

Accessing WoSIS data



World Soil Information

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2018-05-29, Wageningen

World Soil Information Service (WoSIS)

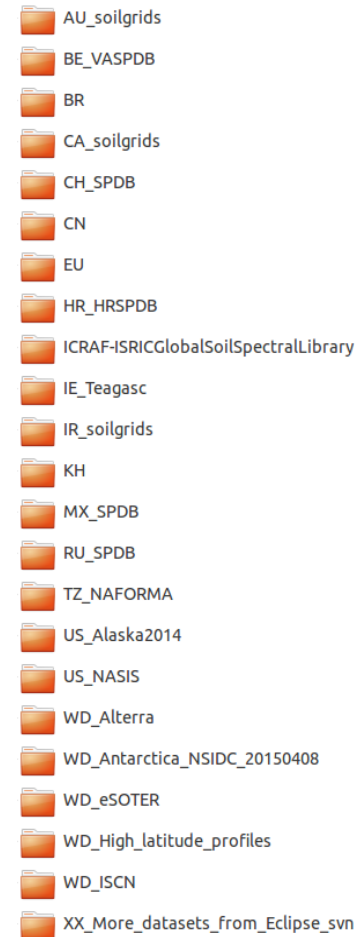
The aims of the WoSIS are:

- Safeguard world soil data 'as is'
- Share soil data (point, polygon) upon their standardization and harmonization
- Provide quality-assessed soil data for digital soil mapping and a range of environmental applications



Import steps

- Select the dataset to be imported, using criteria like:
 - type of license
 - number of profiles
 - spatial distribution
- Convert the dataset into PostgreSQL format. Not into WoSIS! But to a separate schema, respecting the source data structure.
- Import the data into WoSIS.

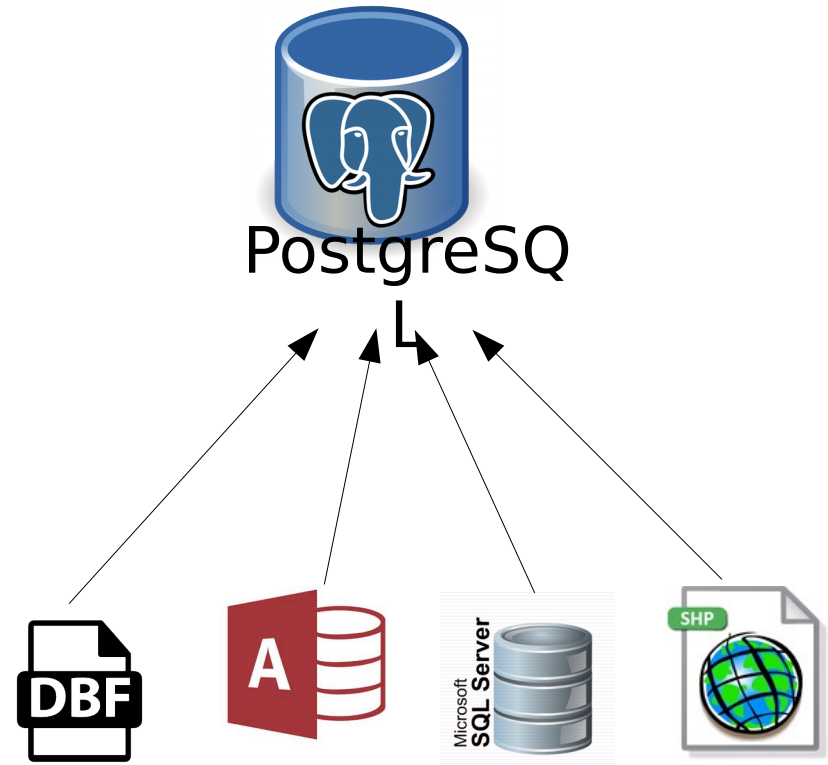


- AU_soilgrids
- BE_VASPD
- BR
- CA_soilgrids
- CH_SPDB
- CN
- EU
- HR_HRSPDB
- ICRAF-ISRICGlobalSoilSpectralLibrary
- IE_Teagasc
- IR_soilgrids
- KH
- MX_SPDB
- RU_SPDB
- TZ_NAFORMA
- US_Alaska2014
- US_NASIS
- WD_Alterra
- WD_Antarctica_NSIDC_20150408
- WD_eSOTER
- WD_High_latitude_profiles
- WD_ISCN
- XX_More_datasets_from_Eclipse_svn



