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NFDI4Earth Pilot

SoilPulse

-

Towards Fair soil process data

→ 2min Madness

→ More on aims

→ More on data and issues

→ Metadataschema

→ (Meta-)Data queries

→ See the team

→ Even more on SoilPulse (Links)

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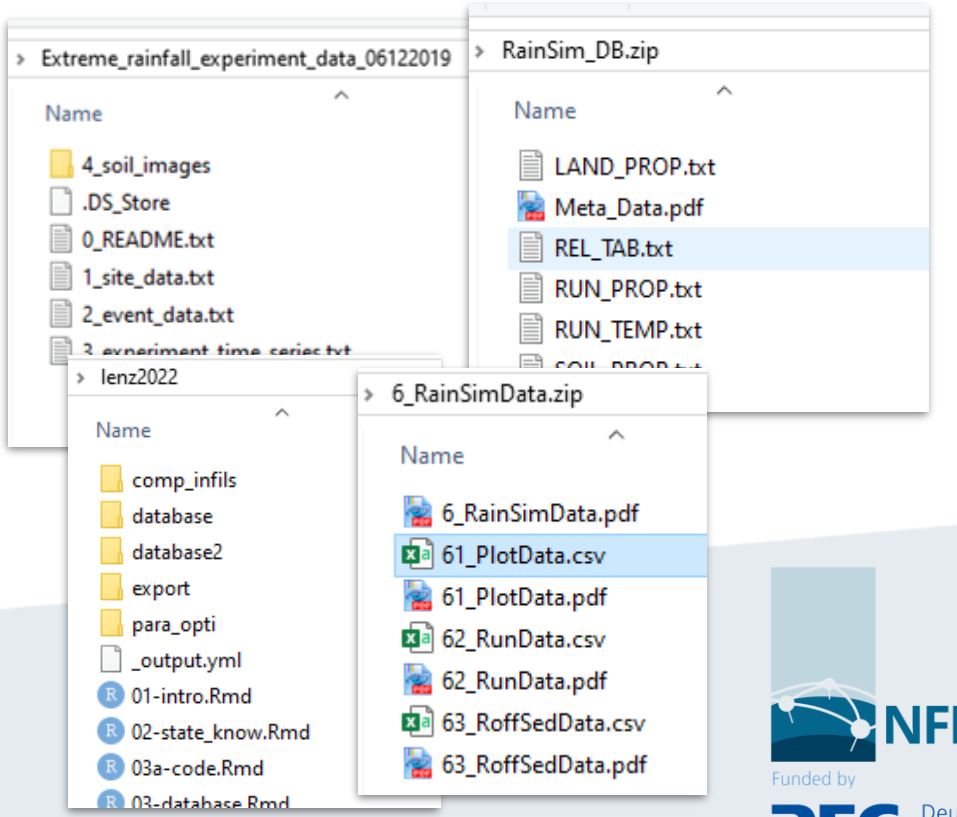
SoilPulse - Motivation

Topic: Observation data for model calibration

- e.g. rainfall-runoff simulations in field or lab

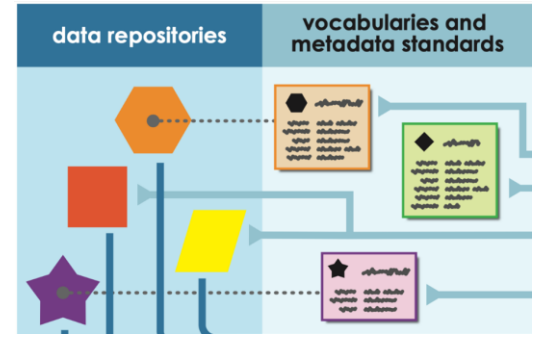
Issue: Missing standards

- In data management
- (In experimental methods)



