Tutorial on Phenology Metrics module

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Phenology Metrics module[2] utilizes a time-series NDVI images and aims to identify the phenological cycles of one year. The outputs are the day of the year, when the "greenup", the "senescence" and the "max NDVI" in each phonological cycle occurred (see Figure 1):

- Start of Season (Greenup): The day of the year that identified as having a consistent upward trend in time series NDVI.
- End of Season (Senescence): The day of the year that identified as having a consistent downward trend in time series NDVI.
- Peak of Season (Max NDVI): The day of the year that the maximum NDVI exists.

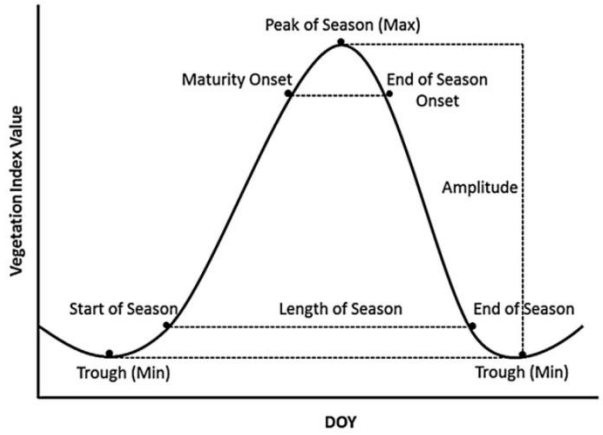


Figure 1. Source: Mountford, G. L., Atkinson, P. M., Dash, J., Lankester, T., & Hubbard, S. (2017). Sensitivity of Vegetation Phenological Parameters: From Satellite Sensors to Spatial Resolution and Temporal Compositing Period. In Sensitivity Analysis in Earth Observation Modelling. Elsevier Inc. https://doi.org/10.1016/B978-0-12-803011-0.00004-5

Some literature as evident in the phenex.R used:

- Badeck, F.W., Bondeau, A., Boettcher, K., Doktor, D., Lucht, W., Schaber, J. and Sitch, S. (2004). Responses of spring phenology to climate change. New Phytologist, 162, 295-309.
- Doktor, D., Bondeau, A., Koslowski, D. and Badeck, F.W. (2009). Influence of heterogeneous landscapes on computed green-up dates based on daily AVHRR NDVI observations. Remote Sensing of Environment, 113, 2618-2632
- Zhang, X.Y., Friedl, M.A., Schaaf, C.B., Strahler, A.H., Hodges, J.C.F., Gao, F., Reed, B.C. and Huete, A. (2003). Monitoring vegetation phenology using MODIS. Remote Sensing of Environment, 84, 471-475.

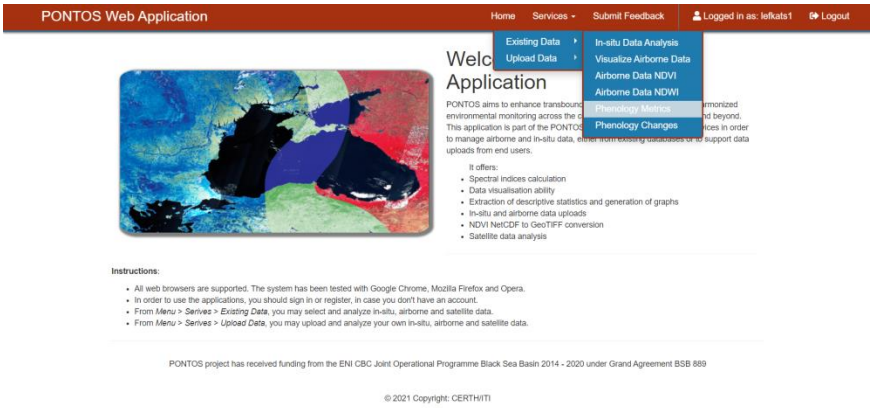
[1] For more information please contact imanakos@iti.gr or lefkats@iti.gr

[2] http://www.ecopotential-project.eu/images/ecopotential/documents/D6.3.pdf (page 20, section 4.4)

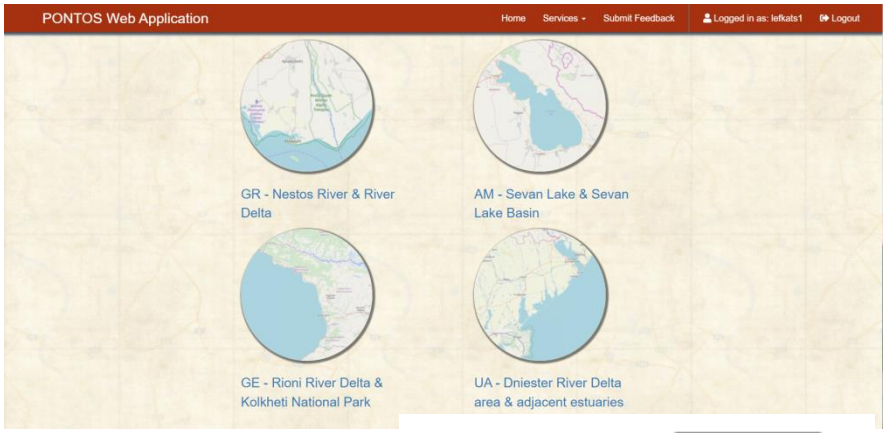
1. Extract Phenology Metrics GeoTIFF

Steps:

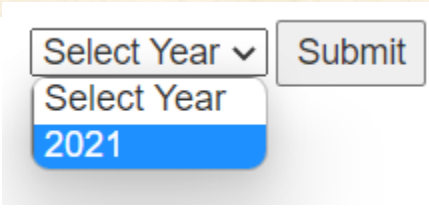
1a. Open PONTOS Web Application > Services > Existing Data > Phenology Metrics



