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Land surface phenology versus traditional observations

M. Hunkár Zemankovics (1), I. Szenyán (2), E. Vincze (2), T. Szerdahelyi (3), and Z. Dunkel (2)

(1) University of Pannonia, Georgikon Faculty, Economic Methodology, Veszprém, Hungary (hunkar@georgikon.hu), (2) Hungarian Meteorological Service (szenyan.i@met.hu; vincze.e@met.hu; dunkel.z@met.hu), (3) Szent István University Institute of Botany and Ecophysiolgy (Szerdahelyi.Tibor@mkk.szie.hu)

Monitoring phenological phases of plants is carried out in many European countries. Each country has its own database, in some cases still on paper, mostly on databank-systems, going back to the 1950s. Recently remote sensing phenology, the use of satellites to track phenological events can complement or in some cases substitute ground observation networks. Satellites provide a unique perspective of the planet and allow for regular, even daily, monitoring of the entire global land surface. Because the most frequently used satellite sensors for monitoring phenological events have relatively large "footprints" on the land surface, they gather data about entire ecosystems or regions rather than individual species. Remote sensing phenology can reveal broad-scale phenological trends that would be difficult, if not impossible, to detect from the ground, and because data collection by satellite sensors can be standardized, the data are reliably objective. Obviously remote sensing data are not the traditional phenological phases but they are reflectance () in different spectral channels. The status of the vegetation is in close connection with its reflectance especially in the near infrared and red spectrums. In our study we used “Enhanced Vegetation Index” (EVI) to characterize the status of vegetation on sample area with the size of 5km x 5km covered by different agricultural and native plants. EVI data are available from MODIS placed at Terra and Aqua satellites. High resolution (250m x250m pixels) composite data with 8 day frequency for the years 2011 and 2012 will be analysed. Spatial average of high resolution EVI data is used to characterize of the vegetation dynamics. Temporal variation in EVI data are modelled using piecewise sigmoid models. Each growth cycle is modelled using two sigmoid functions: one for the growth phase, one for the senescence phase. To identify the land surface phenological transition dates, the rate of change in the curvature of the fitted logistic models is used for each year. Specifically, transition dates correspond to the times at which the rate of change in curvature in the EVI data exhibits local minima or maximums. For each growth cycle, four phenological transition dates are recorded based on the approach described above. The corresponding phenological transition dates are defined as the onset of greenness increase (F1), the onset of greenness maximum (F2), the onset of greenness decrease (F3), and the onset of greenness minimum (F4). The dates of that four “landscape phenological phases” are compared to the pixel-level EVI values for identified plant stands- namely locust (Robinia pseudacacia); poplar (Populus spp); sessile oak, (Quercus petraea); winter wheat (Triticum aestivum); winter barley (Hordeum vulgare); maize (Zea Mays); sunflower (Helianthus annuus); oilseed rape (Brassica napus). The effect of climatic variables on the development of vegetation will be analysed