Reactive Membranes to Map Colloid and Solute Fluxes in Undisturbed Soils

A Data Management Plan created using DMPonline.be

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Template: KU Leuven BOF-IOF

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Project abstract:

The overall objectives of this project are to develop and test a new DGT that can sample solutes and mobile colloids (colloid DGT, briefly cDGT) in undisturbed and unsaturated soils and use this to better understand and predict reactive transport of nutrients and trace metals in soils as affected by colloids, soil structure and soil compaction. It will mainly focus on PO4, Cd and U because of the expertise of the applicants and because of the environmental relevance of vertical leaching of these elements. However, since ICP-MS is used, it will, at the same time, also detect a suite of other elements and may be used as a generic approach for inorganic compounds in soil. This new method will radically change the concept of soil sampling for its chemical characterization because the environmentally relevant soil chemical properties are analysed in the reactive pore space of undisturbed soil, not using sieved and mixed soil samples. This approach is certainly defendable to study processes that are affected by spatial heterogeneities and soil structure, i.e. leaching, and, in general, colloid facilitated processes, these processes occur in a restricted fraction of the soil pore space. It is likely that this will also affect the assessment of bioavailability, although studying bioavailability is outside the scope of this project.

The original idea is to insert reactive gel membranes into the soil that acts as zero-sinks for solutes and colloids. In this project, gels, adsorbents and deployment systems will be developed that exceed the state-of-the-art DGT methods because 1) they will act as the micromorphological print of mobile solutes and mobile colloids, the latter defined as <0.2 µm, not only of the solutes; 2) they can be deployed to unsaturated and undisturbed soils in the field, rather than only to saturated and disturbed ones; 3) they have higher spatial resolution than current methods.

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Research Data Summary

List and describe all datasets or research materials that you plan to generate/collect or reuse during your research project. For each dataset or data type (observational, experimental etc.), provide a short name & description (sufficient for yourself to know what data it is about), indicate whether the data are newly generated/collected or reused, digital or physical, also indicate the type of the data (the kind of content), its technical format (file extension), and an estimate of the upper limit of the volume of the data.

Dataset name / ID	Description	New or reuse	Digital or Physical data	Data Type	File format	Data volume	Physical volume
		Indicate: ***N****(ew data) or* ***E****(xisting data)*	Indicate: **D**(igital) or **P**(hysical)	Indicate: **A**udiovisual **I**mages **S**ound **N**umerical **T**extual **M**odel **SO**ftware Other (specify)		Indicate: <1GB <100GB <1TB <5TB >5TB NA	
WP 1:	Novel adsorbents gels and visualisation methods						
	Selection of adsorbents and suitable gels	N	D/P	N/T	.csv/.xlsx .docx	< 1 GB	< 0.050 m³
	A high throughput diaphragm diffusion-imaging cel	N	D/P	I/N/T	.tiff /.jpeg/.png .csv/.xlsx .docx	<10 GB	< 0.050 m³
	Diffusion-adsorption tests in solution	N	D/P	I/N/T	.tiff /.jpeg/.png .csv/.xlsx .docx	<10 GB	< 0.050 m³
	Visualisation methods	N	D	I	.tiff /.jpeg/.png	<5TB	
	Minimising sampling artefacts	N	D/P	I/N/T	.tiff /.jpeg/.png .csv/.xlsx .docx	<10 GB	< 0.050 m³
	Converting the cDGT data to local pore water concentrations	N	D	N/T/M	.csv/.xlsx .docx matlab, R	<10 GB	
WP2:	Understanding the role of soil structure and soil compaction						
	Column experiments	N	D/P	I/N/T/M	tiff /.jpeg/.png .csv/.xlsx .docx HYDRUS 1D	<10 GB	1 m³
WP3:	Detecting colloid facilitated transport in the field						
	Quantifying colloid concentrations in the reactive pores in the field	N	D	I/N/T	.tiff /.jpeg/.png .csv/.xlsx .docx	<5 TB	
	Modelling colloid facilitated transport in the field with cDGT data	N	D	I/N/T/M	tiff /.jpeg/.png .csv/.xlsx .docx HYDRUS 1D	<5 TB	

If you reuse existing data, please specify the source, preferably by using a persistent identifier (e.g. DOI, Handle, URL etc.) per dataset or data type:

no existing data will be used

Are there any ethical issues concerning the creation and/or use of the data (e.g. experiments on humans or animals, dual use)? If so, refer to specific datasets or data types when appropriate and provide the relevant ethical approval number.

