

Retrieval of harmonized LAI product of agricultural crops from Landsat OLI and Sentinel-2 MSI time series

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Environmental changes have a major impact on agricultural management, affecting for example the timing and length of the growing season, biomass production and consequently the overall harvest. Sentinel-2 MSI and Landsat OLI multispectral satellite imagery provide a valuable source of data for monitoring the condition of agronomic crop stands, for example by deriving various vegetation indices or biophysical parameters. One of the most interesting biophysical parameters in terms of its use in so-called precision agriculture is the Leaf Area Index, describing the amount of biomass in a stand. The aim of this poster presentation is to demonstrate our approach to harmonized LAI calculation based on Sentinel-2 and Landsat satellites for agronomic crops dominant in the Czech Republic, including winter wheat, spring barley, winter rapeseed, alfalfa, sugar beet, and corn, in order to obtain dense seasonal trajectories of LAI. The two-step process of harmonizing the Sentinel-2 MSI and Landsat OLI spectral data began by deriving the vegetations indices NDVI, MSAVI, and NDWI_1610 as proxies for green biomass and foliage water content, the parameters that contribute most to the spectral response of the crop. Second, a simple linear transformation was applied to the resulting VI values. The regression model itself was built on an artificial neural network and then trained on PROSAIL simulations data. LAI estimates were validated on a large dataset of in situ measurements collected in 2017 and 2018 in the lowlands of the Central Bohemia Region. Very strong agreement was observed between LAI estimates from both Sentinel-2 MSI and Landsat OLI data and independent ground-based measurements (r between 0.7 and 0.98). Very good results were also obtained when LAI datasets from Sentinel-2 and Landsat satellites were compared to each other ($r_{RMSE} < 20\%$, r between 0.75 and 0.99). Using data from all currently available Sentinel-2 (A/B) and Landsat (8/9) satellites, a dense harmonized LAI time series with high potential for precision agriculture application can be created.