H+ DATABASE GUIDE

Workshops 1 & 2

Liege & Ploemeur

08.10.17 – 20.10.17

ITN Enigma

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Content

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1 History / Background H+ database

The H+-Network of hydrogeological research sites, created in 2002, includes 6 sites in Europe and India (Fig. 1) and has associated partners, in particular within the Enigma ITN network. This H+ network offers the opportunity to perform well-documented experiments directly on natural systems. This network manages infrastructures and field equipment, the development of new tools, the archiving of field data and its accessibility to the whole community; the database is open to host data from the associated partners. There are now more than 500 million data accessible. (H+-Network 2017).

FIG. 1: H+ SITES

The first goal of the H+ observatory is to maintain and coordinate a network of experimental sites capable of providing data - including chronicles or data on long-term experiments - relevant to the understanding of the water cycle and of the traveling of solute elements in aquifers.

The coupling between measurements, theories, and models, is a fundamental goal of the H+ observatory. Modeling at all scales is an essential prediction tool. The Observatory aims at creating a long-term relation between research teams interested in theoretical, numerical, and experimental aspects of transport in heterogeneous media.

The H+ observatory also aims at maintaining a partnership between basic research, university/continuous training, and professional expertise (consulting agencies, water management services). The H+ sites host students and professionals for traineeships on the exploitation of water resources and the prevention of environmental risks.

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2 Description of the database

Thanks to the H^+ Network, it is possible to collect at one central place available field data from the H^+ Network sites. Currently for the test sites in Ploemeur, India, LSBB, Poitiers, Majorca and Lazarc, it is possible to store all categories of data (see section 3.1). It is also possible to insert with the data some pictures and figures, so that all data are summarized in one Google Earth ".kmz" file.

The access after free registration is possible through http://hplus.ore.fr/en/ (more Chap. 2.3).

2.1 Structure and possibilities

The user interface and interaction with the database are based on predefined, but extendable metadata (Fig. 2). There is an example file system available for all file templates (Chap. 3.1). This ensures a definitive working with the database.

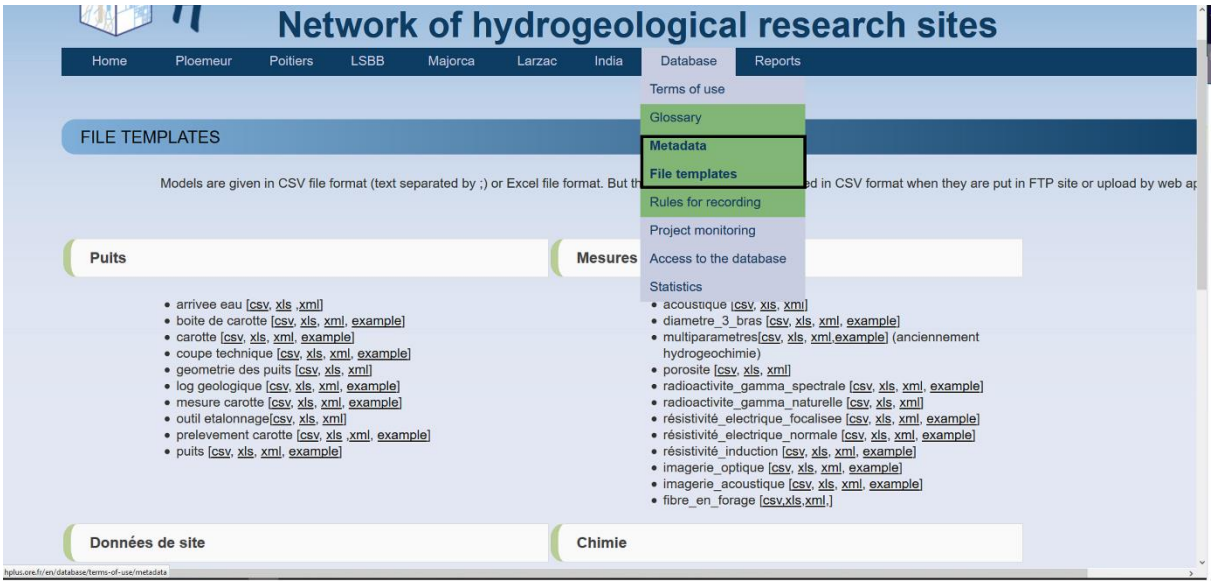

FIG. 2: OVERVIEW DATABASE WEBSITE AND SOME POSSIBLE FILE TEMPLATES ON HTTP://HPLUS.ORE.FR/EN/.

The file templates are free to download, can be filled out with field data and can be uploaded to the database after having correctly renamed the file (more details Chap. 3). Before everybody can access them, a validator checks the uploaded data. Therefore, before the files would be uploaded, check the meta data and file templates, so that "beginners" mistakes can be avoided.

If modifications or extensions are needed, it is necessary to contact the database manager for arranging individual changes. The present database manager is Annick Battais (annick.battais@univ-rennes1.fr).

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2.2 Consultation and extraction of data

The database of the H^+ Network offers three possibilities to consult and extract the uploaded and validated data:

- **A)** Google Earth Application (.kmz file)
- **B)** Pre-defined requests (e.g. Pumping data for a test on Ploemeur experimental site)
- **C)** Self-defined requests (e.g. all measurements done on a test site as time list)

A) The Google Earth Application (.kmz file) is the most comfortable way for a database request. It is possible to choose a wanted test site on the website, to download the ".kmz" file and choose in google earth the possible data, which are visible (Fig. 3). It is a good way to get first information of the test sites and to have a quick access to finalized data and possible maps for a direct and correct citation.

