Calculating Synoptic to Global Scale Spring Phenology

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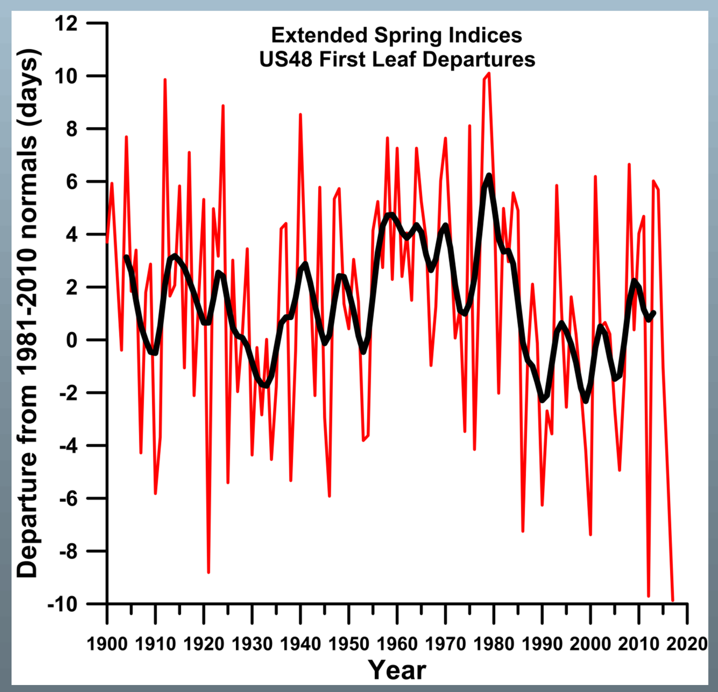
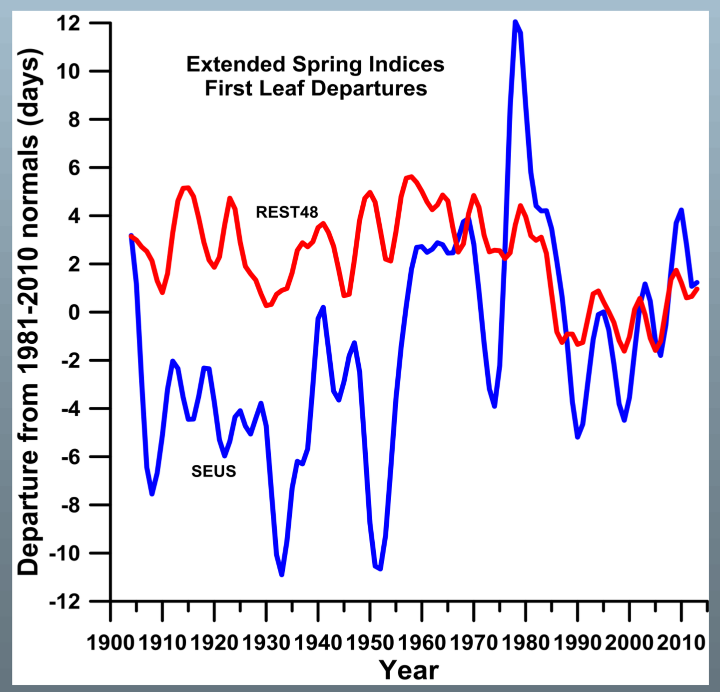
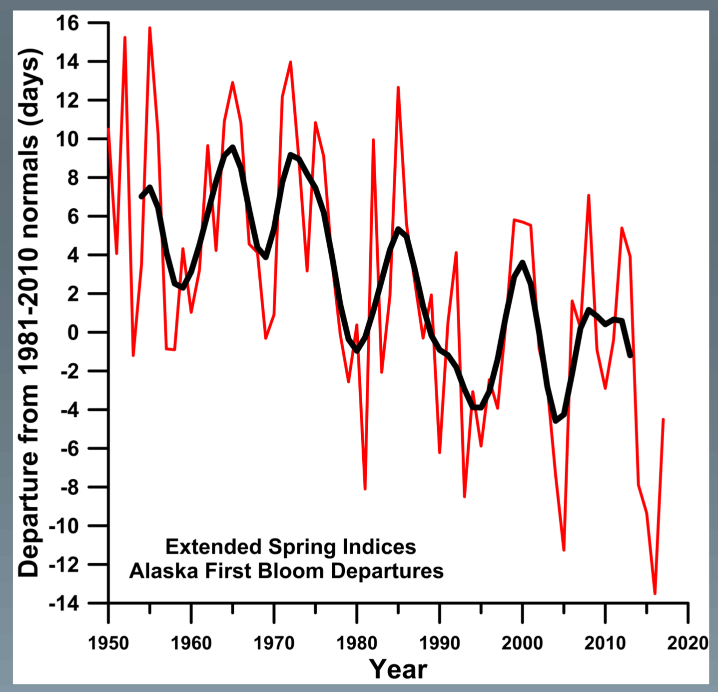
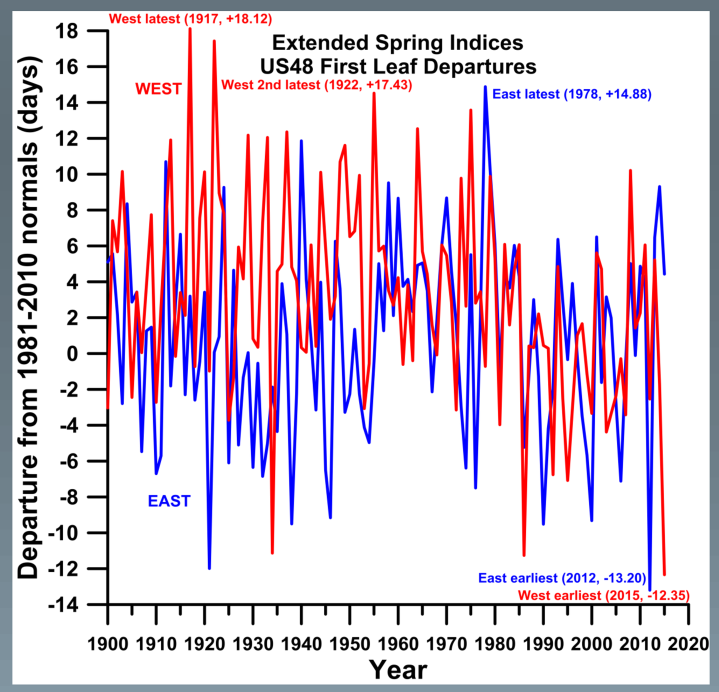
North American Analyses