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Import steps

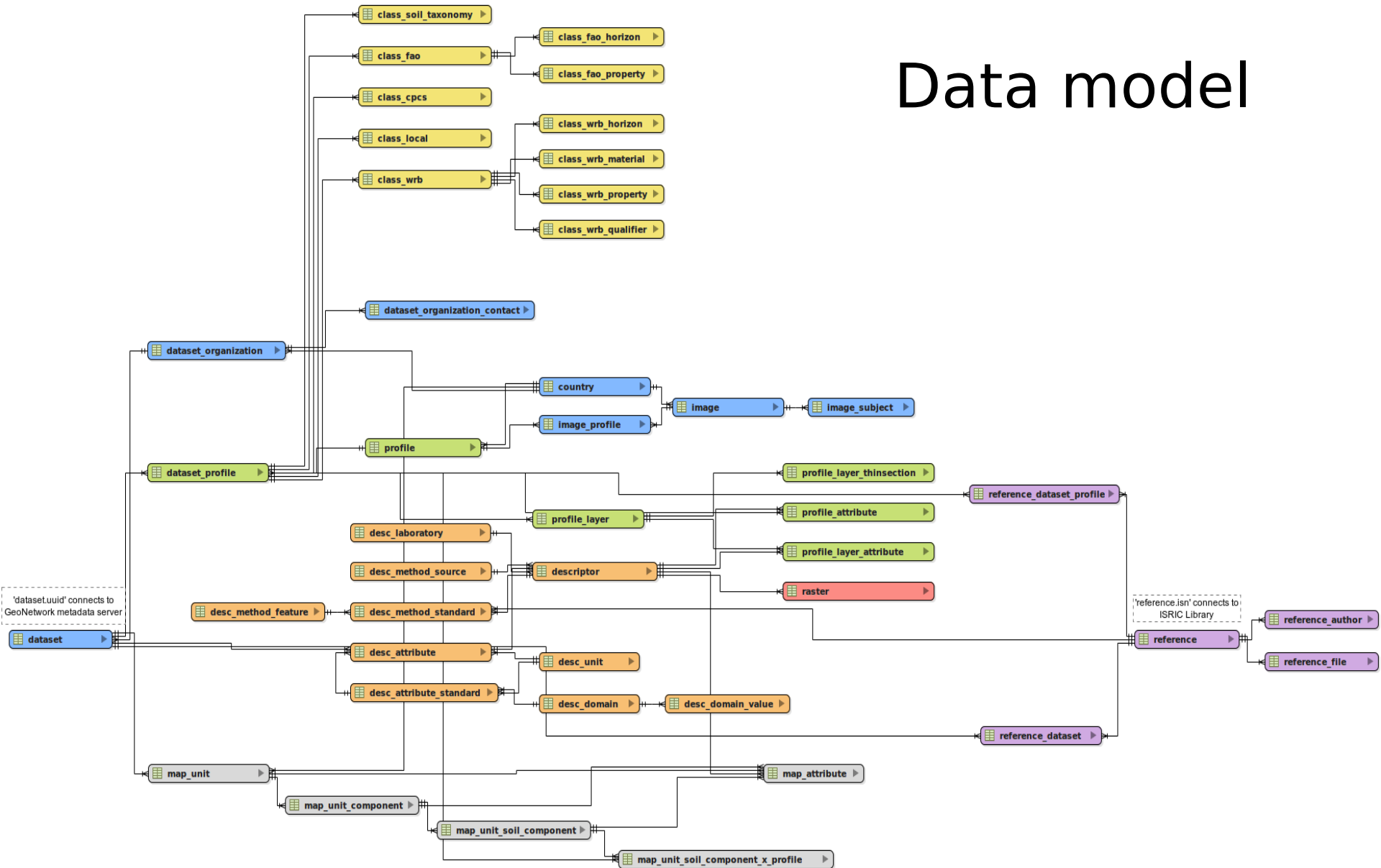
- Select the dataset to be imported, using criteria like:
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- Add primary keys
- Add foreign keys
- Grant permissions
- Change Data types
- Create geometry (Point,4326)
- Add comments on objects
- Fix referential integrity violations
- Fix repeated values
- Check codes and domains
- Fix Typos
- Backup

