Simple approach to predict flowering and full blooming dates by bi-directional Self Organizing Maps

*Shin Nagai[1], Hiroshi Morimoto[2], Taku M Saitoh[3]

1. Research and Development Center for Global Change, Japan Agency for Marine-Earth Science and Technology, 2. Nagoya University, 3. River Basin Research Center, Gifu University

Accurate prediction of blooming phenology is important to evaluate spatio-temporal variability of ecosystem functions and services, and biodiversity under climate change. The process-based phenology models have been developed but they require suitable parameters to account for endodormancy and ecodormancy processes for each species. Our eco-physiological interpretation and observations of these processes are not still enough for various species. Here, we proposed a simple blooming phenology model by the bi-directional Self Organizing Maps (SOM). SOM, which is one of the data mining approaches, is a tool for categorizing patterns in n-dimensional observation data by forming a 2 dimensional lattice (https://clarkdatalabs.github.io/soms/SOM_NBA). The flowering and full blooming dates from 1953 to 2018 in 42 sites, Japan were predicted by the bi-directional SOM. We inputted daily mean air temperature during ecodormancy period (mainly from February to just before the flowering date) into input vectors and observed flowering or full blooming dates into a target vector. The mean absolute errors between predicted and observed flowering and full blooming dates were 2.78 to 4.33 days and 2.77 to 4.76 days, respectively. Compared with the process-based phenology model approach, our proposed approach have a little higher error. However, our approach has a merit that flowering and full blooming dates can be predicted with the very low cost of calculation without accounting for the endodormancy and ecodormancy processes. In this presentation, we show the latest result and discuss usability, uncertainty, and outlook of our proposed method.

Keywords: phenology, Self Organizing Maps, climate change