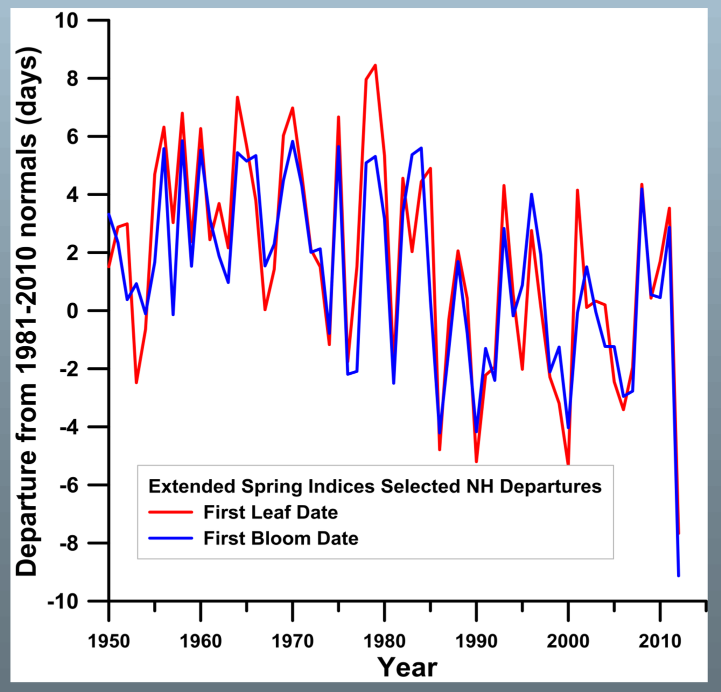


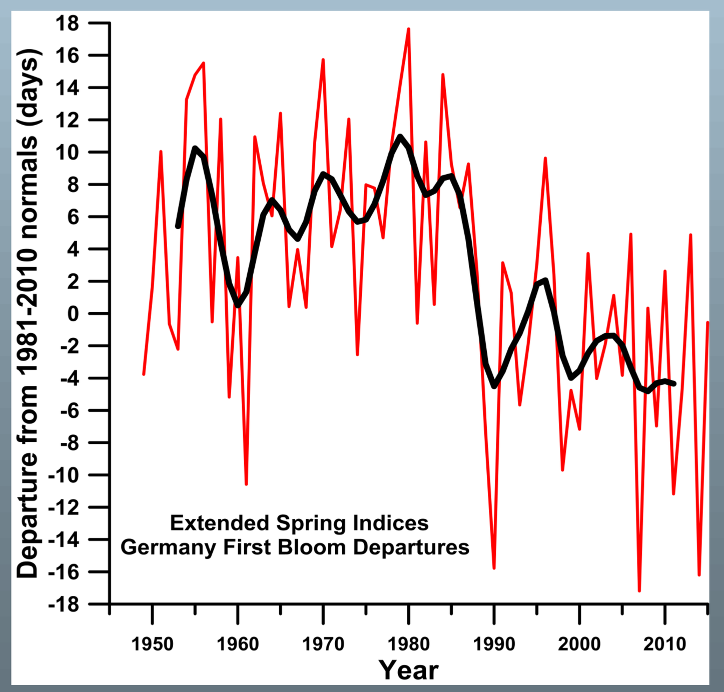


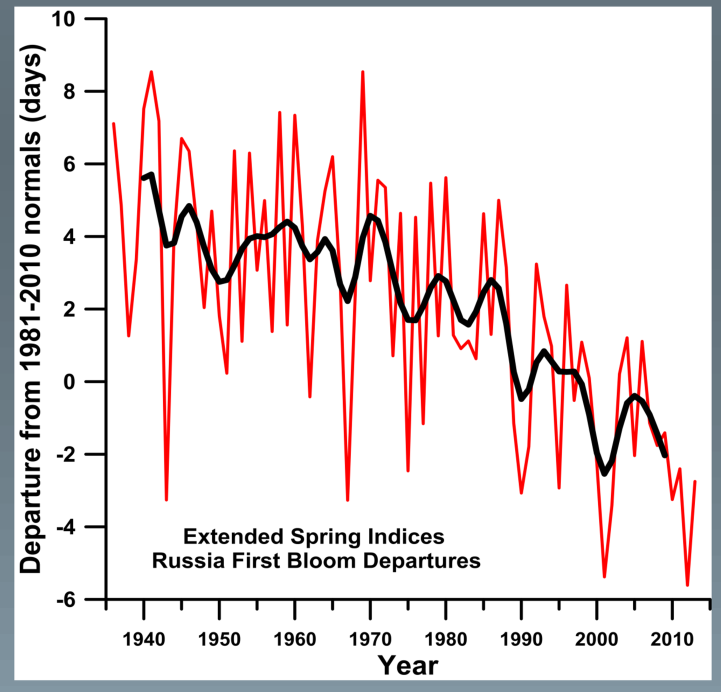
Overview—Phenological research provides valuable approaches for understanding Earth systems interactions and facilitating global change studies. As a simple expression of seasonal plant development biology, phenology offers another independent measure (along with climate records and remote sensing observations) of the extent and impact of climate change. However, phenological data are still not collected and recorded in spatially comprehensive and comparable ways around the world. Thus, for now, continental-scale phenological models can allow simulation of general plant responses, facilitating testing of broad atmosphere-biosphere interaction hypotheses in locations and at times when actual phenological data are not available, but with more detail than possible when using remote sensing-derived measures.

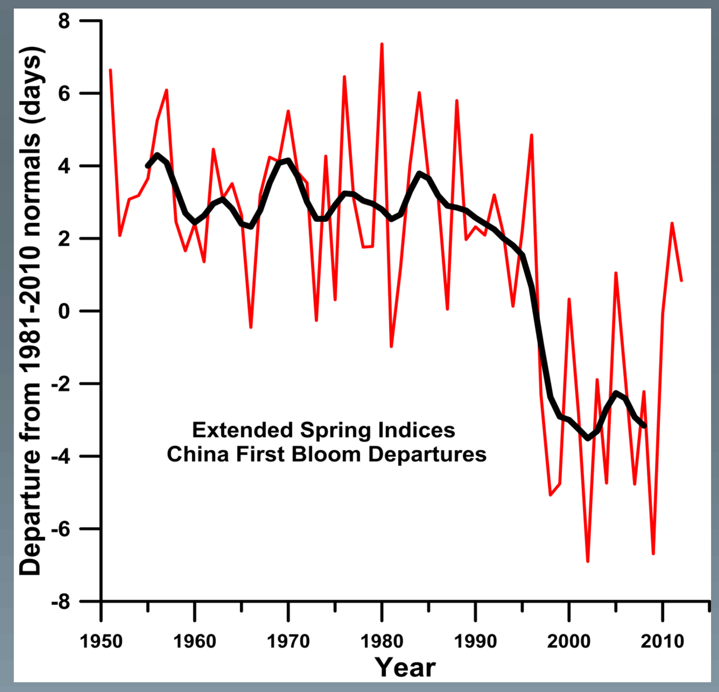
Results—One set of phenological models that have been successfully applied to assess atmosphere-biosphere interactions and impacts of climate change on the onset of the spring growing season across temperate regions around the Northern Hemisphere are the Spring Indices (SI). This suite of metrics includes several sub-models and associated measures, all of which can be calculated using daily maximum/minimum surface temperatures and latitude. SI models process weather data into a form mimicking the spring development stages of many plants that are not water limited but responsive to temperature increases. This poster summarizes earlier results and recent developments from on-going work using longer and denser station network data since 1900 and more recent high-resolution spatially gridded data across the continental USA, which include: 1) the SI onset of spring growing earlier overall since the late 1950s across temperate land areas of the Northern Hemisphere; 2) regional differences in the Western and Southeastern USA; 3) spatial aspects of the large inter-annual variability of spring's onset in recent years; 4) development of an operational system to display near real-time progress of the spring growing season onset across the continental USA; and 5) experimental long-lead forecasting of the onset of the growing season across the continental USA. The operational system displaying near real-time progress of spring growing season onset may have the potential to improve surface air temperature forecasts, through spatial detection of areas likely to undergo lower atmospheric moisture and energy transfer modifications due to the onset of plant transpiration.

