

Supplement to “SoilKsatDB: a global compilation of soil saturated hydraulic conductivity measurements”

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3. Data Description

Abstract:

Saturated soil hydraulic conductivity (Ksat) is a key parameter in many hydrological and climatic modeling applications, as it controls the partitioning between precipitation, infiltration, and runoff. Ksat is often determined using pedotransfer functions developed using soil basic properties such as soil texture and bulk density due to the unavailability of the measured Ksat dataset. However, many datasets of measured Ksat values are available in the literature, but significant efforts are required to standardize the databases. In this work, 1,910 sites with 13,267 Ksat measurements were assembled from published literature and other sources, standardized, and quality-checked to provide a global database of soil saturated hydraulic conductivity (SoilKsatDB). Ksat data include 4,460 values from field measurement and 8,807 values from laboratory measurements. In particular, different types of infiltrometers were used for field measurements, whereas constant or falling head methods were predominantly used in laboratory analyses. The SoilKsatDB covers most global regions, with the highest data density from the USA, followed by Europe, Asia, South America, Africa, and Australia. In

addition to Ksat, other soil variables such as soil texture (11,667 measurements), bulk density (11,151 measurements), soil organic carbon (9,787 measurements), field capacity (7,389), and wilting point (7,418) are also included in the dataset.

3.1. File description

Table1: Description and units of the variables listed in the database ([soilksat_points.arff](#) and [excel file](#)). We used the same codes adopted in the National Cooperative SoilSurvey (NCSS) Soil Characterization Database (National Cooperative Soil Survey, 2016).

Headers	Description	Dimension
site_key	Data set identifier	----
usiteid	Site Id	----
site_obsdate	Date of sample acquired	----
longitude_decimal_degrees	Ranges up to +180 degrees down to -180 degrees	Decimal degree
longitude_decimal_degrees	Ranges up to +90 degrees down to -90 degrees	Decimal degree
labsampnum	Number of sample	----
layer_sequence	Layer sequence	----
hzn_top	Top depth of soil sample	cm
hzn_bot	Lower depth of soil sample	cm
db_13b	Bulk density (33kPa)	g/cm ³
db_od	Bulk density (Oven Dry)	g/cm ³
COLEws	Coefficient of Linear Extensibility (COLE) whole soil	ratio
w6clod	Soil water content at 6 kPa	vol %
w10clod	Soil water content at 10 kPa	vol %
w3cld	Soil water content at 33 kPa (field capacity)	vol %
w15l2	Soil water content at 1500 kPa	vol %

	(wilting point)	
w15bfm	Water Content 1500 kPa moist <2mm	wt %
adod	Air-Dry/Oven-Dry	ratio
wrd_ws13	Water Retention Difference whole soil, 1500-kPa suction and an upper limit of usually 33-kPa	cm ³ / cm ⁻³
cec7_cly	CEC-7/Clay ratio	ratio
w15cly	CEC/Clay ratio at 1500 kPa	ratio
tex_psa	Soil texture classes based on USDA	----
clay_tot_psa	Mass of soil particles, < 0.002 mm	%
silt_tot_psa	Mass of soil particles, > 0.002 and < 0.05 mm	%
sand_tot_psa	Mass of soil particle, > 0.05 and < 2 mm	%
wpg2	Coarse fragments >2-mm weight fraction	% wt
oc	Soil organic carbon content	%
ph_kcl	pH, 1N KCl	ratio
ph_h2o	Soil acidity	----
cec_sum	Sum of Cations (CEC-8.2)	cmol(+)/kg
cec_nh4	NH4OAc, pH 7 (CEC-7)	cmol(+)/kg
Ksat_lab	Soil saturated hydraulic conductivity from lab	cm/day
Ksat_field	Soil saturated hydraulic conductivity from field	cm/day
source_db	Sources of the datasets	----
confidence_degree	Reliability on the data set based on spatial locations	----
location_id	Combination of latitude and longitude	----

3.2. File inventory

Files mentioned in Zenodo.