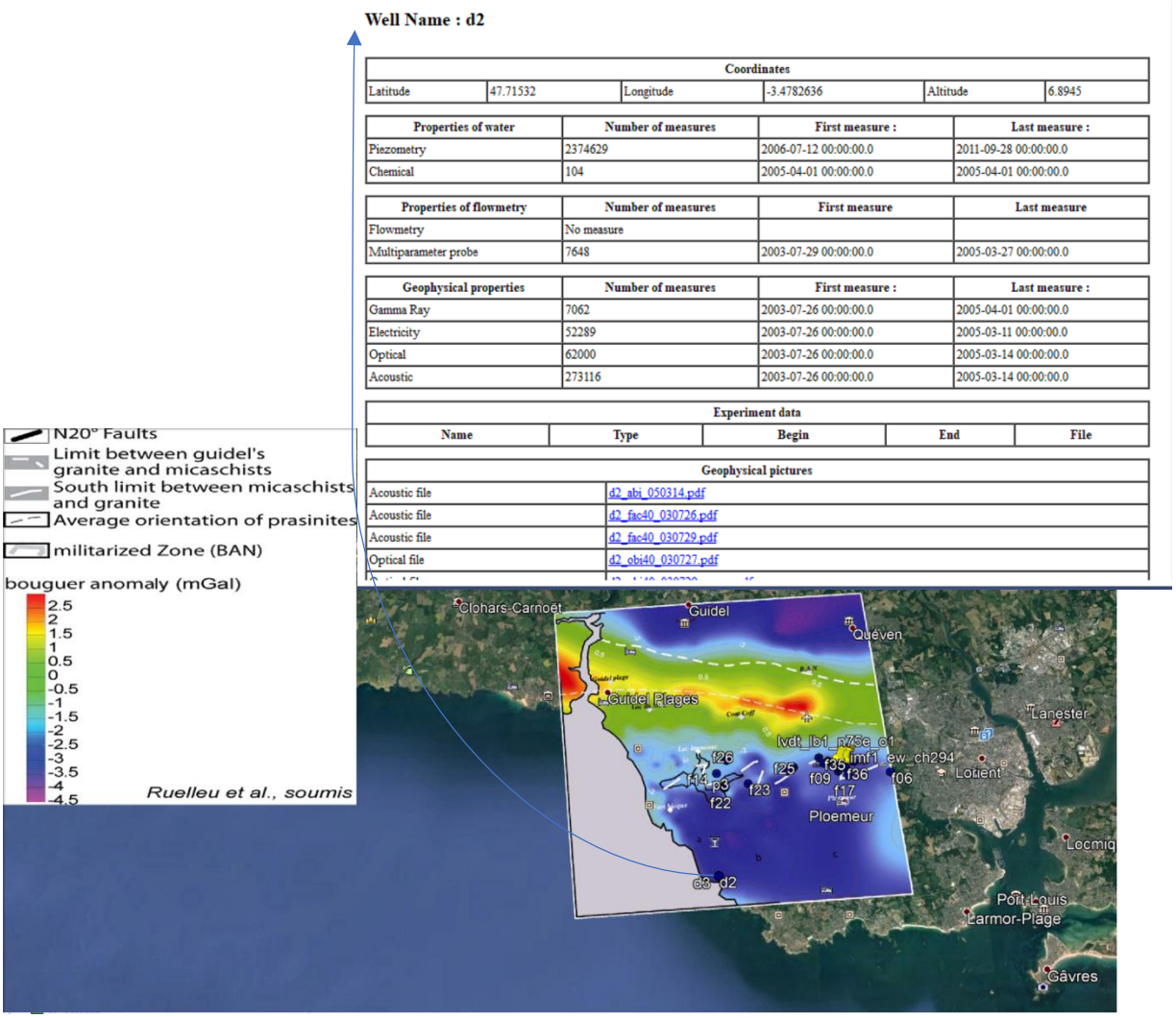

FIG. 3: USE OF THE .KMZ FILE WITH A FINALIZED MAP FOR A DIRECT CITATION AND AN OVERVIEW ABOUT THE INTEGRATED DATA FOR THE LOCATION POINT D2 AT PLOEMEUR (H^+-NETWORK 2017).

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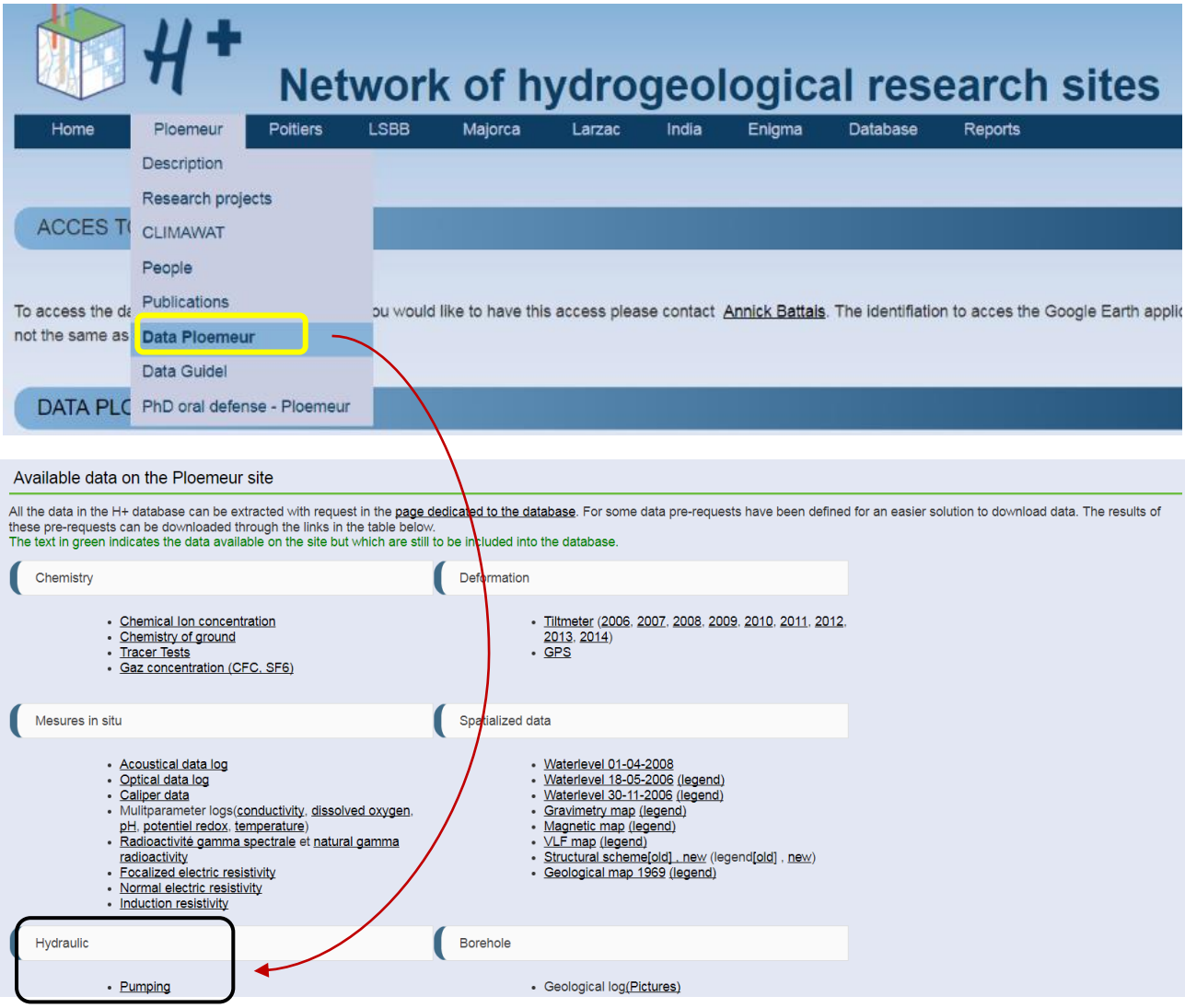
B) Pre-defined requests allow a direct download of wanted data as data files (e.g. .csv). It is possible to download directly for one of the experimental sites the file of interest, so that a further work with this data would be possible. This could be the data from a special pumping test, which is integrated to the database. For instance, in order to get all uploaded pumping tests with the pumping rates for Ploemeur in one .csv file, they can be downloaded on the experimental site page on the website of the database:

Ploemeur => Data Ploemeur => Hydraulic =>Pumping (Ploemeur_pumping_rate)



This kind of request is good for an individual working about past data, which have been stored in the database for several years.

C) Self-defined Requests allow to filter and extract from the database the data of an own, personal and individual interest. Therefore, in three-steps, there is the possibility to choose firstly objects, then to set filters and then to create the self-defined request to get an individual data output. One should keep in mind that a too big request could take some time, because the whole database is to be investigated. The main advantage of self-defined request is the full access to all kind of data and the total individuality in the working process.

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The upload process of a file to the database in detail and how to create a self-defined request will be shown in Chapter 3.

2.3 Preparation steps for the workshops

The database use is free and has a secured access with a user registration on one of the both sites for one of four possible types (Tab. 1):

FR: http://hplus.ore.fr/connexion or EN: http://hplus.ore.fr/en/database/acces-database)

TAB. 1: USER TYPES (H^+-NETWORK 2017).

classical user	can request the data from the database
supplier	can upload files, makes some formatting test file or technical validation
validator	can be specific for a site or a theme (like chemical) can additional validate scientifically the data, before these are free to access.
administrator	creates accounts and manages the metadata

For the workshop in Liege and Ploemeur:

- It is recommended :
  - to get familiar with the Internet site (Access) of the database (http://hplus.ore.fr/en/).
  - to go through Chapter 3 and 4
- Then please create an account by using the register form at EN: http://hplus.ore.fr/en/database/acces-database
- A .txt, .csv reader is necessary (Notepad, MS Excel, open office and so on…)

Additional notice: Change of date style to a "/" format

- It is necessary to write in every file for the database every date format in the style of 15/07/2015 instead of 15.07.2015 or any other format. (change possibilities are at Annex 1)

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3 Guideline: how to integrate, insert and export Data

The normal process is to use the file templates on the site and to integrate your data. The necessary steps then are: Upload – Test – Technical validation – Insertion – Scientific validation and normally to wait one day for the update overnight to be able to extract or visualize the data.

