

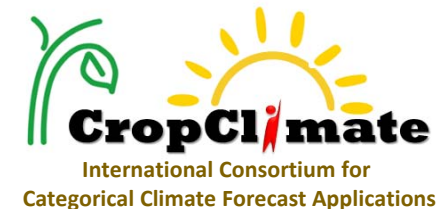


Using the Arctic Oscillation to Improve Agricultural Decisions

Guillermo A. Baigorria

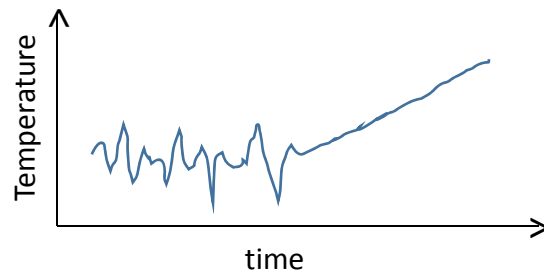
gbaigorria@unl.edu

School of Natural Resources - and - Department of Agronomy & Horticulture



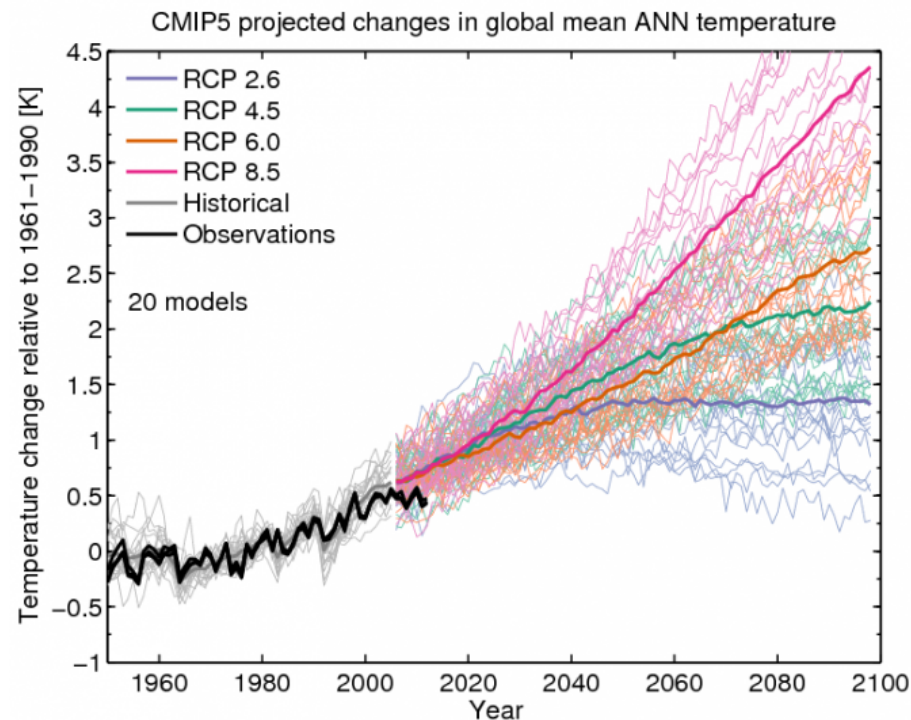
Many people think that:

- Because there is climate change there is no longer climate variability or climate variability is no longer important

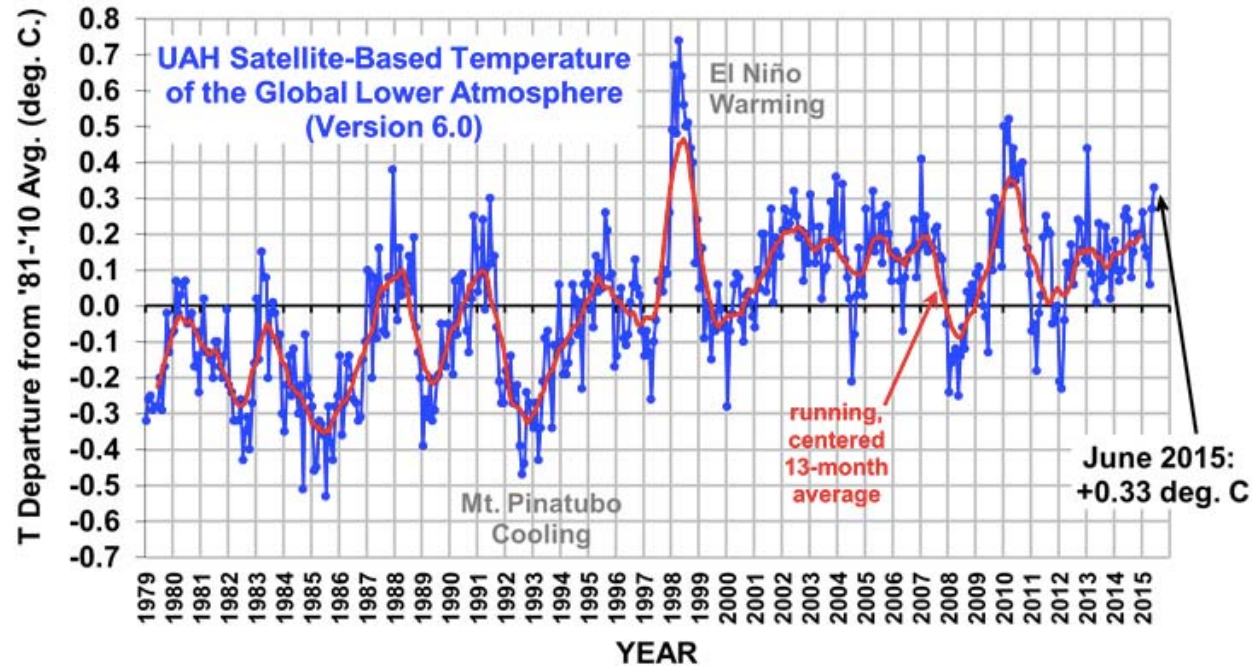


Many people think that:

- Because there is climate change there is no longer climate variability or climate variability is no longer important



- Because climate is non-stationary, global and regional climate driver trends are no longer important



Source: The University of Alabama in Huntsville

Categorical Seasonal Climate monitoring & forecasts (teleconnection indices)

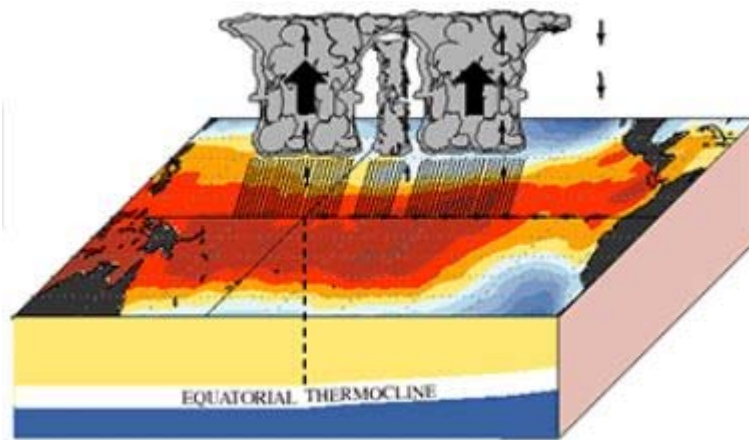
Categorical
Discrete (e.g. El Niño, Neutral, La Niña)

Seasonal Climate
1 to 6 months in advance

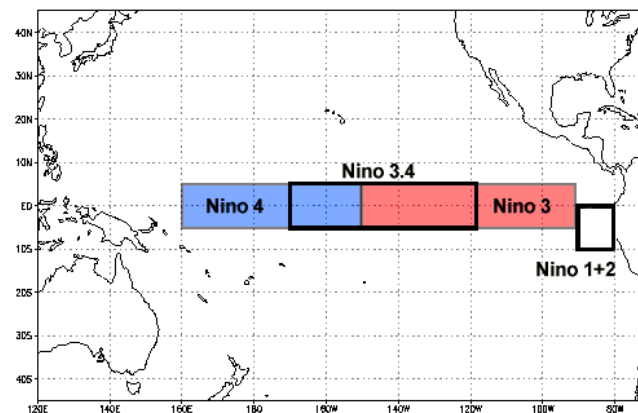
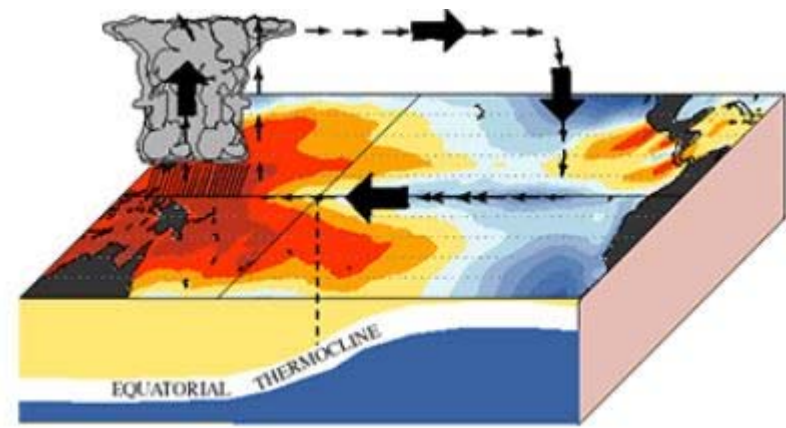
Teleconnection indices

El Niño and the Southern Oscillation (ENSO)

El Niño



La Niña



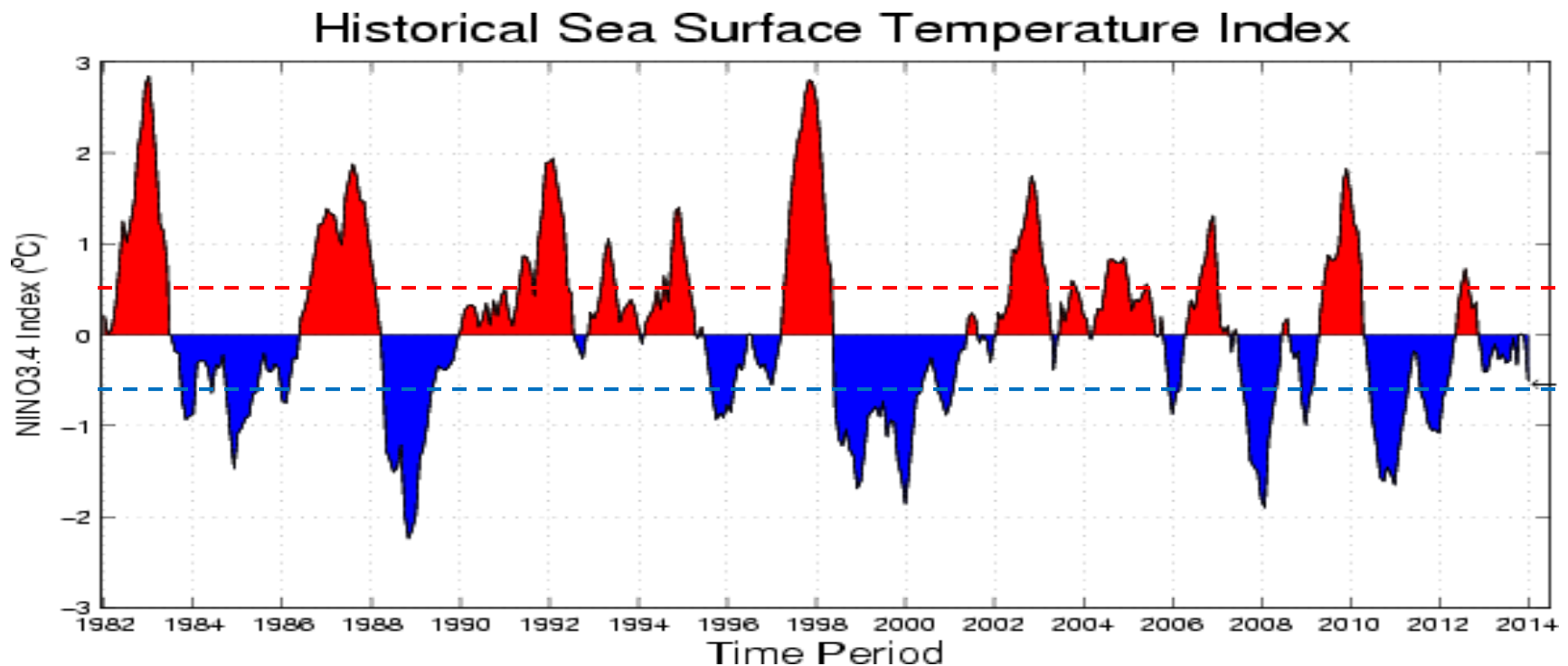
Teleconnection indices

El Niño and the Southern Oscillation (ENSO)

El Niño

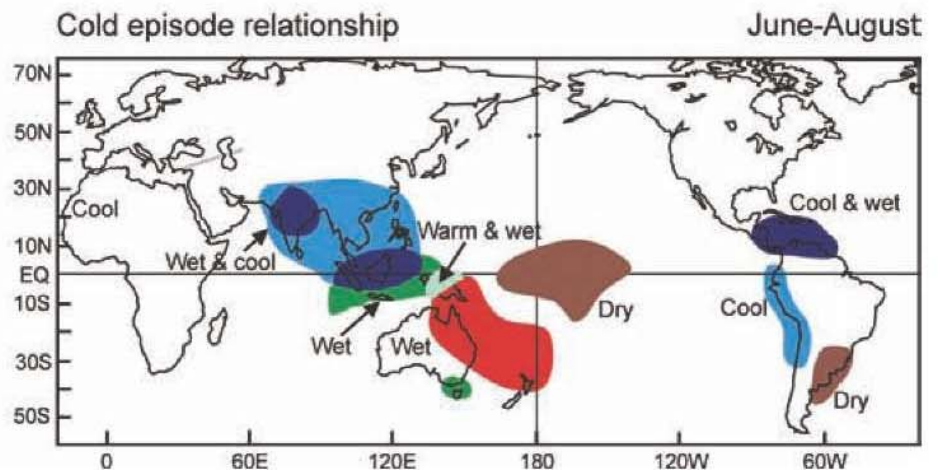
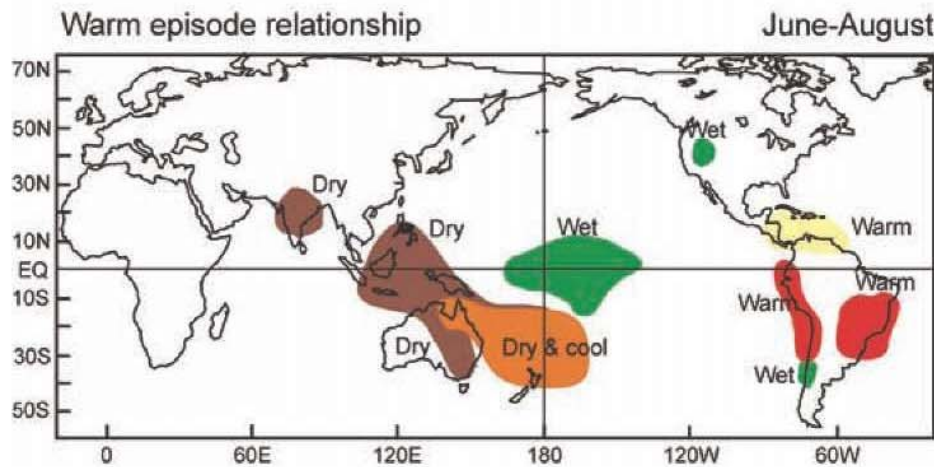
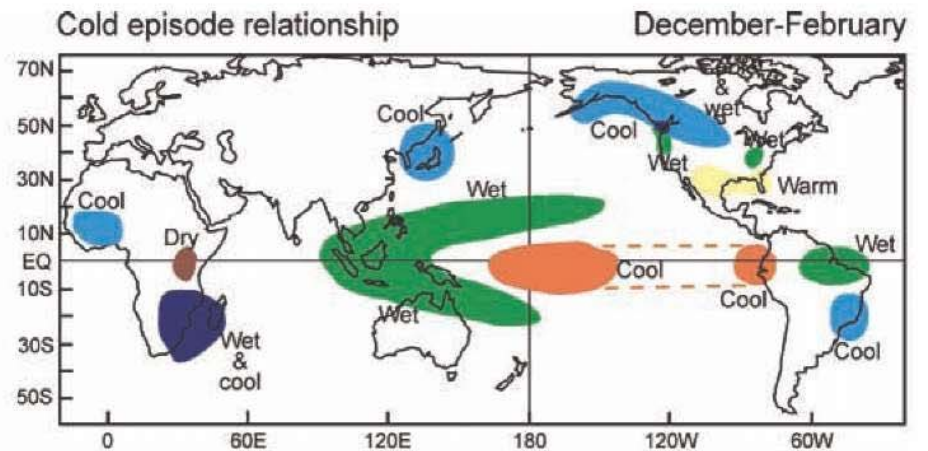
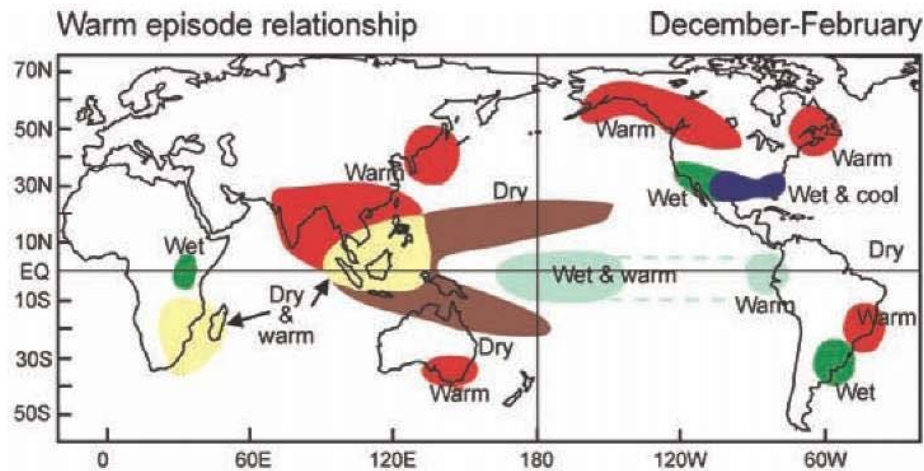
Neutral

