

Using cloud computing to study trends and patterns in the Extended Spring Indices

Emma Izquierdo-Verdiguier¹, **Raul Zurita-Milla**¹, Toby R. Ault², Mark D. Schwartz³

¹Department of Geo-Information Processing, Faculty of Geo-Information Science and Earth Observation (ITC), University of Twente, Enschede (The Netherlands)

²Department of Earth and Atmospheric Sciences, Cornell University, Ithaca (USA)

³Department of Geography, University of Wisconsin-Milwaukee, Milwaukee (USA)

The Extended Spring Indices (SI-x) models SCHWARTZ et al. (2013) are a suite of regression-based models that predict the general timing of spring first leaf and of first bloom based on indicator plant species lilac and honeysuckle (genera *Syringa* and *Lonicera*). These models use daily maximum and minimum temperatures to calculate accumulated degree hours and estimate to the number of “high energy” synoptic weather warm weather events since January 1st each year.

Previous studies based on the SI-x models e.g. AULT et al. (2013) have been developed using point data, i.e. values from single weather stations or coarse grid cells. However, it is now possible to obtain maximum and minimum daily temperature grids at high spatial resolution. This allows SI-x model calculation at continental scales. For instance, DAYMET provides long term records (1980 to the present) of daily gridded weather products for the contiguous United States, Mexico and parts of Canada at a 1 x 1 km resolution. Running the SI-x models for DAYMET poses, however, a significant computational challenge because regular desktop machines are not prepared to deal with such large amount of data.

In recent years, cloud computing has become an operational and affordable solution to process large amounts of data. In this study we report on our efforts to calculate the SI-x models using DAYMET and a specialized cloud computing platform, namely Google Earth Engine, which also allows the analysis of the results.

The calculation of SI-x as a continuous product reveals high spatial resolution patterns formed by the temperature regimes and day length of each location. It also allows examination of the relative importance of the different regressors used in the SI-x models and to map phenological changes, trends and dynamics at a continental scale.

References:

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