

Workshop on SOPHIE

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13:00 – 16:00

Minutes: Coleen Carranza

List of Participants

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12	Hendrik van den Bosch	ISRIC – World Soil Information	rik.vandenbosch@wur.nl
13	Martine van der Ploeg	Wageningen University	martine.vanderploeg@wur.nl
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I. Presentation on SOPHIE by Gerben Bakker

Gerben Bakker gave a presentation on the concept behind SOPHIE. It is an acronym for Soil Program on Hydro-Physics via International Engagement. As the program focuses on hydro-physics, background information, coverage, as well as the environmental applications of the field were elaborated. Gerben Bakker also focused on the challenges with field measurements and laboratory analysis given the current methods and equipment used. He stressed that current measurement techniques and methodologies can be laborious, and a widely recognized set of

standards for the hydro-physics properties measurements are still lacking. The SOPHIE initiative can provide a platform to address these issues especially in three key aspects. There is a need for 1) Standardization of values, 2) Harmonization of measurement expressed in different units/values, and 3) Innovation of the current techniques.

During the presentation a question was raised by one of the participants regarding the depth of measurement that is most interesting for the field of hydro-physics. Gerben Bakker replied that this is in most cases up to 1.5 meter depth or the depth, also dependent on the ground water level. Saskia Visser also pointed out that during the discussion part of the program, the issue of the relevance of SOPHIE can also be raised: whether the participants agree or not on the need to address the issues that SOPHIE is interested in.

Another question from a participant is whether more data always leads to better results. It was remarked that this is related to the scale at which the results of the measurements or models are needed. Another related matter is the variability expected in the soil properties under consideration.

II. Presentation from ISRIC - World Soil Information (ISRIC) by Rik van den Bosch

A keynote presentation from Rik van den Bosch focused on the need to standardization of soil data. A short introduction about ISRIC was given including its history, mission, and vision. Their current projects were also briefly mentioned. The focus of the presentation is on the steps or methods undertaken by ISRIC to create soil data products. Rik stressed that ISRIC also performs standardization and harmonization of the datasets stored in databases. These are important steps in further analysis to come up with their data products. A sample framework for standardization was presented. Harmonization rules are also formulated, but have shown to be a more difficult step than standardization.

One of the projects of ISRIC is SoilGrids in which 250x250m resolution global soil products (e.g. Soil Organic Carbon) are produced. Currently, it is perhaps the best global products in terms of accuracy, but they are aware it comes with uncertainties. Products for areas with lesser available data have higher uncertainties. A participant commented on the aspect of interpolation as this can be a problem for soil hydro-physics properties, because variability can differ for different areas. Rik replied that the products are more reliable on a regional scale and not so for field scale. The last part of the presentation focused on the connection between ISRIC and SOPHIE. Rik mentioned that ISRIC uses soil data, and can therefore benefit from the goals established by SOPHIE. A question was raised by one of the participants regarding how harmonization works, and what are the tasks and hurdles associated with it. Rik replied that it involves defining a set of rules to put all the values into the same format/units. This was a challenging step as it can be difficult to define a set of rules to convert different formats. In addition he remarked that if all measurements are made using the same set of standards, then harmonization step will no longer be needed.

III. Discussion Session

The presentations were followed by the discussion session on the three main goals of SOPHIE – Standardization, Harmonization, and Innovation. Each participant selected a topic where he/she would like to take part in. Each discussion group exchanged ideas about the current situation, the problems encountered, as well as some actions that can be undertaken. Martine van der Ploeg led the discussion on Harmonization, Winnie van Vark on Standardization, and Gerben Bakker on Innovation. Afterwards, each group shared the outcomes with everyone in the forum.

Harmonization

The group first defined Harmonization. They refer to it as international scientific agreement of comparability of measurements. The motivation for having harmonized measurements is that at present a standard measurement method is still lacking. This is also useful for error estimation.

They listed several action points that will help further discussions and broaden the audience for SOPHIE. They proposed to have links with other sectors such as Global Soil Partnership, urban agenda, LUCAS, or include it within the framework of climate resilience. Having a metadata for analysis would also help harmonization goals. They proposed for the coming years, up to year 2020, that harmonization of three most common parameters in soil hydro physics be achieved. These common soil parameters are bulk density, texture, and structure. Furthermore, sessions in international conferences such as the European Geosciences Union to promote or discuss SOPHIE can be organized. It can also be included within EU projects, such as a COST action proposed by the International Soil Modeling Consortium.

A participant remarked that harmonization is also needed because of Big Data that is now available to scientific community. Another question was raised about the parameters to be harmonized. Soil structure could be a difficult parameter to measure compared to the other two and which test would be used. Martine replied that there are several methods to provide a measure of soil structure but a universal standard method is still lacking.