La Niña



Worldwide effects of ENSO

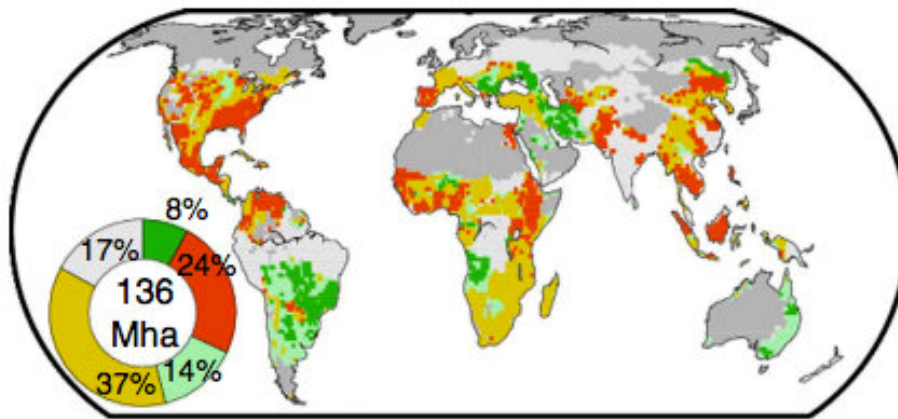
El Niño



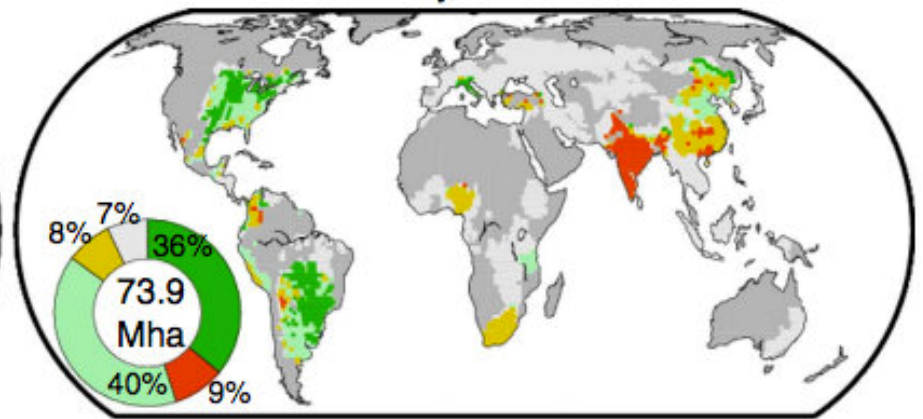
Worldwide effects of ENSO

El Niño

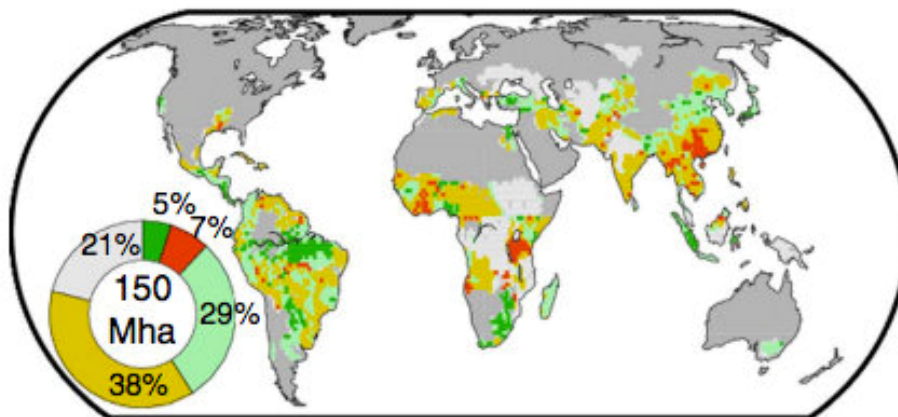
Maize



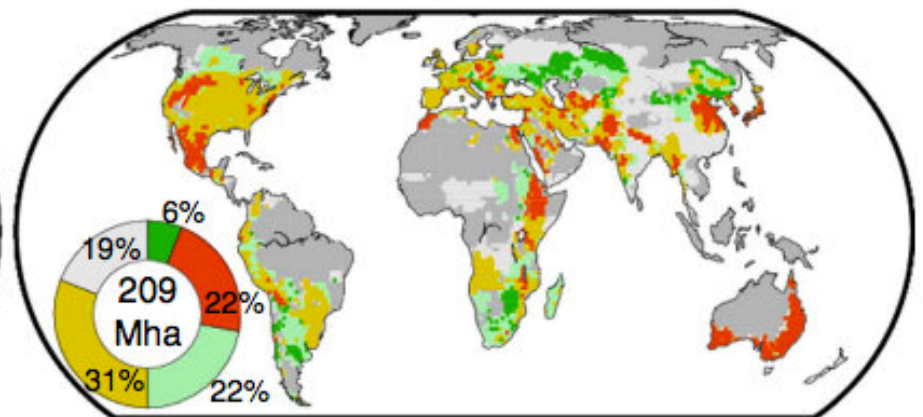
Soybean



Rice



Wheat

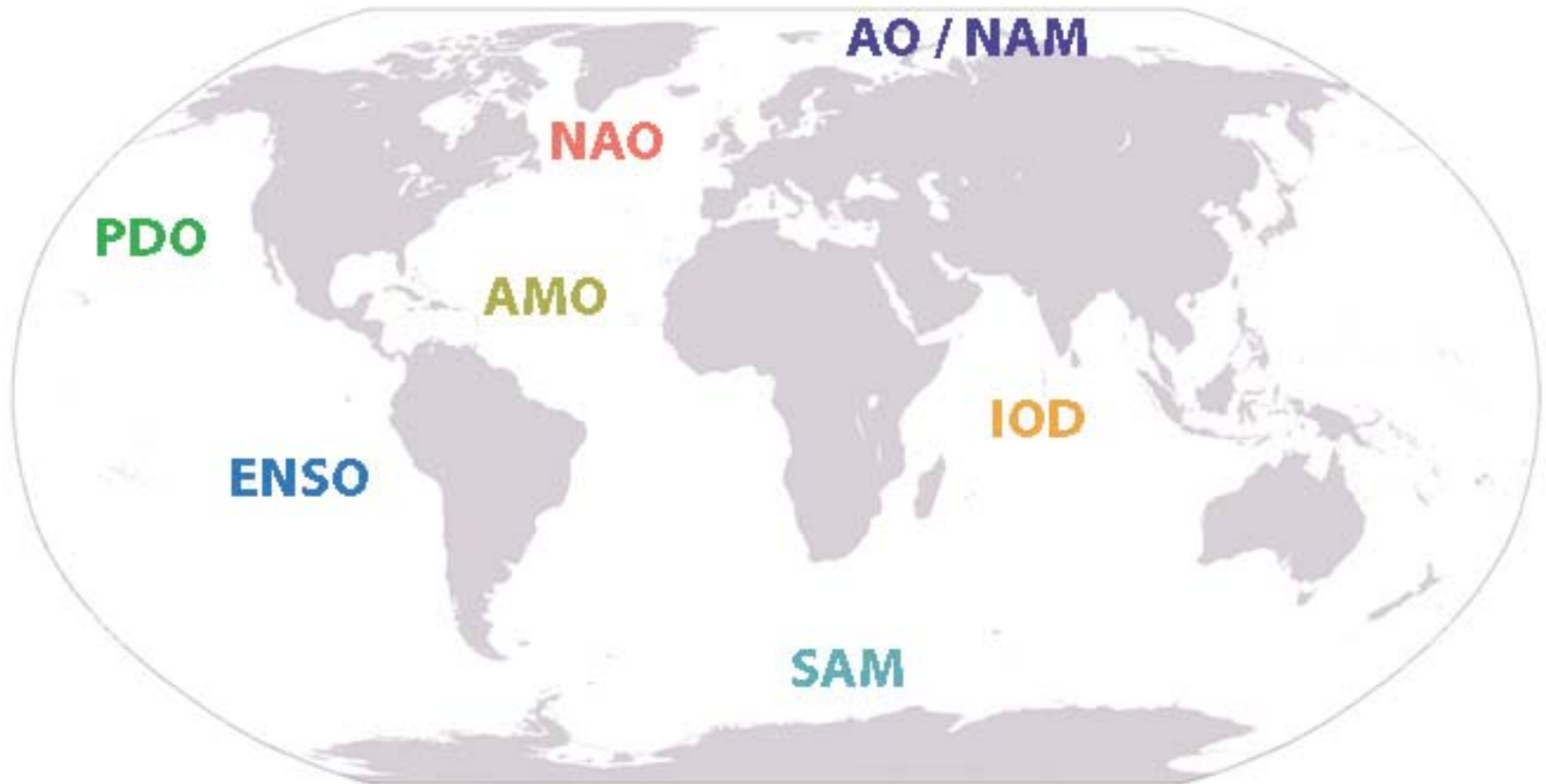


Significant-positive impacts
Insignificant-positive impacts

Significant-negative impacts
Insignificant-negative impacts

No yield data are available
Non-cropland

Teleconnections Map



Source: <https://www2.ucar.edu/>

The Arctic Oscillation (AO)

Represents the state of atmospheric circulation over the Arctic

- **Positive phase:** a belt of strong winds circulating around the North Pole acts to confine colder air across the Polar Region
- **Negative phase:** The belt of winds becomes weaker and more distorted allowing an easier southward penetration of colder, arctic air masses and increased storminess into the mid-latitudes

Source: <http://ossfoundation.us/projects/environment/global-warming/arctic-oscillation-ao>



English

Español



HOME

CLIMATE

CROPS

CROP/CLIMATE

ABOUT

'Taking advantage and reducing impacts of climate on agriculture'



Welcome to CropClimate. This is a platform intended to produce climate-related useful information for agricultural decision makers at scales finer than county level. CropClimate uses state-of-the-art knowledge in climate-, soil-, and crop-modeling to link the effects of environmental conditions and management on crop growth. By exploring these modeling capabilities our focus is to improve field management of food, fiber, and fuel crops for more sustainable production systems. Either you want to tailor your crop management according to the forthcoming seasonal climate forecast or just learn and understand the physical-chemical processes occurring in the soil-plant-atmosphere interphases, CropClimate is designed to help the user to answer these questions.

Partners



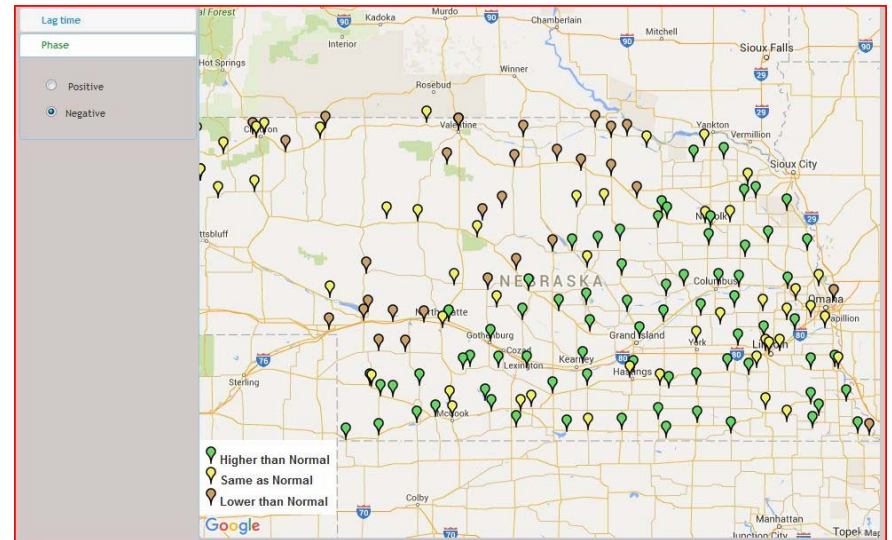
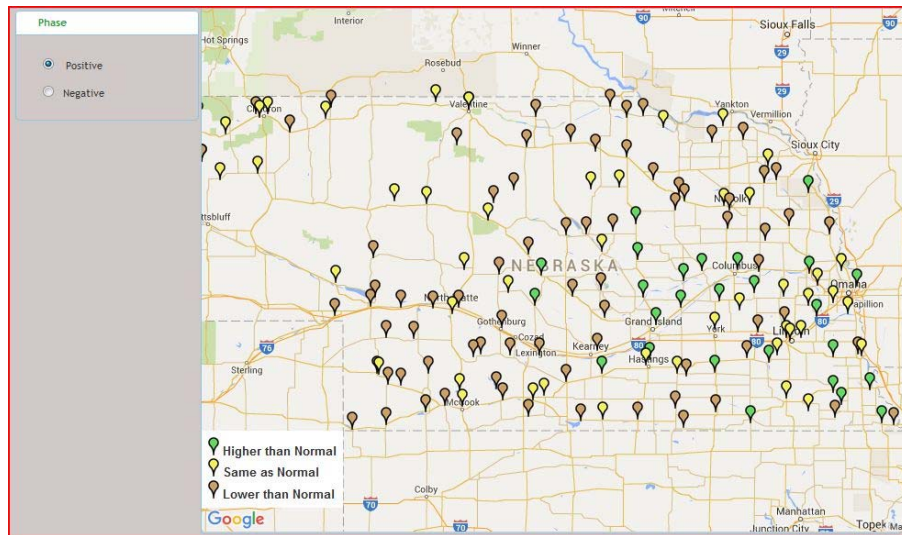
The Arctic Oscillation (AO)