State of data resources

- incompatible
- unFAIR
- unpublished



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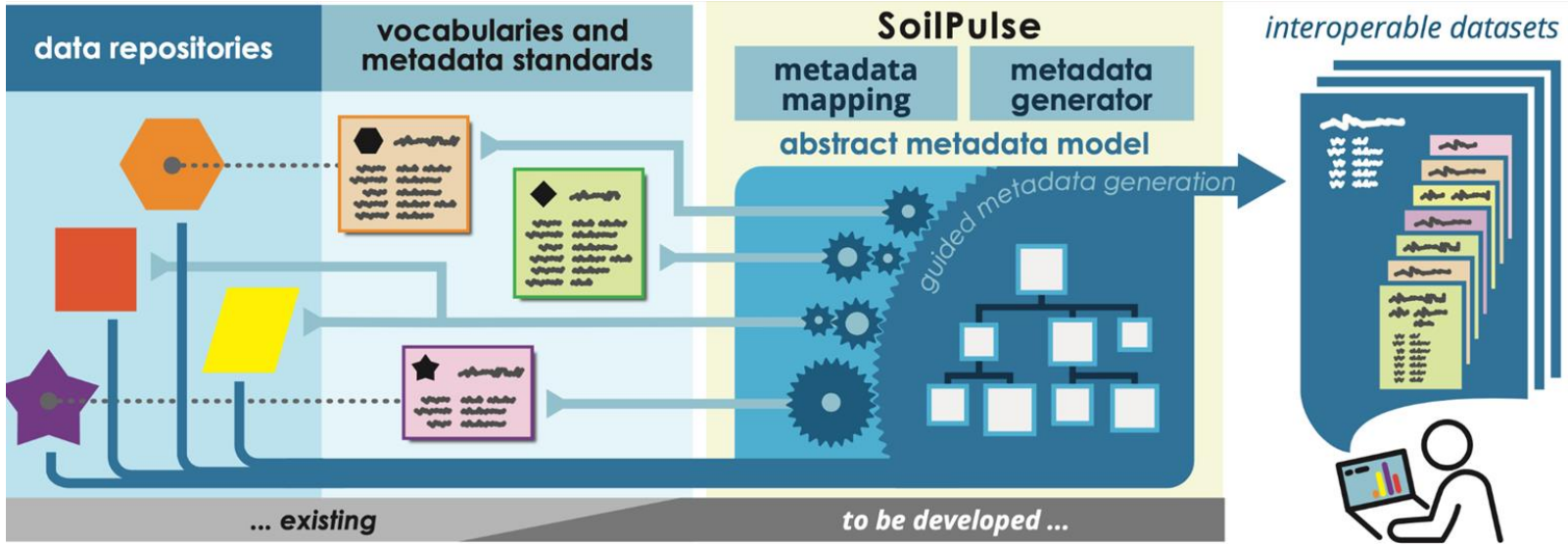
SoilPulse - Aims

1 - Data harmonization assisted by a tool for metadata generation.

2 - Allow for semi-automatic analysis through (meta-)data querying.

3 - Learn from others (meta-)data needs

Make (existing) data sets reusable!



You are an experimenting / data wrangling / modelling / interested person?

–> See you on the screen!

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NFDI4Earth Pilot:

SoilPulse Team

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SoilPulse @ EGU 2024

April 16th 2024

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SoilPulse - Aims 1/2

Metadata generation in a web interface (Demo: https://soilpulse-egu.streamlit.app/Metadata_retriever)

- User/Data creator provides files (**non standardized structure**), metadata shall be generated as automatically as possible, so the user “only” needs to approve and complete it.
  → Data structure needs to be mapped within metadata.
  → User gets feedback how the machine understands his data, while preparing the metadata.
  → User gets feedback if his data complies with data of other resources.
  → Semi-automatic generation of submission ready metadata to data files.

- Also applicable to **already published** resources (e.g. Datasets on Zenodo) -> Reference to the resource is then included in metadata to avoid republication.

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SoilPulse - Aims 2/2

(Meta-)Data querying (Demo: https://soilpulse-egu.streamlit.app/Explorer)

- Metadata becomes access point for data
- Making data points queryable: “Get runoff values from all rainfall simulation experiments with total organic carbon content > 3% of a soil sample.”
- Feed data aggregates to models by defining model requirement templates.
- Combination with data from other resources.

