

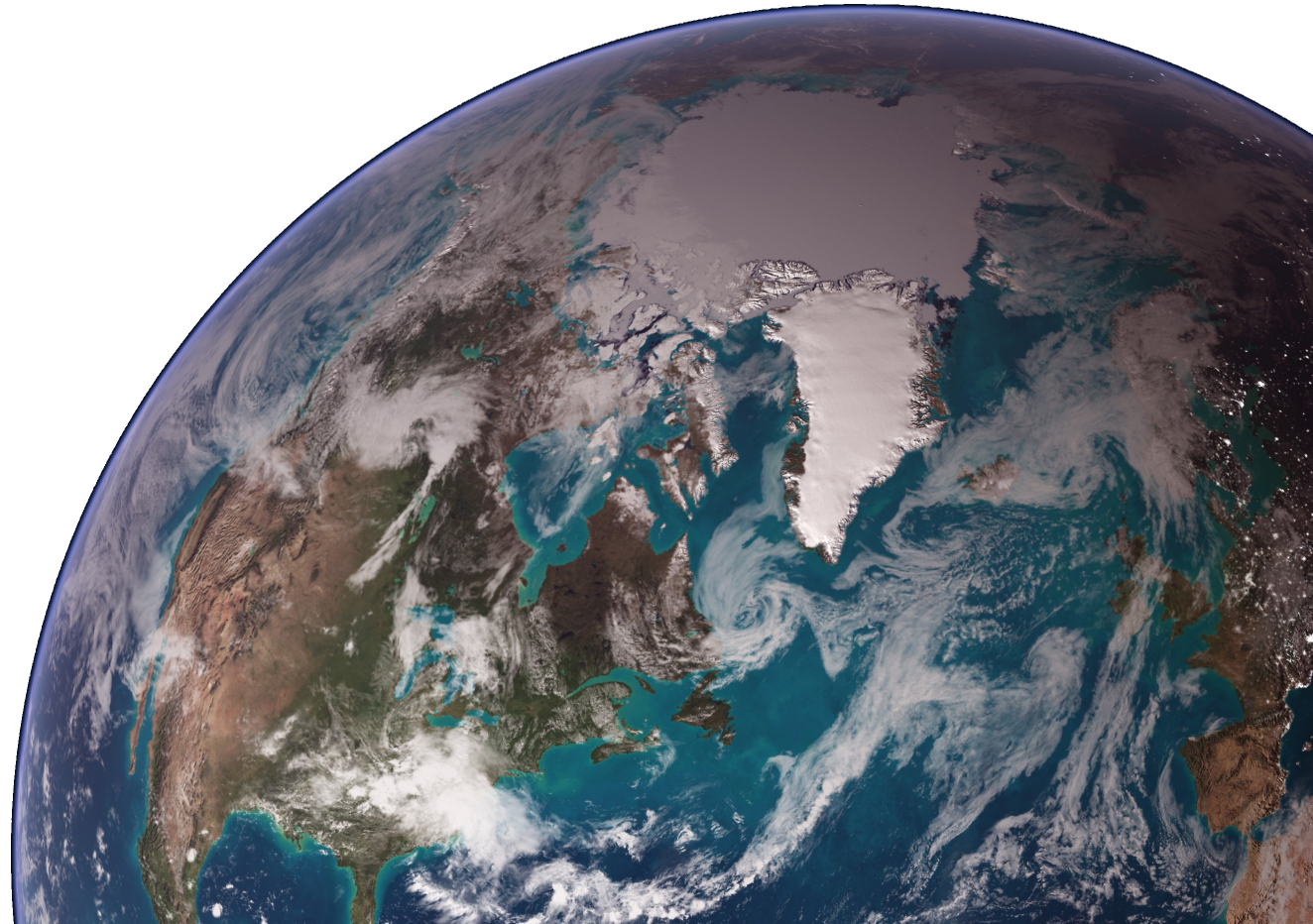


NOAA RESEARCH • ESRL • PHYSICAL SCIENCES DIVISION

Understanding and Explaining Causes for Trends in Regional Precipitation

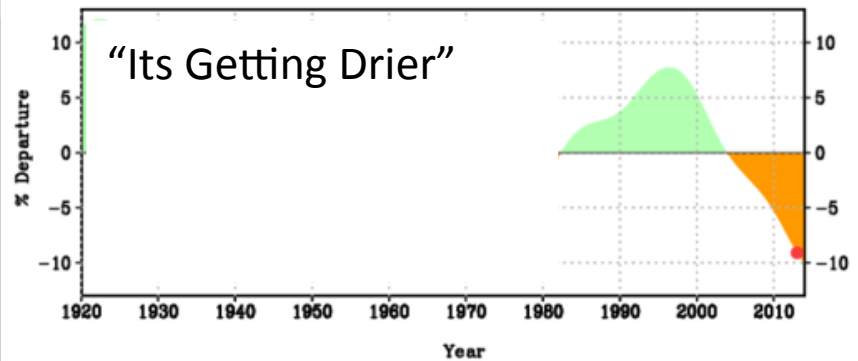
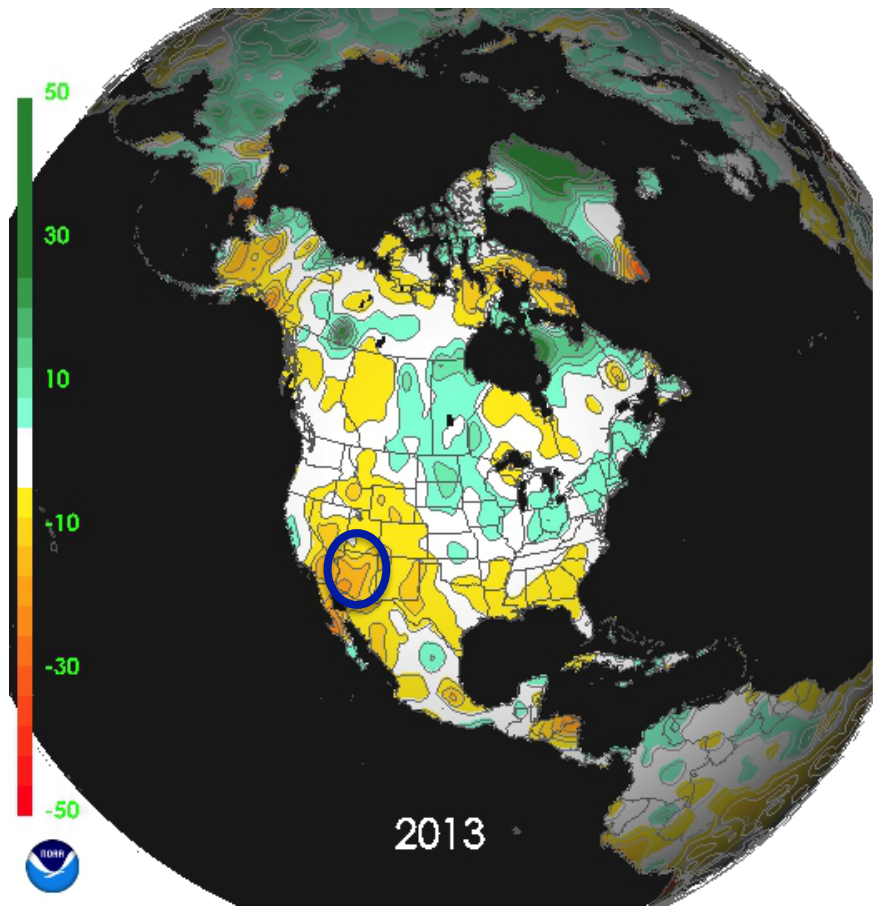
Martin Hoerling