Rainfall

March

Positive

Negative



Nebraska

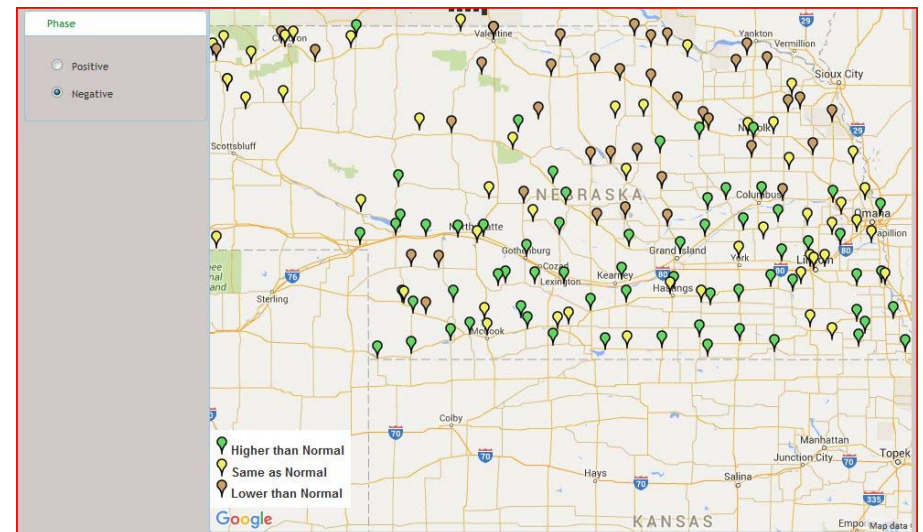
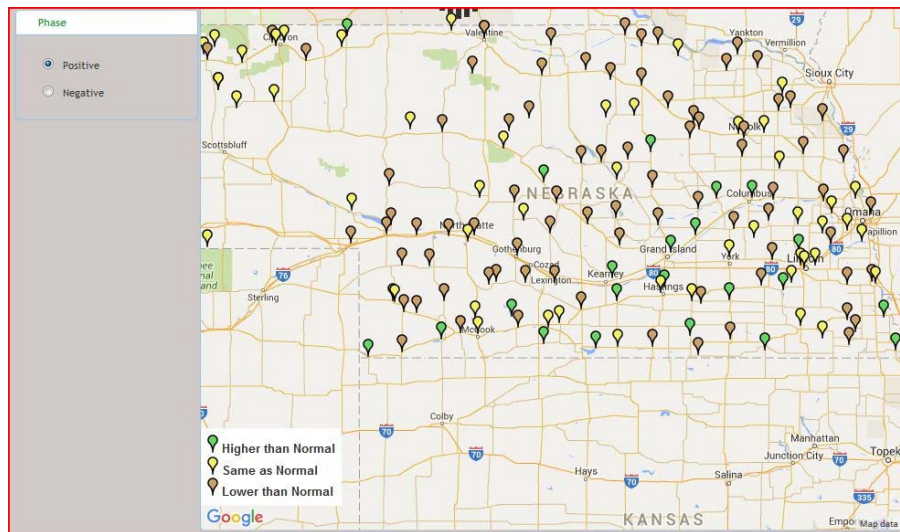
The Arctic Oscillation (AO)

Number of rainy days

March

Positive

Negative



Nebraska

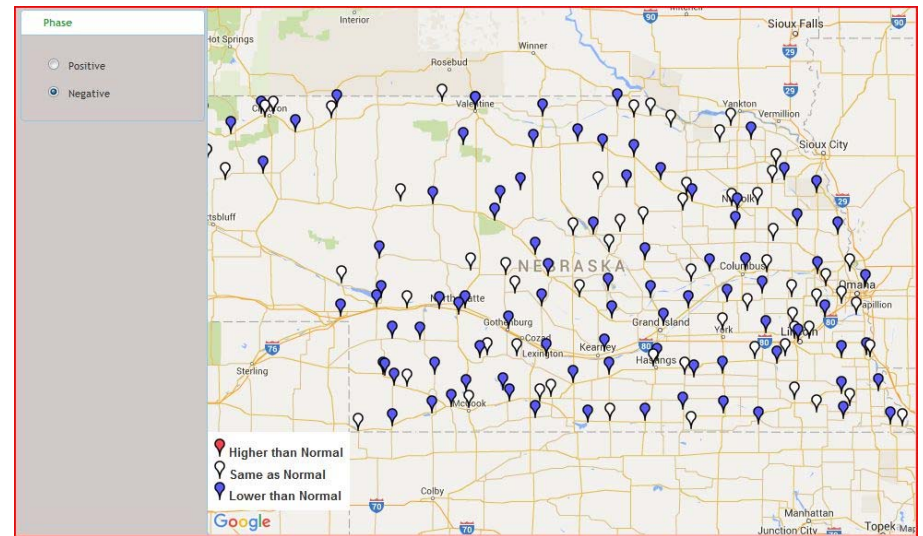
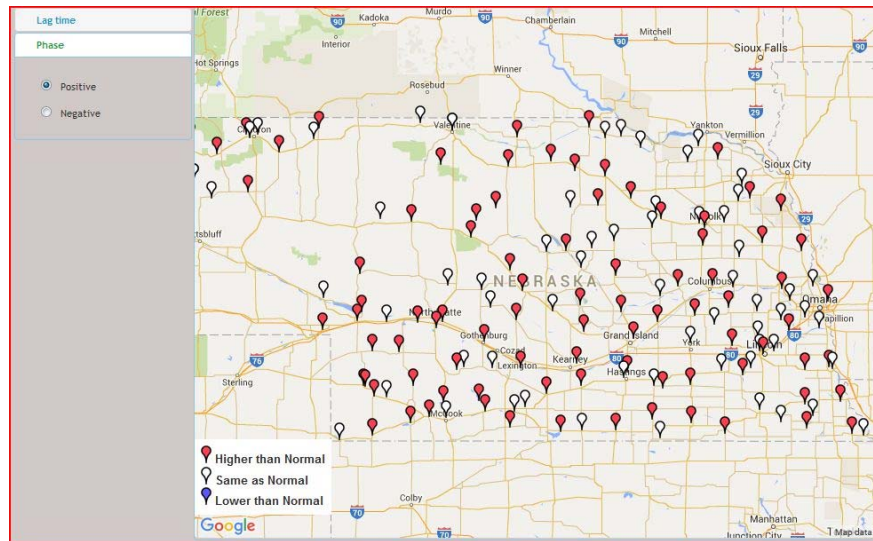
The Arctic Oscillation (AO)

Maximum Temperature

March

Positive

Negative



Nebraska

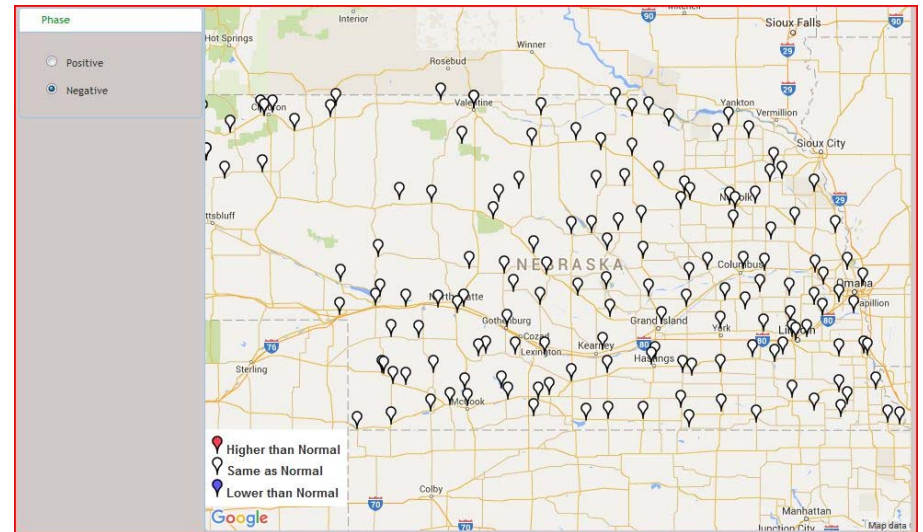
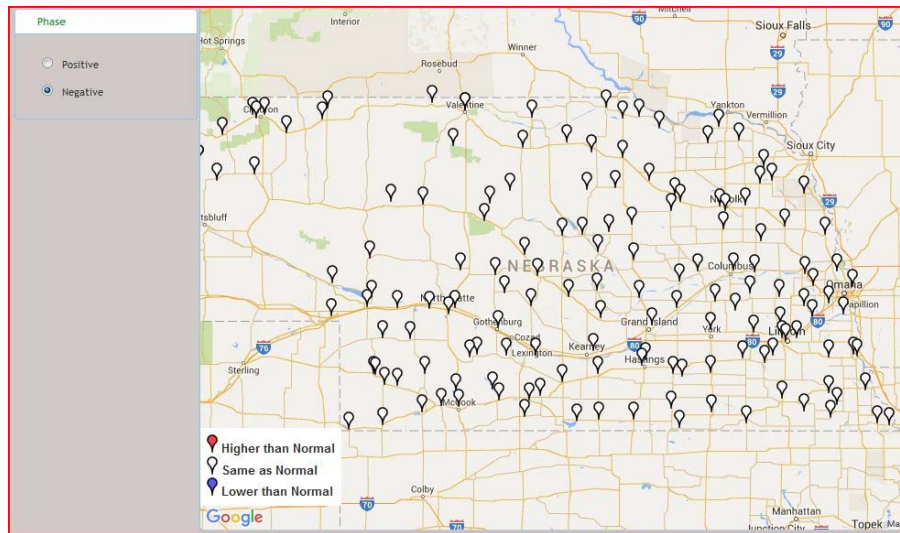
The Arctic Oscillation (AO)

Minimum Temperature

March

Positive

Negative

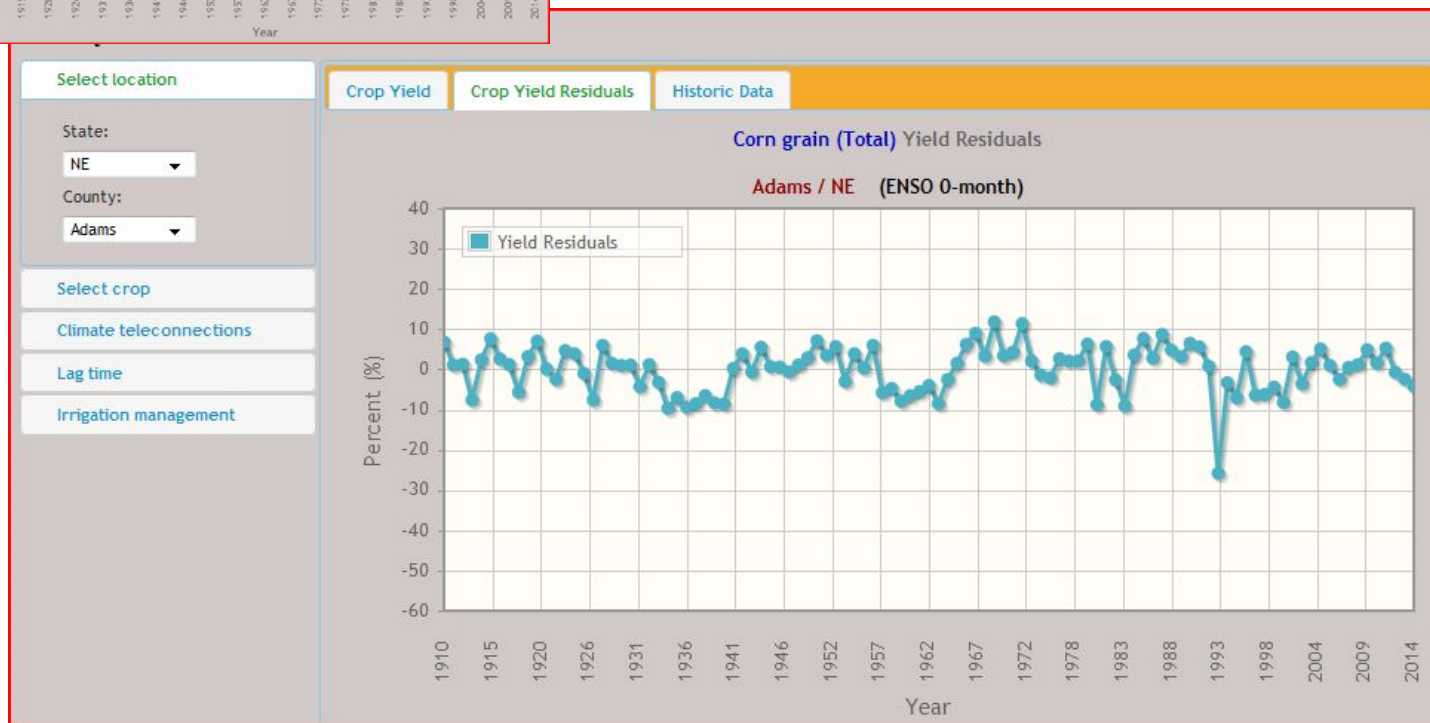


Nebraska

Yield timeseries



Technology de-trended yield timeseries

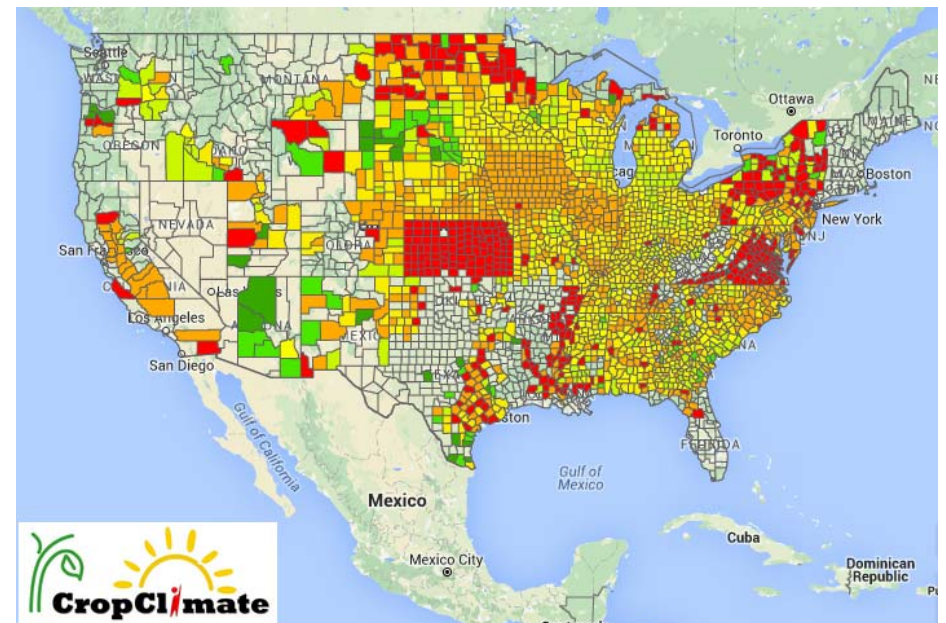
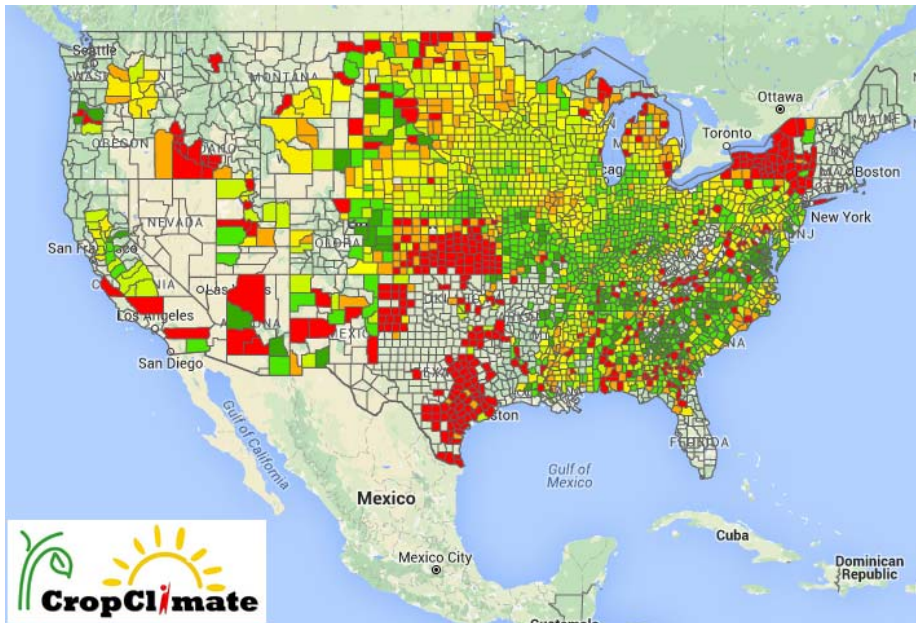


The Arctic Oscillation (AO)

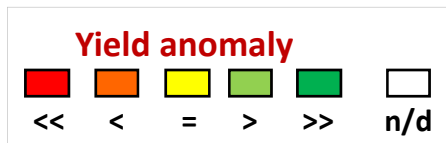
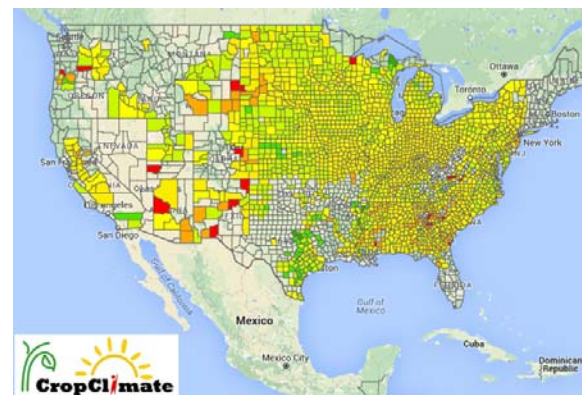
Corn Grain