Northern Hemisphere Analyses

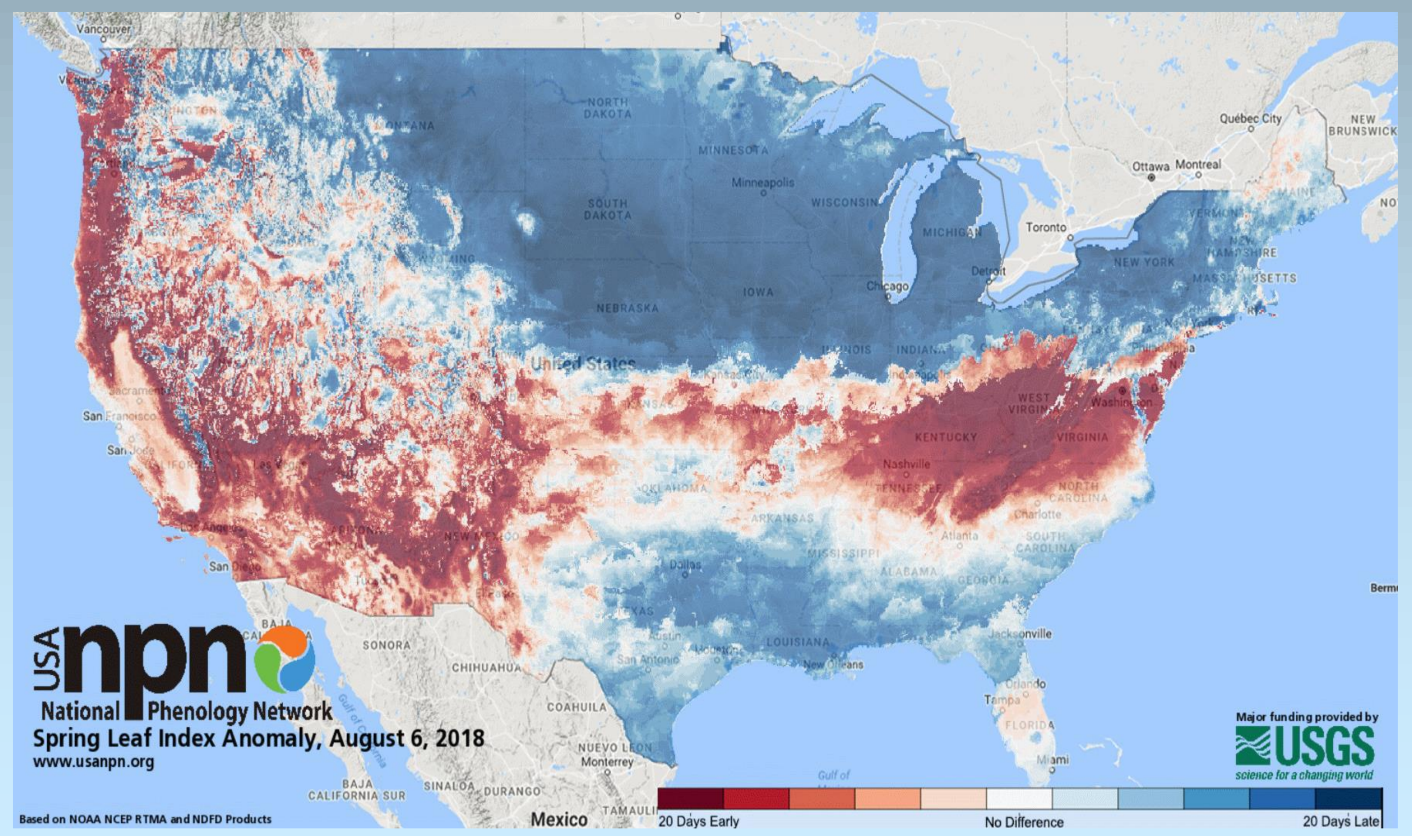




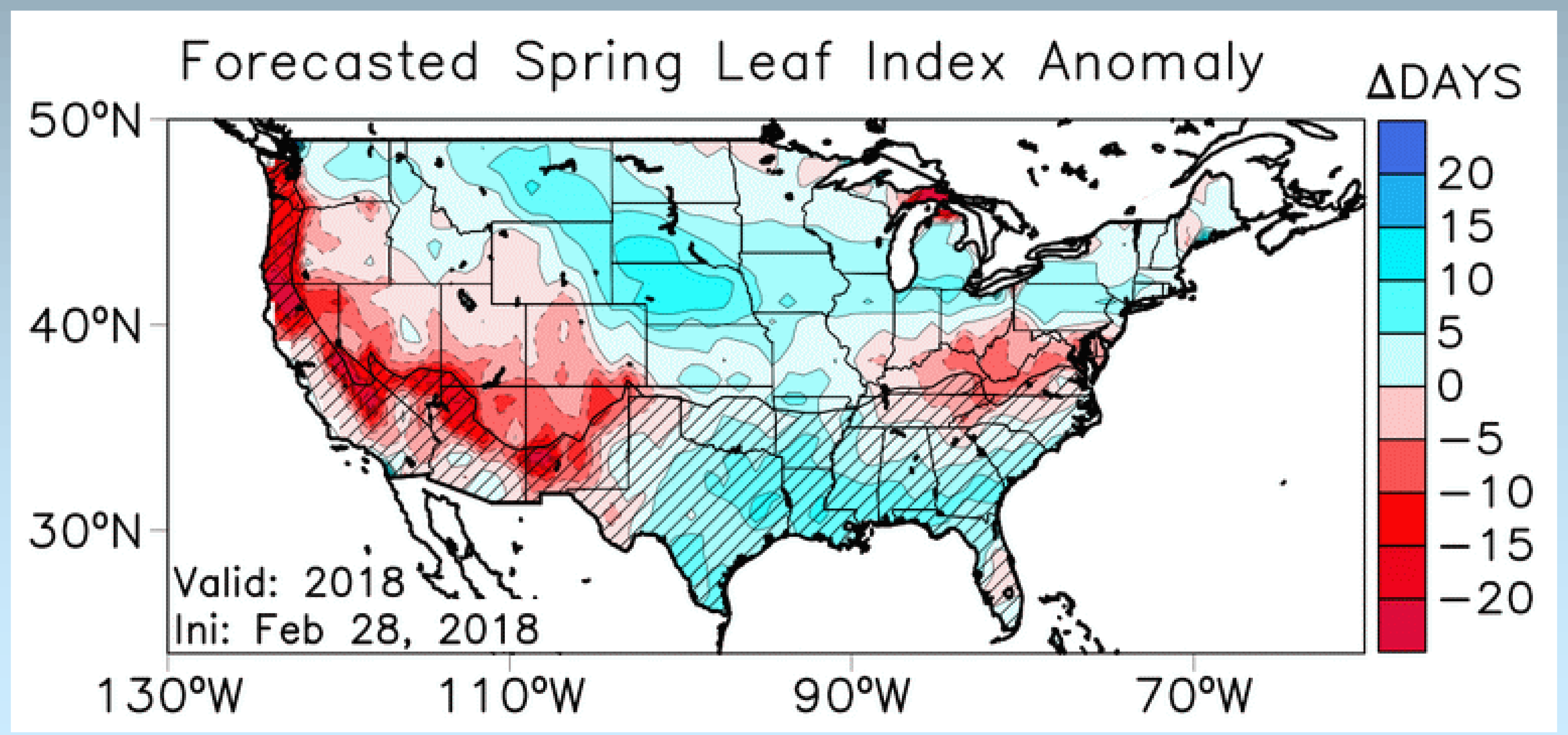




SI-x 2018 First Leaf Anomaly



T. Ault Lab (Cornell) Spring 2018 Forecast



SI-x 2017 First Leaf Anomaly