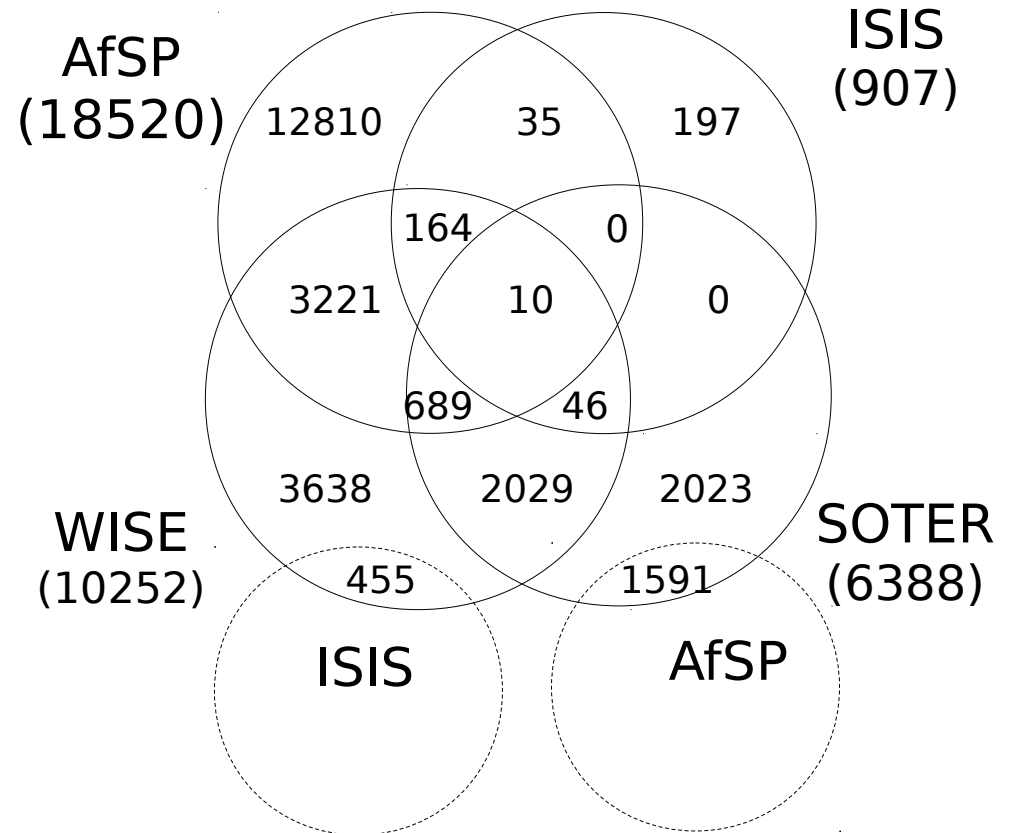


Data model



Standardization steps

- Identify repeated profiles
- Attribute names
- Units
- Conversion factors
- Measured values
- Analytical methods



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AfSP-1.2	Sand	% weight/weight	Sand total	g/100g	*1.0
CanSIS	PS SAND T	% weight/weight	Sand total	g/100g	*1.0
Caturrita-BR	Sand	g/kg	Sand total	g/100g	/10.0
ISIS	Total sand	% weight/weight	Sand total	g/100g	*1.0
NCSS	sand tot psa		Sand total	g/100g	*1.0
SMaria-BR	Sand	g/kg	Sand total	g/100g	/10.0
SOTER-AR	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-CAF	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-CN	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-CU	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-EUR	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-KE	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-KET	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-LAC	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-MW	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-NP	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-SAF	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-SN&GM	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-TN	Total sand	% weight/weight	Sand total	g/100g	*1.0
SOTER-ZA	Total sand	% weight/weight	Sand total	g/100g	*1.0
WISE	Sand content	% weight/weight	Sand total	g/100g	*1.0



Standardization steps

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source_value text	standard_value numeric(6,2)
104	10.40
116	11.60
144	14.40
145	14.50
149	14.90
155	15.50
163	16.30
164	16.40
165	16.50
169	16.90
170	17.00
175	17.50
179	17.90
182	18.20
184	18.40
186	18.60
187	18.70
189	18.90
191	19.10
192	19.20
196	19.60
197	19.70
198	19.80
200	20.00
201	20.10



Standardization steps

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Coarse sand text	Middle sand text	Fine sand text	Coarse silt text	Middle silt text	Fine silt text	Clay text	total_sand numeric	total_silt numeric	total numeric
1.01	2.87	19.62	12.95	19.02	15.05	29.4	23.50	47.02	99.99
1.44	6.77	15.62	14.46	18.61	16.36	26.7	23.83	49.43	100.01
0.84	2.68	16.19	13.55	17.77	15.03	33.9	19.71	46.35	100.00
2.55	3.52	18.23	11.38	20.24	20.05	24.0	24.30	51.67	100.00
3.65	7.43	22.95	17.06	20.80	11.74	16.3	34.03	49.60	100.00
4.85	15.93	25.91	15.35	19.99	6.67	11.2	46.69	42.01	99.99
2.07	10.02	31.97	13.14	17.34	10.44	15.0	44.06	40.92	99.99
30.26	14.29	9.71	4.59	8.47	12.27	20.4	54.26	25.33	100.00
25.84	17.45	10.35	5.03	9.47	12.33	19.5	53.64	26.83	99.99
27.43	15.65	12.33	5.35	9.45	12.74	17.0	55.41	27.54	100.02
26.26	17.62	11.19	1.98	8.33	14.09	20.5	55.07	24.40	100.00
41.55	14.78	11.04	2.67	6.50	11.22	12.2	67.37	20.39	100.00
0.28	0.89	6.86	7.51	19.29	21.89	43.2	8.03	48.69	100.00
0.34	1.13	6.82	9.49	19.54	21.71	40.9	8.29	50.74	100.00
0.12	0.95	6.60	8.86	20.76	22.37	40.3	7.67	51.99	99.99
0.27	0.88	6.86	9.89	19.78	21.85	40.4	8.01	51.52	100.00
0.68	1.59	9.52	9.34	18.83	19.06	40.9	11.79	47.23	100.00
1.40	2.44	13.89	13.57	20.46	13.75	34.4	17.73	47.78	99.99
1.80	2.76	15.14	13.03	17.41	13.82	36.0	19.70	44.26	100.01
3.01	3.45	15.77	13.65	18.45	12.85	32.8	22.23	44.95	100.00
4.20	14.61	18.46	7.30	10.08	11.11	34.2	37.27	28.49	100.00
4.22	15.83	18.63	6.72	7.68	9.89	37.0	38.68	24.29	100.00
2.67	15.32	21.23	6.71	9.58	11.36	33.1	39.22	27.65	100.00