Positive

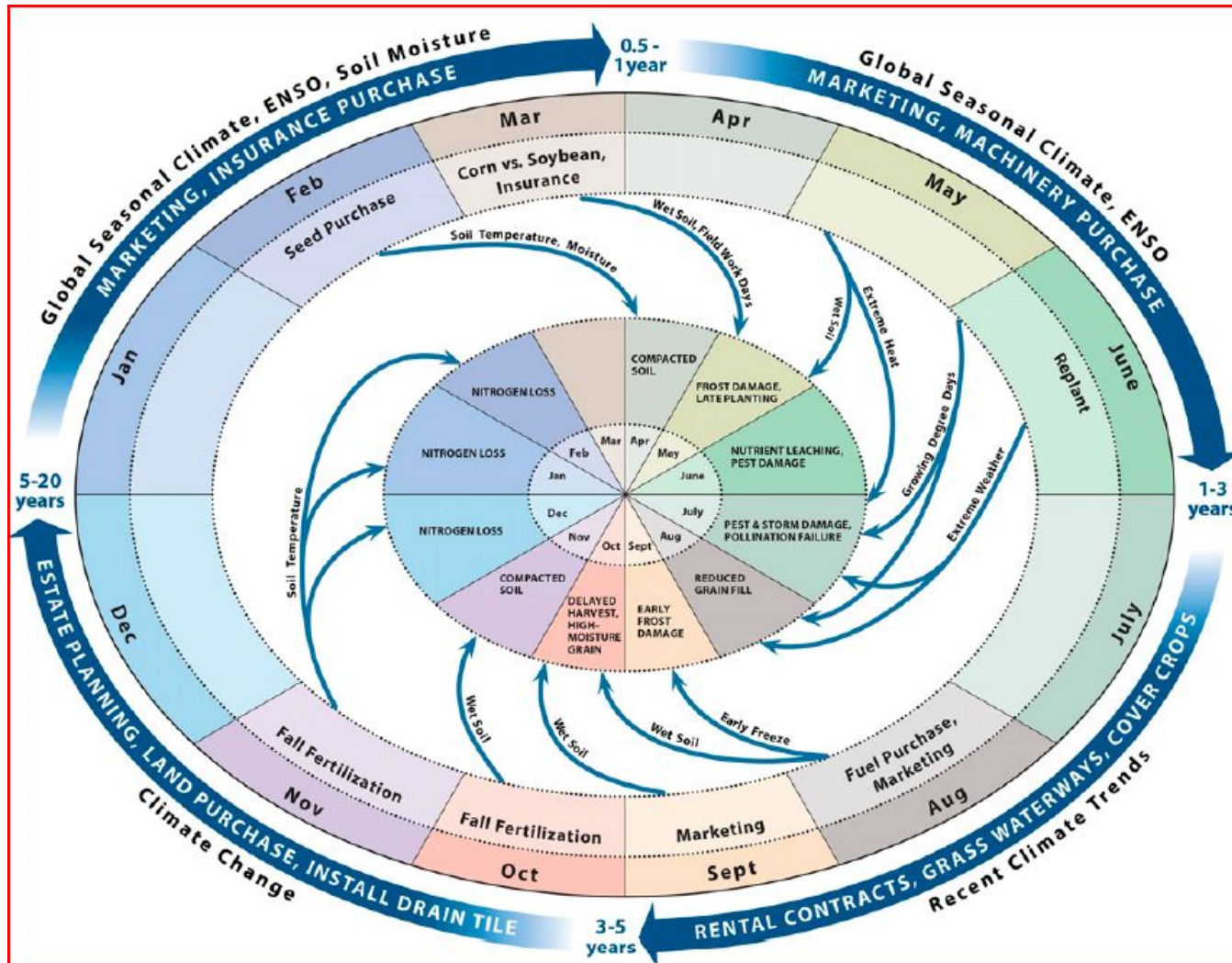
Negative



Neutral



Climate-based decision cycle for corn

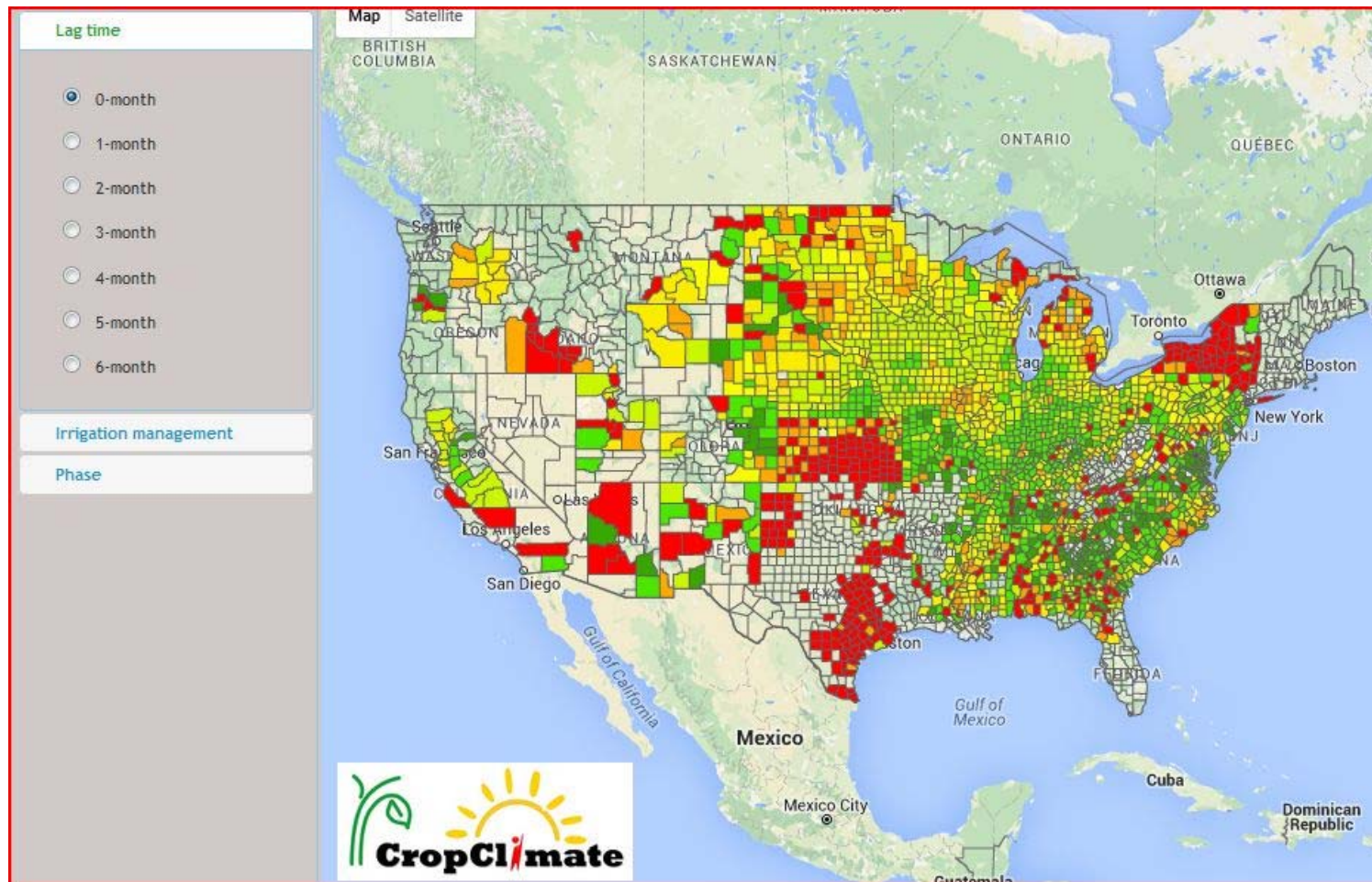


Source: Takle et al., 2014. Climate Forecasts for Corn Producer Decision Making. *Earth Interactions*. doi: 10.1175/2013EI000541.1

The Arctic Oscillation (AO)

Corn Positive

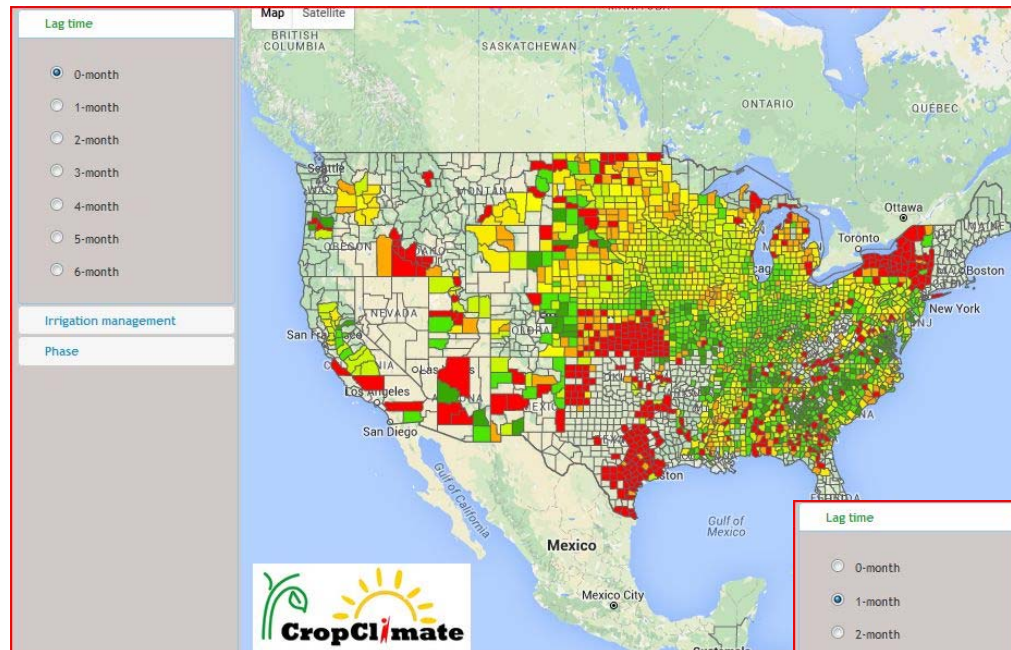
0-month Lag



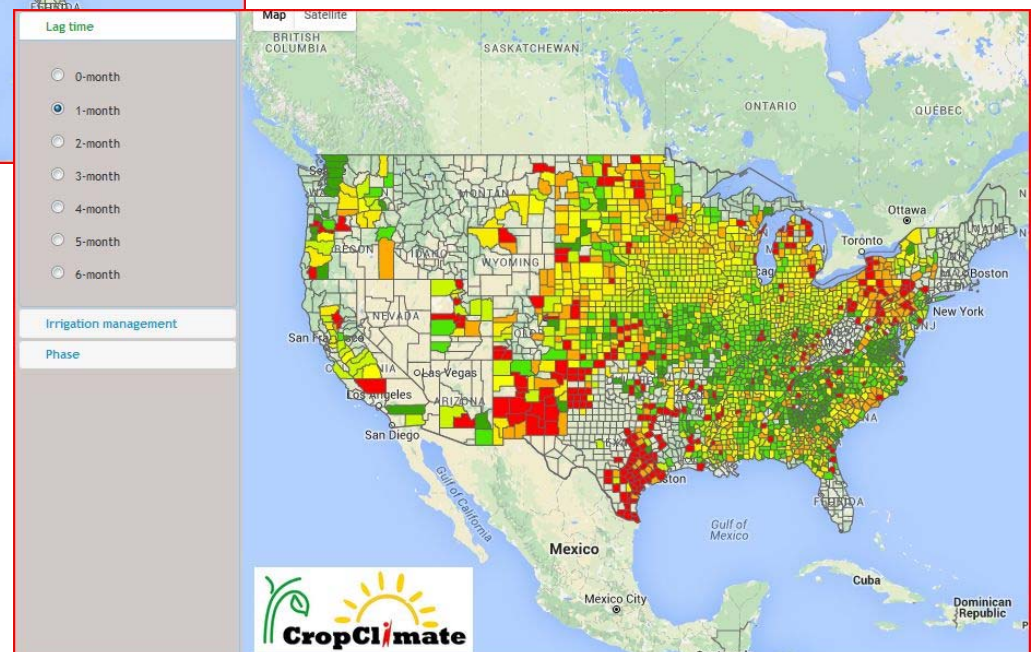
The Arctic Oscillation (AO)

Corn **Positive**

0-month Lag



1-month Lag

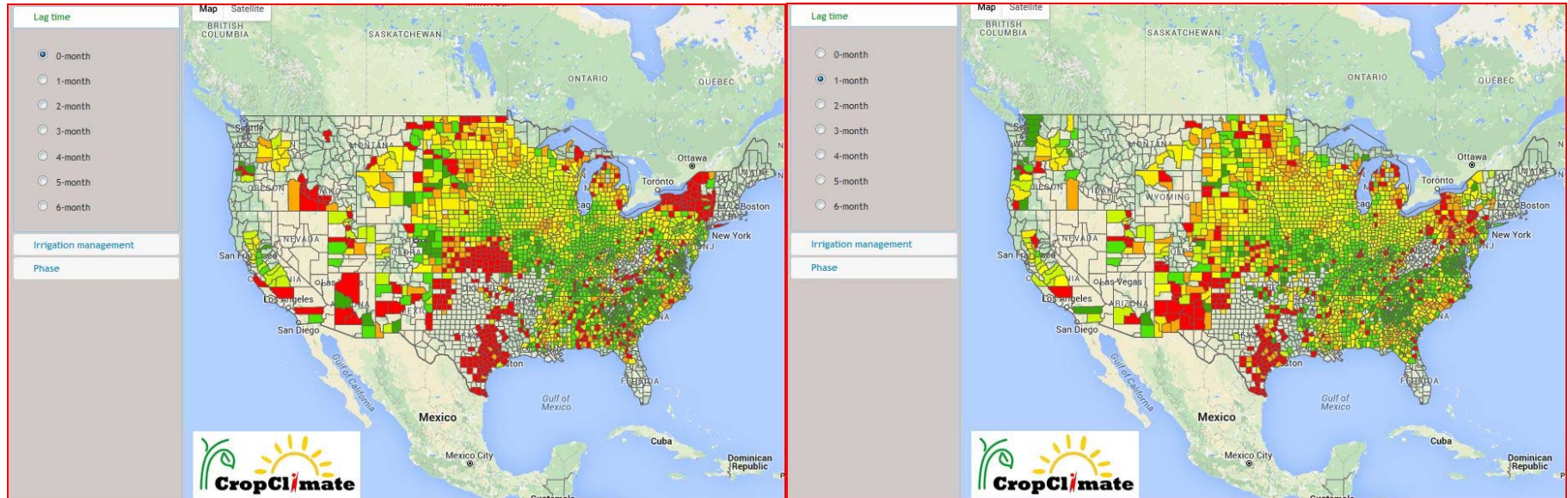


The Arctic Oscillation (AO)