Use one of the different defined models on 8 themes: http://hplus.ore.fr/en/database/terms-of-use/file-templates. Since the database has a hierarchical structure you must keep in mind that in order to upload lower level data files the corresponding higher-level data files must be already in the database. For example, if you want to upload a piezometric data file the database must already contain data files from the well and the site where your measurements took place.

3.1 Upload/Insertion

1) Choose a data template for your data. Go to the website and choose Database → File Templates to see all the available templates. There are several defined templates on the next 9 different themes (Fig. 4):
    - Borehole
    - In situ measurements (measurements done in the borehole)
    - Site data (surface flowrate time series, station flowrate time series, weather time series, flow)
    - Chemistry (samplings and chemistry analysis results)
    - Geodesy
    - Hydraulics (flowrate time series, flowrate, impeller, hydraulics parameters, piezometric level, pumping and slug test)
    - Station (station description/data)
    - Spatialized data (map, cross section)
    - Experiments

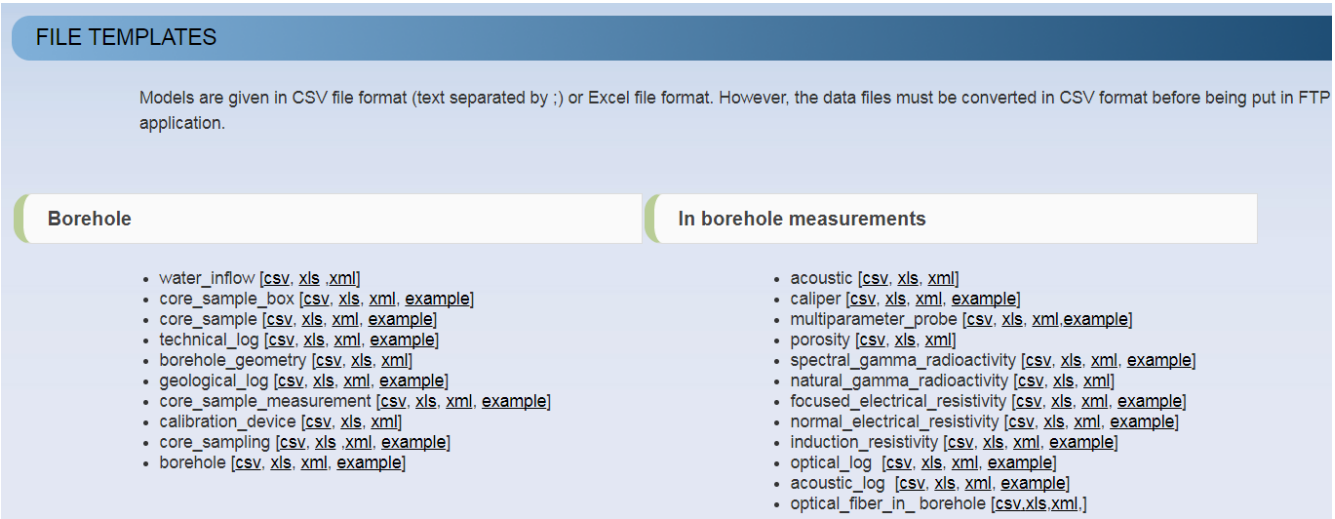

FIG. 4: FILE TEMPLATES.

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2) Download the selected file template (either csv, xls, xml) and open it (e.g. with MS Excel, WordPad, etc.) to see how the data is structured in the file template (Fig. 5).

   - First, check the headers and identify which fields are obligatory. All data fields for obligatory columns must contain valid data; optional columns must be left empty; however, all headers must remain in the data file (i.e., do not delete any header in the template file). The explaining line should be removed before insertion.
   - Take notice on the format of the data field (e.g. date format), measurement units (e.g. m3/s) and reference datum (e.g. altitude NGF)
   - It is important to correctly name your csv data file :
     - Some examples for chronical data : PZ7_20161130-140000_20170523-073000.csv, STS_SC39_31032010_23062010.csv
       You should use a name like : Site_Device/WellName__startdate_enddate.csv
     - For experiment: Stang_er_brune_exp_HPFMsingle_2005.csv.
       You should use a name like : Site__ExpName_startdate_enddate.csv
     - Idem for attached files (pdf, url…)

	A	B	C	D	E	F	G	H	I	J	K	L
1	email address											
2												
3	site name	Borehole name	experience	date	time	z_definition	z_definition reference	z	pumping rate	temperature	upper	lower
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*	*altitude NGF (par rapport au niveau de la mer) en mètres du point qui sert de définition des profondeurs décrit dans la colonne definition z_relatif*	*profondeur en mètres calculée par rapport au point de définition (optionnel)*	*en m3/s (obligatoire)*	*en °C (optionnel)*	*limite supérieure de la chambre d'imposition du débit (optionnel)*	*limite inférieure de la chambre d'imposition du débit (optionnel)*
5												

FIG. 5: EXAMPLE OF A FILE TEMPLATE

3) Once the data file is completed with the correct format, access the H^+ database. Go to the website and choose Database → Access to the database. Type your login (username) and your password (Fig. 6).

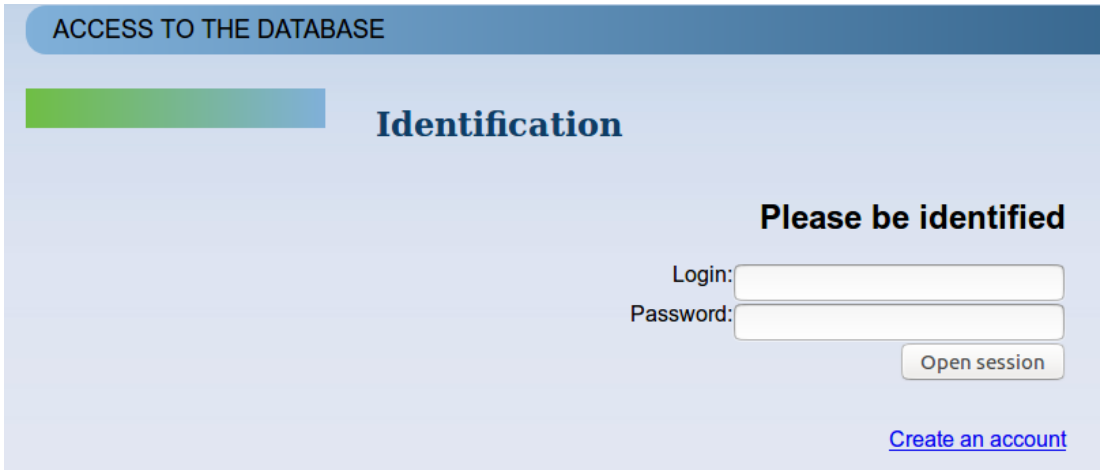

FIG. 6:DATABASE LOGIN.

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4) In the “Access to the database” window, look up for the section “Manage data” and select the option “Upload files”. Here you will have to choose in order: the site, the theme (in accordance with 9 different themes) and the data type (in accordance with one of the available file templates). In each of these steps you must press the “Select” button in order to see the available options in the next level. Finally, browse for your data file, select it and press “Upload” (Fig. 7).

   Be careful, this step only works if your files (to upload) are smaller than 4 Mb. To upload bigger files or if you have to upload several files at the same time, you should use a “filezilla” client (or another one like winscp). For security and to have an access to the server:

   - The administrator needs to know the IP address of your computer (or a small network with netmask information).
   - The administrator needs to know your login to give you the appropriate rights.

   The host to connect is hplusbd-mv.spm.univ-rennes1.fr and the login account is the same as the database registration.

FIG. 7: UPLOADING THE FILES.