Table 2: Example for an associated “List of Files”

File name	Description
sol_hydro.pnts_horizons.arff	ARFF format: This is the dataset to show the all soil hydraulic properties dataset (soil saturated hydraulic conductivity, water content at 33kpa and 1500kpa. Please visit the link to see the distribution of points and the import steps. https://gitlab.com/openlandmap/compiled-ess-point-data-sets/-/tree/master/themes/sol/SoilHydroDB
sol_ksat.pnts_horizons.arff	ARFF format: Only Ksat dataset
sol_hydro.pnts_horizons.csv.gz	CSV format: All soil hydraulic properties dataset
sol_ksat.pnts_horizons.csv.gz	CSV format: Only Ksat dataset

We provided both ARFF and CSV format. Note that the ARFF file format is the default format used by OpenML.org and several other organizations (hence a recommended standard for multi-platform data exchange). An ARFF-file is de facto a CSV with a specific header. Read more about ARFF at: <https://www.cs.waikato.ac.nz/~ml/weka/arff.html>. ARFF files can be imported into Python and Matlab, i.e. they work cross-platform. One can also open the file using Open Office or similar tabular data editors:

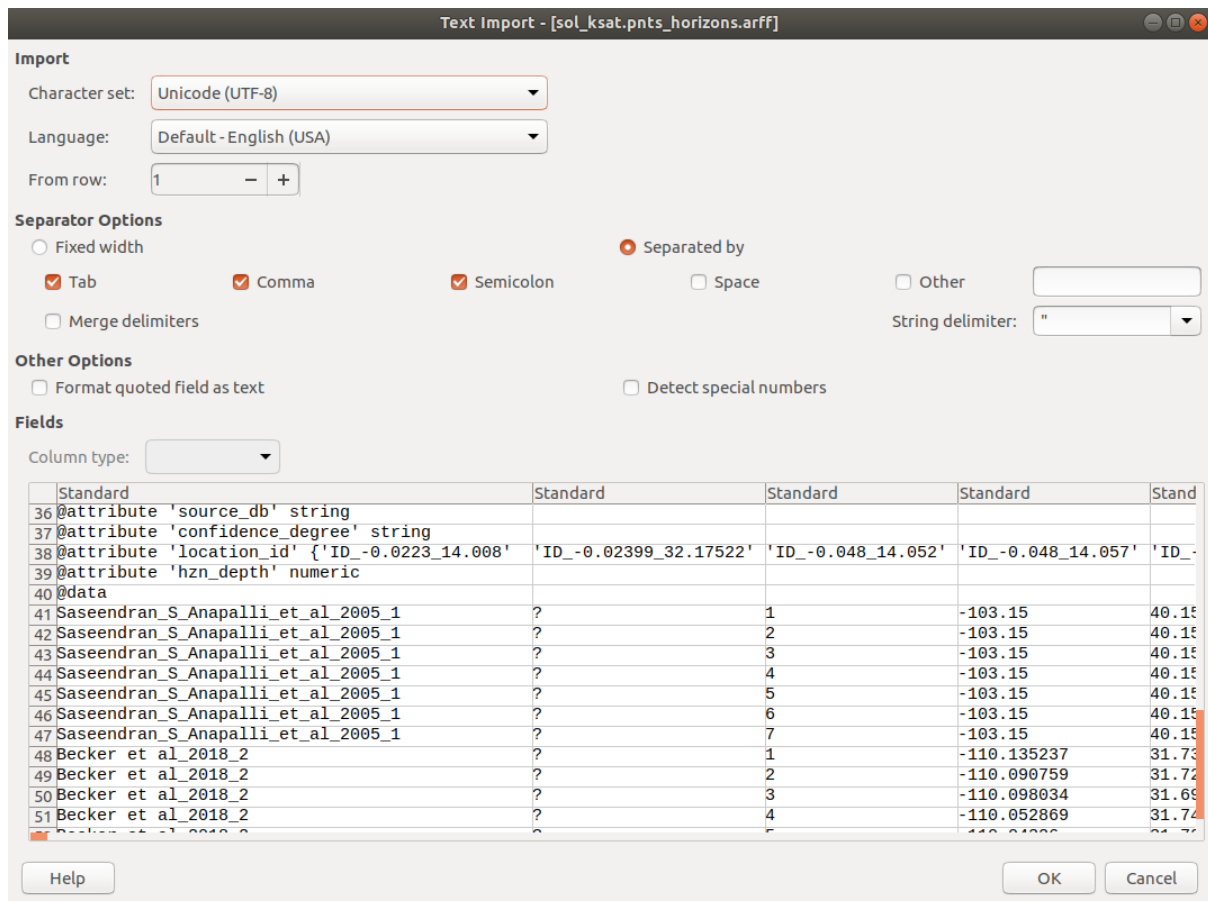


Figure1. Example: to open the arff file in tabular data editor. “?” referred as a NA.

References to the dataset

Data extracted from the literature (each dataset referred with the source in the dataset, look at site_key column):

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