Science Review
12-14 May 2015
Boulder, Colorado

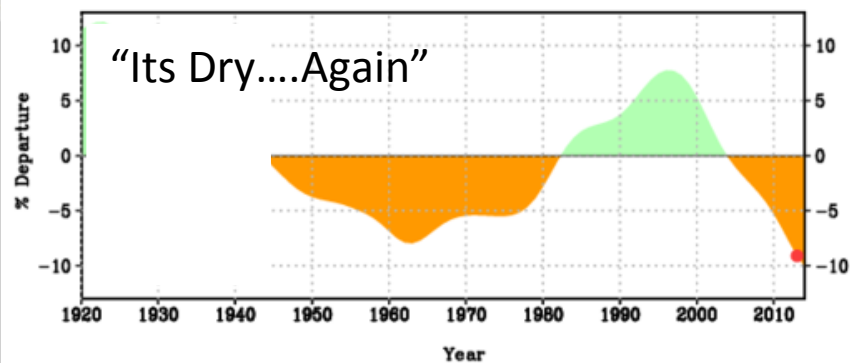
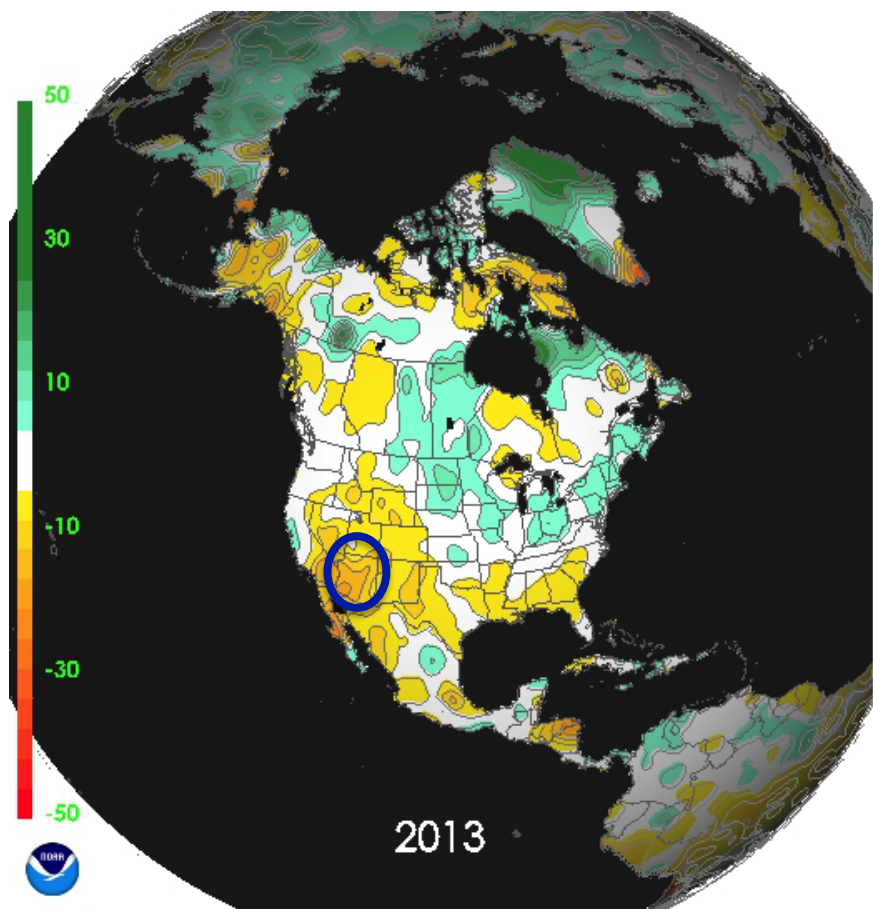




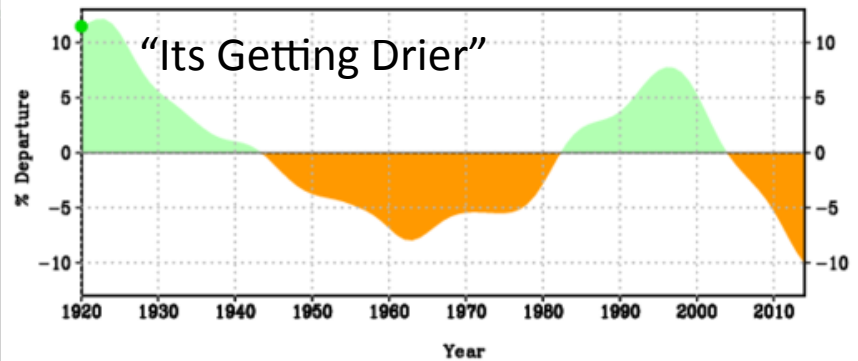
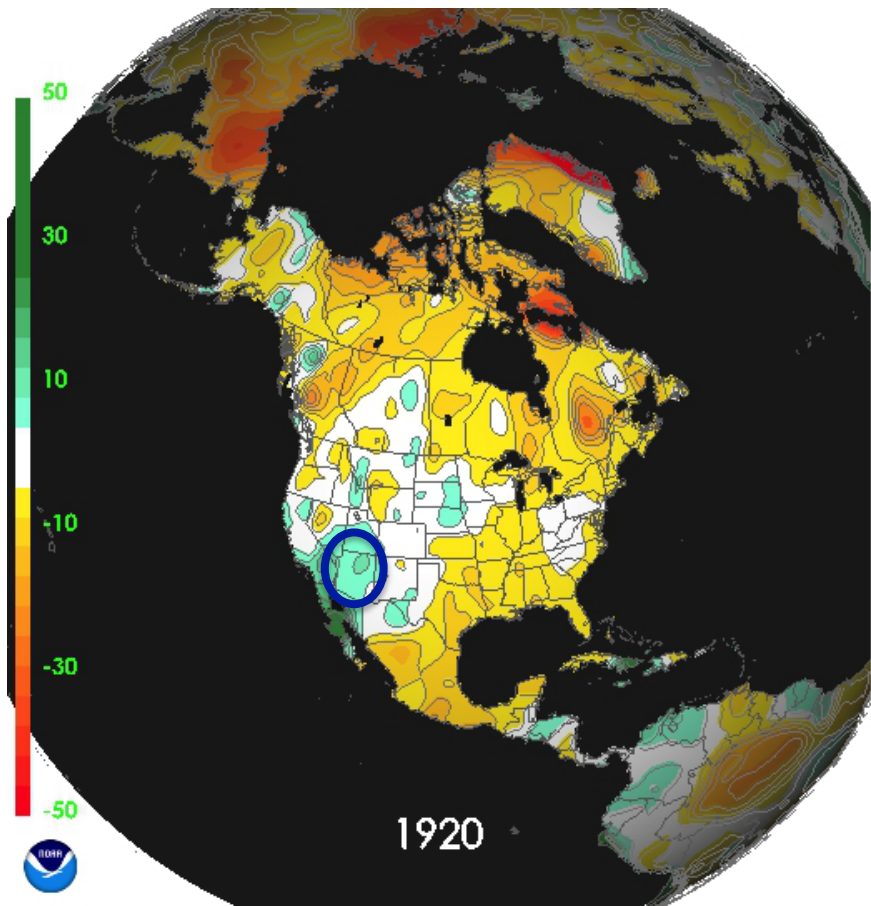
Characterizing Observed Precipitation Trends