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desc_attribute_standard_id character varying(100)	minimum numeric(6,2)	maximum numeric(6,2)
Bulk density fine earth	0.05	2.70
Bulk density whole soil	0.05	3.60
Calcium carbonate equivalent total	0.00	1000.00
Clay total	0.00	100.00
Coarse fragments gravimetric total	0.00	100.00
Coarse fragments volumetric total	0.00	100.00
Organic carbon	0.00	1000.00
pH CaCl2	1.50	13.00
pH H2O	1.50	13.00
pH KCl	1.50	13.00
pH NaF	1.50	13.00
Sand total	0.00	100.00
Silt total	0.00	100.00
Total carbon	0.00	1000.00
Water retention gravimetric	0.00	100.00
Water retention volumetric	0.00	100.00



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attribute_agg_name [PK] character varying	feature_name [PK] character	feature_option [PK] text
Sand	dispersion	Ammonium [NH4]
Sand	dispersion	no dispersion
Sand	dispersion	Sodium hexametaphosphate [(NaP03)6] - Calgon ty
Sand	dispersion	Sodium hydroxide [NaOH]
Sand	dispersion	unknown
Sand	instrument	analyzer
Sand	instrument	field hand estimate
Sand	instrument	hydrometer
Sand	instrument	sieve
Sand	instrument	unknown
Sand	pretreatment	Hydrogen peroxide [H2O2] plus Hydrochloric acid
Sand	pretreatment	Hydrogen peroxide [H2O2] plus mild Acetic acid
Sand	pretreatment	no pretreatment
Sand	pretreatment	pretreatment, deferration included
Sand	pretreatment	unknown
Sand	size	0.02 - 2 mm
Sand	size	0.05 - 0.1 mm
Sand	size	0.05 - 1.7 mm
Sand	size	0.05 - 1 mm
Sand	size	0.05 - 2 mm
Sand	size	0.06 - 2 mm
Sand	size	0.063 - 2 mm
Sand	size	0.10 - 0.25 mm
Sand	size	0.2 - 2 mm
Sand	size	0.25 - 0.5 mm
Sand	size	1 - 2 mm
Sand	size	unknown



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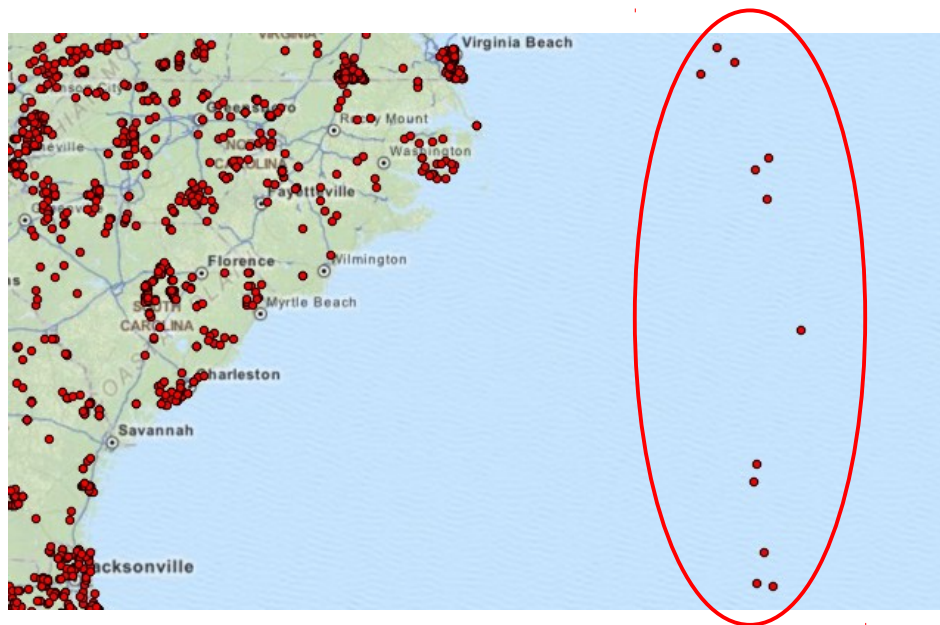
- Analytical methods