- Requires (self-hosted) live system/ server holding (temporarily) all data.

Which Metadata do we need to generate in addition to existing metadata schemas to increase data reusability?

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SoilPulse - Metadata schema 1/2

Adaptation of bonares metadata schema (Gärtner et al. 2017)

- Extensive soil specific schema, building upon INSPIRE and DataCite (https://doi.org/10.1016/j.cageo.2019.07.005)
- Bonares has metadata down to table structure and relation of tables

Extension:

- Assignment of controlled vocabulary concepts to single data points/columns:
  - e.g. “SOC”/”TOC”/”Corg” of original datasets becomes “total organic carbon” of AGROVOC (http://aims.fao.org/aos/agrovoc/c_c35fdd26).
- Make metadata within files readable for machines (e.g. table structure, timesteps, experiment ID). → Map down to single values.

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SoilPulse - Metadata schema 2/2

Implementation (in progress):

- Devátý, J., Lenz, J., and Jackisch, C.: SoilPulse – A software package for semi-automated metadata management and publication, EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-18775, https://doi.org/10.5194/egusphere-egu24-18775, 2024.

- will be available as python package

SoilPulse - Data and issues 1/2

Soil, Erosion/Infiltration Experiments

- at the boundary between hydrology, agriculture and soil properties
- various process' observation
- state dependent (intial water content, plant development, …)
- functional characteristics of soils/ experimental sites

Data types

- single measurements of soil properties
- descriptions of treatment (last or history), plant development
- time series of processes (runoff, irrigation intensity)
- images
- …

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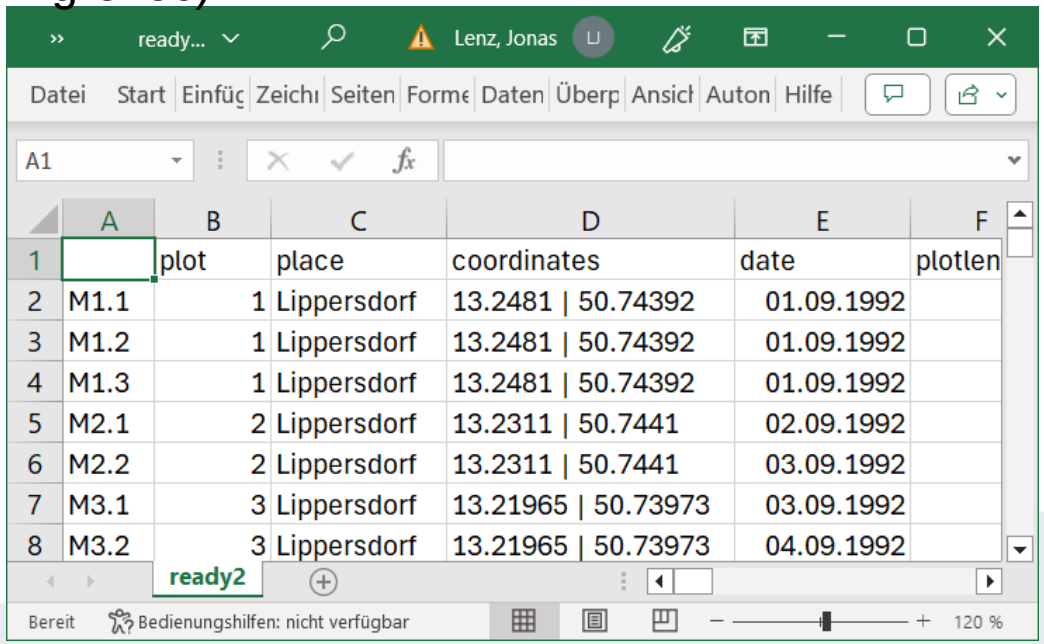
SoilPulse - Data and issues 2/2

Missing standards in datamanagement

- Differing table structures → capture table reading instructions in metadata
- Differing namings → Use controlled Vocabulary (e.g. Agrovoc)



ready...