- No

Will you process personal data? If so, please refer to specific datasets or data types when appropriate and provide the KU Leuven or UZ Leuven privacy register number (G or S number).

- No

Does your work have potential for commercial valorization (e.g. tech transfer, for example spin-offs, commercial exploitation, …)? If so, please comment per dataset or data type where appropriate.

- No

Do existing 3rd party agreements restrict exploitation or dissemination of the data you (re)use (e.g. Material or Data transfer agreements, Research collaboration agreements)? If so, please explain in the comment section to what data they relate and what restrictions are in place.

- No

Are there any other legal issues, such as intellectual property rights and ownership, to be managed related to the data you (re)use? If so, please explain in the comment section to what data they relate and which restrictions will be asserted.

- No

Documentation and Metadata

Clearly describe what approach will be followed to capture the accompanying information necessary to keep data understandable and usable, for yourself and others, now and in the future (e.g. in terms of documentation levels and types required, procedures used, Electronic Lab Notebooks, README.txt files, codebook.tsv etc. where this information is recorded).

OneDrive will be used to store and manage the data. The onedrive folder is shared with the promotor.

The folder structure based on the project proposal will be used (Readme files and metadata will be stored in the same folders)
Folder structure: Project/ WPs/ Milestones/ experiment
Including Readme file (Description of the experiment) & metadata (details of the experiment)

WP1: novel adsorbent gels and visualisation methods
- Documentation

Work package	desciption	Documentation of the dataset
WP 1:	Novel adsorbents gels and visualisation methods	Experiment Progress (.docx), Results (Raw data, processed data) Literature (Referenced literature) Deliverables (Scientific publications, presentations, posters) Methods: Preparations, protocols - Protocols for preparation of binding gels - evaluation of the performance of the binding gels - Visualisation method of the gels with LA-ICP-MS - Numerical code for modelling local colloid pore water concentrations from 1D diffusion of colloids from soil to the DGT phase
WP 2:	Understanding the role of soil structure and soil compaction on colloid facilitated transport	Experiment Progress (.docx), Results (Raw data, processed data) Literature (Referenced literature) Deliverables (Scientific publications, presentations, posters) Methods: Preparations, protocols - protocol column setup - protocol undisturbed soil sampling - Dye tracer test protocol
WP3	Detecting colloid facilitated transport in the field	Experiment Progress (.docx), Results (Raw data, processed data) Literature (Referenced literature) Deliverables (Scientific publications, presentations, posters) Methods: Preparations, protocols - colloid transport modelling code

Will a metadata standard be used to make it easier to find and reuse the data?
If so, please specify which metadata standard will be used.

If not, please specify which metadata will be created to make the data easier to find and reuse.

- No

Add Readme file (.txt) (Description of the experiment) & metadata (details of the experiment)
README.txt files will be made in Windows notepad.
To make data findable a README.txt file will be made at the top level of the project folder to explain the purpose of the project, the relevant summary and contact details, and general organization of the files following the structure of the project.
ORGANIZATION
All files will be organized into subfolders as follows:
– 'RawData': All raw data goes into this folder, with subfolders organized by date
– 'AnalyzedData': Data analysis files
– 'PaperDrafts': Draft of paper, including text, figures, outlines, reference library, etc.
– 'Documentation': Scanned copies of my written research notes and other research notes
– 'Miscellaneous': Other information that relates to this project

NAMING
All data file names will include the full date of when the experiment/analysis is done

Data Storage & Back-up during the Research Project

Where will the data be stored?

- Shared network drive (J-drive)
- OneDrive (KU Leuven)

How will the data be backed up?

- Standard back-up provided by KU Leuven ICTS for my storage solution

Is there currently sufficient storage & backup capacity during the project?

If no or insufficient storage or backup capacities are available, explain how this will be taken care of.