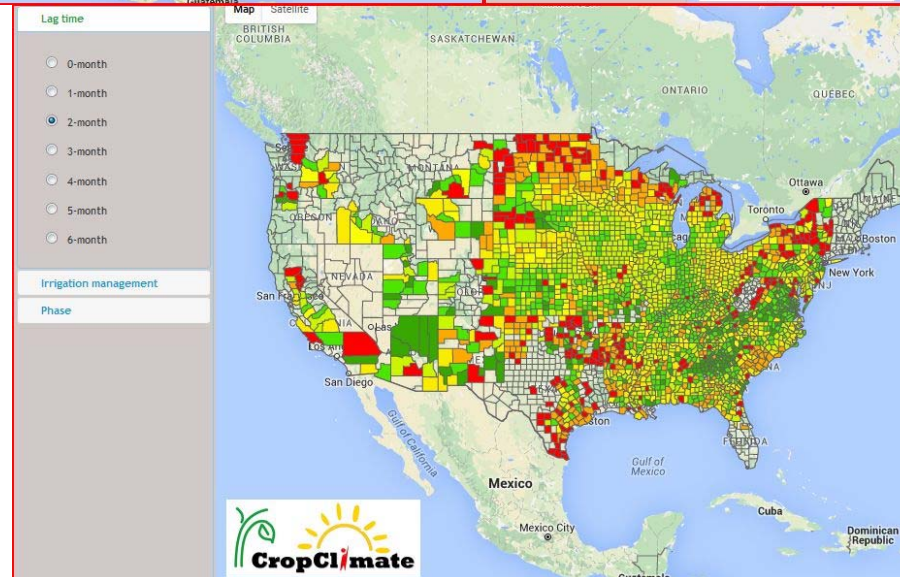
Corn **Positive**

0-month Lag

1-month Lag



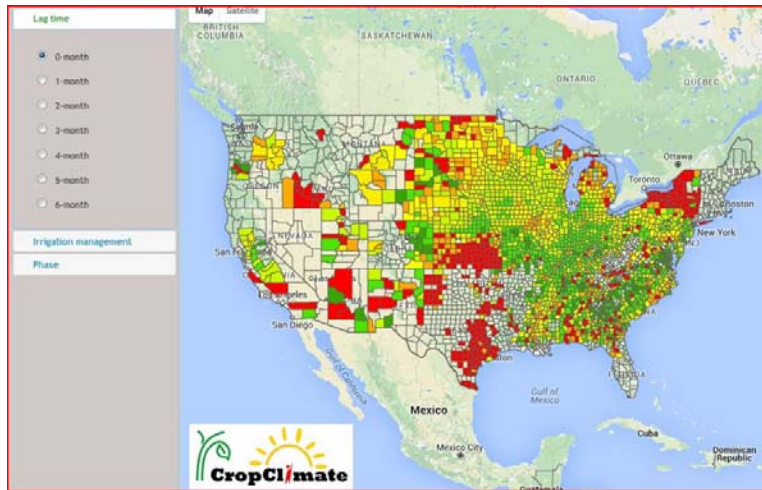
2-month Lag



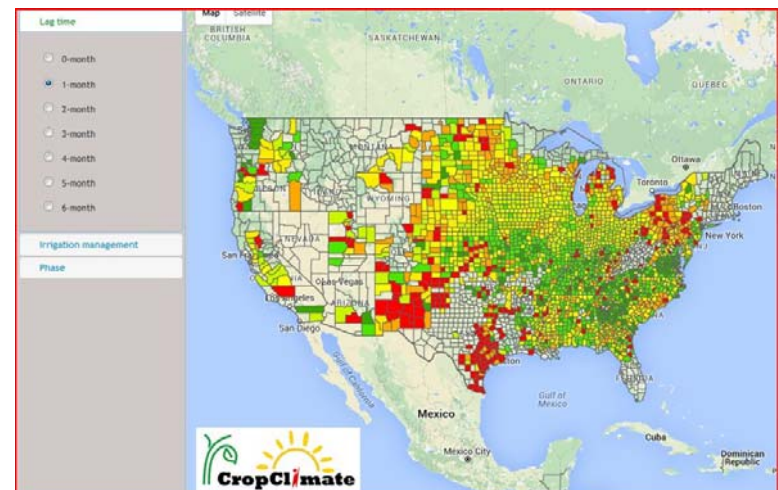
The Arctic Oscillation (AO)

Corn **Positive**

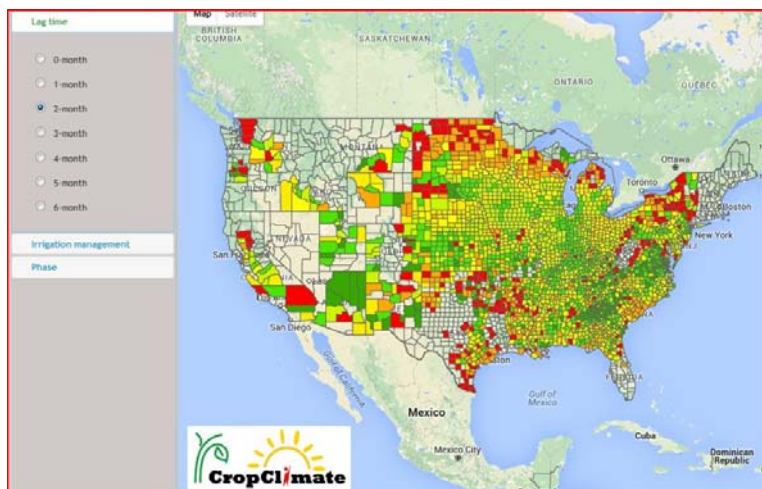
0-month Lag



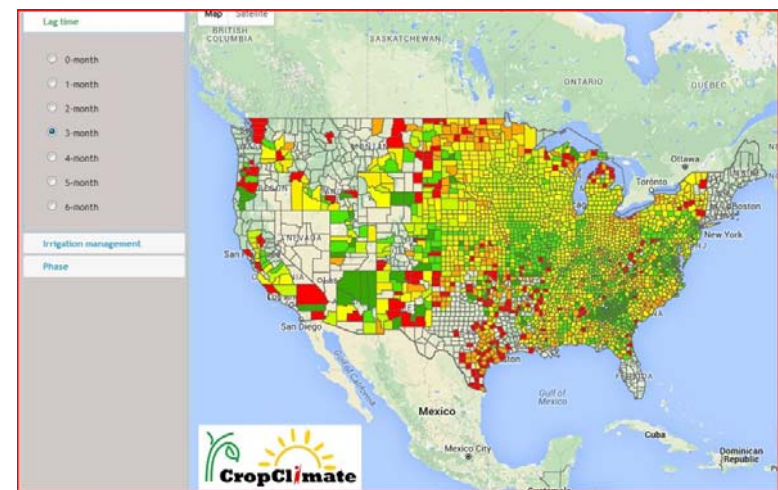
1-month Lag



2-month Lag



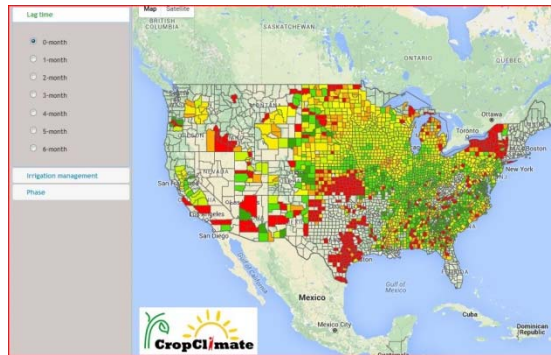
3-month Lag



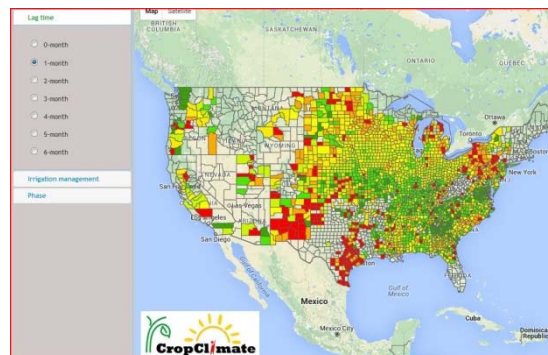
The Arctic Oscillation (AO)

Corn Positive

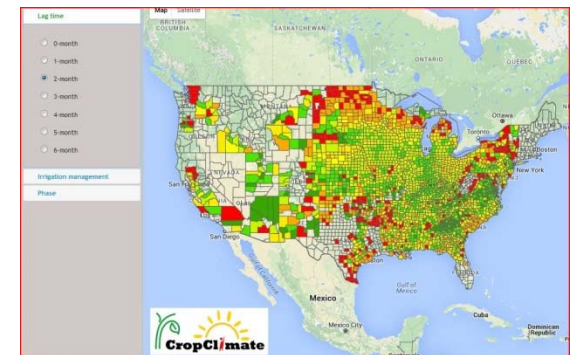
0-month Lag



1-month Lag

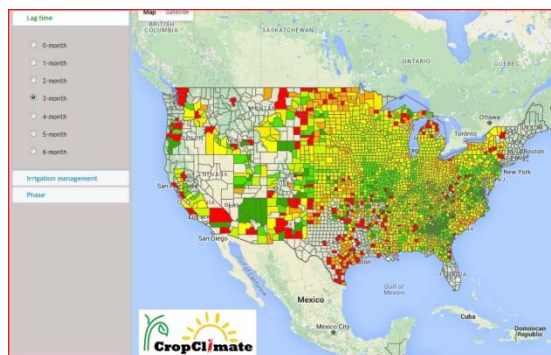


2-month Lag

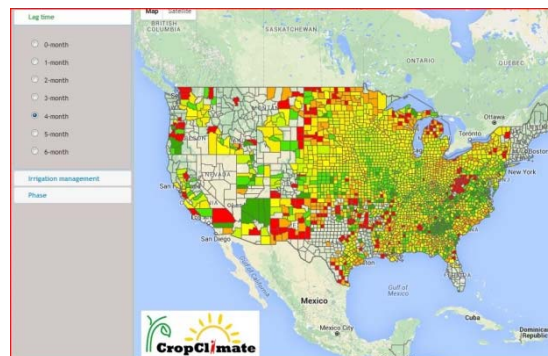


Signal persistence

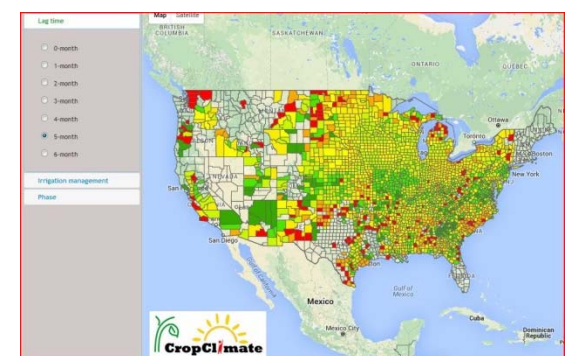
3-month Lag



4-month Lag



5-month Lag

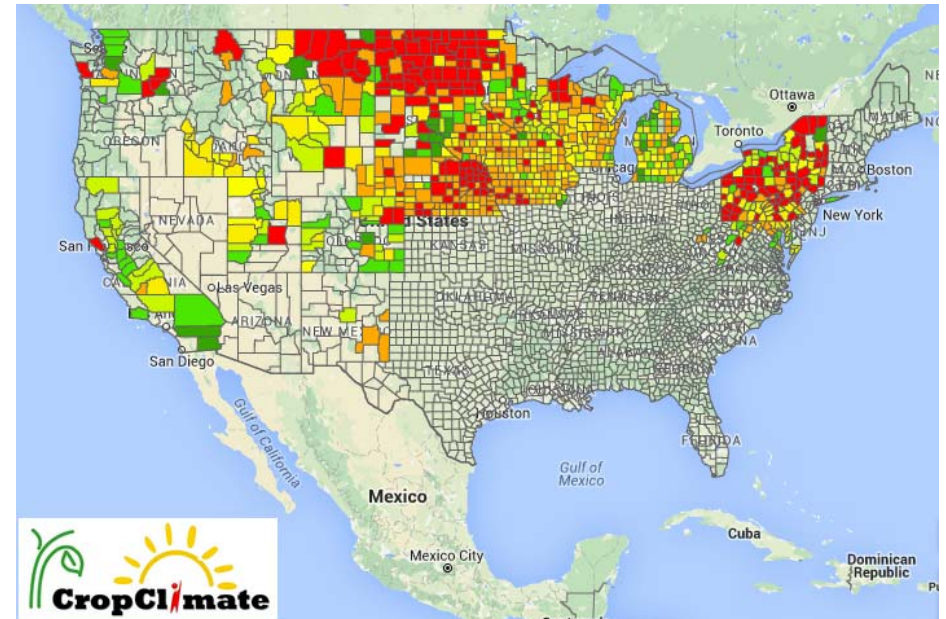
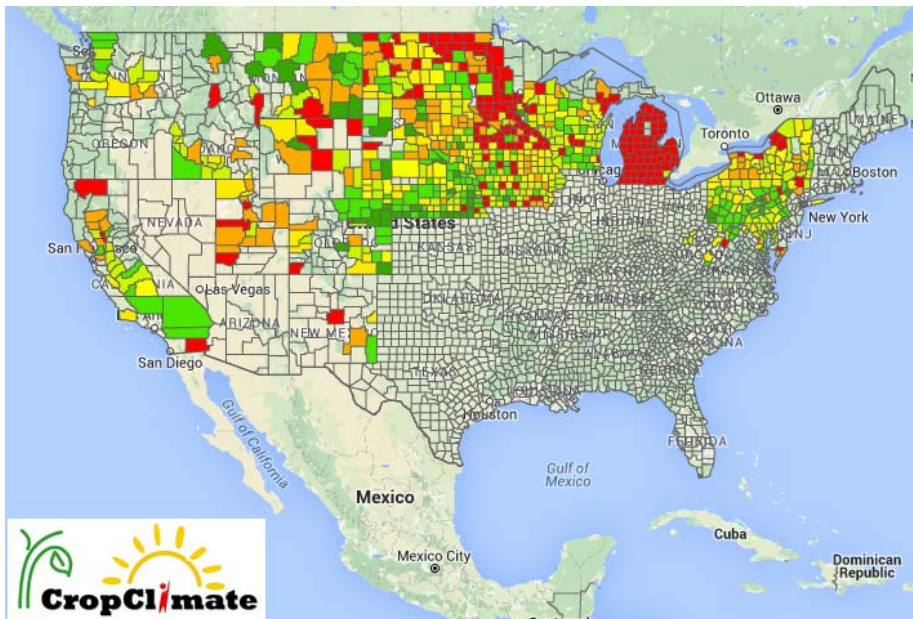


The Arctic Oscillation (AO)

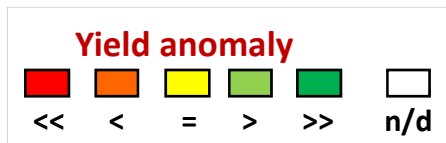
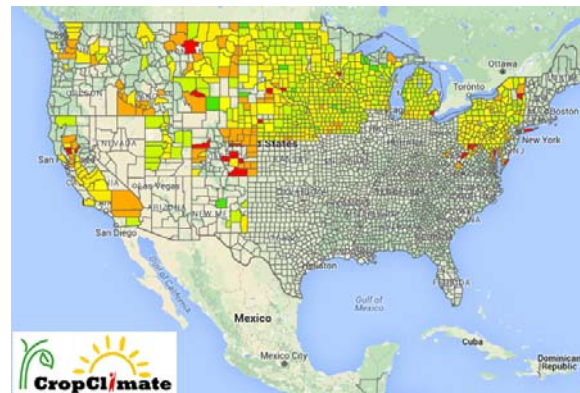
Corn Silage

Positive

Negative



Neutral

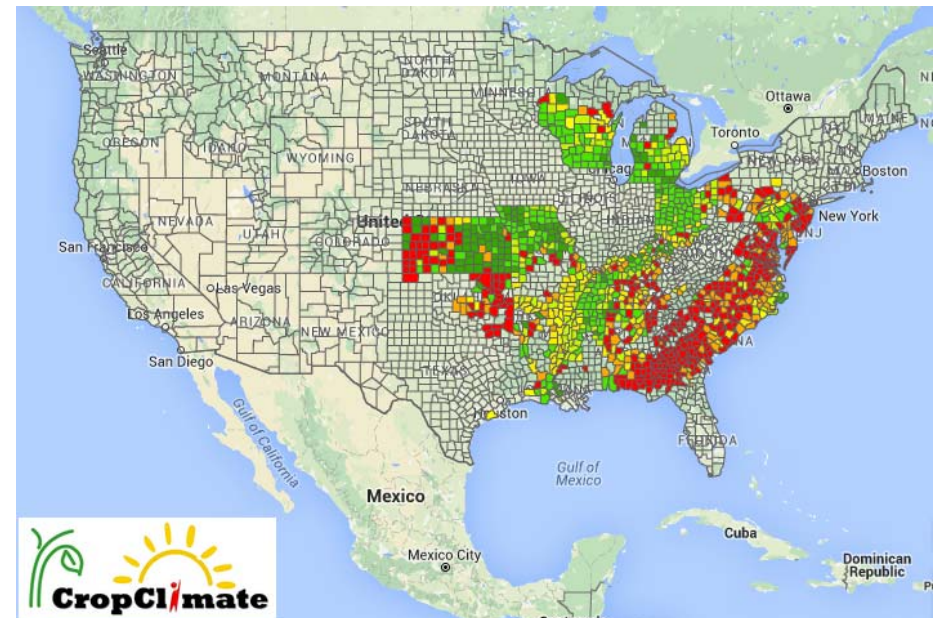
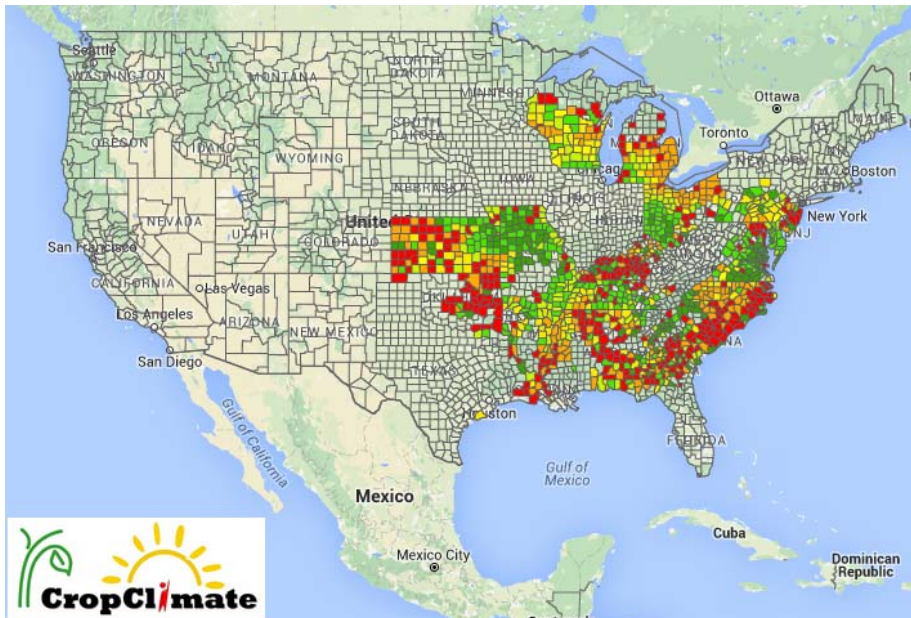