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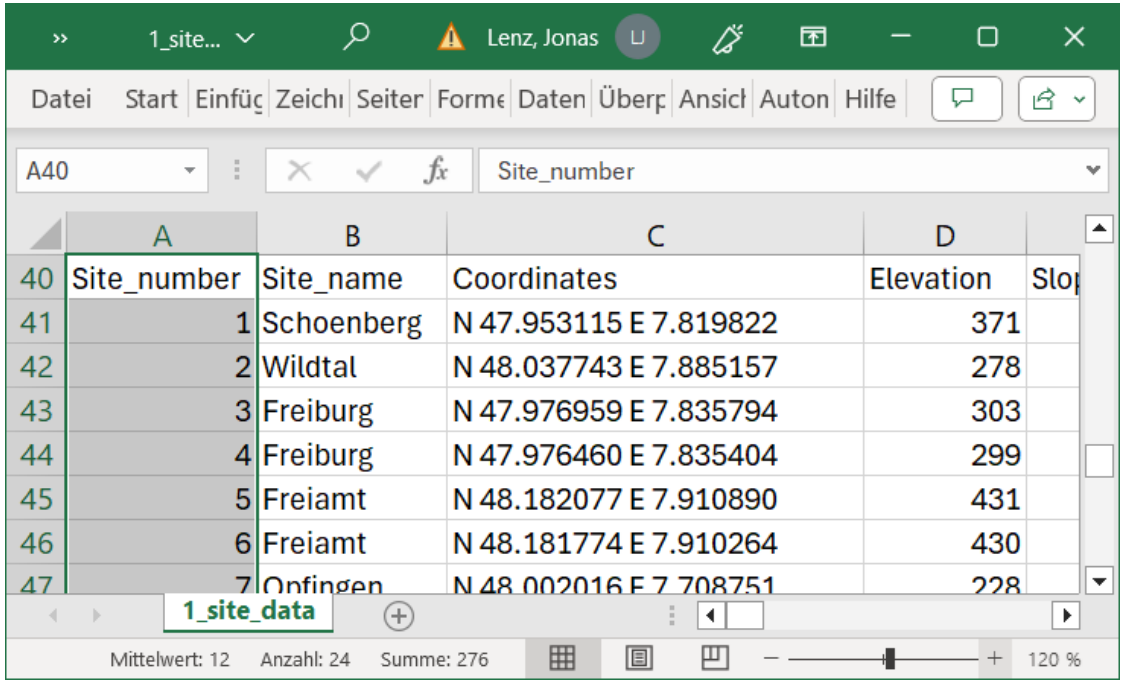
Datei Start Einfüg Zeichn Seiten Forme Daten Überp Ansicl Auton Hilfe

A1

	A	B	C	D	E	F
1		plot	place	coordinates	date	plotlen
2	M1.1	1	Lippersdorf	13.2481 | 50.74392	01.09.1992	
3	M1.2	1	Lippersdorf	13.2481 | 50.74392	01.09.1992	
4	M1.3	1	Lippersdorf	13.2481 | 50.74392	01.09.1992	
5	M2.1	2	Lippersdorf	13.2311 | 50.7441	02.09.1992	
6	M2.2	2	Lippersdorf	13.2311 | 50.7441	03.09.1992	
7	M3.1	3	Lippersdorf	13.21965 | 50.73973	03.09.1992	
8	M3.2	3	Lippersdorf	13.21965 | 50.73973	04.09.1992	

ready2

Bereit Bedienungshilfen: nicht verfügbar 120 %



1_site...

