Second Enigma ITN meeting 12 / 13 October Liège

ENIGMA *Innovative Training Network :* **European training Network for In situ imaGing of dynaMic processes in heterogeneous subsurfAce environments**

Database creation for the Hermalle site in H^+ database

Jorge Lopez-Alvis, Richard Hoffmann, Marie-Francoise Gerard, Annick Battais and Thomas Hermans

J. Lopez-Alvis & R. Hoffmann

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Content

- General Basics

- Summary of database structure

- Advantage and „Things" to think about

- Current upload and how to do

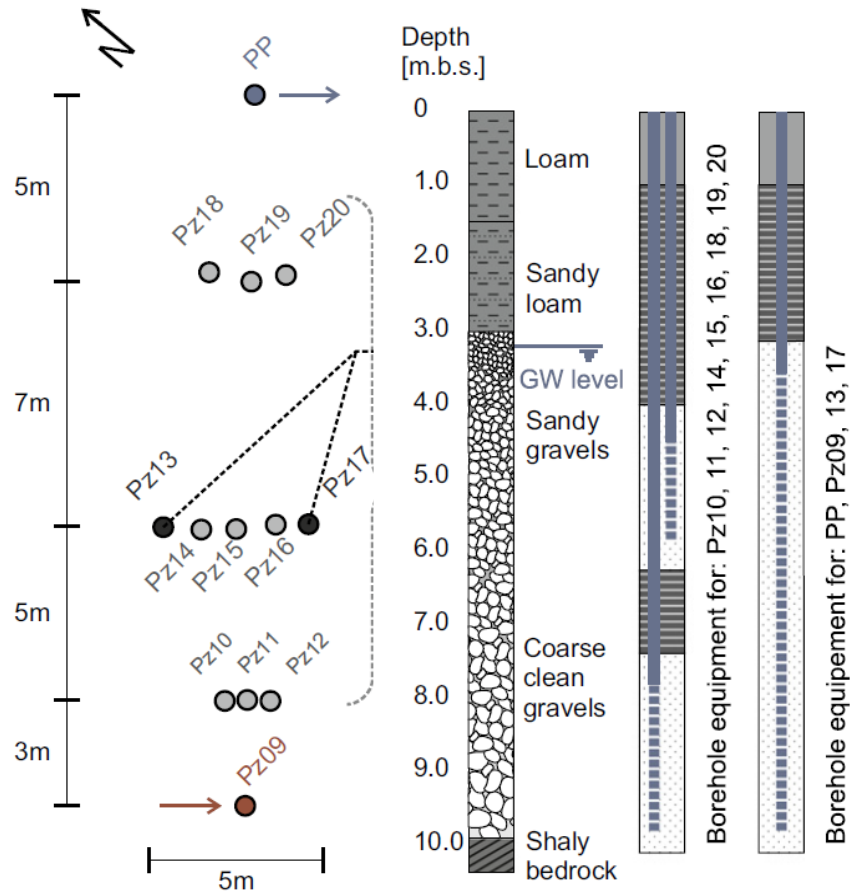- What we want to upload

- Outlook and Summary

General Basics

Fig. 1: Overview Hermalle-sous-Argenteau
(WILDEMEERSCH et al. 2014)

Summary of H+ database structure

- **Insert data**

  Topics :

  - Borehole description
  - In situ measurements (done in the borehole)
  - Site data (surface & weather flowrate time series…)
  - Chemistry (samplings and analysis)
  - Geodesy
  - Hydraulics ((flowrate time series, impeller, hydraulics parameters, piezometric level, pumping & slug test)
  - Station
  - Spatialized data (map, cross section
  - Experiments

templates

	A	B	C	D	E	F
1	email address					
2						
3	site name	Borehole name	experience	date	time	z_definition
4	appartient à la liste des sites (obligatoire)	appartient à la liste des puits (obligatoire)	appartient à la liste des experiences (obligatoire)	jj/mm/aaaa (obligatoire)	hh:mm:ss (optionnel)	texte libre précisant quel point de référence a été pris pour calculer la profondeur enregistrée dans la colonne z_relatif
5						

- **Extract data**

  - Predefined request
  - Advanced request
  - Google Earth

Choice of a universe :
Point Data ▼

Available objects

- ⊞ **Basic data** ☐
- ⊞ **Borehole location** ☐
- ⊞ **Technical/Geological log** ☐
- ⊞ **Geophysical log** ☐
- ⊞ **Cores / Cuttings** ☐
- ⊞ **Water or core sampling** ☐
- ⊞ **Location of stations (weather, GPS, tiltimer, seismic,...)** ☐
- ⊞ **Experiment** ☐
- ⊞ **Information on packers and geophysical sources** ☐
- ⊞ **Information on measurement** ☐
- ⊞ **Information on the insertion of the data into the database** ☐

Benefits of an integration to the H+ database

Tab. 2: Decision background to add field data to H^+ database.