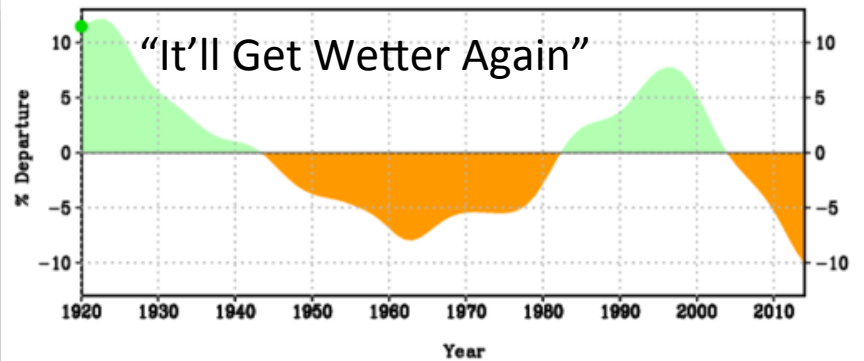
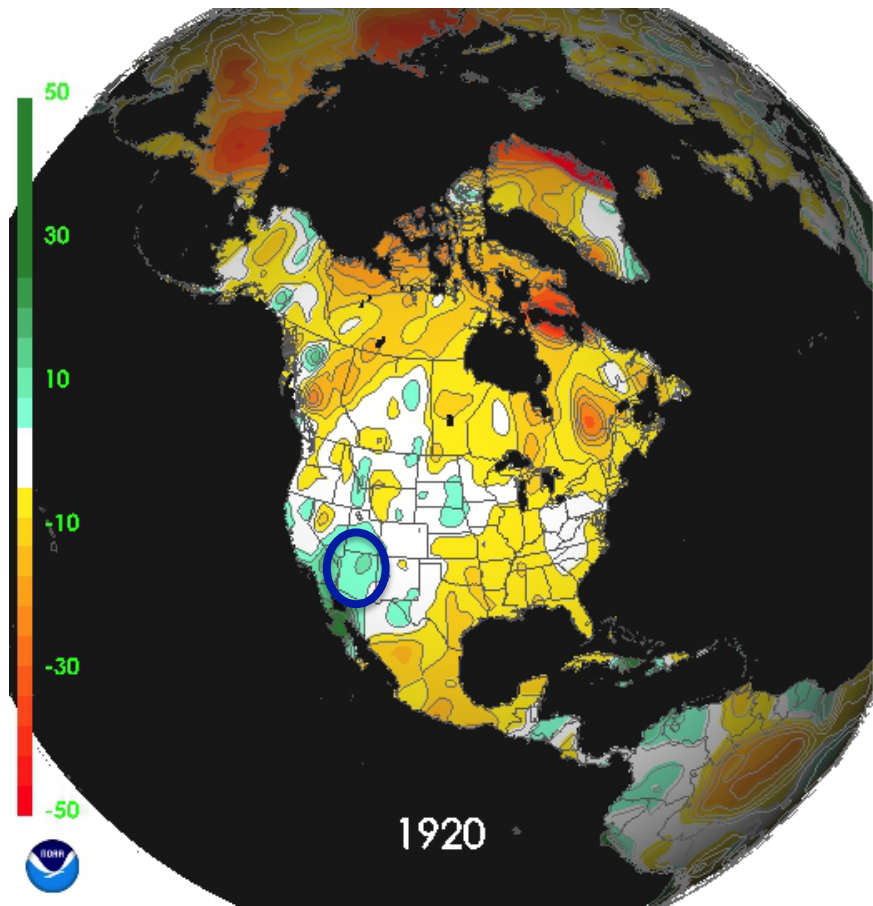
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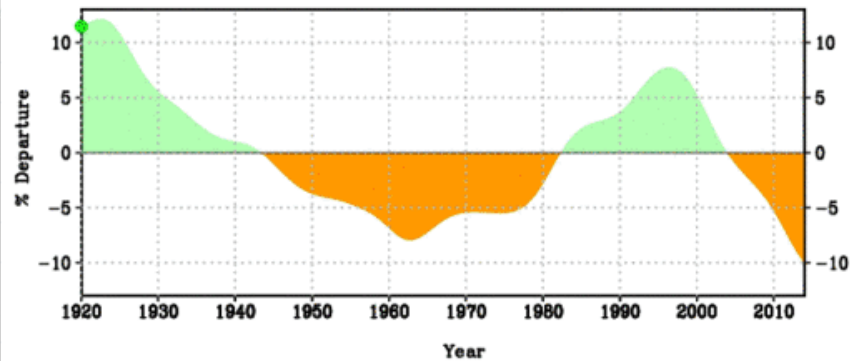