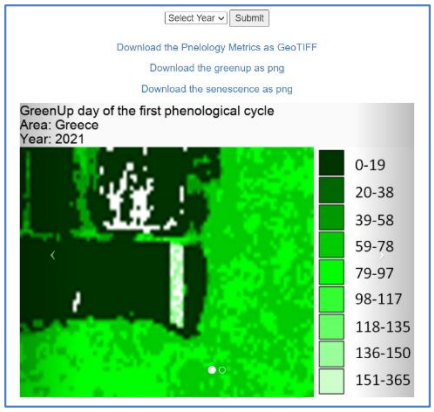
1b. Select Pilot Site

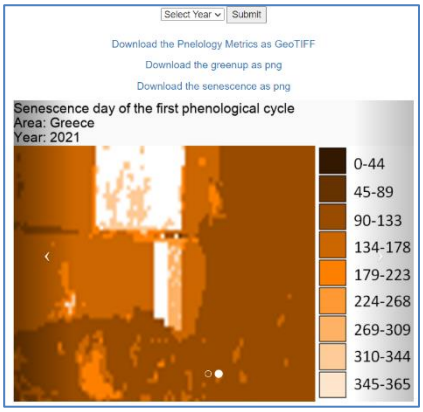


1c. Select year & submit

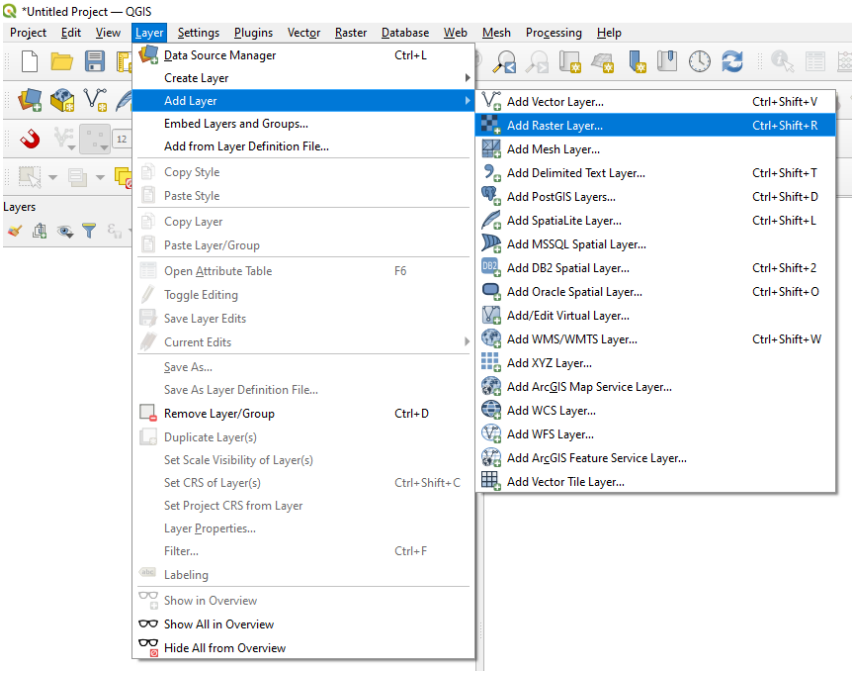


1d. Download the Phenology Metrics as GeoTIFF

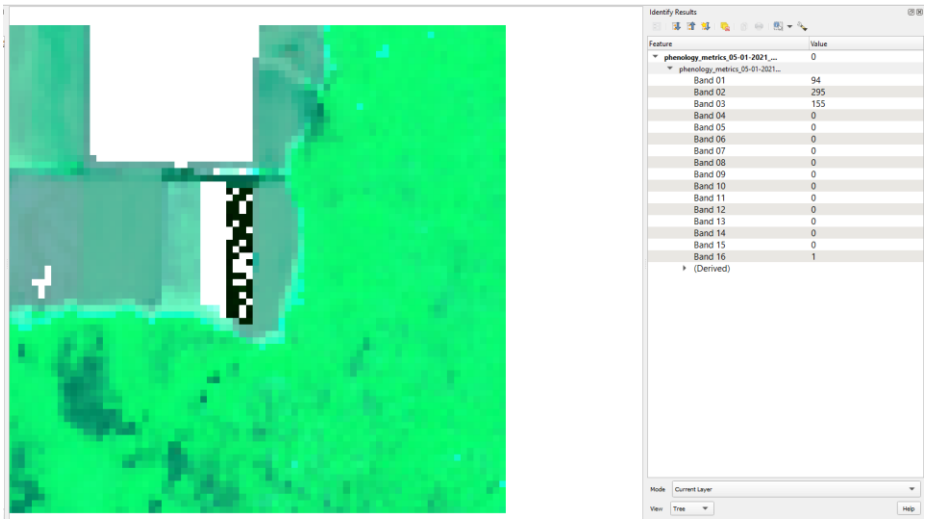




2. Import Phenology Metrics GeoTIFF in QGIS software



3. Phenology Metrics results' interpretation



Phenology Metrics GeoTIFF outuput consists of multiple layers. For each one of the detected NDVI peaks, 3 consecutive layers are recorded sequentially, i.e. for the first NDVI peak the first 3 layers, for the next NDVI peak the next 3 layers, and so on. Pixel values denote the distance in days from the starting date, that represent: a) Day at which greenup takes place; b) Day at which senescence takes place; c) Day with highest NDVI value. Finally, there is one last layer that denotes per pixel (i.e. pixel value) the total number of the phenological cycles that have been detected within the set date range.

For more information please contact imanakos@iti.gr or lefkats@iti.gr