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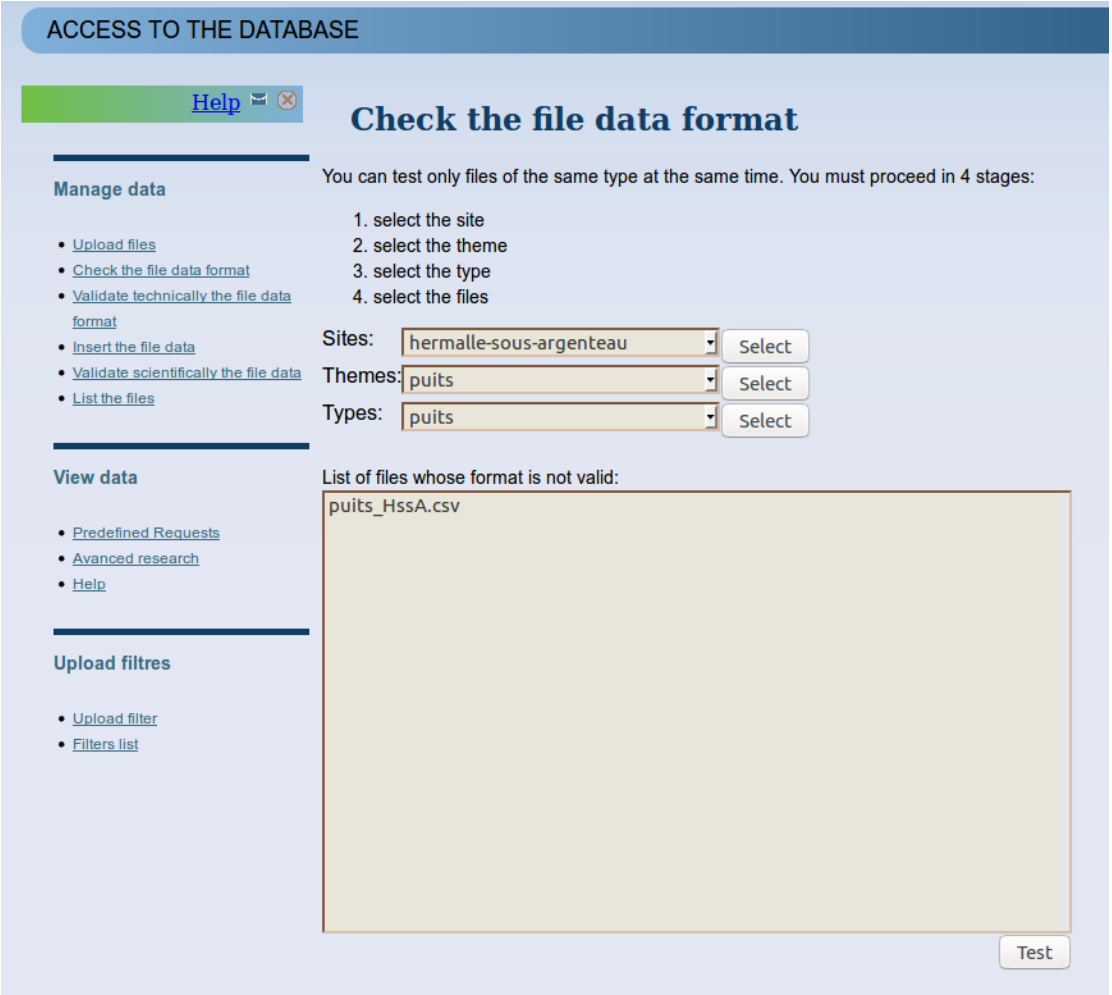
5) Go to the next step in “Manage data” which is “Check the file data format”, and select the same options of each level to be able to see your uploaded file. Select your data file and click “Test”. An email will be sent where any errors or warnings of the test in the file data format will be noted and if the data format is valid, a sentence “File is valid” will be written at the end (Fig. 8). After this first step, there is nothing yet registered in the database.



The email response:

```
Technical validation of 1 files was asked : 1 files with valid format.  .

**********************************************************************
Fichier : hermalle-sous-argenteau/puits/puits/puits_HssA.csv
19 lignes et 17 colonnes analysées.

FICHIER VALIDE.

**********************************************************************
```

FIG. 8: CHECKING THE FILE FORMAT (TOP) AND CORRESPONDING EMAIL(BOTTOM).

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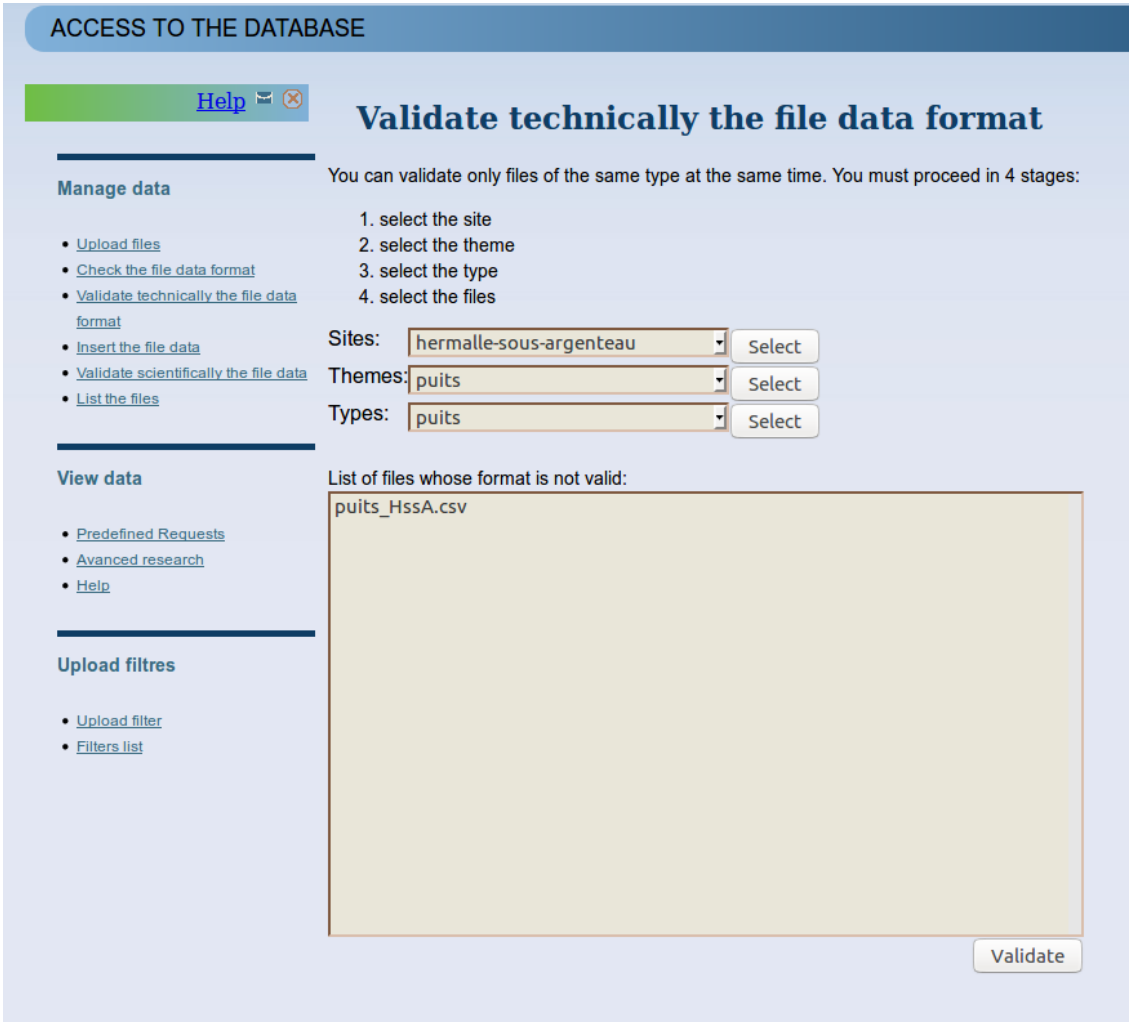
6) Go to “Validate technically the file data format”, perform the same actions as in the previous step and press “Validate”. Once again, an email will be sent and if no errors show up, the file data has been successfully validated (Fig. 9). The file is now registered in the database.