source_analytical_method_name text	standard_analytical_method_name text
Sand fraction (0.053 to 2 mm) determined	dispersion = Sodium hydroxide [NaOH], instrument = sieve,
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
NaOH 1N, shaking witho.remov.OM&carbonate	dispersion = Sodium hydroxide [NaOH], instrument = unknow
TE07-/- Bouyoucos. Sand= 0.2-2mm plus 50	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Calgon, shaking,without remov.OM&carbona	dispersion = Sodium hexametaphosphate [(NaPO3)6] - Calgon
Pipette method, full dispersion (c<0.001	dispersion = unknown, instrument = sieve, pretreatment =
TAMIZADO	dispersion = unknown, instrument = sieve, pretreatment =
Fine earth fraction; 0.25-0.10 mm by sie	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = Ammonium [NH4], instrument = sieve, pretreat
Hydrometer method, with dipersion treat	dispersion = unknown, instrument = hydrometer, pretreatme
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Fine earth fraction; 1.0-0.5 mm by siev	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = Ammonium [NH4], instrument = sieve, pretreat
TE07-/- Sand= 0.2-2mm plus 50% of 0.02-0	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Hydrometer method, with dispersion treat	dispersion = unknown, instrument = hydrometer, pretreatme
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Pipette method, with appropriate dispers	dispersion = unknown, instrument = sieve, pretreatment =
Fine earth fraction; 0.10-0.05 mm by sie	dispersion = unknown, instrument = sieve, pretreatment =
Hydrometer method, with dispersion treat	dispersion = unknown, instrument = hydrometer, pretreatme



Last steps

- Filter profiles (water, wrong country,...)
- Refresh tables for GeoServer



Last steps

- Filter profiles (water, wrong country,...)
- Refresh tables for GeoServer

The screenshot displays the GeoServer interface. On the left, a tree view shows the database structure under the 'isric' catalog. The 'web_services' table is highlighted with a red circle, and an arrow points to it from the 'web_services' entry in the tree. Below it, the 'wise' and 'wosis' entries are also circled in red. On the right, a list of tables is shown, including 'wosis_latest_bdfi33', 'wosis_latest_bdfiad', 'wosis_latest_bdfifm', 'wosis_latest_bdfins', 'wosis_latest_bdfiod', 'wosis_latest_bdws33', 'wosis_latest_bdwsad', 'wosis_latest_bdwsfm', 'wosis_latest_bdwsns', 'wosis_latest_bdwsod', 'wosis_latest_cecnsf', 'wosis_latest_cecph7', 'wosis_latest_cecph8', 'wosis_latest_cfgr', 'wosis_latest_cfvo', 'wosis_latest_clay', 'wosis_latest_ecec', 'wosis_latest_elco1x', 'wosis_latest_elcons', 'wosis_latest_elcosp', 'wosis_latest_layers', 'wosis_latest_nitkj', 'wosis_latest_orgc', 'wosis_latest_phaq', 'wosis_latest_phca', 'wosis_latest_phkc', 'wosis_latest_phnf', 'wosis_latest_phpbyi', 'wosis_latest_phpmh3', 'wosis_latest_phpols', and 'wosis_latest_phprt'. The 'wosis' table is highlighted in the list.

Table Name	Database	Description
wosis_latest_bdfi33	postgres	Standardized values of Bulk densi
wosis_latest_bdfiad	postgres	Standardized values of Bulk densi
wosis_latest_bdfifm	postgres	Standardized values of Bulk densi
wosis_latest_bdfins	postgres	Standardized values of Bulk densi
wosis_latest_bdfiod	postgres	Standardized values of Bulk densi
wosis_latest_bdws33	postgres	Standardized values of Bulk densi
wosis_latest_bdwsad	postgres	Standardized values of Bulk densi
wosis_latest_bdwsfm	postgres	Standardized values of Bulk densi
wosis_latest_bdwsns	postgres	Standardized values of Bulk densi
wosis_latest_bdwsod	postgres	Standardized values of Bulk densi
wosis_latest_cecnsf	postgres	Standardized values of Cation excl
wosis_latest_cecph7	postgres	Standardized values of Cation excl
wosis_latest_cecph8	postgres	Standardized values of Cation excl
wosis_latest_cfgr	postgres	Standardized values of Coarse fra
wosis_latest_cfvo	postgres	Standardized values of Coarse fra
wosis_latest_clay	postgres	Standardized values of Clay total
wosis_latest_ecec	postgres	Standardized values of Effective c
wosis_latest_elco1x	postgres	Standardized values of Electrical c
wosis_latest_elcons	postgres	Standardized values of Electrical c
wosis_latest_elcosp	postgres	Standardized values of Electrical c
wosis_latest_layers	postgres	All standardized layers and attribu
wosis_latest_nitkj	postgres	Standardized values of Total nitro
wosis_latest_orgc	postgres	Standardized values of Organic ca
wosis_latest_phaq	postgres	Standardized values of pH H2O
wosis_latest_phca	postgres	Standardized values of pH CaCl2
wosis_latest_phkc	postgres	Standardized values of pH KCl
wosis_latest_phnf	postgres	Standardized values of pH NaF
wosis_latest_phpbyi	postgres	Standardized values of Phosphoru
wosis_latest_phpmh3	postgres	Standardized values of Phosphoru
wosis_latest_phpols	postgres	Standardized values of Phosphoru
wosis_latest_phprt	postgres	Standardized values of Phosphoru

