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Analyzing the cross-correlation between the extended spring indices and the AVHRR start of season phenometric

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Phenology is the science that studies the timing of recurring plant and animal biological phases, their causes, and their interrelations. This timing varies from place to place and from year to year because it is strongly driven by environmental conditions. Understanding phenological variability and phenological changes is key to recognizing the impact of climate change on our natural and man-made ecosystems.

Here, we describe a novel analysis that aims at studying the coherence of two of the most important sources of phenological data: temperature-based phenological models and land surface phenological metrics derived from Earth observation sensors. In particular, we study the cross-correlation between spring onset as predicted by the so-called extended spring indices (SI-x) and the start of season (SOS) metric derived from the AVHRR sensor. This analysis, which requires the computation of the singular value decomposition (SVD) of the product of the SI-x by the SOS, was done using long time series (1989-2014) of high spatial resolution (1 km) gridded products over the conterminous USA. The computational complexity of the analysis was reduced by making use of a special algorithm that allows computing the required SVD without explicitly calculating the product of the two phenological products.

Preliminary results show that there is a high cross-correlation between the SI-x and the SOS products. Moreover, the use of the SVD approach allows the visualization of the main modes of spatial cross-correlation (i.e. main phenological patterns from both datasets) as well as the identification of the years where these modes were found. These results represent a first stepping stone towards the analysis of the complementary and synergistic value of the numerous phenological products that are currently available to study the impact of climate change at continental to global scales.