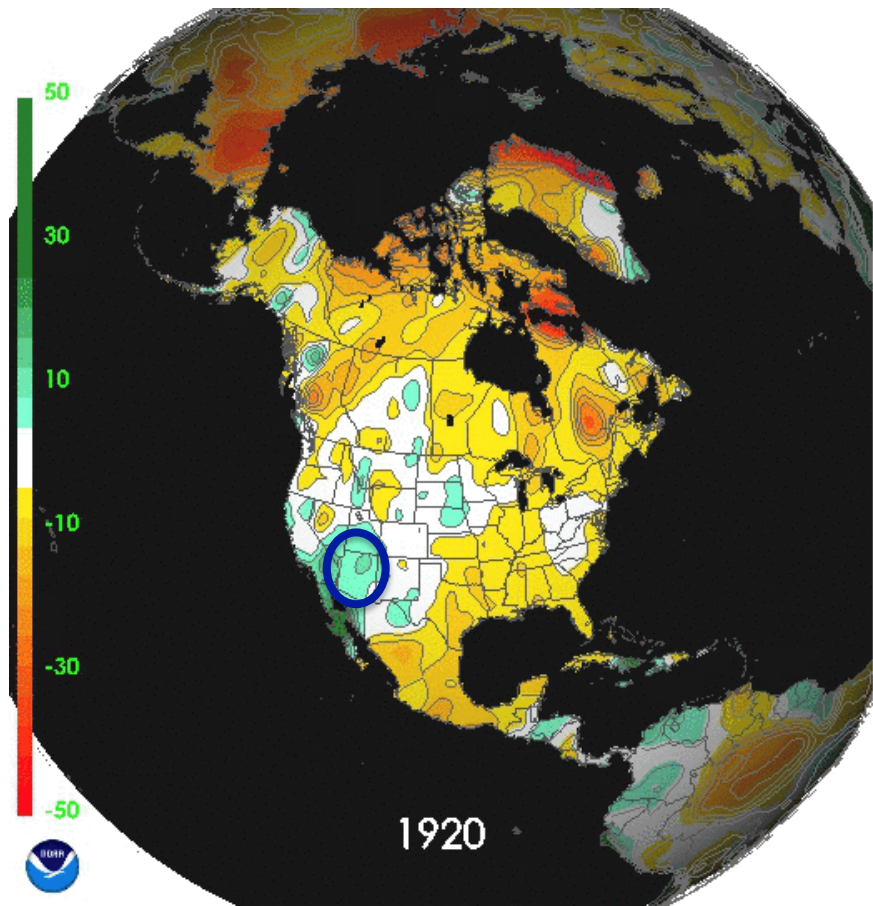
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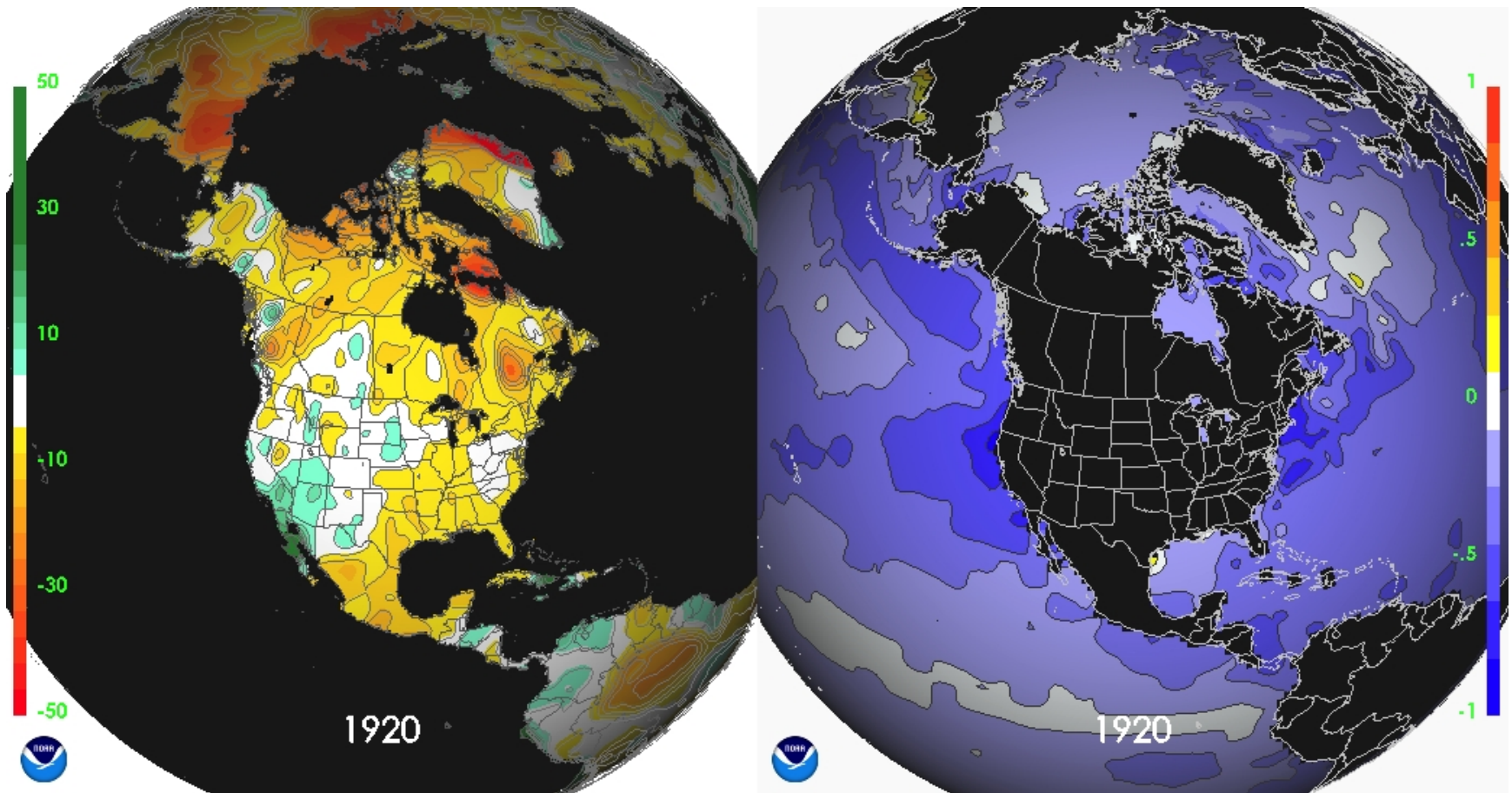