The email response:

```
Technical validation of 1 files was asked : 1 files with valid format.

**********************************************************************
Fichier : hermalle-sous-argenteau/puits/puits/puits_HssA.csv
19 lignes et 17 colonnes analysées.

FICHIER VALIDE.

**********************************************************************
```

FIG. 9: DATA VALIDATION (TOP) AND CORRESPONDING EMAIL(BOTTOM).

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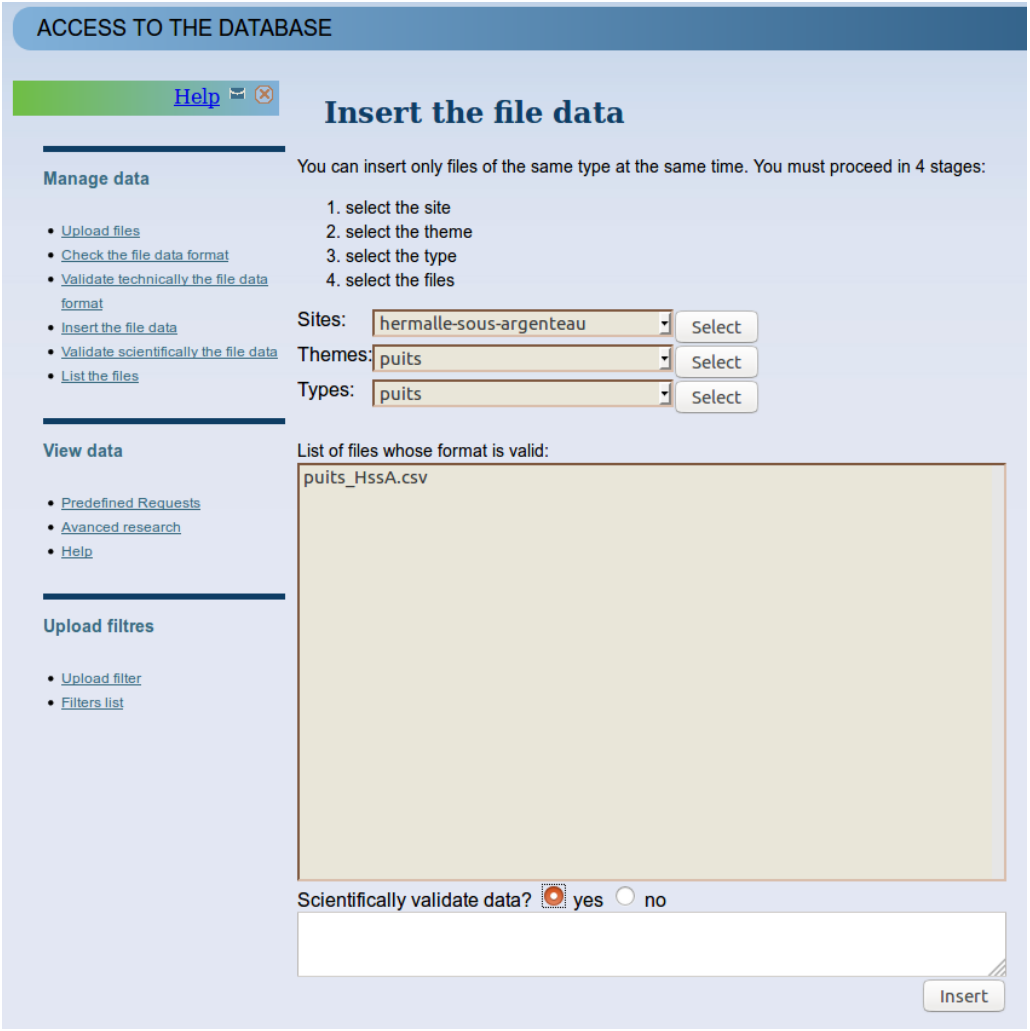
7) Once the file data format is validated, the file data can be inserted to the database through “Insert the file data”. Look for the just validated file and click “Insert”. You can choose to validate data scientifically with the checkbox (Fig. 10). The supplier of the data (as written in the csv data file) also receives the email response.



The email response:

```
The insertion in the database of  1 file(s) are asked : 1 file(s) inserted.
**********************************************************************
Fichier : hermalle-sous-argenteau/puits/puits/puits_HssA.csv

FICHIER VALIDE.

**********************************************************************
```

FIG. 10: INSERTING THE DATA (TOP) AND CORRESPONDING EMAIL (BOTTOM).

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8) At the end, your data file should be uploaded and validated both in format and scientifically. The file names will show up if you choose “List the files” ending with a “(FIV)” (Fig. 11), which indicates that your files have been inserted and validated in a correct format.

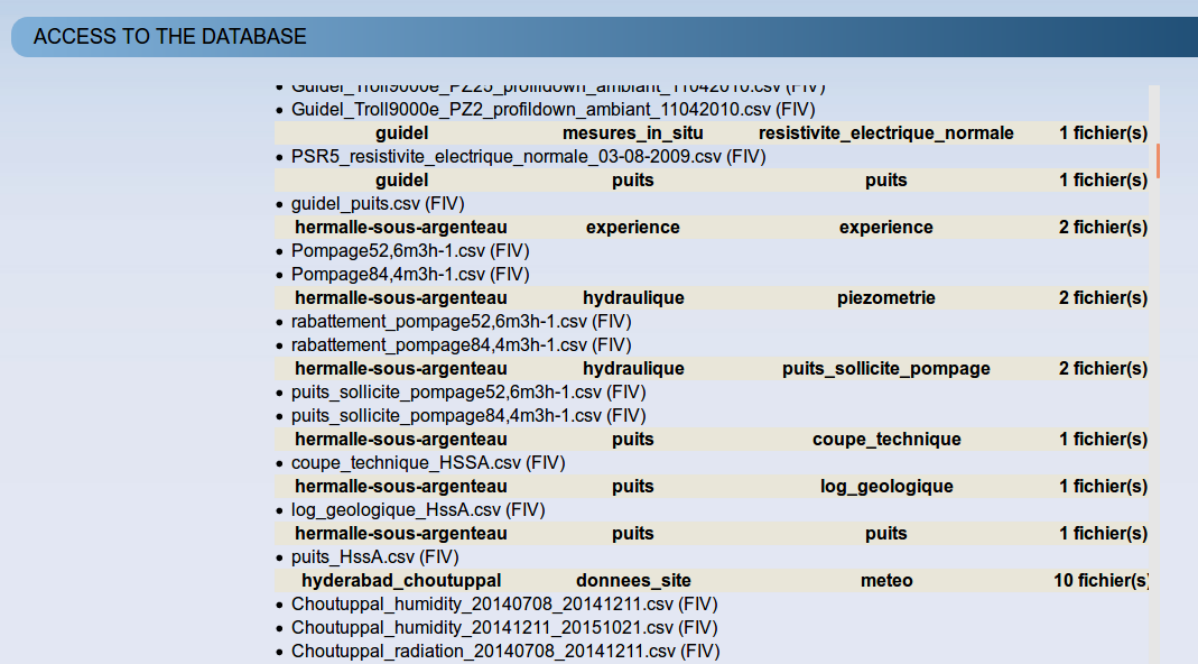

FIG. 11: LIST OF FILES IN THE DATABASE AND THEIR CORRESPONDING LABELS (F STANDS FOR FLAGGED OR CORRECT FORMAT, I STANDS FOR INSERTED AND V STANDS FOR VALIDATED).

9) If needed, you can re-insert csv data file, but please use the same data file name otherwise the database system considers it as a new one (and the data would be inserted twice). If you want to delete one file, send an email to the database manager.