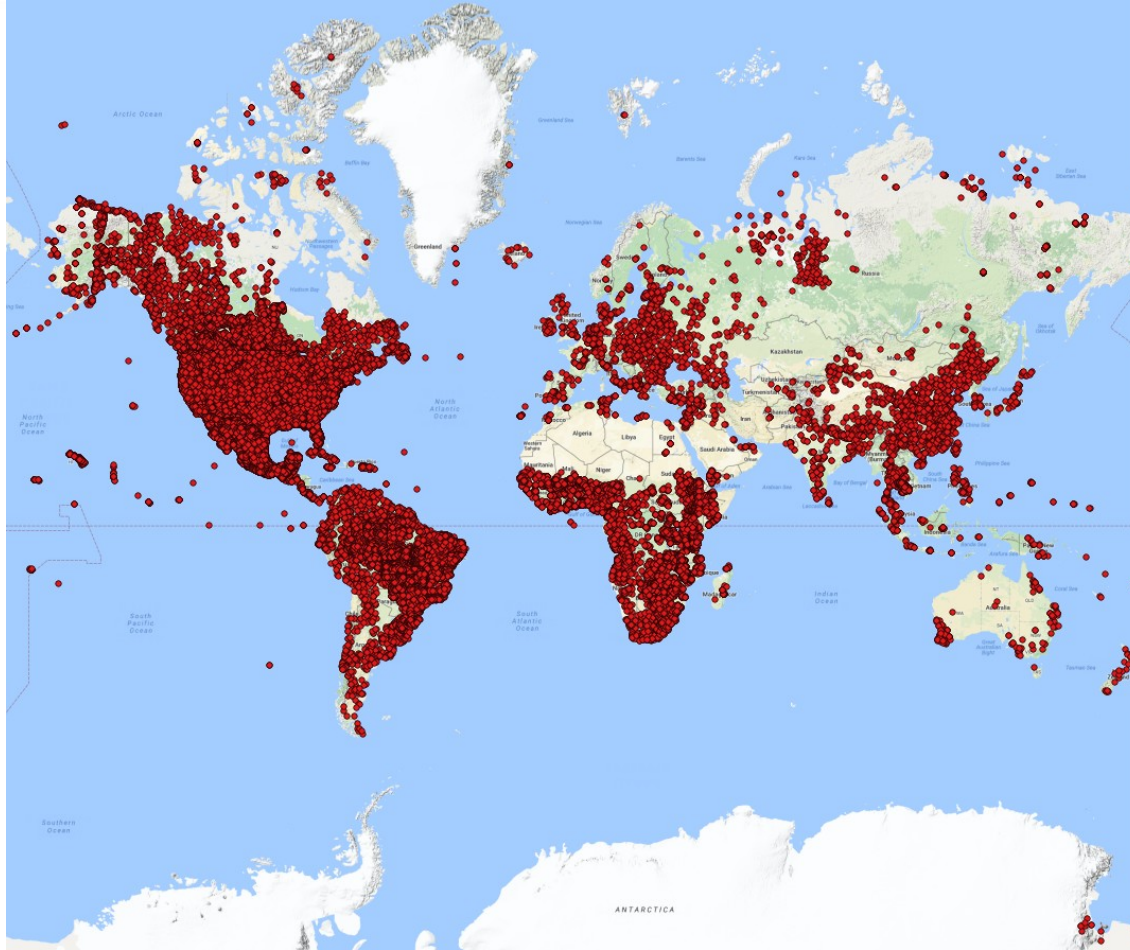


Imported datasets

dataset_id character varying(20)	dataset_title character varying(220)	n_profiles integer	n_layer_rows_inserted integer
US-NCSS	National Cooperative Soil Survey, National Cooperative Soil Cl	64049	24263841
AF-AfSP-1.2	Africa Soil Profiles Database	18514	1619478
MX-INEGI	Conjunto de Datos Edafológicos Alfanuméricos, Serie I & II, Co	12535	656423
WD-WISE	World Inventory of Soil Emission Potentials	10242	701669
CA-CanSIS	Canadian Soil Information Service	7177	781624
BR-Cooper	National Soil Profile Database for Brazil Available to Internat	5616	186148
BR-Bernoux	Radam Brazil Project - Exploratory Soil Surveys / Projeto Rada	3795	406487
KH-CambSoils	Cambodia Soils Data Base	1712	55933
LAC-SOTER	Soil and Terrain Database for Latin America and the Caribbean	1672	117614
CN-SOTER	Soil and Terrain Database for China	1430	58242
SAF-SOTER	Soil and Terrain Database for Southern Africa	969	74702
WD-ISIS	ISRIC Soil Information System	907	323319
EU-SOTER	Soil and Terrain Database for Central and Eastern Europe	661	44192
ZA-SOTER	Soil and Terrain Database for South Africa	619	48929
KE-SOTER	Soil and terrain database for Kenya	440	35709
BR-Samuel-Rosa-2015	Alessandro Samuel-Rosa PhD thesis data from Santa Maria, Rio G	410	9638
MW-SOTER	Soil and Terrain Database for Malawi	375	19879
BE-UplandsI	Soil sampling in the belgian uplands I	305	21779
AR-SOTER	Soil and Terrain Database for Argentina	222	10008
CAF-SOTER	Soil and Terrain Database for Central Africa	165	21421
NP-SOTER	Soil and Terrain Database for Nepal	156	8787
NL-Kempen	Bas Kempen data from Drenthe province in The Netherlands	150	1253
KET-SOTER	Soil and Terrain Database for Upper Tana River Catchment	140	9479
SN&GM-SOTER	Soil and Terrain Database for Senegal and the Gambia	96	5467
BT-Caspari	Thomas Caspari PhD thesis data from Bhutan	80	13492
TN-SOTER	Soil and Terrain Database for Tunisia	56	5317
BR-Samuel-Rosa-2011	Alessandro Samuel-Rosa data from Caturrita, Santa Maria, Rio G	48	863
CU-SOTER	Soil and Terrain Database for Cuba	30	3363



WoSIS in numbers



- **126 589** unique profiles
- **110 897** profiles with geometry
- **30 million** soil properties measurements
- **4 million** soil properties measurements being served through WFS
- **10** soil properties being served through WFS:
 - Bulk density
 - Calcium carbonate
 - Carbon (Total / Organic)
 - Coarse fragments
 - pH
 - Water retention
 - Texture (Sand, Silt, Clay)
 - Cation exchange capacity
 - Electrical conductivity
 - Phosphorus
 - Total nitrogen
 - Classification: FAO, WRB, S. taxonomy



WoSIS products

Latest (dynamic) dataset: This dataset contains the most recent complement of standardised soil data served from WoSIS. Being dynamic, the dataset will grow once new point data are standardised, additional soil properties are considered, and/or when possible corrections are required. The latest dataset is served through an OGC-compliant WFS (Web Feature Service). The point data can be accessed from GIS or R.