Observed Precipitation: 1901-2014



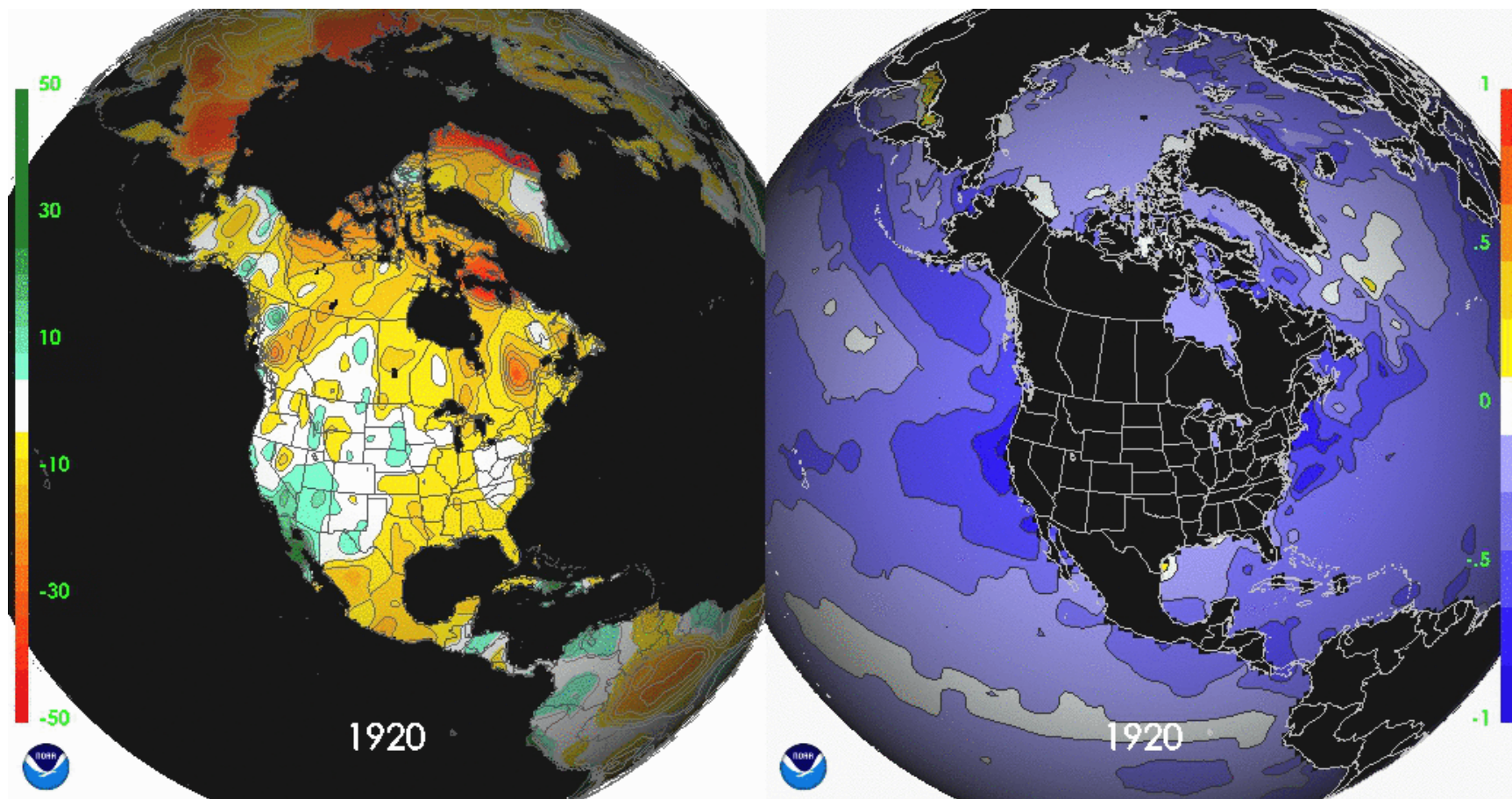
Extended Dry & Wet Regimes are Symptoms of the Semi-Arid West

Observed Precip & SST – 1901-2013



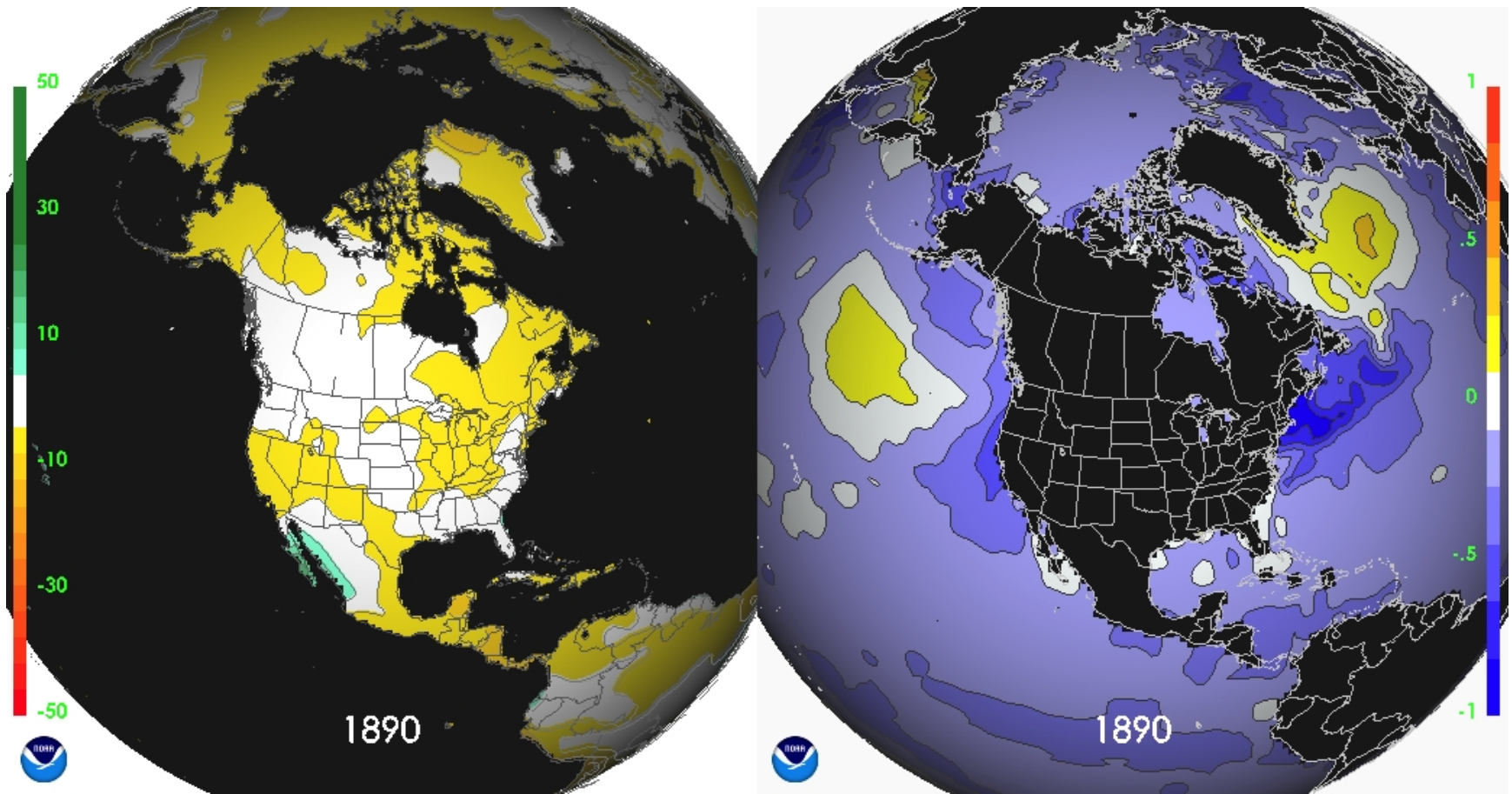
Got Forcing?

