Impact of spatial scale for phenological indices derived from remotely sensed data

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Land surface phenology (LSP) characterizes the vegetated land surface and is practical to understand terrestrial environmentals at a global scale. Regularly observed remotely sensed data such as Landsat, MODIS, and AVHRR contributes to analyze LSP spatially. However, at least two main challenges should be addressed such that (i) the spatial resolution which attributes to the data source may significantly impact to LSP estimation, and (ii) the estimated LSP may not represent the vegetated land surface well due to the mixed land cover. Previous studies have shown that the estimation of LSP from different data is not consistent due to the spatial scale of data but yet fully linked with the mixed land cover problem. Thus, in this study, we attempt to analyze the impact of spatial scale issue to the estimated LSP in homogenous land cover areas. We use freely available remotely sensed data with different spatial resolution such as Landsat (30m), MODIS (250m, 500m, 1km), and GIMMS3g (8km) and estimate phenological indices for each. As land cover description differs among data products, land cover classes are aggregated into 12 classes globally from major global land cover producs (GLCC, GLC2000, and globcover), then spatially homogenuous land cover are only picked up. Phenological indices such as the magnitude and the peak of DOY are calculated by harmonic analysis to compare results among different spatial scales. The variability of phenological indices is explored according to the different spatial scale under the condition of homogenuous land cover. It is expected to model such variability to overcome the spatial scale impact and such characteristics depending on the spatial scale should be taken into account when considering LSP from satellite.

Keywords: Spatial scale, Land surface phenology, remotely sensed data

