Questions & Answers Part 3

Please type your questions in the Question Box. We will try our best to answer all your questions. If we don't, feel free to email Pierre Defourny (Pierre.Defourny@uclouvain.be) or Sean McCartney (sean.mccartney@nasa.gov).

Question 1: Are some Sen4Stat processes and products able to be replicated in GEE (Google Earth Engine)?
Answer 1: Sen4Stat is designed to run automatically and continuously as the data are acquired; this is the reason why Sen4Stat can run on any cloud computing infrastructure that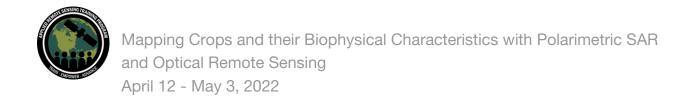 has the Sentinel-1 SLC and Sentinel-2 L2A or L1C data. Unfortunately, the Sentinel-1 SLC data are not provided by GEE and do not allow for derivation of SAR coherence. For analysis of the optical Sentinel-2 data, GEE would be compatible but it is not really appropriate.

Question 2: Is polarimetry good for distinguishing or classifying: 1) salinity in soil (C or L band), 2) sub-soil water using L band, 3) soil vs. snow vs. glacial ice (C or L band)?
Answer 2: SAR signals are sensitive to the dielectric properties of the material. As the salinity and the sub-soil water content modify the electrical conductivity of the material, this would in principle influence the signal. The latter is however influenced by other factors. It is common to assess the sub-soil water using L or even C band. While I am not an expert in polarimetry and this is not the topic of today, I believe that the signal intensity is more sensitive to the suggested variables than the polarimetry. For the snow and ice, it is not my field of expertise.

Question 3: Does the toolbox extend to other applications like deforestation and forest degradation mapping on a large scale?
Answer 3: Sen4Stat is designed with a processing workflow for crop type mapping, which can also be used for land cover mapping over large areas. This has been done in the Philippines. Forest degradation however requires the appropriate in situ dataset to train the supervised RF classifier.

Question 4: When will Sen4stat be available to download?
Answer 4: Sen4Stat will be released officially by early July 2022. The system is already developed but in a beta version and currently tested for demonstration cases. Meanwhile the Sen2Agri system, and even the Sen4CAP system, have been available for several years and are regularly updated.
http://www.esa-sen2agri.org/
http://esa-sen4cap.org/

Question 5: In a lot of developing countries, the field data is not available, but the area statistics are available. Is there any way to perform an unsupervised classification to determine areas and then back out crop type based on the area?
Answer 5: The solution you proposed is only feasible for very simple agricultural landscapes with only two or three largely dominant crops, which are significantly different. The unsupervised classification will only provide clusters but there is no guarantee that it will capture the respective crop signatures.

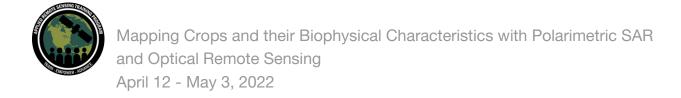**Question 6: Is the field data for South Sudan publicly available?**
Answer 6: The field data for South Sudan belongs to the World Food Program and has been shared with UCLouvain for a demonstration in the Sen2-Agri project.

Question 7: You mentioned "temporal metrics of SAR time series". Can you give some examples and explain this further?
Answer 7: Sen4Stat includes a set of SAR temporal metrics derived from SAR time series, which are monthly mean composites and annual standard deviation for the different polarizations (VV, VH, and ratio). Ascending and descending time series are processed separately providing different temporal metrics accordingly.

Question 8: Can you explain Sen4Stat ID & PASS?
Answer 8: You engage the system as a default user, which establishes the first connection (user: sen4stat and pwd: sen4stat). Once in the system, you will be able to configure a new user and delete the one by default.