Observed Precip & SST – 1901-2013

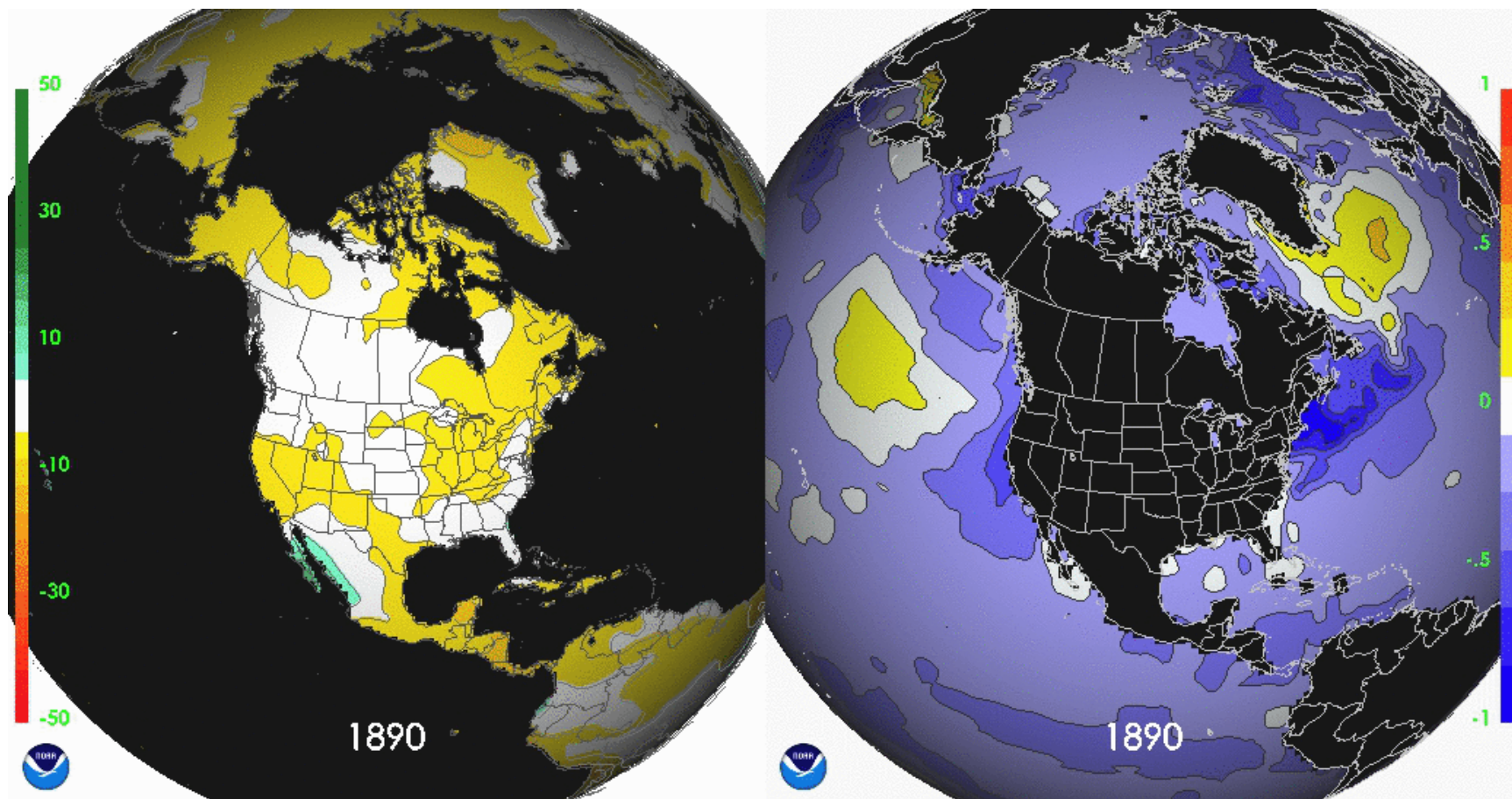


Are Wet and Dry Regimes Determined by Warm and Cold Ocean Regimes?

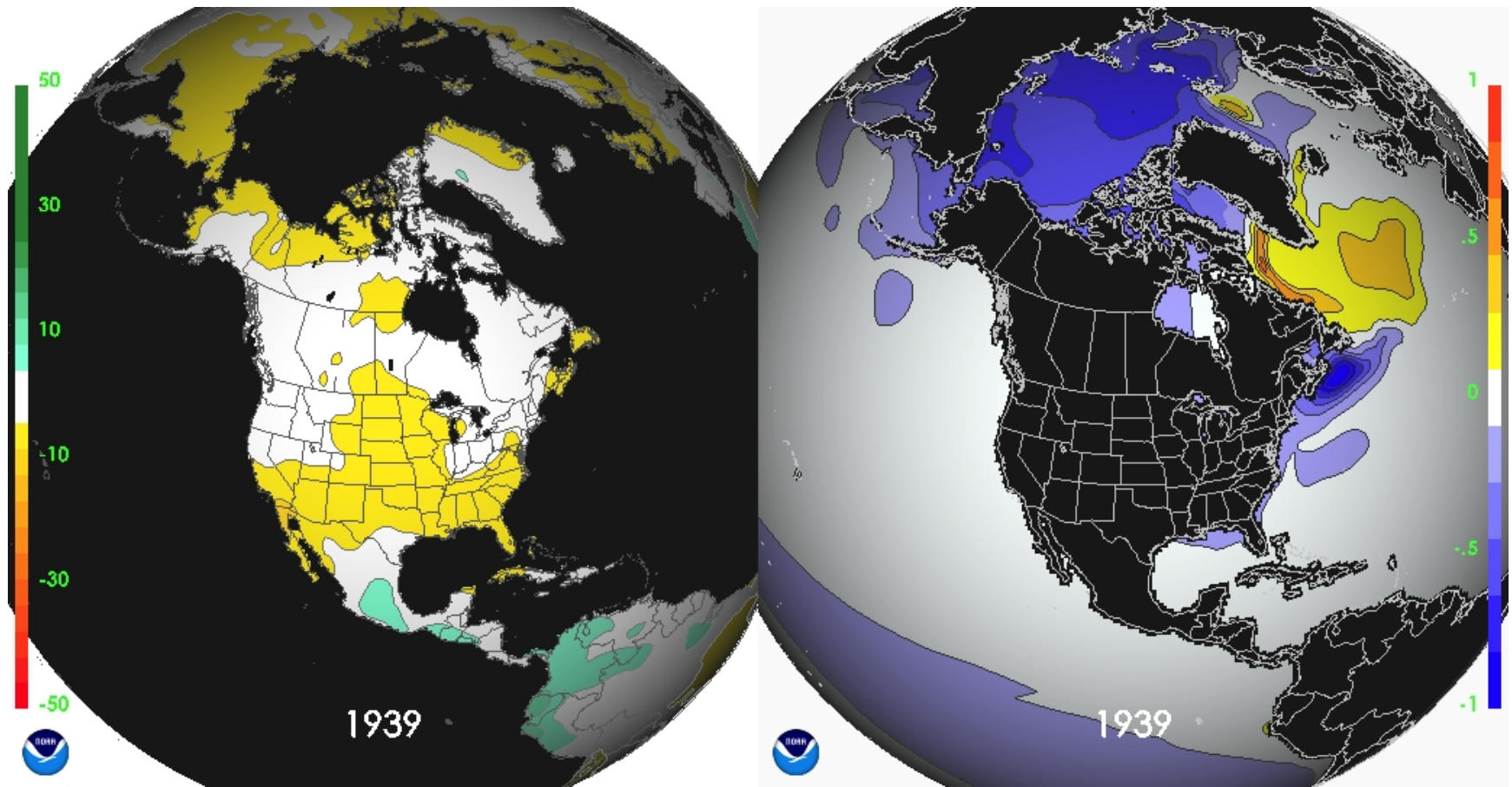
Historical Simulations (AMIP) : 1871-2013



