



Questions & Answers Part 4

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), Fabrizio Ramoino (fabrizio.ramoino@esa.int), or Sean McCartney (sean.mccartney@nasa.gov).

Question 1: Do Sen2Cor2.5 and 2.8 both reduce the spatial resolution (e.g. each band to 60 m) if working in command line mode without any parameters? How to work with Sen2Cor in offline mode?

Answer 1: Yes, the user can define the resolution of the output: native (multi-resolution) 10m, 20m and 60m. All the information on how to use Sen2Cor in command line mode is available here: <http://step.esa.int/thirdparties/sen2cor/2.9.0/docs/S2-PDGS-MPC-L2A-SUM-V2.9.0.pdf>

You can find different versions of Sen2Cor, depending on the baseline of the S2 data. The last release is Sen2Cor 2.10. Further information can be found at: <http://step.esa.int/main/snap-supported-plugins/sen2cor/>

Question 2: How can I download the Sen4Stat application, to be able to practice?

Answer 2: 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 3: Is a Windows operating system compatible with using Sen4Stat?

Answer 3: At this point, Sen4Stat can only be installed in CentOS7 Linux.

CentOS7 is very stable for our use case and for large scale processing. CentOS is also an open source software.

Question 4: To use Sen4Stat, do I need a computer with large memory, large CPU, and large storage capacity?



Mapping Crops and their Biophysical Characteristics with Polarimetric SAR and Optical Remote Sensing

April 12 - May 3, 2022

Answer 4: No, Sen4Stat itself does not require a specific computer for the installation. The performance of the computer must be compatible with the size of the area that will be processed and the length of the season to monitor.

Question 5: Can you please explain how 21 November 2020 was identified as the outlier during the practical session?

Answer 5: The red reflectance for one of the invariants is identified as an outlier on this date as it deviates more than the median plus a tolerance of 0.01. This threshold for maximum deviation to reject an image is rather strict and is related to the radiometric calibration performance.

Question 6: Regarding the invariants, aren't the titles shuffled? The reflectance time series seems high for pines and low for water and airport track. I would have expected the opposite.

Answer 6: Indeed these reflectances are different than expected as absolute values. These values were averaged from each invariant target polygon respectively but biased for display reason by a constant value different for each target. Such a bias had no impact in relative terms for a given target and therefore didn't affect the outlier detection.

Question 7: What should be the interpretation of bright white pixels in the different date composite RGB image?

Answer 7: The bright pixels correspond to high values in all the displayed bands. The combination of high display values in the red, green, and blue channels leads to a white color.

Question 8: How does LAI provide different or additional information than traditional vegetation indices such as NDVI?

Answer 8: The NDVI is only a normalized difference of spectral bands while the LAI is a variable, which can be measured on the ground, used in field observations for developing stage identification, and in crop growth models. NDVI does not correspond to any biological measurement, but LAI does.

Question 9: Along with LAI, which other biophysical parameters can be estimated with SAR?



Mapping Crops and their Biophysical Characteristics with Polarimetric SAR and Optical Remote Sensing

April 12 - May 3, 2022

Answer 9: For optical imagery, you can derive LAI along with other biophysical variables such as FAPAR, fCover, Canopy Water Content, and Canopy Chlorophyll Content. With regard to biophysical variables retrieved using SAR data, some studies have demonstrated that Plant Area Index and Wet Biomass could be retrieved using S1 dual-pol (VV and VH).

Question 10: In the case of parcels doing agroforestry, how can we compare the productivity versus parcels using open field principles and fertilizers ?

Answer 10: Agroforestry systems by definition include trees in the fields or around the fields, which have to be masked out before any comparison can be made with the green biomass of an open field crop. It is important to know what variables you are measuring when looking into this.

Question 11: Is it possible to get LAI from fusion of Sentinel-1 and Sentinel-2? How effective is it in yield prediction?

Answer 11: LAI can also be retrieved from Sentinel-1 imagery. S1 and S2 are two different datasets and the combination of both LAI time series, respectively S1 and S2 derived, cannot be merged directly. Determining how to proceed to fuse both time series is still a research question.

Question 12: Does Sentinel-2 MSI Level 2A data require atmospheric correction, like using Sen2Cor?

Answer 12: Sentinel-2 L2A data is already atmospherically corrected. The S2 L2A data distributed by ESA (through Copernicus Open Access Hub <https://scihub.copernicus.eu/dhus/#/home>) are processed using Sen2Cor. Beyond Sen2Cor, S-2 L1C (TOA) data can be atmospherically corrected using other processors depending on your application:

- MAJA (developed jointly by CESBIO/CNES and DLR)
- LaSRC (developed by NASA GSFC/USA)
- i-COR (developed by VITO)
- CorA (developed by Brockmann Consult)
-

Question 13: Is LAI providing any information regarding biomass or shade level for agroforestry systems?



Mapping Crops and their Biophysical Characteristics with Polarimetric SAR and Optical Remote Sensing

April 12 - May 3, 2022

Answer 13: LAI refers to all green biomass materials (green leaves and green stem) but does not include any woody elements necessarily present in agroforestry systems.

Question 14: How do I set a threshold in order to detect the outliers when checking quality control of the LAI?

Answer 14: The threshold value needs to be set higher than the instrument noise and aligned with radiometric calibration performances; it was set as a maximum deviation of 0.01 from the median values computed for the entire time series. Outlier detection helps to screen out suspicious observations where there are large residual atmospheric perturbations, in spite of the applied atmospheric correction.

Question 15: What is the significance or advantage of using L1C data if S2A is corrected atmospherically?

Answer 15: Sentinel-2 L2 imagery is already atmospherically corrected, but L1C is not. It is dependent on conditions. An L1C cloud free image could be used for a land cover classification if the study area fits on a single image (same orbit, same day of observation, no clouds). We want to use a surface reflectance product (S2 L2A) in order to:

- Allow comparisons between images
- Allow repeatable measurements (e.g., ground spectra comparison to satellite observations)
- Represent a known physical unit.

Question 16: What is the correct tool in SNAP for image to image registration like in ENVI?

Answer 16: In SNAP there is a collocation module (under Raster → Geometric) that allows the user to create a stack of images based on geolocation information. There is a co-registration tool called GeFolki for automatic image co-registration (optical-optical or optical-SAR) but it is not very fast. In the near future a new co-registration module will be included.

Question 17: Do we have to always create a subset of the image in SNAP before doing our analysis? What is the main significance of creating a subset?

Answer 17: The subset allows for a reduction of volume from the dataset, for instance when training or when the study area is much smaller than a S2 tile.



Mapping Crops and their Biophysical Characteristics with Polarimetric SAR and Optical Remote Sensing

April 12 - May 3, 2022

Question 18: Can we use the LAI from Sentinel-2 as input for crop simulation models, without ground truth?

Answer 18: The BV Net software, which is physically-based, has been validated enough to be proven useful. It is quite generic and you don't need to validate LAI. On the other hand, the results of the crop simulation model will probably need to be validated.

Question 19: When adding irrigation during the growing season, can it be seen like a booster on the normal growing curve?

Answer 19: Yes, a better irrigated field will have a better growing curve in regards to green biomass.

Question 20: Can we link the area under the curve to the total yield for a given parcel?

Answer 20: For some crops such as corn, cumulated green biomass is an excellent indicator of crop development and in most cases will correspond to a good indicator of crop yield. However, this has to be considered as a variable probably correlated with the yield and not a yield estimate as such. In some meteorological circumstances, this cumulated green biomass does not translate into a grain yield due to problems during the grain filling stage for instance.