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From area to point: scaling land-surface phenology processes using dense time-series of Landsat, Sentinel-2, and phenocams

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Land-surface phenology (LSP) reflects the seasonal pattern of variation in vegetated land surfaces observed from remote sensing. As an integrated signal of various plant species, it can be characteristic for species composition of an ecosystem. However, discrimination between plant species and physiological processes that determine the start of the growing season requires observations at stand level, for instance using phenocams (Keenan et al. 2014, Brown et al. 2016). These need to be scaled to ecosystem level (Nijland et al. 2016), where they meet the spatial resolution of Earth observation sensors like those onboard the Landsat family and Sentinel-2 (Vrieling et al. 2017).

Myriad studies have used long-term time series of spectral vegetation indices to globally derive LSP metrics and trends at coarse and moderate resolutions (for a review, see Garonna et al. 2016). In this study, we explored the step from moderate to high spatial resolution (merged Landsat and Sentinel-2) at three test sites in temperate forest, arctic tundra and alpine grassland respectively. We show the detected differences and similarities between red-edge based indices that are commonly used with satellite imagery and greenness-based indices that are commonly used with phenocams. In the analysis, we focused on ecological processes and how these can be used for biodiversity assessment. This is a crucial step for narrowing the scale gap between plant phenology and land-surface phenology and has the potential for application at large – even global – spatial extent.

The study is part of the GlobDiversity project that is funded by the European Space Agency. It targets among other the observation of LSP as an Essential Biodiversity Variable that can be observed by Remote Sensing (RS-enabled EBV).

- Brown TB, Hultine KR, Steltzer H et al. (2016) Using phenocams to monitor our changing Earth: toward a global phenocam network. Frontiers in Ecology and the Environment, 14, 84-93.
- Garonna I, de Jong R, Schaepman ME (2016) Variability and evolution of global land surface phenology over the past three decades (1982-2012). Global Change Biology, 22, 1456-1468.
- Keenan TF, Darby B, Felts E et al. (2014) Tracking forest phenology and seasonal physiology using digital repeat photography: a critical assessment. Ecological Applications.
- Nijland W, Bolton DK, Coops NC, Stenhouse G (2016) Imaging phenology; scaling from camera plots to landscapes. Remote Sensing of Environment, 177, 13-20.
- Vrieling A, Skidmore AK, Wang T et al. (2017) Spatially detailed retrievals of spring phenology from single-season high-resolution image time series. International Journal of Applied Earth Observation and Geoinformation, 59, 19-30.