Supplement to “Global soil water characteristics datasets and parameters” (https://doi.org/10.5281/zenodo.5547338)

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1. Licence

2. Citation

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3. Data Description

The representation of land surface processes in hydrological and climatic models is critically dependent on the soil water characteristics curve (SWCC) that defines the hydrological behavior of the unsaturated soil layers. The SWCC depends not only on soil texture but is also a function of soil structure (aggregates, biopores) and clay mineral type. Despite the availability of SWCC datasets in the literature, significant efforts are required to harmonize and fill in gaps in data before parameters can be determined and implemented in modeling applications. In this work, 15,259 SWCCs from 2,702 sites were assembled from published literature and other sources, standardized, and quality-checked to obtain global database of soil hydraulic properties (GSHP). The GSHP database covers most regions across the globe, with the highest number of curves from North America followed by Africa, Europe, Asia, South America, Australia/Oceania. In addition to SWCCs, other soil variables such as soil texture (12,233 measurements), bulk density (15,125 measurements), and soil organic carbon (2,255 measurements) are also listed in the database.

The data is arranged in one file. The "**WRC_dataset_surya_et_al_2021_final.csv"** presents the soil water characteristics curves data (SWCC), saturated hydraulic conductivity data, soil physical and chemical properties. Note that the SWCC data were fitted with the model of van Genuchten (VG) using "soilhypfit" package (Papritz, 2021).

Papritz, A. soilhypfit: Modelling of Soil Water Retention and Hydraulic Conductivity Data (2022). R package version 0.1-5.

3.1 Description of file "WRC_dataset_surya_et_al_2021_final.csv"

Table 1: Description and units of the variables listed in the database **WRC_dataset_surya_et_al_2021_final.csv** (layer_id, disturbed/undisturbed samples, climate classes, profile_id, reference, DOIs_URLs, methods used, longitude and latitude (decimal degree), top and bottom of soil sample (cm), horizon designation, dry and 33 kPa bulk density (g cm^{-3}), soil organic carbon content (%), soil textural class, sand, silt, and clay content (%), soil reaction, saturated hydraulic conductivity measured in lab or field (cm day^{-1}), porosity (m^3/m^3), gravimetric water content at 33 kPa (kg/kg), lab measured suction head (m) and corresponding volumetric water content (%), field measured suction head (m) and corresponding volumetric water content (m^3/m^3), soil texture classes to define the limits for vG parameters and source of the data, minimum and maximum value of location accuracy (m), classes for location accuracy, shape parameter and standard error of α (m^{-1}), pore size distribution parameter and standard error of n, residual water content (m^3/m^3), saturated water content (m^3/m^3), likelihood-based confidence intervals of α and n for 3 confidence levels (0.5, 0.8, and 0.95), and quality indicator of SWCCs. NA is 'no value'. Column names are also explained in Table 2 of main paper.

Headers	**Description**	**Units**
layer_id	Unique ID of each SWCC	----
disturbed_undisturbed	Sample soil structure disturbed or undisturbed during the analysis	----
climate_classes	Climate information (temperate, boreal, tropical, arid etc.)	----
profile_id	Unique ID of each profile	----
reference	Data reference	----
DOIs_URLs	Data DOIs or URLs	----
method	Method used to measure the SWCC	----
method_keywords	Comments on the methods if applicable	----

latitude_decimal_degrees	Ranges up to +90 degrees down to -90 degrees	Decimal degree
longitude_decimal_degrees	Ranges up to +180 degrees	Decimal degree

	down to -180 degrees	
hzn_desgn	Soil horizon designation	----
hzn_top	Upper depth of soil sample	cm
hzn_bot	Lower depth of soil sample	cm
db_33	Bulk density at 3.3 m matric potential	g cm^{-3}
db_od	Dry bulk density	g cm^{-3}
oc	Soil organic carbon content	%
tex_psda	Soil texture classes based on USDA	----
sand_tot_psa_percent	Mass of soil particle, > 0.05 and < 2 mm for fine earth	dekagram/kg
silt_tot_psa_percent	Mass of soil particle, > 0.05 and < 2 mm for fine earth	dekagram/kg
clay_tot_psa_percent	Mass of soil particles, < 0.002 mm for fine earth	dekagram/kg
ph_h2o	Soil reaction	----
ksat_field	Soil saturated hydraulic conductivity from field	cm/day
ksat_lab	Soil saturated hydraulic conductivity from lab	cm/day
porosity	Porosity	m^3/m^3
WG_33kpa	Gravimetric water content at 3.3 m matric potential	kg/kg
lab_head_m	Lab measured matric potential	m
lab_wrc	Lab measured volumetric water content	m^3/m^3
field_head_m	Field measured matric potential	m
field_wrc	Field measured volumetric water content	m^3/m^3
keywords_total_porosity	Extra information regarding porosity	----
SWCC_classes	SWCC classes (indicators for presence of wet- and dry-end information)	----
source_db	Source of the data	----
location_accuracy_min	Minimum value of location accuracy	m
location_accuracy_max	Maximum value of location accuracy	m
broad_accuracy_classes	Classes for location accuracy	----
α	VG shape parameter	m^{-1}

se_ α	Standard error of α vG shape parameter	m^{-1}
n	VG shape parameter	----
se_n	Standard error of n vG shape parameter	----
θ_r	Residual water content	m^3/m^3
θ_s	Saturated water content	m^3/m^3
q2.5_ α	2.5th percentile of α	m^{-1}
q97.5_ α	97.5th percentile of α	m^{-1}
q10_ α	10th percentile of α	m^{-1}
q90_ α	90th percentile of α	m^{-1}
q25_ α	25th percentile of α	m^{-1}
q75_ α	75th percentile of α	m^{-1}
q2.5_ n	2.5th percentile of n	----
q97.5_ n	97.5th percentile of n	----
q10_ n	10th percentile of n	----
q90_ n	90th percentile of n	----
q25_ n	25th percentile of n	----
q75_ n	75th percentile of n	----
data_flag	Classes that defines the quality of the vG parameters	----

Database reference:

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