The Arctic Oscillation (AO)

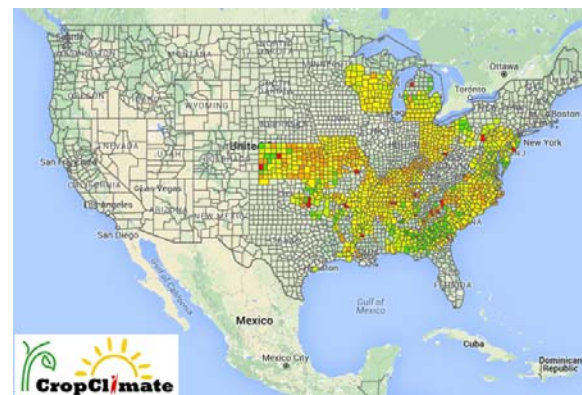
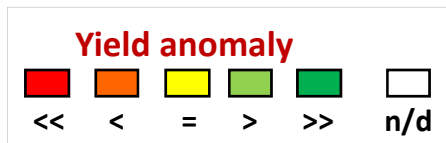
Soybean

Positive

Negative



Neutral

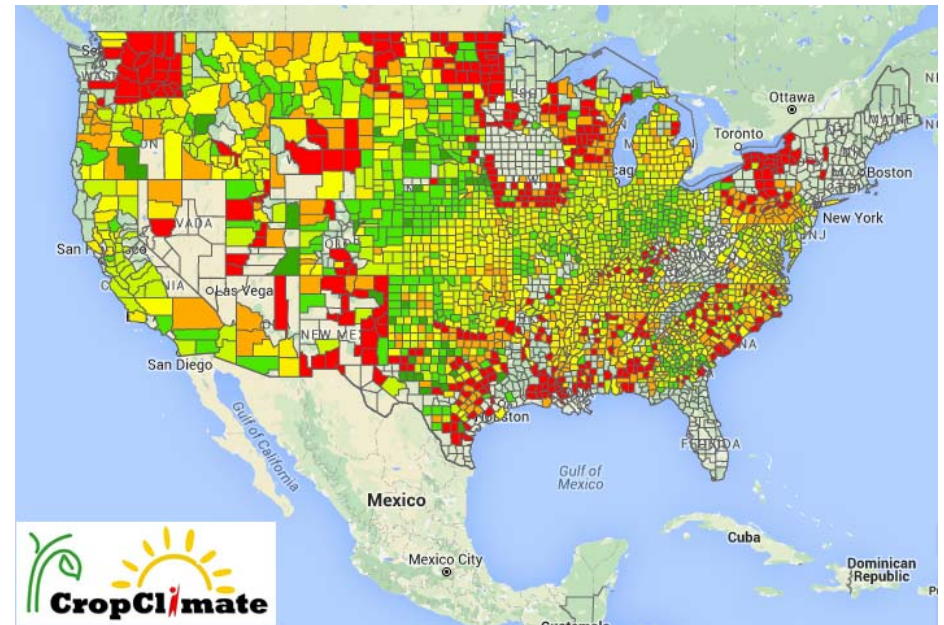
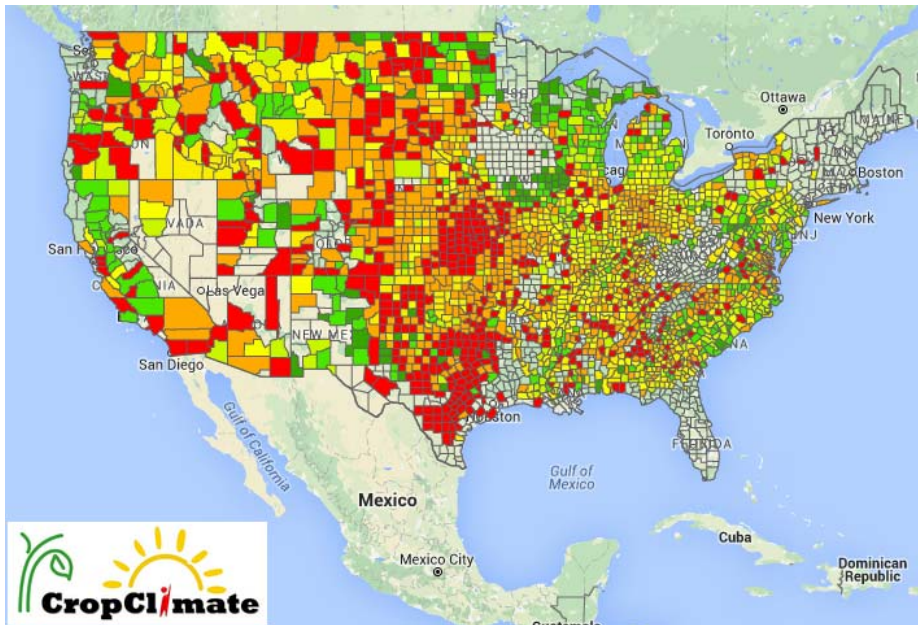


The Arctic Oscillation (AO)

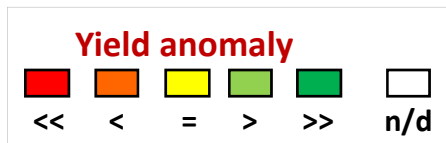
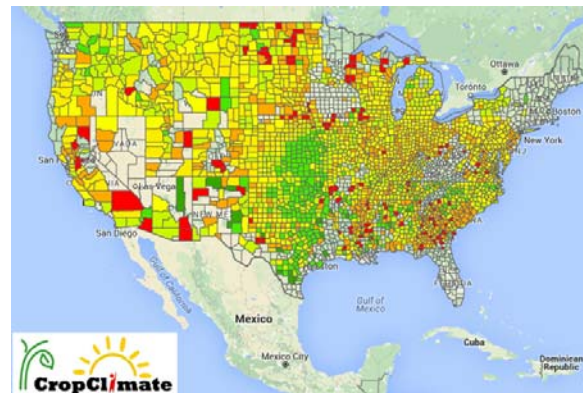
Winter Wheat

Positive

Negative



Neutral

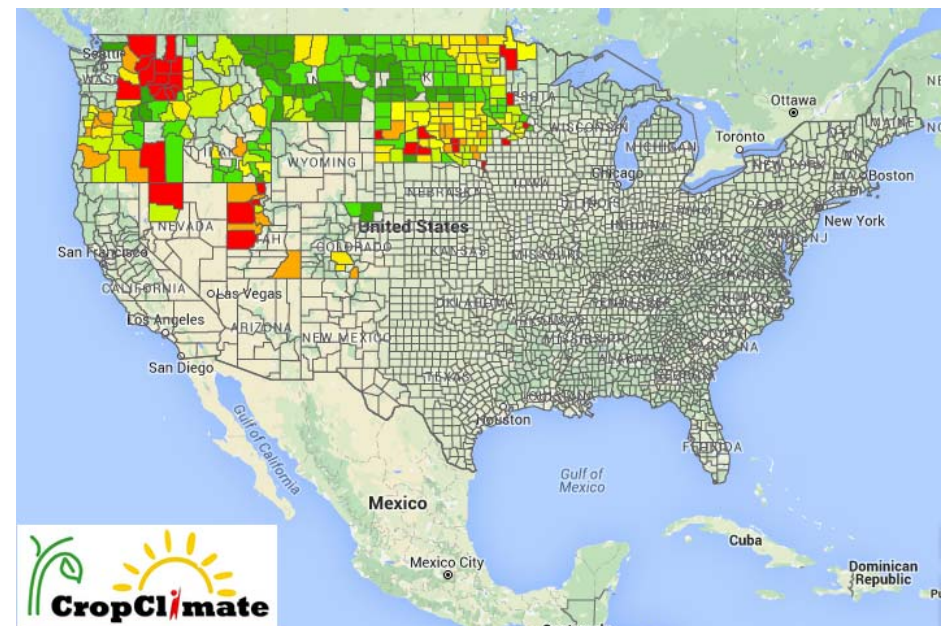
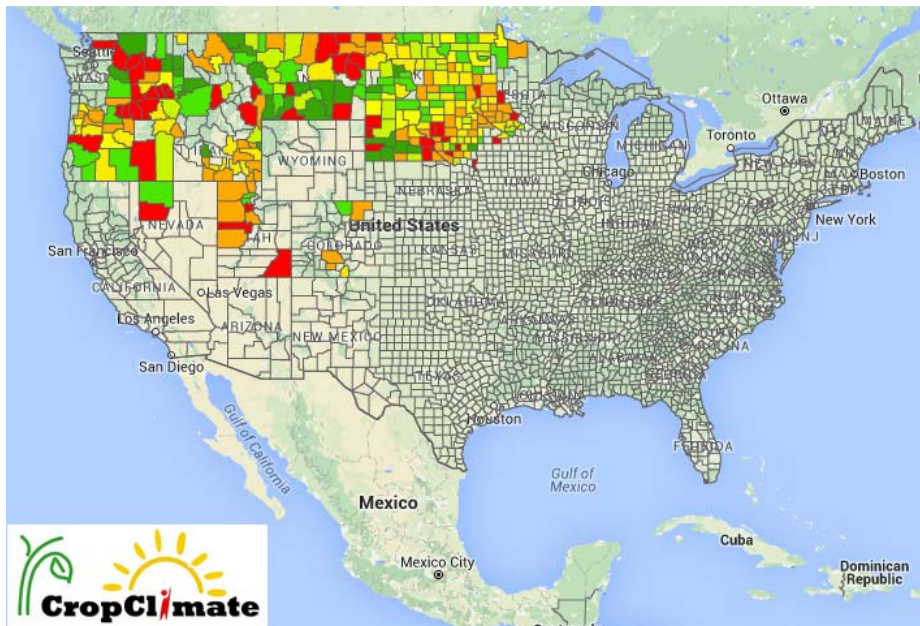


The Arctic Oscillation (AO)

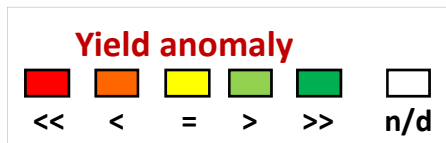
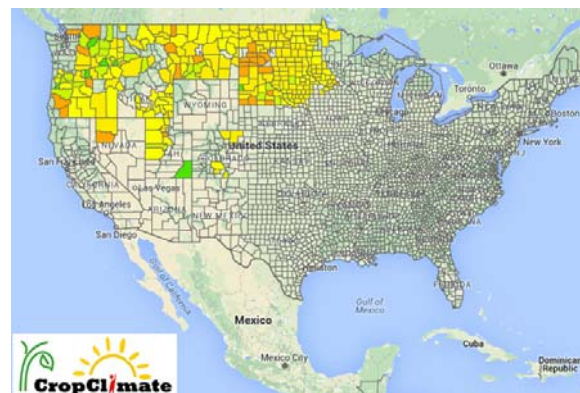
Spring Wheat

Positive

Negative



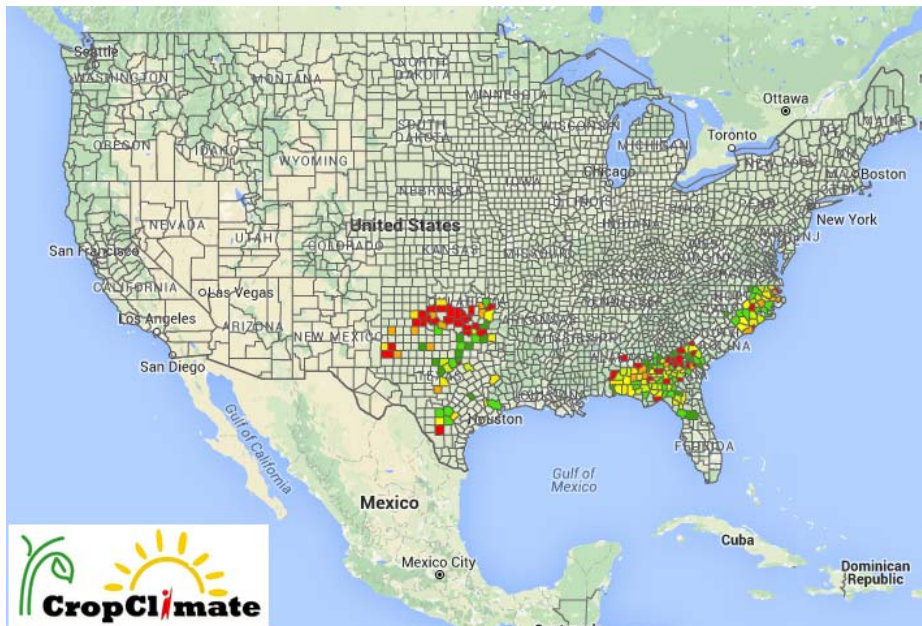
Neutral



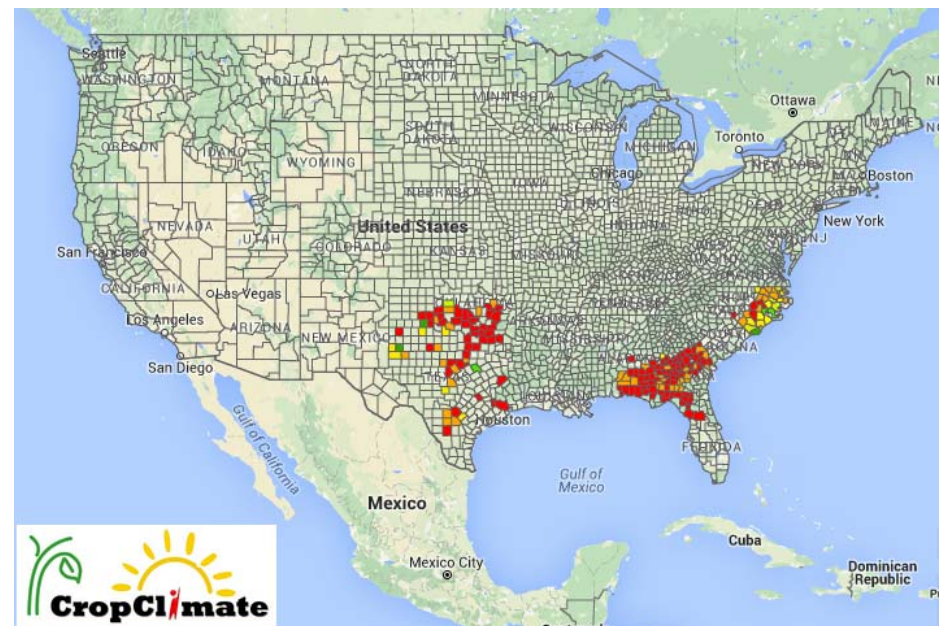
The Arctic Oscillation (AO)

Peanut

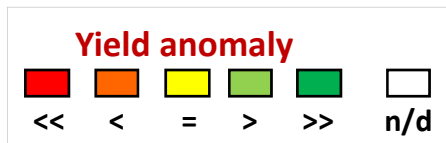
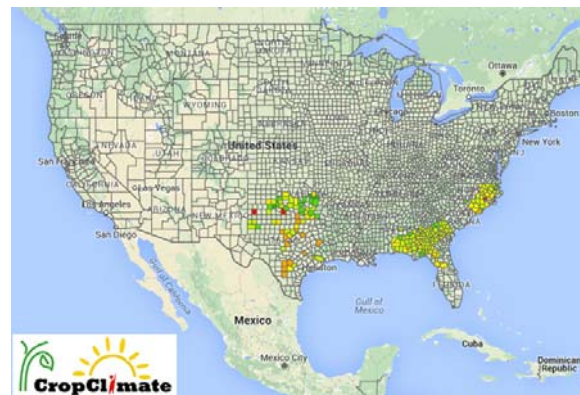
Positive



