EGU2020-840
https://doi.org/10.5194/egusphere-egu2020-840
EGU General Assembly 2020

Variability of green-up duration of deciduous broadleaf forests in Central Europe during 2000-2019 based on MODIS NDVI

Anikó Kern[1], Hrvoje Marjanović[2], and Zoltán Barcza[3]
[1]Department of Geophysics and Space Science, Eötvös Loránd University, Budapest, Hungary (anikoc@nimbus.elte.hu)
[2]Croatian Forest Research Institute, Jastrebarsko, Croatia (hrvojem@sumins.hr)
[3]Department of Meteorology, Eötvös Loránd University, Budapest, Hungary (bzoli@elte.hu)

Spring leaf unfolding is a spectacular recurring event at the mid- and high latitudes that is associated with deciduous vegetation. Several lines of evidence indicate that the timing of spring green-up (i.e. the start of the season, SOS) changed in the past decades resulting in an earlier leaf unfolding - a phenomenon which is considered to be a major indicator of the effects of global warming. Contrary to the timing of the SOS, considerably less attention was paid to studying the dynamics of vegetation green-up, characterized by the leaf unfolding speed or the duration of spring green-up. The importance of studying the spring green-up dynamics lies in the fact that the duration of leaf development and timing of the onset of growth jointly determine the annual cycle of vegetation activity including carbon and energy balance, canopy conductance and evapotranspiration.

The aim of our research was to characterize the dynamics of leaf unfolding of deciduous broadleaf forests in the wider Carpathian Basin, located in Central Europe, using satellite remote sensing. The study was based on the Normalized Difference Vegetation Index (NDVI) time-series derived from the MOD09A1 official MODIS products during 2000–2019, the IGBP land cover classification dataset of the MCD12Q1 products, the CORINE 2012 (CLC2012) land cover dataset, the SRTM elevation dataset, and the FORESEE meteorological database. Our results clearly show that there is considerable interannual variability in the green-up duration of the deciduous broadleaf forest during 2000–2019. The last three years had, on average, the shortest (2018) and the two longest (2017 and 2019) recorded green-up durations in the region. Observed variability was partially attributed to the meteorological conditions, namely the extreme weather events occurring during the spring. We demonstrate that the meteorological conditions during the green-up period have a strong effect on the duration. The relationship between the SOS and the green-up duration reveals that the SOS also played an important role as a driver. Our results also reveal considerable elevation dependency both in the green-up duration and also in its correlation with SOS. Multiple linear regression models based on the SOS and the meteorological variables were also created to explain and predict the green-up duration.