Advantages	„Things to think about"
Possibility to interact	
Data is saved at a central place	Depends on server availability
Create special requests (resort files)	Geophysical data is not yet well included => in progress
Exchange extends network	
Share with other scientists/community	Be clear about the data you uploaded

$\Rightarrow$ **Final Decision:**

- Test it and use it for the Hermalle-sous-Argenteau site
- Extend it for the new Ulg site Colonster

Current upload and how to do

- Data of 5 pumping tests
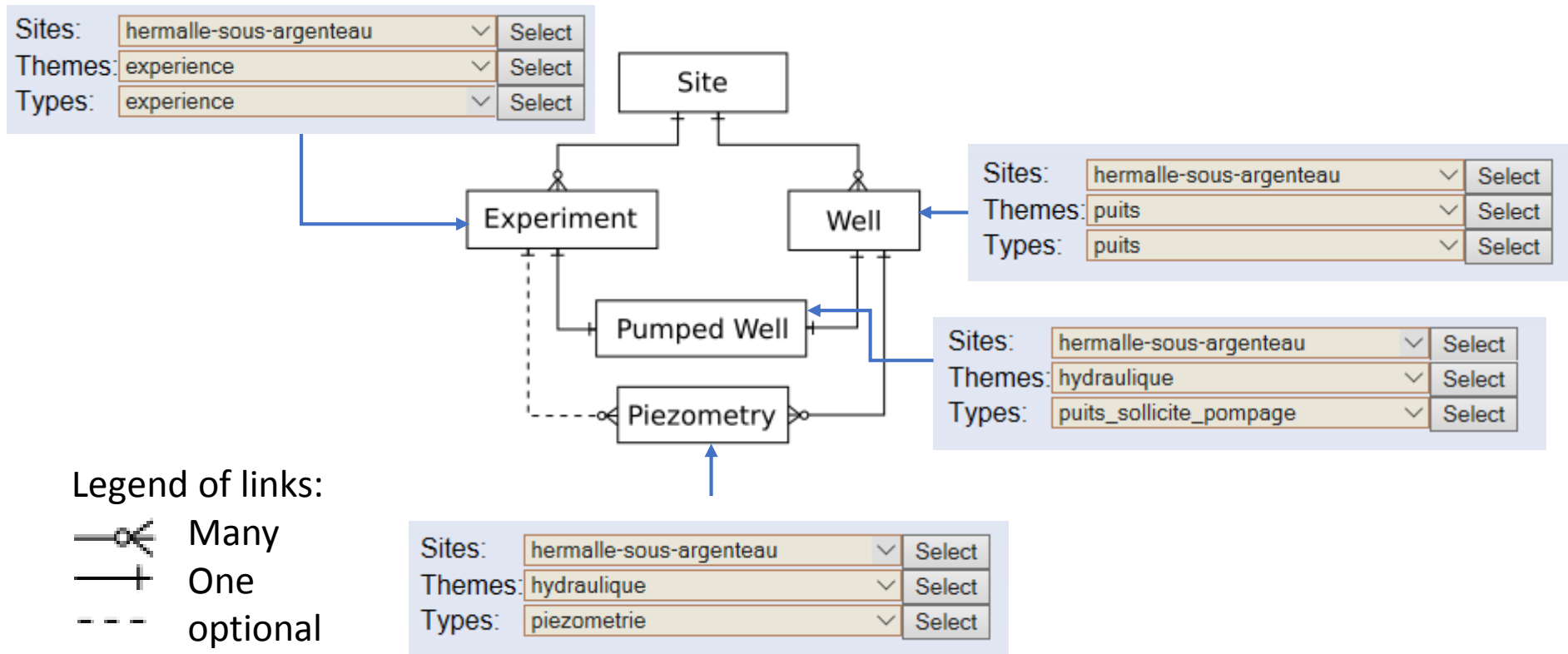- Example for inserting a pumping test:
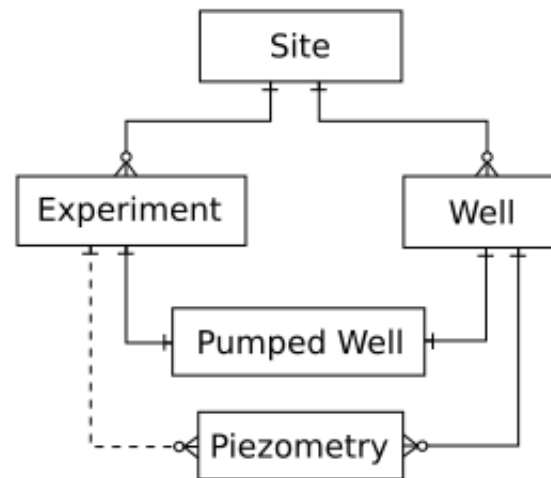
Legend of links:

─○<	Many
──+	One
- - -	optional

Current upload and how to do

- Data of 5 pumping tests
- Example for inserting a pumping test:

Legend of links:

Symbol	Meaning
⤙	Many
⊢	One
- - -	optional

Google Earth File Hermalle-sous-Argenteau

OSU de Rennes

Terre, Écosystèmes et Sociétés
Observatoire de Rennes

ORE H+

Well Name : pp		Coordinates					
Latitude	50.71752	Longitude		5.681086		Altitude	56.628

Properties of water	Number of measures	First measure :	Last measure :
Piezometry	30	1989-05-06 00:00:00.0	1998-03-01 00:00:00.0
Chemical	No measure		

Properties of flowmetry	Number of measures	First measure	Last measure
Flowmetry	5	1989-05-06 00:00:00.0	1998-03-01 00:00:00.0
Multiparameter probe	No measure		

Geophysical properties	Number of measures	First measure :	Last measure :
Gamma Ray	No measure		
Electricity	No measure		
Optical	No measure		
Acoustic	No measure		

Experiment data				
Name	Type	Begin	End	File
pompage_62,72m3/h_05_89	pumping test	1989-05-06 12:00:00	1989-05-06 12:45:00	
pompage_28,57m3/h_05_89	pumping test	1989-05-07 12:00:00	1989-05-07 12:30:00	
pompage_84,4m3/h_07_89	pumping test	1989-07-06 12:00:00	1989-07-06 12:35:00	
pompage_116m3/h_07_89	pumping test	1989-07-06 12:35:00	1989-07-07 12:35:00	
pompage_52,6m3/h_03_98	pumping test	1998-03-01 12:00:00	1998-03-01 13:00:00	

Fig. 2: Extract for Pumping well (PP) of current google earth .kmz file for Hermalle-sous-Argenteau.

What we want to upload

Tab. 3: Overview data upload ULg test sites.

Hermalle-sous-Argenteau	Colonster (planned for future)
Chemistry data	Boreholes and site description
Heat tracer test data	Hydrogeological measurements
Geophysical measurements	Geophysical measurements

Details on Hermalle-sous-Argenteau:

