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Global trends in vegetation phenology from 32-year GEOV1 leaf area index time series

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Phenology is a critical component in understanding ecosystem response to climate variability. Long term data records from global mapping satellite platforms are valuable tools for monitoring vegetation responses to climate change at the global scale. Phenology satellite products and trend detection from satellite time series are expected to contribute to improve our understanding of climate forcing on vegetation dynamics. The capacity of monitoring ecosystem responses to global climate change was evaluated in this study from the 32-year time series of global Leaf Area Index (LAI) which have been recently produced within the geoland2 project. The long term GEOV1 LAI products were derived from NOAA/AVHRR (1981 to 2000) and SPOT/VGT (1999 to the present) with specific emphasis on consistency and continuity. Since mid-November, GEOV1 LAI products are freely available to the scientific community at geoland2 portal (www.geoland2.eu/core-mapping-services/biopar.html). These products are distributed at a dekadal time step for the period 1981-2000 and 2000-2012 at 0.05º and 1/112º, respectively. The use of GEOV1 data covering a long time period and providing information at dense time steps are expected to increase the reliability of trend detection.
In this study, GEOV1 LAI time series aggregated at 0.5º spatial resolution are used. The CACAO (Consistent Adjustment of the Climatology to Actual Observations) method (Verger et al, 2013) was applied to characterize seasonal anomalies as well as identify trends. For a given pixel, CACAO computes, for each season, the time shift and the amplitude difference between the current temporal profile and the climatology computed over the 32 years. These CACAO parameters allow quantifying shifts in the timing of seasonal phenology and inter-annual variations in magnitude as compared to the average climatology. Interannual variations in the timing of the Start of Season and End of Season, Season Length and LAI level in the peak of the growing season are analyzed. Trend analysis with robust statistical test of significance is conducted. Climate variables (precipitation, temperature, radiation) are then used to interpret the anomaly patterns detected in vegetation response.