Snapshot (static) dataset: These are a representation of the complement of standardised data available at a given moment (e.g. July 2016). Each snapshot is given a unique name and digital object identifier (doi) for consistent citation purposes. So far, one snapshot has been released. Served as a zipped txt files. Methodological details are provided in a paper in Earth System Data Journal.



WoSIS - peer review





Earth System Science Data

The Data Publishing Journal



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Earth Syst. Sci. Data, 9, 1–14, 2017
<https://doi.org/10.5194/essd-9-1-2017>
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17 Jan 2017

WoSIS: providing standardised soil profile data for the world

Niels H. Batjes, Elói Ribeiro, Ad van Oostrum, Johan Leenaars, Tom Hengl, and Jorge Mendes de Jesus
ISRIC – World Soil Information, Wageningen, 6708 PB, the Netherlands

Received: 22 Jul 2016 – Discussion started: 21 Oct 2016
Revised: 19 Dec 2016 – Accepted: 22 Dec 2016 – Published: 17 Jan 2017

Abstract. The aim of the World Soil Information Service (WoSIS) is to serve quality-assessed, georeferenced soil data (point, polygon, and grid) to the international community upon their standardisation and harmonisation. So far, the focus has been on developing procedures for legacy point data with special attention to the selection of soil analytical and physical properties considered in the *GlobalSoilMap* specifications (e.g. organic carbon, soil pH, soil texture (sand, silt, and clay), coarse fragments (< 2 mm), cation exchange capacity, electrical conductivity, bulk density, and water holding capacity). Profile data managed in WoSIS were contributed by a wide range of soil data providers; the data have been described, sampled, and analysed according to methods and standards in use in the originating countries. Hence, special attention was paid to measures for soil data quality and the standardisation of soil property definitions, soil property values, and soil analytical method descriptions. At the time of writing, the full WoSIS database contained some 118 400 unique “shared” soil profiles, of which some 96 000 are georeferenced within defined limits. In total, this corresponds with over 31 million soil records, of which some 20 % have so far been quality-assessed and standardised using the sequential procedure discussed in this paper. The number of measured data for each property varies between profiles and with depth, generally depending on the purpose of the initial studies. Overall, the data lineage strongly determined which data could be standardised with acceptable confidence in accord with WoSIS procedures, corresponding to over 4 million records for 94 441 profiles. The publicly available data – WoSIS snapshot of July 2016 – are persistently accessible from ISRIC WDC-Soils through [doi:10.17027/isric-wdcsoils.20160003](https://doi.org/10.17027/isric-wdcsoils.20160003).