Lenz, Jonas

Datei Start Einfüg Zeichn Seiten Forme Daten Überp Ansicl Auton Hilfe

A40 Site_number

	A	B	C	D
40	Site_number	Site_name	Coordinates	Elevation
41	1	Schoenberg	N 47.953115 E 7.819822	371
42	2	Wildtal	N 48.037743 E 7.885157	278
43	3	Freiburg	N 47.976959 E 7.835794	303
44	4	Freiburg	N 47.976460 E 7.835404	299
45	5	Freiamt	N 48.182077 E 7.910890	431
46	6	Freiamt	N 48.181774 E 7.910264	430
47	7	Opfingen	N 48.002016 E 7.708751	228

1_site_data

Mittelwert: 12 Anzahl: 24 Summe: 276 120 %

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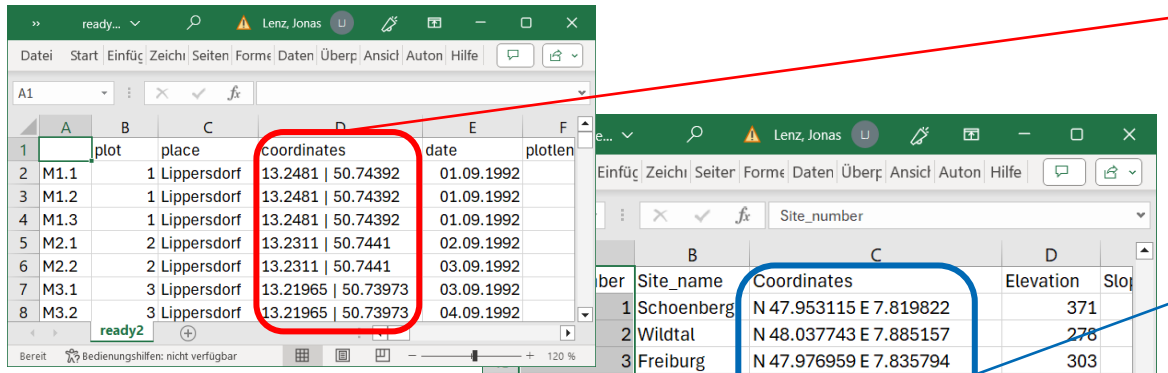
SoilPulse - (Meta-)Data queries 1/1

- Query multiple data sets at once
- Define your queries in templates
- Easier analysis



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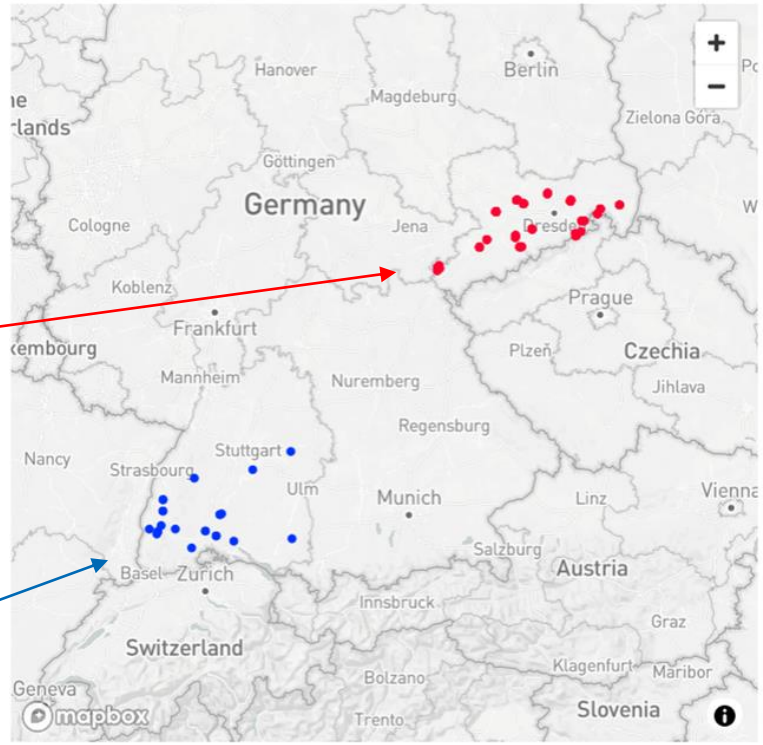

SoilPulse - Links

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More on the project:

https://soilpulse.github.io/

Test it on streamlit:

https://soilpulse-egu.streamlit.app

Get in touch:

mailto:conrad.jackisch@tbt.tu-freiberg.de

Abstract for EGU 2024:

https://doi.org/10.5194/egusphere-egu24-19497

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