Standardization

The discussion focused on increasing efforts in having national standards for methods used. Perhaps for some European countries, these standards already exist. Links to other universities and other organization such as the the Global Soil Partnership is also important for standardization. The group had a challenge in discussing specific analytical methods because only a few of them were familiar with soil physical analyses. It was mentioned that new technologies, such as 3D printing can useful in replicating standard samples used in the field or laboratory analyses. One participant who had experience with 3D printing agreed that this is indeed a good idea but it can be quite difficult to create some samples, such representing pore matrix in soils.

Innovation

The discussion on the innovation topic focuses on listing the current methods/measurements used, the ideal situations sought, and the actions needed to take in order to achieve ideal situations.

Currently, there are many different measurement methods available but offer different values. There are also differences between those measured in the field and in the laboratory. Current laboratory methods are already old, can be very laborious and may not be cost effective.

Ideal conditions would be to have automated laboratory system. Or perhaps, if measurements can be validated in the field, laboratory methods may no longer be necessary. In terms of development of equipment, instruments within the category of “proximal sensing” is a good avenue to explore in the near future. They also recognize the need for a standard sample both for field and laboratory analysis.

Some key points during the discussion are:

- 1) To increase accuracy of measurements and to have better equipment to improve accuracy.
- 2) From manufacturers perspective, field activities would be a good area for innovation. It was also mentioned that most of the methods today are already very old methods.

There are a lot of unused data today. Some are not considered accurate, but if some level of uncertainties are accepted, some level of database development/improvement can be undertaken.

They also identified actions that need to be taken. One action is the translation of rough field measurements into refined and standardized ones through modeling. Another is to have measurement methods available for properties that are most needed and to ensure the quality of the measurements taken.

One comment from a participant is to build and work with other scientific communities that work with similar types of measurements (e.g. geotechnical community). A question was raised by another participant to clarify which aspects of the discussion focused on innovation of methods. Gerben Bakker replied that innovation should focus on improving current methods, but also on the development of new and cost effective ones, which was seconded by another participant. Another comment from a participant was on improvement of the modeling aspect because there are already numerous measurement techniques available.

IV. Presentation from International Soil Modeling Consortium (ISMC) by Martine van der Ploeg

The discussion session was followed by a presentation of Martine van der Ploeg, who was besides one of the representatives of SOPHIE, also a representative of the International Soil Modelling Consortium (ISMC). She introduced ISMC and presented the motivation for creating such an consortium. ISMC aims to integrate and advance soil systems modeling, data gathering, and observational capabilities. They believe at present, there are sometimes fragmented modeling efforts across the scientific community as well as lack of access to available datasets and protocol. This latter aspect is where ISMC and SOPHIE have an objective in common.

One of the goals of ISMC is to be able to integrate models and have results at different spatial and/or temporal scales. Regarding the issue of scale, there are still a lot of unknowns in modeling soil processes. Martine highlights that the basis of good models are the need of good quality data. She stressed the need for good quality data and the emergence of Big Data, such as those from the field of remote sensing, that can aid in advancing soil systems modeling.

V. Closing Program

The last part of the program was devoted to summarize the outcome of the workshop. Saskia Visser provided a short summary of the highlights for each discussion group. It is clear that currently, we face many challenges with field- and laboratory methods that are used for the measurement of soil hydro-physics parameters. The discussion is just a first step for future endeavors, and she hopes that further collaboration with other organizations will take place. She encouraged the participants to share/advertise SOPHIE initiative in order to broaden its audience. In the immediate future, perhaps collaboration with Global Soil Partnership (GSP) Pillar 5 could be established. Both Wageningen UR and ISRIC are participating in the GSP. Pillar 5 is explicitly devoted to standardization and harmonization. ISRIC has a seat in the Pillar 5 working group and can make the contacts. In the immediate future, perhaps collaboration with Global Soil Partnership could be established with the help of one of the participants. In addition, having some budget to move the agenda of SOPHIE forward is also crucial for future initiative. The actions outlined by each group in the coming years are a good set of goals to achieve and end with.

Before the program ended, each participant shared his/her views and opinions of the SOPHIE workshop. In general, everyone provided positive statements about the idea and goals within SOPHIE. They also would try to share SOPHIE to their own group or community.

There was a remark from a participant representing Eijkelkamp that SOPHIE is a good venue for companies to be embedded into the science. He also added that during the workshop, it seems that there was focus on the dry soil conditions, but attention to wet conditions, or the “hydro” aspect of the field is lacking. Martine van der Ploeg replied that this “hydro” aspect is implicitly included, for example in the soil parameters mentioned within the Harmonization discussion. Saskia Visser added that indeed this can be highlighted in the next meetings of SOPHIE. Another participant remarked that links to other existing institutions are very important. And perhaps there are already existing protocols or methods that can be adopted within SOPHIE.