Citation: Batjes, N. H., Ribeiro, E., van Oostrum, A., Leenaars, J., Hengl, T., and Mendes de Jesus, J.: WoSIS: providing standardised soil profile data for the world, *Earth Syst. Sci. Data*, 9, 1–14, <https://doi.org/10.5194/essd-9-1-2017>, 2017.


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Short summary

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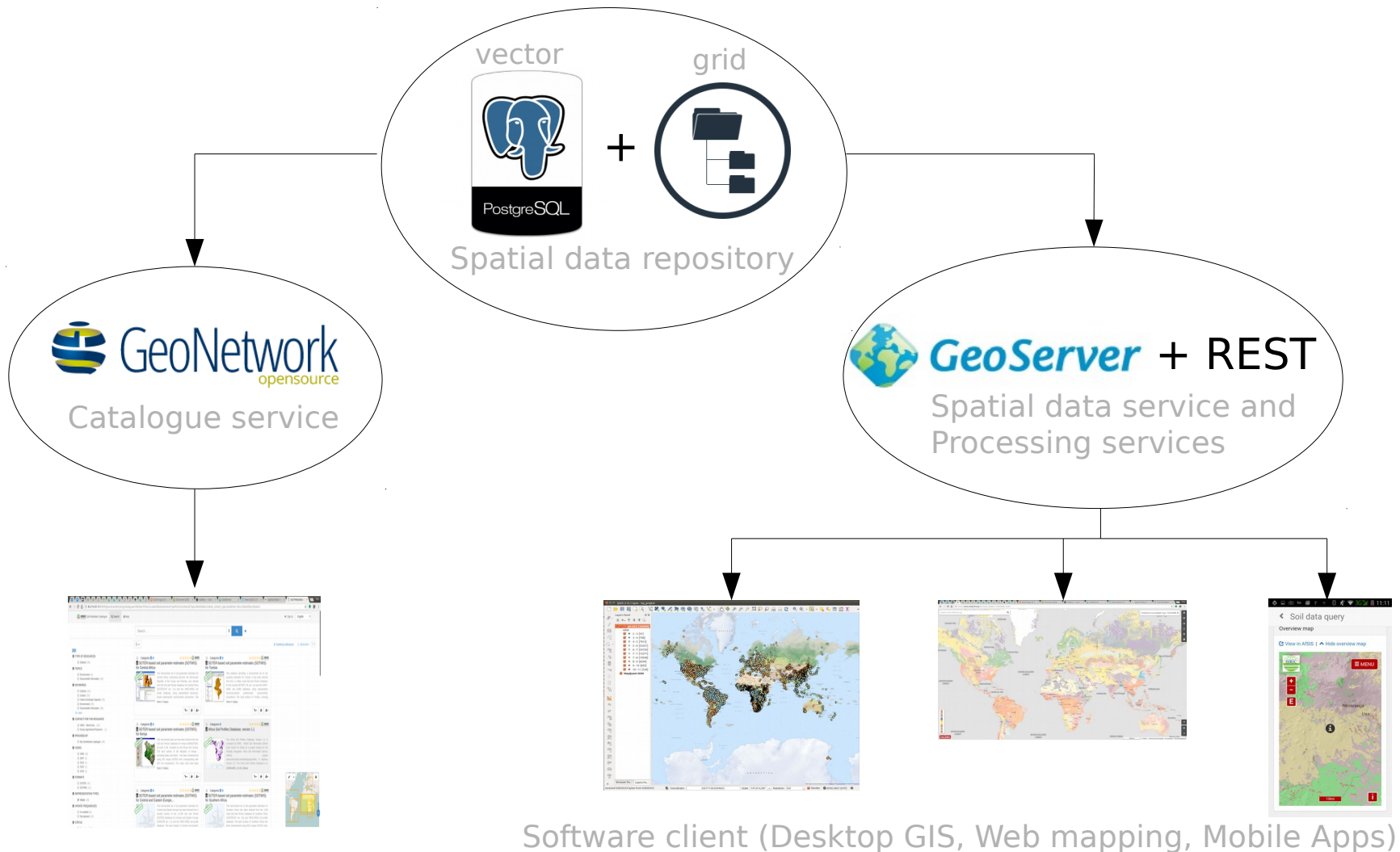
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Open Geospatial Consortium (OGC)



ISRIC Spatial data infrastructure



Thank you



World Soil Information

Niels Batjes
Eloi Ribeiro
Ad van Oostrum

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