3.2 Request or Extraction/Visualization

1) Go to the website and click on Database → Access to the database, and type your login and password.
2) Look up for the section “View Data” and click on the option “Advanced search”. It will bring a window with the title “Objects selection (1/3) choice columns”. Select an option in “Choice of universe:”. Current options are “Point data” and “Spatial data” (Fig. 12).
3) Go to frame “Available objects” on the right side and choose one element from the list by clicking on the plus symbol. This will display all the options available for the selected element. Check all the boxes you may need for your data, these will represent data columns in your requested data. Now click on the arrow next to frame to add all your selected options. To proceed click on “Filters page” (Fig. 12).
4) Once in the page “Filters selection”, choose the variables to filter your data similarly to the last step. Click on the arrow and you will be able to select the values to filter from your selected variables.

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Click on “Validate” and you will have the option to activate the filters (by clicking the checkboxes) you just set. Continue and click on “Exportation options” (Fig. 13).

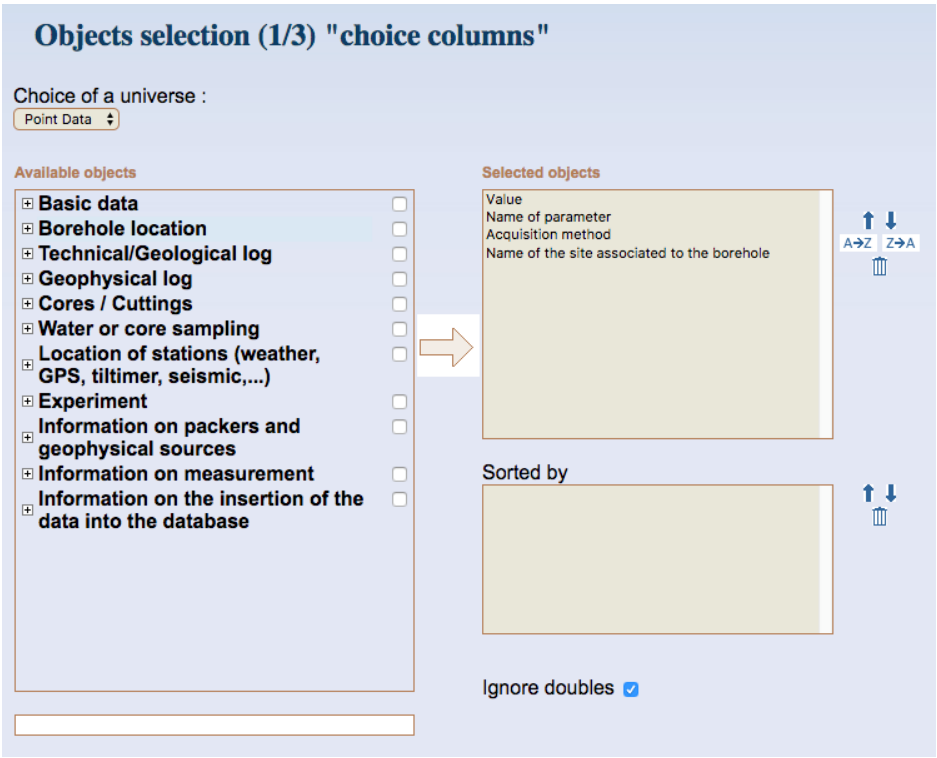

FIG. 12: OBJECTS OR COLUMNS SELECTION.

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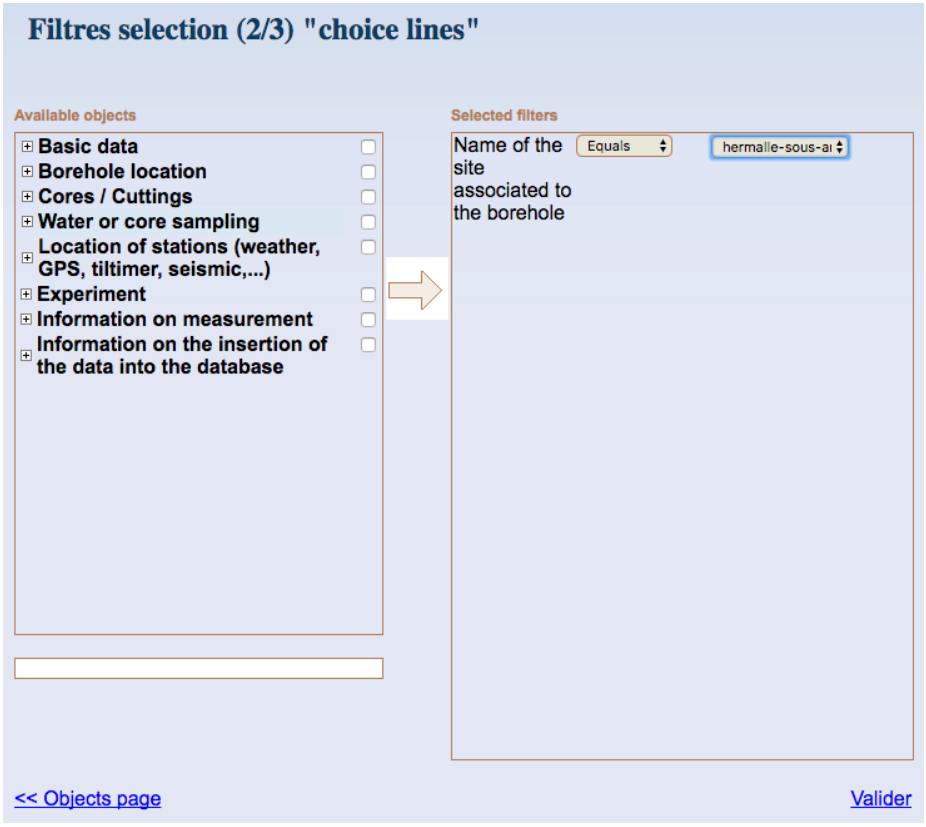

FIG. 13: FILTERS SELECTION.

5) In the "Results" window, you will see four different tabs. The first "Summarization" will show a summary of your request of data (objects and filters selected). The "Preview" tab will display the first lines of your request of data and also the SQL query of this request. On the "Export" tab you will be able to select the format of your data (.html or .csv), the name of the file and the email to where the file will be sent. Finally, the "Save request" tab will allow you to save your request to the section "Predefined requests" so other users can use your same request of data. Depending on the size of your data, you will receive an email with your data promptly and you will be able to download the data by clicking on the link (Fig. 14).

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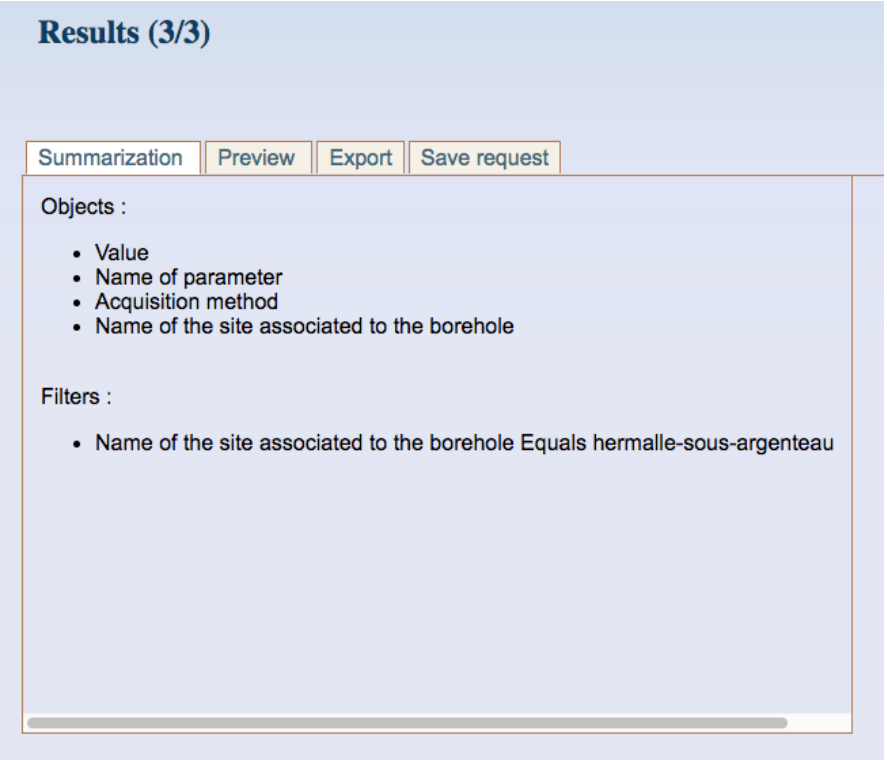

The email sent will look like this:

```
Bonjour,
les résultats de votre requête sont disponibles à l'adresse suivante :
http://hplus.ore.fr/documents/extraction/testhss_1500454891354.csv
```

FIG. 14: CHECKING RESULTS FROM THE REQUEST OF DATA.