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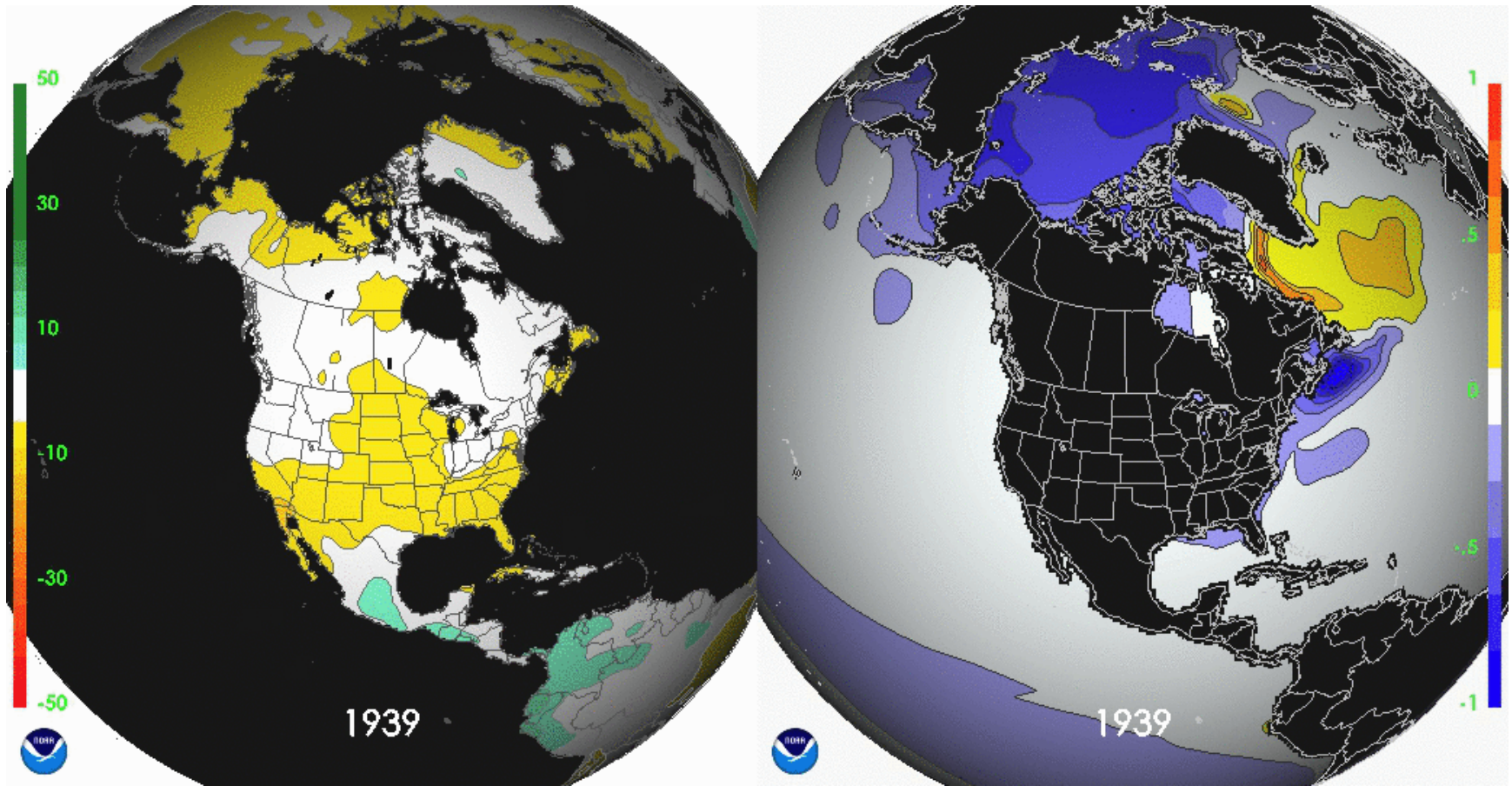


Historical Simulations (CMIP) : 1921-2013

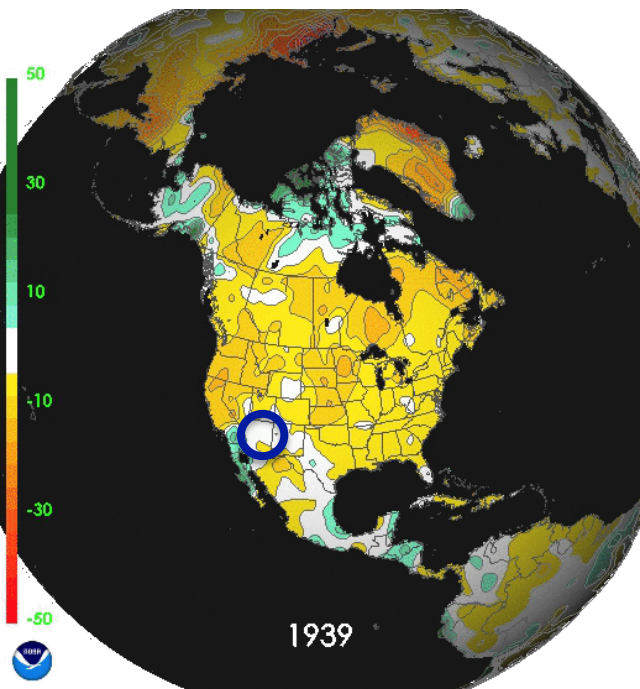


What's the Nature of the Forcing?

