Geophysical Research Abstracts
Vol. 19, EGU2017-13411, 2017
EGU General Assembly 2017

NDVI derived from IR-enabled digital cameras: applicability across different plant functional types

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Phenological time-series based on the deployment of radiometric measurements are now being constructed at different spatial and temporal scales ranging from weekly satellite observations to sub-hourly in situ measurements by means of e.g. radiometers or digital cameras. In situ measurements are strongly required to provide high-frequency validation data for satellite-derived vegetation indices. In this study we used a recently developed method to calculate NDVI from NIR-enabled digital cameras (NDVIC) at 17 sites encompassing 6 plant functional types and totalizing 74 year-sites of data from the PHENOCAM network. The seasonality of NDVIC was comparable to both NDVI measured by ground light emitting diode (LED) sensors and by MODIS, whereas site-specific scaling factors are required to compare absolute values of NDVIC to standard NDVI measurements. We also compared green chromatic coordinate (GCC) extracted from RGB-only images to NDVIC and found that the two are characterized by slight different dynamics, dependent on the plant functional type. During senescence, NDVIC lags behind GCC in deciduous broad-leaf forests and grasslands, suggesting that GCC is more sensitive to leaf decoloration and NDVIC to the biomass reduction resulting from leaf abscission and green to dry biomass ratio of the canopy. In evergreen forests, NDVIC peaks later than GCC in spring, likely tracking the processes of shoot elongation and new needle formation. Our findings suggest therefore that NDVIC and GCC can complement each other in describing ecosystem phenology.