Note: for specific users, if you have experience with SQL language and PostgreSQL it could be possible to use SQL queries directly.

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4 Technical description of Hermalle

The test site for the workshop in Liege is placed nearby Hermalle-sous-Argenteau in the alluvial plain (KLEPIKOVA et al 2016). The city Liege lies nearly 10 km south-west, on the east site of the test site is the Meuse, on the left site the canal Albert and nearly 5 km northwards is the German border (Fig. 15).

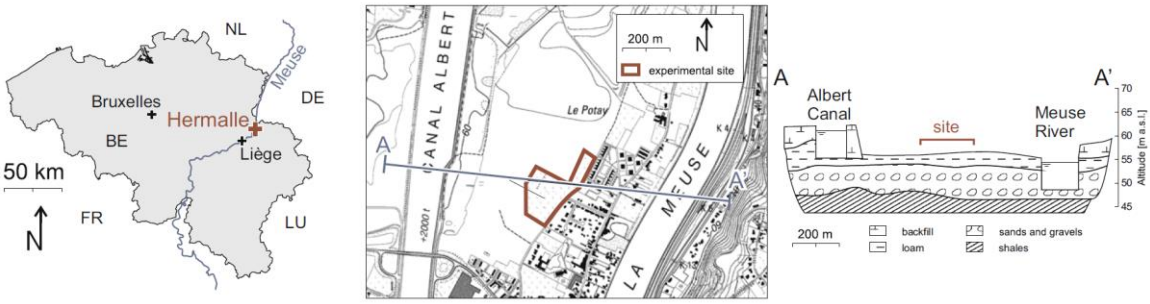

FIG. 15: TEST SITE LOCATION OF HERMALLE-SOUS ARGENTEAU (WILDEMEERSCH ET AL. 2014).

The topography of the test site is flat and there is one pumping well and 18 piezometers in total installed (WILDEMEERSCH et al. 2014). An injection well is installed 20 m upgradient from the pumping well (Fig. 16). During the 1980s six piezometers were installed, which are equipped with a PVC tube of diameter of 0.05 m and monitor the alluvial gravel (WILDEMEERSCH et al. 2014).

In 2012, as preparation for WILDEMEERSCH et al. (2014), twelve new piezometers with 1 m between each other were drilled up streamed from the pumping well. These piezometers are drilled as three transverse control planes, which are placed 17 m, 12 m and 5 m away from the pumping well (Fig. 16). Pz09, Pz13, Pz17 and PP monitor the subsurface from 3 m to 10 m depth, while the other ones are double screen piezometers, so they monitor between 5 m to 6 m and 8 m to 10 m depth (Fig. 16).

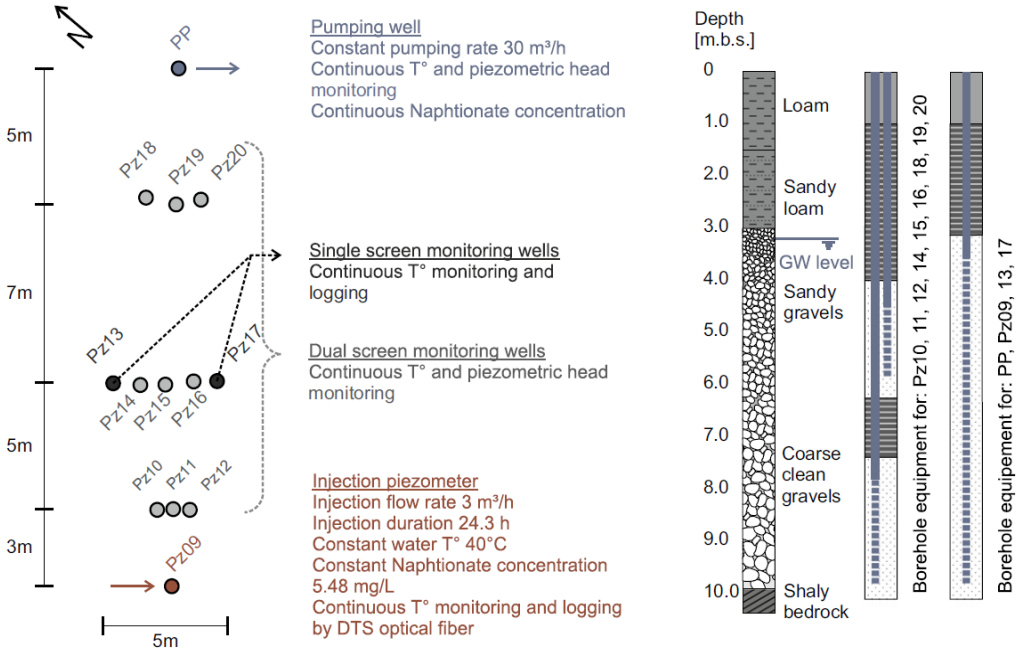

FIG. 16: PIEZOMETER LOCATION AND THEIR PROFILES (WILDEMEERSCH ET AL. 2014).

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Geology:

The alluvial deposits consist of four different units (WILDEMEERSCH et al. 2014). In the upper part, the loam is around 1 m to 1.5 m thick, which is followed by a sandy loam with a depth increasing proportion of millimetric gravels up to a depth of 3 m (Fig. 17). Then from 3 m to 10 m depth, the deposits are composed of alluvial sand and gravels where the gravel-to-sand ratio increases with depth (Fig. 17). The bottom is a zone of clean pebbles with a diameter more than 0.2 m (Fig. 17). Below the alluvial deposits, shale and sandstone units are considered as the hydrogeologic basement.

