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Match and mismatch – comparing plant phenological metrics from ground-observations and from a prognostic model

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Changes in the seasonality of life cycles of plants as recorded in phenological observations have been widely analysed at the species level with data available for many decades back in time. At the same time, seasonality changes in satellite-based observations and prognostic phenology models comprise information at the pixel-size or landscape scale. Change analysis of satellite-based records is restricted due to relatively short satellite records that further include gaps while model-based analyses are biased due to current model deficiencies.,

At 30 selected sites across Europe, we analysed three different sources of plant seasonality during the 1971–2000 period. Data consisted of (1) species-specific development stages of flowering and leave-out with different species observed at each site. (2) We used a synthetic phenological metric that integrates the common interannual phenological signal across all species at one site. (3) We estimated daily Leaf Area Index with a prognostic phenology model. The prior uncertainties of the model's empirical parameter space are constrained by assimilating the Fraction of Photosynthetically Active Radiation absorbed by vegetation (FPAR) and Leaf Area Index (LAI) from the MODerate Resolution Imaging Spectroradiometer (MODIS). We extracted the day of year when the 25%, 50% and 75% thresholds were passed each spring.

The question arises how the three phenological signals compare and correlate across climate zones in Europe. Is there a match between single species observations, species-based ground-observed metrics and the landscape-scale prognostic model? Are there single key-species across Europe that best represent a landscape scale measure from the prognostic model? Can one source substitute another and serve as proxy-data? What can we learn from potential mismatches? Focusing on changes in spring this contribution presents first results of an ongoing comparison study from a number of European test sites that will be extended to the pan-European phenological database Cost725 and PEP725.