

```
@Article{Labe2016,  
author="Labe, Zachary  
and Ault, Toby  
and Zurita-Milla, Raul",  
title="Identifying anomalously early spring onsets in the CESM large ensemble project",  
journal="Climate Dynamics",  
year="2016",  
pages="1--18",  
abstract="Seasonal transitions from winter to spring impact a wide variety of ecological and  
physical systems. While the effects of early springs across North America are widely  
documented, changes in their frequency and likelihood under the combined influences of  
climate change and natural variability are poorly understood. Extremely early springs, such as  
March 2012, can lead to severe economical losses and agricultural damage when these are  
followed by hard freeze events. Here we use the new Community Earth System Model Large  
Ensemble project and Extended Spring Indices to simulate historical and future spring onsets  
across the United States and in the particular the Great Lakes region. We found a marked  
increase in the frequency of March 2012-like springs by midcentury in addition to an overall  
trend towards earlier spring onsets, which nearly doubles that of observational records.  
However, changes in the date of last freeze do not occur at the same rate, therefore, causing a  
potential increase in the threat of plant tissue damage. Although large-scale climate modes,  
such as the Pacific Decadal Oscillation, have previously dominated decadal to multidecadal  
spring onset trends, our results indicate a decreased role in natural climate variability and  
hence a greater forced response by the end of the century for modulating trends. Without a  
major reduction in greenhouse gas emissions, our study suggests that years like 2012 in the US  
could become normal by mid-century.",  
issn="1432-0894",  
doi="10.1007/s00382-016-3313-2",  
url="http://dx.doi.org/10.1007/s00382-016-3313-2"  
}
```