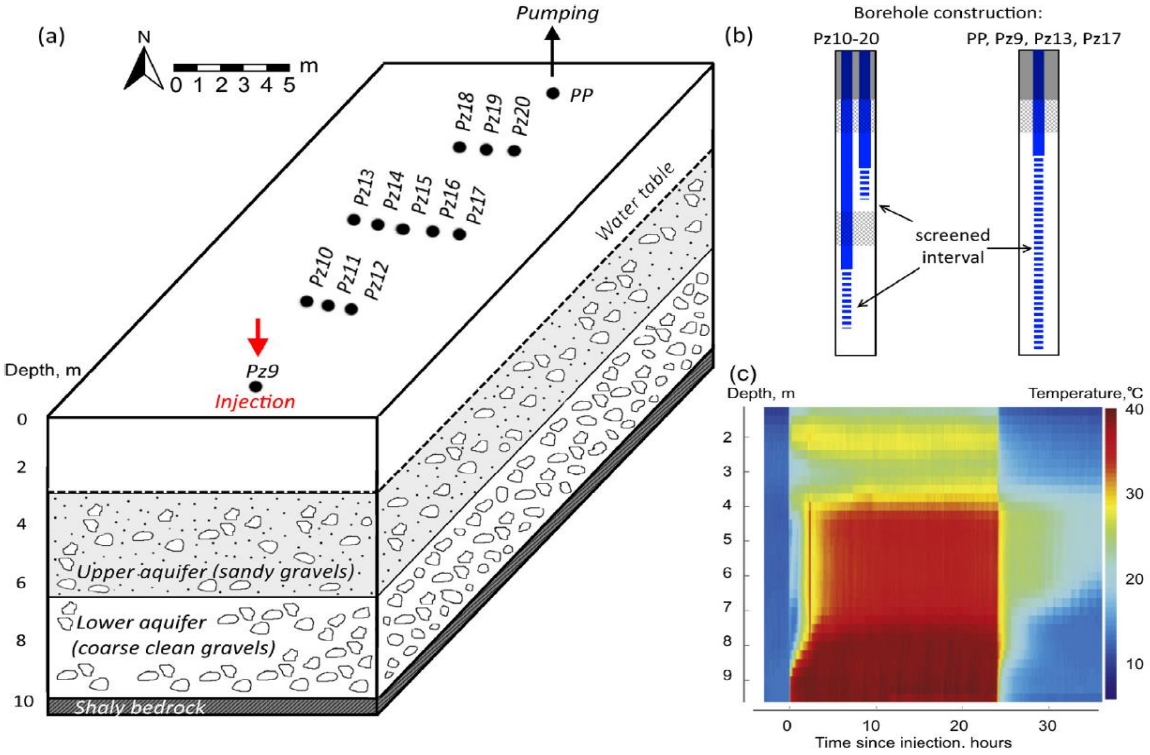

FIG. 17: (A)(B) FIELD SITE (KLEPIKOVA ET AL 2016) (C) TEMPERATURE PROFILE BY WILDEMEERSCH ET AL. (2014).

Hydrogeology:

The groundwater table is located at around 3.2 ± 0.5 m below the land surface, while the highest observed levels are during January (WILDEMEERSCH et al. 2014). For Hydrogeological questions, the Aquifersystem can be described as an upwards orientated fine up sequence. The gradient is around $i = 0.06\,\%$, the effective porosity is 4 to 8 % and the hydraulic conductivity is between $1.2 \cdot 10^{-1}\,\mathrm{m\,s^{-1}}$ to $2 \cdot 10^{-3}\,\mathrm{m\,s^{-1}}$ (BROUYÈRE 2001, KLEPIKOVA et al 2016). The groundwater temperature fluctuates between $T_C = 11.91\,°C$ in June and $T_C = 13.34\,°C$ in December (WILDEMEERSCH et al. 2014).

Field tests carried out:

The test site was used the last years as field site for different scientific questions and tasks. Started with first experiences by DASSARGUES (1997) and DEROUANE & DASSARGUES (1998), BROUYÈRE (2001) went farther with pumping and solute Tracer tests, while WILDEMEERSCH et al. (2014) as well as KLEPIKOVA et al. (2016) did heat tracer experiments and HERMANS et al. (2015 a,b) did geophysical measurements including fiber optic and simulations with a prediction forward approach (PFA). Now the test site will be used in the ENIGMA workshop and in the ITN projects ESR 11 and ESR 15.

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5 Literature

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Annex 1: Change possibilities for the date format:

Sometimes the "/" format is not the standard format for date numbers in MS Excel. Quick solutions would be software changes (defaults of MS Excel) and a fix change would be a system date format change of the workstation, which can be reset (temporal change as well):

a) In Excel: select the dates, go to start=>numbers=>click on the little arrow beside numbers=> select user defined and type in the new date format.
   ⇨ Only an optical change => normally, re changed after reopening
b) In notepad: change date in line and don't open the file with "wrong" settings in excel
   ⇨ Often to do for every date singular
c) Change Excel Software standard format options from system date options individual
   ⇨ System and Software are working with different settings
d) Quick change of the region options of the workstation
   ⇨ Like sometimes necessary with comma and dot

Finally, the current easiest solution, which is recommend currently, is to make a quick change in Region option of the workstation, like with the comma and dot problem is done, too.

Windows 10 workflow (Fig. 18): Start => 1 Control Panel (in german it is "Systemsteuerung") => 2 Time, Language, and Region => 3 Region => 4 Change the date, time, or number format=> 5 Change Format country or go to extended options and type for the date format the correct one in

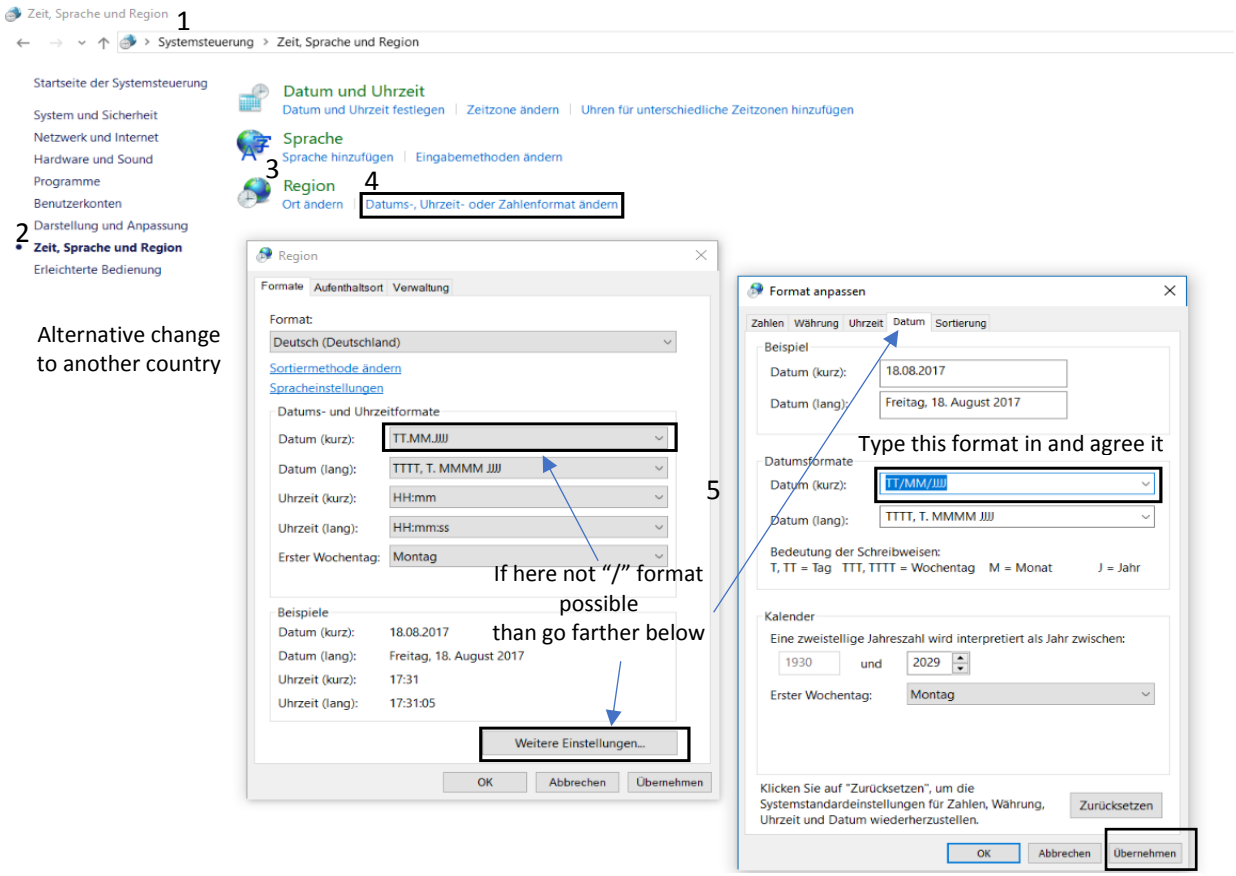

FIG. 18: WORKFLOW TO CHANGE DATE FORMAT BASED ON WINDOWS 10.

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