Negative



Neutral

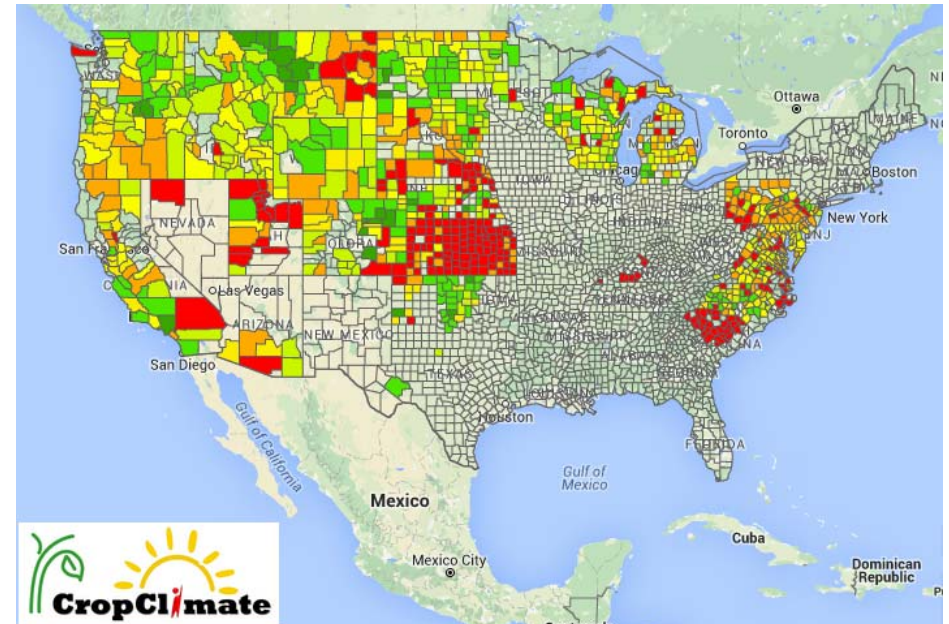
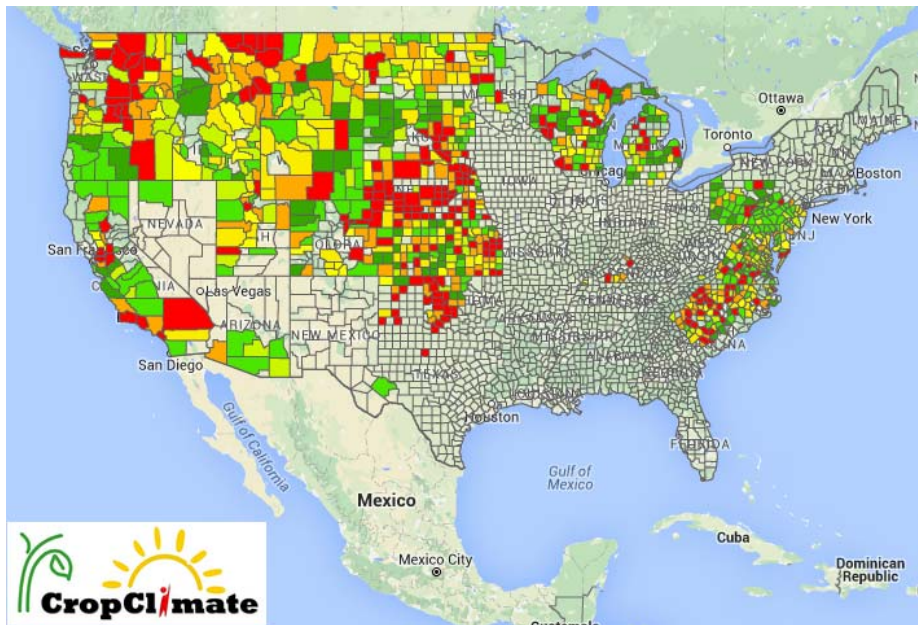


The Arctic Oscillation (AO)

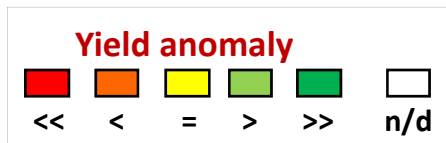
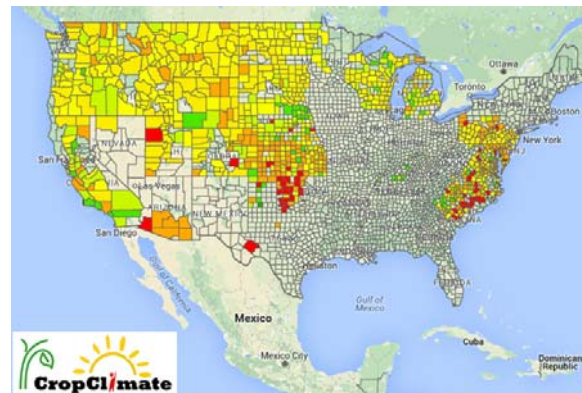
Barley

Positive

Negative



Neutral

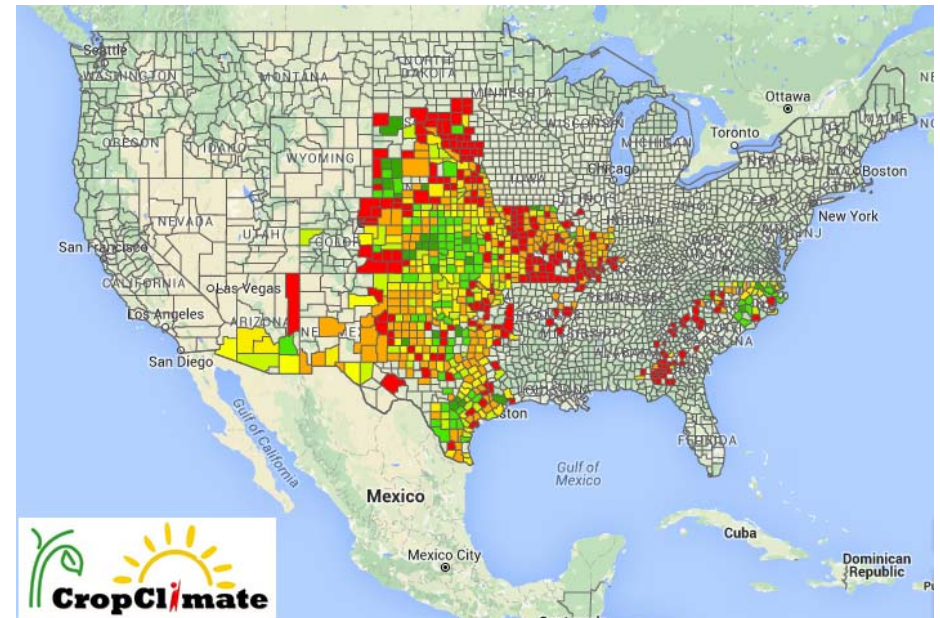
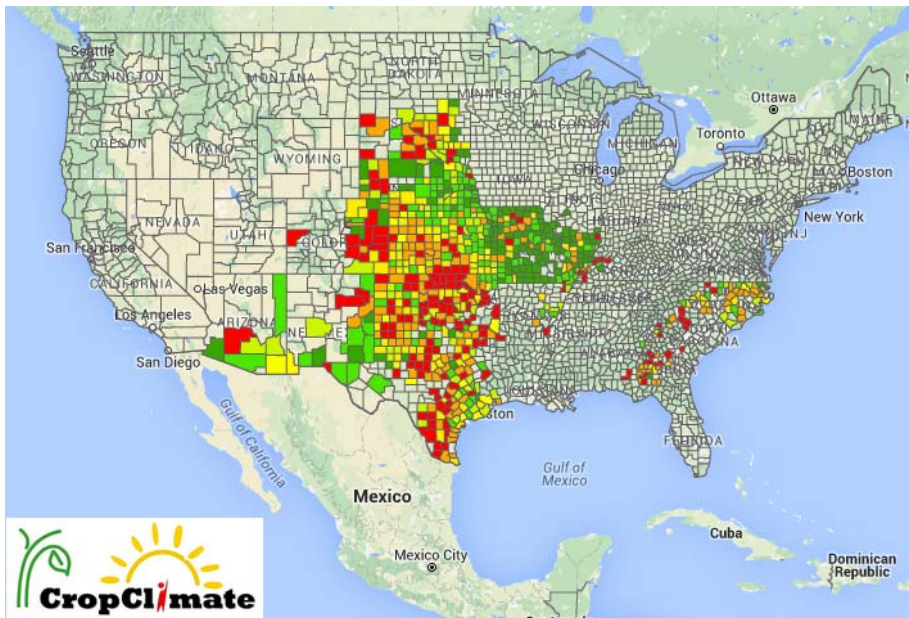


The Arctic Oscillation (AO)

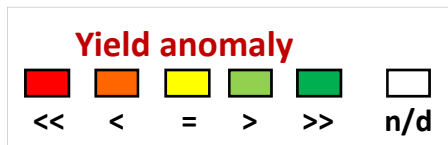
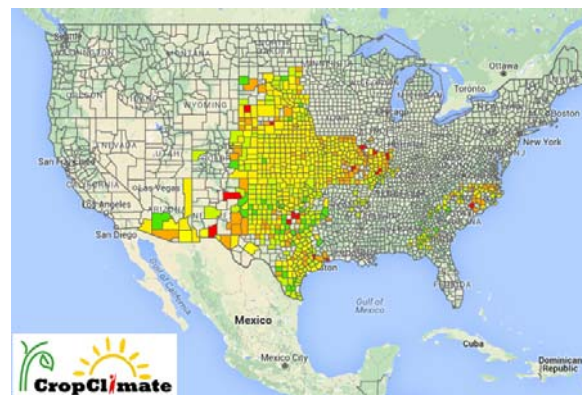
Sorghum Grain

Positive

Negative



Neutral

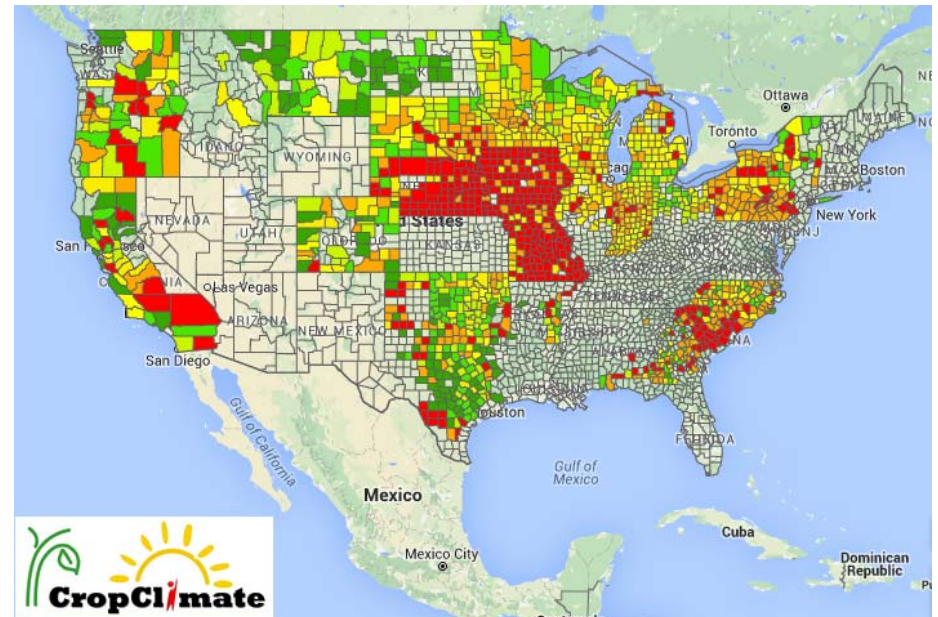
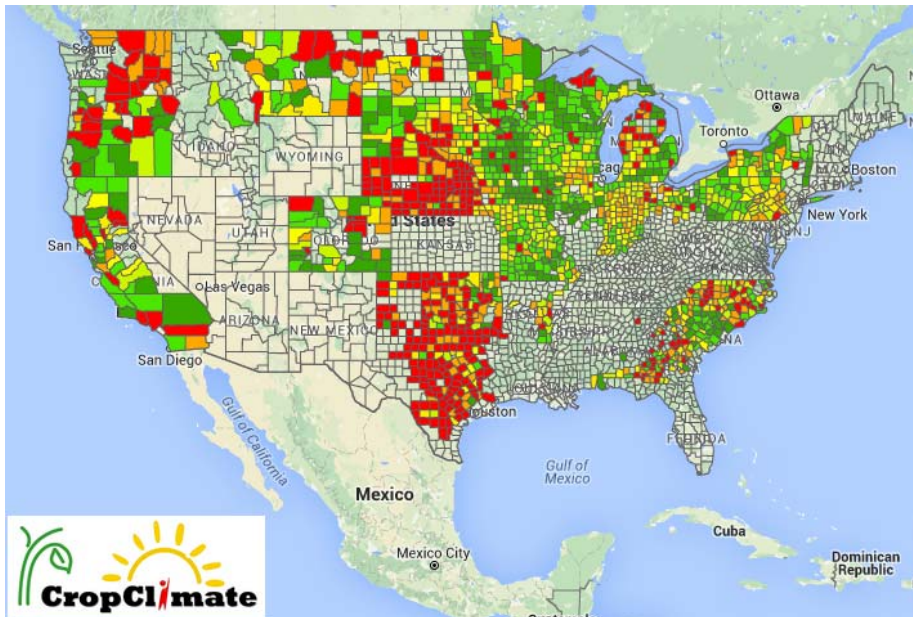


The Arctic Oscillation (AO)

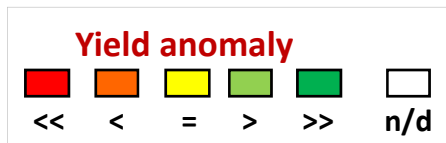
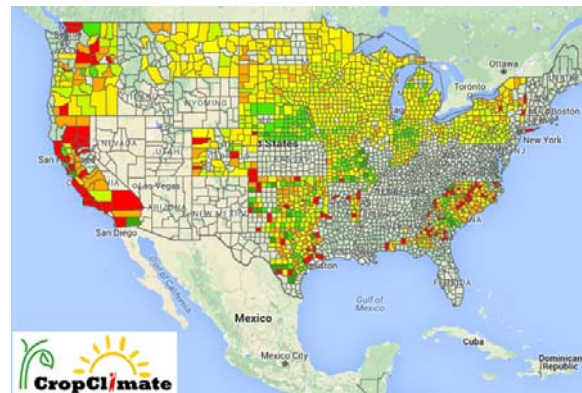
Oats

Positive

Negative



Neutral

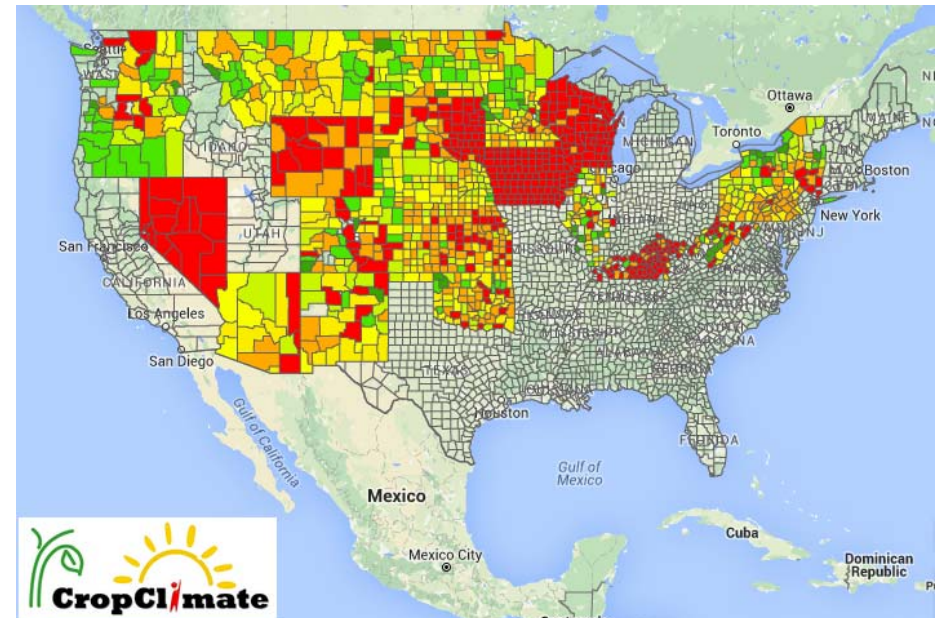
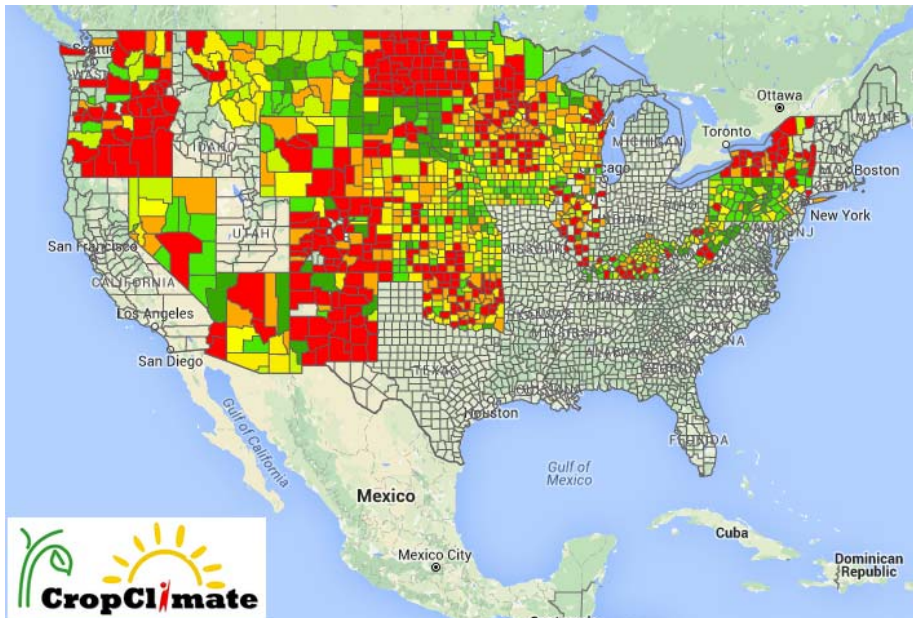