- Comparison of chemistry metadata with measurement data is running

  => E.g. compare/add grades of water hardness (units) or free carbon dioxide

- Heat tracer measurement data is in preparation

  => An experiment has to be created in the database

- Find a way to add geophysical measurements effective

Details: Upload of heat tracer measurements

- <u>Note:</u> Heat tracer measurements are monitored in time steps

Legend of links:
— ○< Many
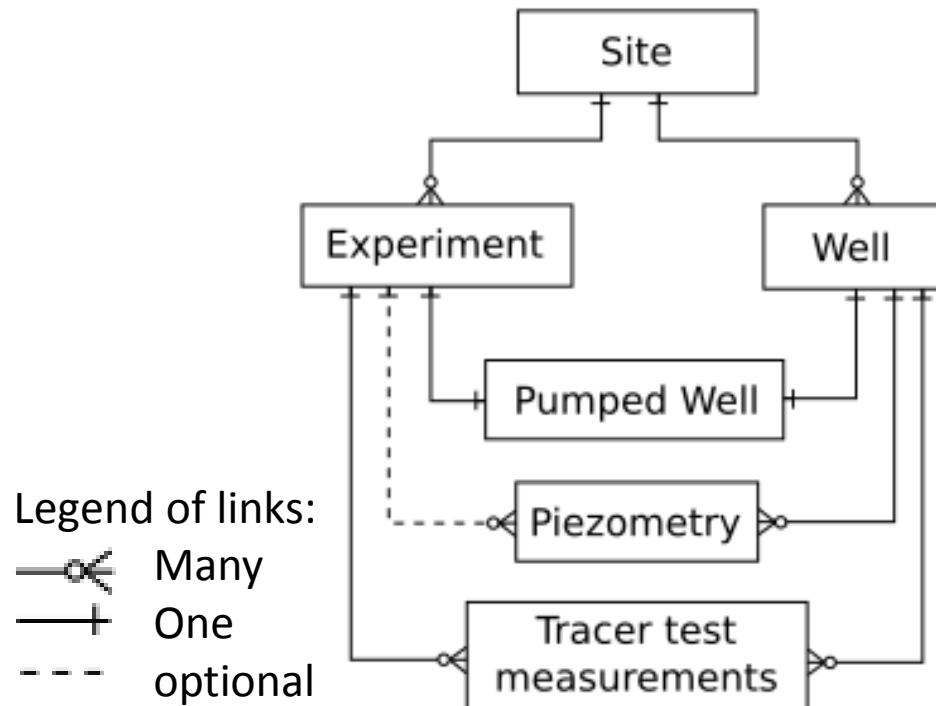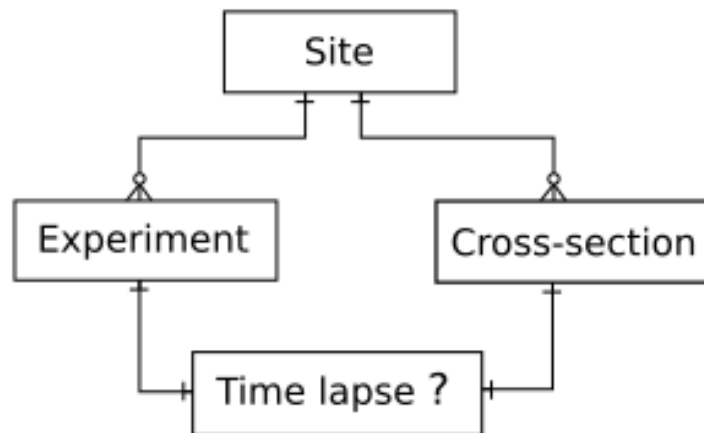— + One
- - - optional

Fig. 3: Database structure for adding the heat tracer measurements

Possible way to add geophysical data

- <u>Note:</u> Current geophysical measurements are monitored for one time step in the database

Experiment
- name
- starting date
- starting hour
- ending date
- ending hour
- type of exp.
- packers
- equipe
- remark
- site.name

Cross-section
- title
- url raw file
- url data file
- date creation
- type of data file
- …
- lat. of left corner
- lon. of left corner
- orientation
- scale
- site.name

Legend of links:

Many

One
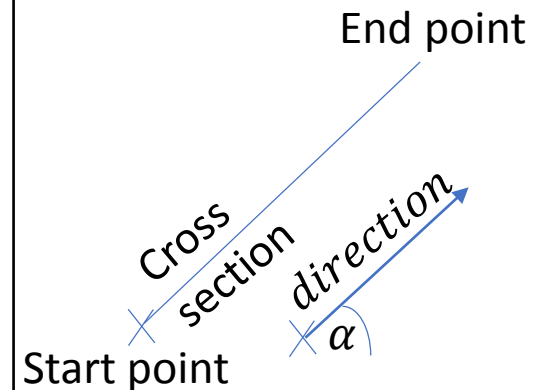
$\Rightarrow$ Geophysical measurements over many time steps need a link between cross-section and experiment

$\Rightarrow$ Use time lapse working as connector (?)

Outlook and Summary

Outlook:

- Possibility to share dynamic measurements between ESR projects (time lapse)

- Make ENIGMA project visible with data beside ENIGMA website

Summary:

- Simple file structure => good to learn

- Possibilities for individual extensions (like geophysical data)

Literature

H^+-Network (2017): National network of hydrogeological sites H+. – CRNS. – URL: http://hplus.ore.fr/en/, (Last call: 05/10/2017).

Hoffmann, R., Alvis, J. L., Battais, A. & Gerard, M. F. (2017): Guide H^+ Database for workshop Liege. – First Workshop ENIGMA ITN, **1**. – 19 p..

Wildemeersch, S., Jamin, P., Orban, P., Hermans, T., Klepikova, M., Nguyen, F., Brouyère, S. & Dassargues, A. (2014): Coupling heat and chemical tracer experiments for estimating heat transfer parameters in shallow alluvial aquifers. – Journal of Contaminant Hydrology, **169**: 90-99.

- Many time lapse componets in differen measurments
- Time steps were problem => no time insert possibility in cross section file
- Time lapse is the sparring partner of all geophyiscal measuremnts
- => so we don't need special files for every single experiment
- => this enabale one import => connected over time lapse