Abstract

This work aims to evaluate the detection of phenological phases of vegetation based on phenometric parameters according to archival Sentinel-2 data in the selected areas over the period 2018-2020. The first part of the work describes literature review of the relevant publications, which is followed by the description of the suggested methodology. Then, there are the results with the graphic material and description for each monitored site. In the final part of the work, advantages and disadvantages of the developed algorithm are discussed followed up by suggestions for future research and improvement. The developed algorithm consists of two parts. Masking out cloudy and cloud shadow pixels and generation on the vegetation indices time series is done in the GEE platform. The time series analysis and detection of SOS and EOS as well as statistical analysis are done in the R environment. The study areas of size 20 x 20 m represent different species of perennial vegetation across the Czech Republic. For the assessment of the phenophases detection are selected NDVI, RENDVI, NDRE, NDMI and MCARI. The Asymmetric Gaussian function and Double Logistic function are fitted to the time series of each vegetation season in each tested site, the phenology metrics are derived based on threshold or derivatives methods. The results are validated by the in-situ data provided by the CHMI. NDMI showed the highest accuracy in SOS detection when Asymmetric Gaussian function is applied (5-7 days mean absolute standard deviation). NDVI, RENDVI and NDRE detected SOS accurately with fitted Double Logistic function depending on the monitored species (RENDVI for ash – 1 day, NDVI for beech – 5 days, RENDVI for hornbeam – 8 days). For EOS RENDVI showed the highest reliability for all tested sites, whereas NDMI and MCARI failed to detect senescence.

Key words: time series, phenology, Google Earth Engine, Sentinel-2, phenophase