The Arctic Oscillation (AO)

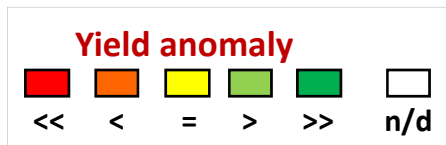
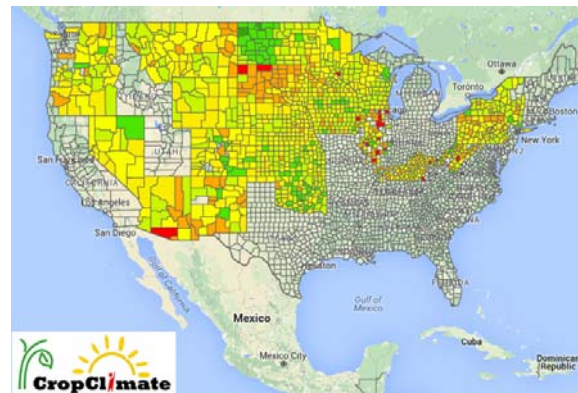
Hay and Alfalfa

Positive

Negative



Neutral

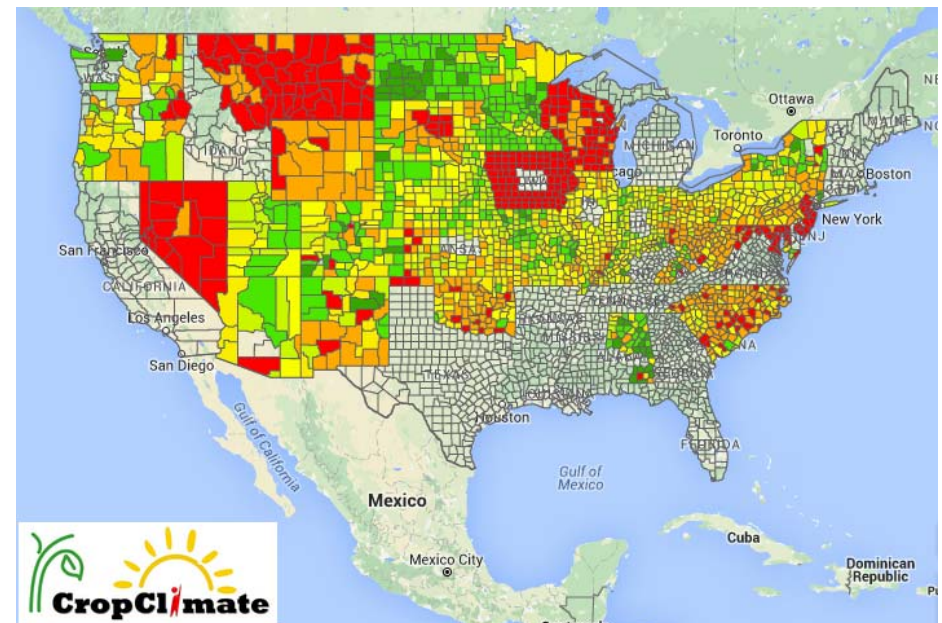
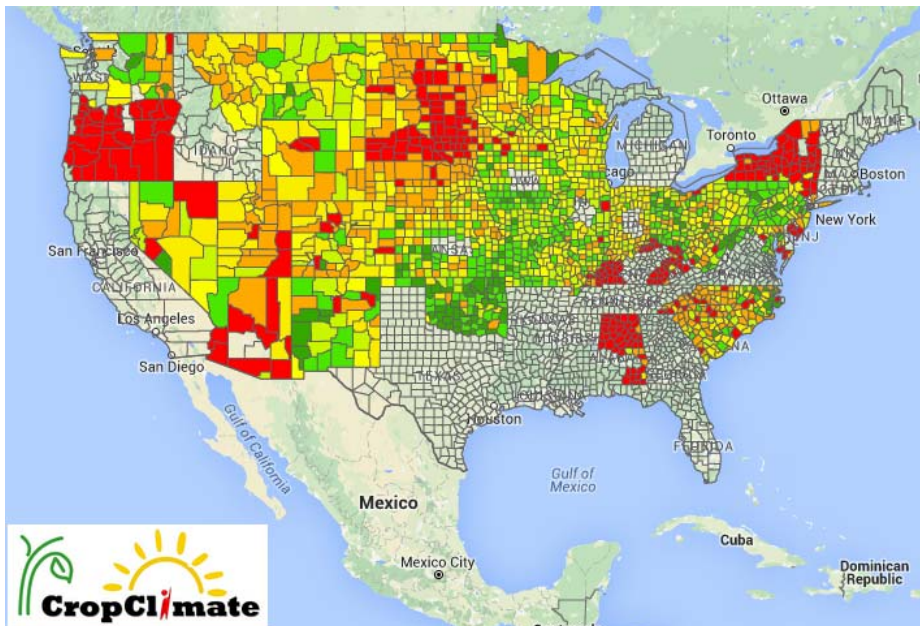


The Arctic Oscillation (AO)

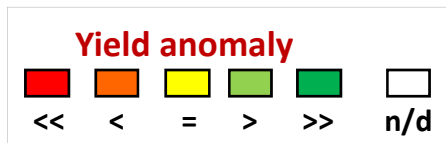
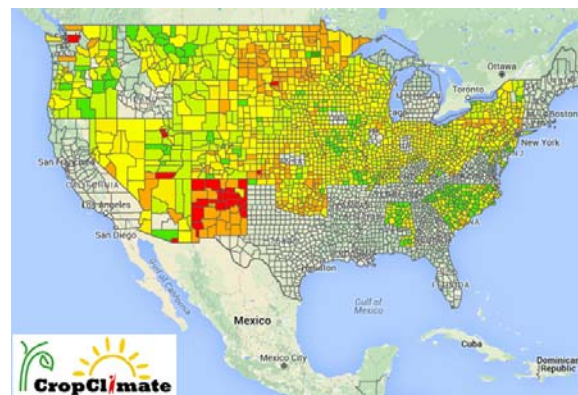
Hay (alfalfa excluded)

Positive

Negative



Neutral

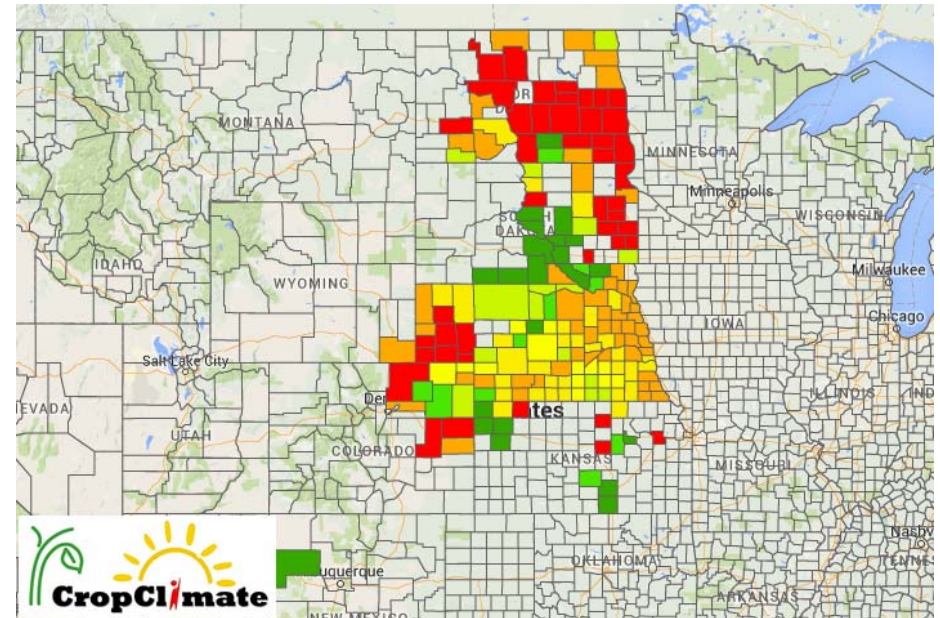
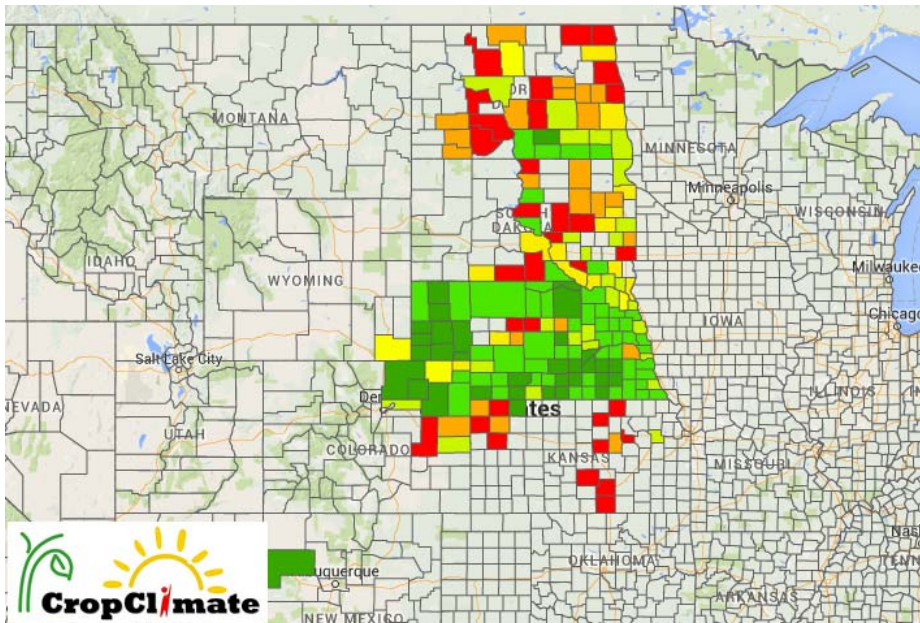


The Arctic Oscillation (AO)

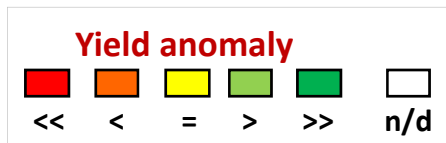
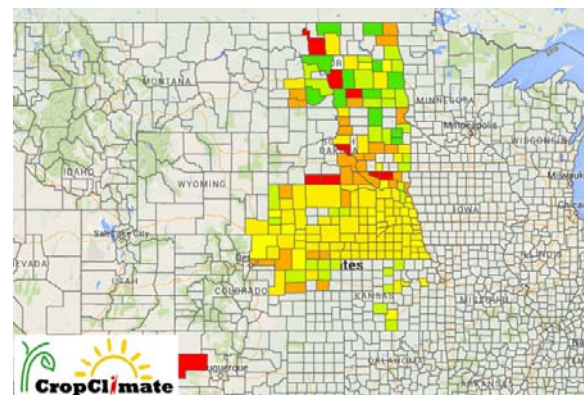
Rainfed Corn Grain

Positive

Negative



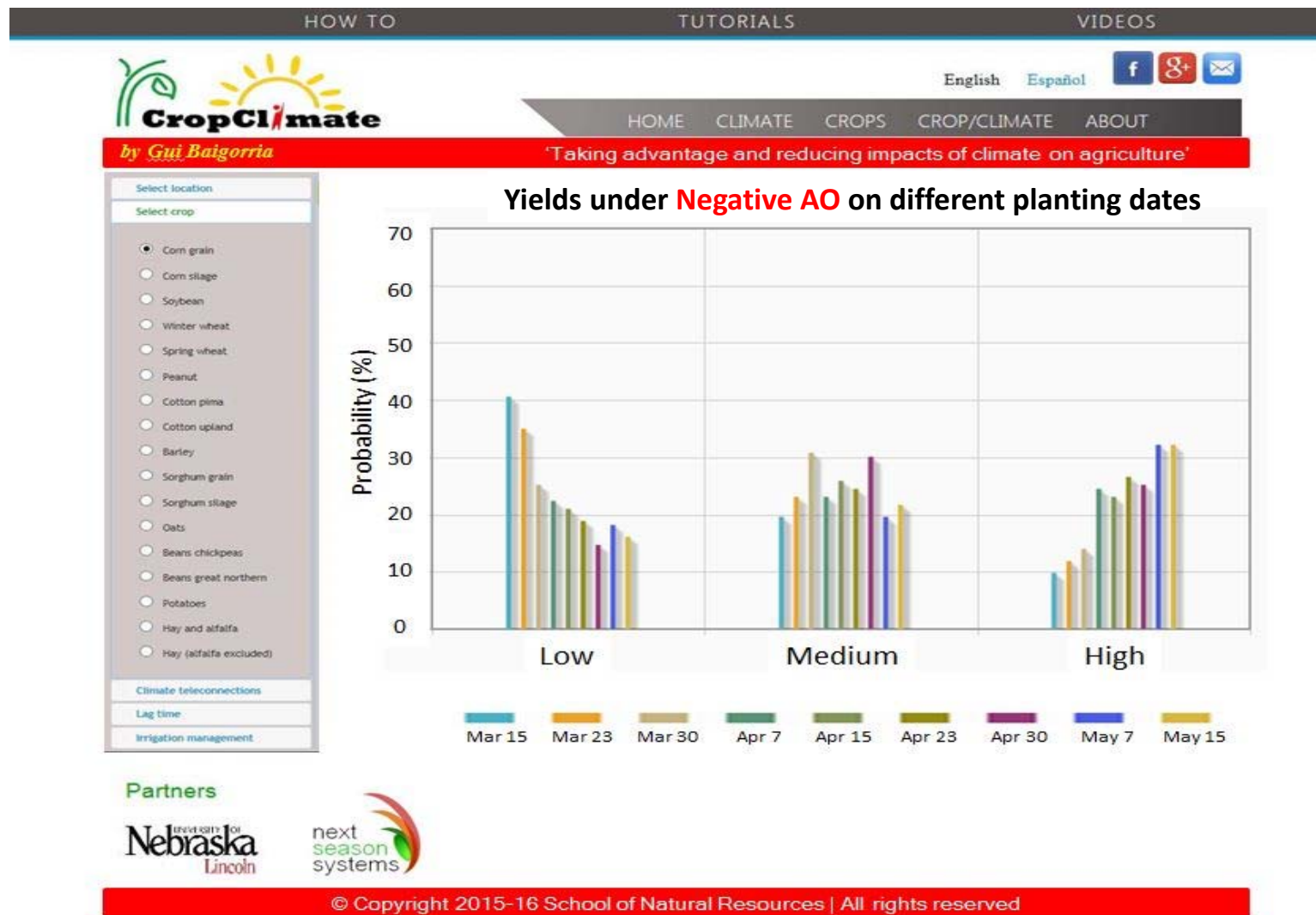
Neutral



So we know the effects, now

What can we do?

Modeling adaptation strategies using CropClimate platform





Using the Arctic Oscillation to Improve Agricultural Decisions

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