL_PCT	3	3	I	-
Alfisol % of polygon	ALFISOL_PCT	3	3	I	-
Natric soils % of polygon	NATRIC_PCT	3	3	I	-
Aqu soils % of polygon	AQU_PCT	3	3	I	-
Water % of polygon	WATER_PCT	3	3	I	-

DESCRIPTION	ITEM NAME	IN	OUT	TYPE	DEC
Rockland % of polygon	ROCKLAND_PCT	3	3	I	-
Glacier % of polygon	GLACIER_PCT	3	3	I	-
Miscellaneous % of polygon	MISC_PCT	3	3	I	-
Gelisol — Turbel % of polygon	TURBEL_PCT	3	3	I	-
Gelisol — Orthel % of polygon	ORTHEL_PCT	3	3	I	-
Gelisol — Histel % of polygon	HISTEL_PCT	3	3	I	-
Total	TOTAL_PCT	3	3	I	-
Permafrost extent	EXTENT	4	4	C	-
Gelisol area (m^2)	GE_AREA	16	16	N	1
Alfisol area (m^2)	AL_AREA	16	16	N	1
Entisol area (m^2)	EN_AREA	16	16	N	1
Inceptisol area (m^2)	IN_AREA	16	16	N	1
Spodosol area (m^2)	SP_AREA	16	16	N	1
Natric soils area (m^2)	NA_AREA	16	16	N	1
Aqu soil area (m^2)	AQ_AREA	16	16	N	1
Vertisol area (m^2)	VE_AREA	16	16	N	1
Mollisol area (m^2)	MO_AREA	16	16	N	1
Histosol area (m^2)	HI_AREA	16	16	N	1
Aridisol area (m^2)	AR_AREA	16	16	N	1
Andisol area (m^2)	AN_AREA	16	16	N	1
Ultisolarea (m^2)	UL_AREA	16	16	N	1
Turbel area (m^2)	GET_AREA	16	16	N	1
Orthel area (m^2)	GEO_AREA	16	16	N	1
Histel area (m^2)	GEH_AREA	16	16	N	1
Rockland area (m^2)	ROCK_AREA	16	16	N	1
Glacier area (m^2)	GLACIER_AREA	16	16	N	1
Miscellaneous area (m^2)	MISC_AREA	16	16	N	1
SOCM 30cm depth Gelisol (kg)	GE_30SOCM	16	16	N	1
SOCM 30cm depth Alfisol (kg)	AL_30SOCM	16	16	N	1
SOCM 30cm depth Entisol (kg)	EN_30SOCM	16	16	N	1

DESCRIPTION	ITEM NAME	IN	OUT	TYPE	DEC
SOCM 30cm depth Inceptisol(kg)	IN_30SOCM	16	16	N	1
SOCM 30cm depth Spodosol(kg)	SP_30SOCM	16	16	N	1
SOCM 30cm depth Natric (kg)	NA_30SOCM	16	16	N	1
SOCM 30cm depth Aqu soils(kg)	AQ_30SOCM	16	16	N	1
SOCM 30cm depth Vertisol (kg)	VE_30SOCM	16	16	N	1
SOCM 30cm depth Mollisol (kg)	MO_30SOCM	16	16	N	1
SOCM 30cm depth Histosol (kg)	HI_30SOCM	16	16	N	1
SOCM 30cm depth Aridisol (kg)	AR_30SOCM	16	16	N	1
SOCM 30cm depth Andisol (kg)	AN_30SOCM	16	16	N	1
SOCM 30cm depth Ultisol (kg)	UL_30SOCM	16	16	N	1
SOCM 30cm depth Turbel (kg)	GET_30SOCM	16	16	N	1
SOCM 30cm depth Orthel (kg)	GEO_30SOCM	16	16	N	1
SOCM 30cm depth Histel (kg)	GEH_30SOCM	16	16	N	1
SOCM 100cm depth Gelisol (kg)	GE_100SOCM	16	16	N	1
SOCM 100cm depth Alfisol (kg)	AL_100SOCM	16	16	N	1
SOCM 100cm depth Entisol (kg)	EN_100SOCM	16	16	N	1
SOCM 100cm depth Inceptisol (kg)	IN_100SOCM	16	16	N	1
SOCM 100cm depth Spodosol (kg)	SP_100SOCM	16	16	N	1
SOCM 100cm depth Natric (kg)	NA_100SOCM	16	16	N	1
SOCM 100cm depth Aqu (kg)	AQ_100SOCM	16	16	N	1
SOCM 100cm depth Vertisol (kg)	VE_100SOCM	16	16	N	1
SOCM 100cm depth Mollisol (kg)	MO_100SOCM	16	16	N	1
SOCM 100cm depth Histosol (kg)	HI_100SOCM	16	16	N	1
SOCM 100cm depth Aridisol (kg)	AR_100SOCM	16	16	N	1
SOCM 100cm depth Andisol (kg)	AN_100SOCM	16	16	N	1
SOCM 100cm depth Ultisol (kg)	UL_100SOCM	16	16	N	1
SOCM 100cm depth Turbel (kg)	GET_100SOCM	16	16	N	1
SOCM 100cm depth Orthel (kg)	GEO_100SOCM	16	16	N	1
SOCM 100cm depth Histel (kg)	GEH_100SOCM	16	16	N	1

DESCRIPTION	ITEM NAME	IN	OUT	TYPE	DEC
SOCC 30cm depth polygon (kg/m^2)	SOCC_30CM	8	8	N	1
SOCC 100cm depth polygon (kg/m^2)	SOCC_100CM	8	8	N	1
Soil Area (m^2)	SOIL_AREA	16	16	N	1
SOCM 30cm depth polygon (kg)	SOCM_30CM	16	16	N	1
SOCM 100cm depth polygon (kg)	SOCM_100CM	16	16	N	1