- Yes

How will you ensure that the data are securely stored and not accessed or modified by unauthorized persons?

All data will be stored on the servers of the KU Leuven, assuring secure storage of all data.

What are the expected costs for data storage and backup during the research project? How will these costs be covered?

Within the research group data storage is provided for all research projects, no additional data storage are required for this project.
€ 100,86 / TB / jaar

Data Preservation after the end of the Research Project

Which data will be retained for 10 years (or longer, in agreement with other retention policies that are applicable) after the end of the project?

In case some data cannot be preserved, clearly state the reasons for this (e.g. legal or contractual restrictions, storage/budget issues, institutional policies...).

- All data will be preserved for 10 years according to KU Leuven RDM policy

Where will these data be archived (stored and curated for the long-term)?

- Large Volume Storage (longterm for large volumes)
- Shared network drive (J-drive)
- KU Leuven RDR

Data are stored >10 years in the format of folders with raw data that have back-ups on One Drive. One drive folders are shared between PhD students, postdocs and promotor.
Published datasets will be put on the KU Leuven RDR
Shared network drive for the whole research group of the promotor will be used for the protocols and method descriptions developed in this project
The large dataset generated from imaging will be additionally stored on a harddrive for long-term storage

What are the expected costs for data preservation during the expected retention period? How will these costs be covered?

€ 100,86 / TB / jaar
The costs are covered by the research funding

Data Sharing and Reuse

Will the data (or part of the data) be made available for reuse after/during the project?
Please explain per dataset or data type which data will be made available.

- Yes, as open data

If access is restricted, please specify who will be able to access the data and under what conditions.

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Are there any factors that restrict or prevent the sharing of (some of) the data (e.g. as defined in an agreement with a 3rd party, legal restrictions)?

Please explain per dataset or data type where appropriate.

- No

Where will the data be made available?

If already known, please provide a repository per dataset or data type.

- KU Leuven RDR (Research Data Repository)

Published datasets will be made available on KU Leuven RDR
Additional data can be requested by email to the researchers involved.
Raw data in publications is available open access by providing raw data in the Supporting Information files of the papers.

When will the data be made available?

- Upon publication of research results

Which data usage licenses are you going to provide?

If none, please explain why.

- CC-BY 4.0 (data)

Do you intend to add a persistent identifier (PID) to your dataset(s), e.g. a DOI or accession number? If already available, please provide it here.

- Yes, a PID will be added upon deposit in a data repository

What are the expected costs for data sharing? How will these costs be covered?

Expected costs for data sharing are considered to be negligible

Responsibilities

Who will manage data documentation and metadata during the research project?

Three people will be working on the project, 1 Post doc and 2 PhD's.
One post-doc, hired for three years will start of the project and do all initial data documentation and metadata management and follow up data documentation and metadata generated during the whole project by everyone.
We will start WP2 with a PhD at the start of Year 2, with column set-up and measuring colloid facilitated transport, yet without the cDGT. That same PhD student will collaborate with the post-doc on the cDGT and its applications to soil (the latter part of WP1). Data will be stored by the PhD under supervision of the post doc.
We will start WP3 with a PhD at the start of Year 3. That PhD would be mainly on the soil physics, modelling and the field sampling. He will recieve all previous data from Post Doc & PhD2. PhD 2 will be responsible for the data storage of Modelling and field sampling.

All folders related to the project will also be shared with the promotor.

Who will manage data storage and backup during the research project?

Year 1 - 3 : Post-doc
Year 2 -5 : PhD 1
Year 3 - 6 : PhD 2
shared responsibility during overlapping years

Who will manage data preservation and sharing?

Upon publication the main author will be responsible for sharing and preserving data on long term.
Year 1 - 3 : Post-doc
Year 2 -5 : PhD 1
Year 3 - 6 : PhD 2

shared responsibility during overlapping years

Who will update and implement this DMP?

Post Doc will start with the implementation and share the file structure with the PhD 1 and PhD2 so they implement the same DMP.
Year 1 - 3 : Post-doc
Year 2 -5 : PhD 1
Year 3 - 6 : PhD 2
shared responsibility during overlapping years