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Assessing the seasonality of multi-source fAPAR time series

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The fraction of Absorbed Photosynthetically Active Radiation (fAPAR) is an essential diagnostic variable to investigate the temporal and spatial dynamics of the terrestrial biosphere. We introduce a new method to compare global vegetation greening phase dynamics, derived from fAPAR time series from remote sensing sensors, and from climate models.

This poster provides a two-tier presentation of this study: First, the greening phase pattern analysis is presented. The method is developed to compare the phase of seasonal signals in multi-annual data sets. We apply it to three long term satellite vegetation data sets, namely from AVHRR (Advanced Very High Resoluted Radiometer), SeaWiFS (Sea-viewing Wide Field-of-view), and MODIS (Moderate Resolution Imaging Spectroradiometer) sensors.

While previous comparison studies focused on the estimation of specific phenological events, e.g. spring date, the current study introduces a new algorithm that allows for the robust identification of seasonal signals from multi-sensor time series with a special focus on the difference in the seasonal phases of the characteristic signal. By vector normalisation and integral calculation, we isolate the seasonal signal from any amplitudinal aspects that are influenced by the inconsistencies of the various data sets. The comparison of three independent remote sensing data sets shows significantly consistent global spatio-temporal patterns at the 95% confidence level. Based on the monthly resolved data sets that have been evaluated in this study, no remarkable shifts are visible. Shifts stay in the range of +/- 1 month, which is the expected minimum shift for monthly resolved data.

Second, the robust greening phase pattern algorithm is ideal for the assessment of seasonal processes simulated by the vegetation components of climate models. A couple of models have been evaluated by the greening phase pattern analysis. Regions where the seasonality of the models agree with the remote sensing data sets can be detected as well as regions, where models and observations disagree. Results from global as well as regional evaluations are presented.