Question 9: Where can we get the installation packet for Sen4Stat? I couldn't find it using the link https://esa-sen4stat.org/.
Answer 9: Sen4Stat will be released officially by early July 2022 along with the installation package. Meanwhile the Sen2Agri system (similar but only has optical Sentinel-2 data), and even the Sen4CAP system (Sentinel-1 and 2 but object-based approach) have been available for several years and are regularly updated.
http://www.esa-sen2agri.org/
http://esa-sen4cap.org/

Question 10: What methods were used in the collection of field data?
Answer 10: The in situ data collection strategy follows the JECAM recommendations: http://jecam.org/documents/. Of course, different strategies might be considered, but these recommendations are helpful.

Question 11: On the ARSET description page, this workshop said it would also include "national statistical data sets and surveys for agricultural statistics". How are those incorporated?
Answer 11: National statistical datasets are incorporated as in situ data to train and validate classifier algorithms to produce accurate crop type maps. Then, these crop type maps allow for improvement of the agriculture statistics (cost-efficiency, spatial disaggregation, timeliness, etc.).

Question 12: Can we export different products generated using Sen4Stat?
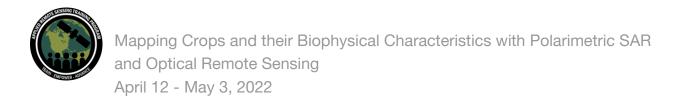Answer 12: Yes, you can download the final products directly from the web interface. The products can also be accessed through a Linux terminal.

Question 13: Can the Sen4Stat platform be used to monitor the conditions of mangrove vegetation?
Answer 13: The platform allows for generation of vegetation indices (NDVI, fAPAR, fCOVER) and biophysical variables.

Question 14: How can we assess crop fields having two crop types for the same study period?
Answer 14: In many countries, we refer to these as mixed crops. In certain situations, you cannot use one crop for a single classification, but you have to use a classification

that incorporates mixed crops. In situ observations play a big role in order to know what dominant crop is present in a given area.

Question 15: How do you transfer learning for Random Forest and use it in another area? Can you also provide any information on crop classification using harmonic time series?

Answer 15: Transfer learning is a key research topic in this area of study. The research however is still not complete and can be unreliable when conducted on a large scale. Harmonic time series for this use case was not useful for us.

Question 16: Will we be able to install Sen4Stat in Ubuntu? Sen4CAP accepts CentOS 7 only, which makes it difficult to operate.

Answer 16: At this point, Sen4Stat can only be installed in CentOS7.
CentOS7 is very stable for our use case and for large scale processing.

Question 17: Do you need the crop type before estimating biophysical variables? Or at least improve the accuracy of the estimates?

Answer 17: The biophysical variables do not need any crop type before being launched. Here, the system provides only generic variables and not crop specific ones.

Question 18: Is it possible to classify fruit tree types and/or olive trees?

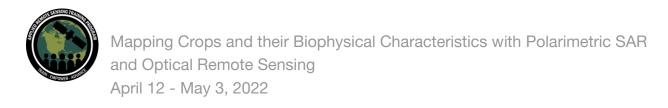Answer 18: Yes. A specific processor dedicated to permanent crop type is available in Sen4Stat.

Question 19: Can we measure soil parameters such as soil moisture content, soil texture, organic matter, pH, salt, and lime contents using Sen4Stat?

Answer 19: The system focuses on vegetation and not on soil parameters. Sentinel-1 can estimate soil moisture content, but not the other soil parameters.

Question 20: Can the Sen4Stat app be installed in the Windows OS or can it only work with Linux?

Answer 20: Sen4Stat can only work with Linux.

Question 21: Is there a method or software to geocode the phase image of some other type of SAR?

Answer 21: This is not part of Sen4Stat and only works with Sentinel-1 imagery. SNAP (also available through ESA) is a good tool for this.

Question 22: What is the minimum phenological phase that can help to distinguish between annual crop types?
Answer 22: I am not sure I understand your question. The minimum phenological phase required to run the crop classification for the early delivery would probably correspond to half of the season (e.g. 3 months), but of course, this would depend on the complexity of your agricultural landscape.