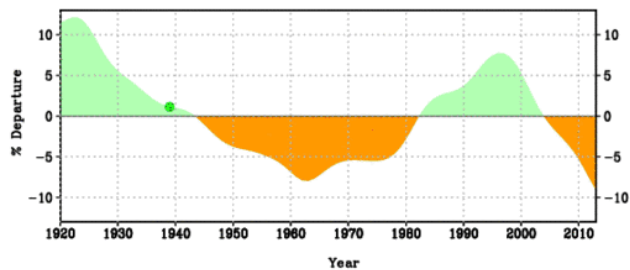
Historical Simulations (CMIP) : 1921-2013



OBS

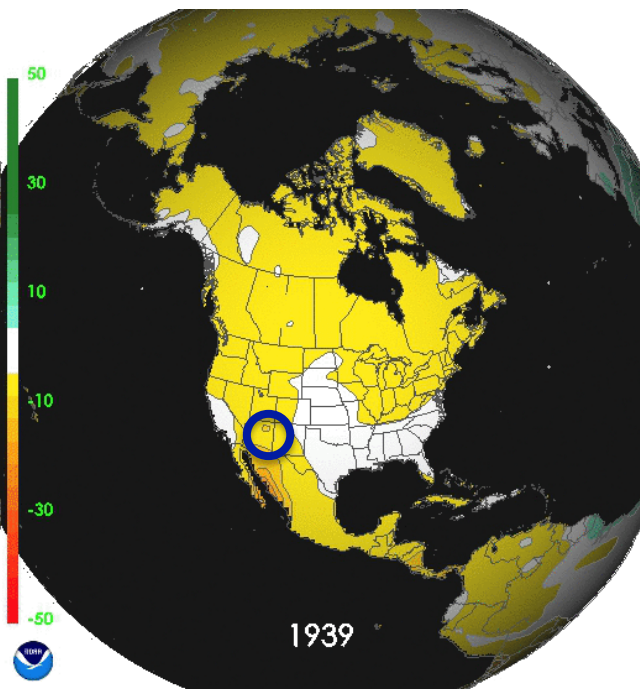


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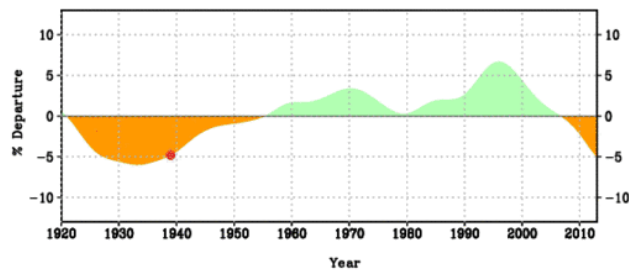


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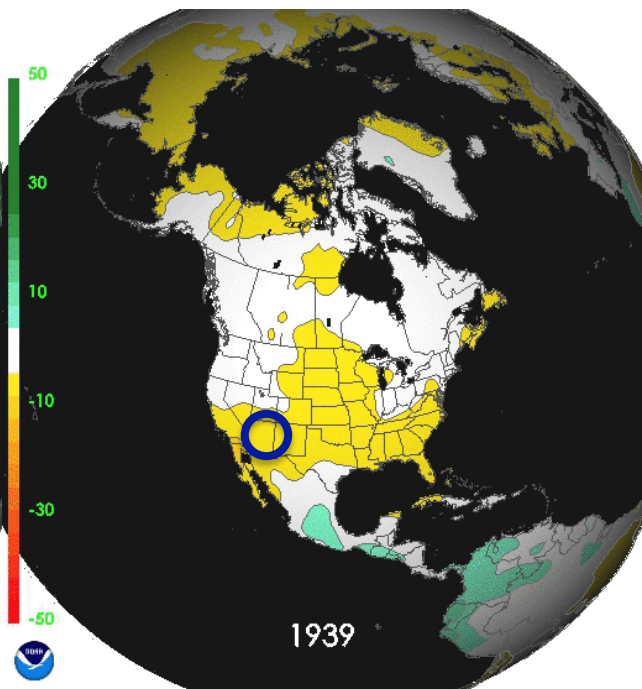


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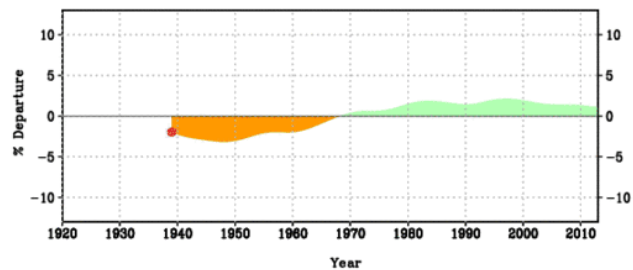


AMIP

CMIP

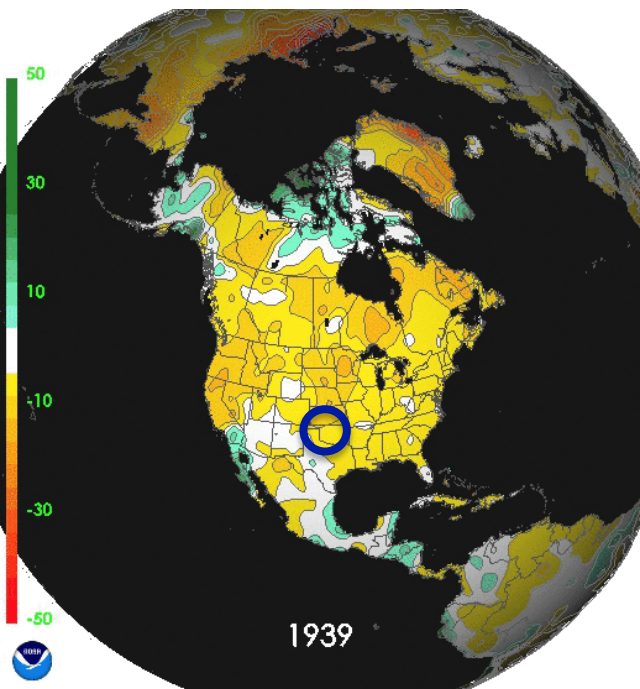


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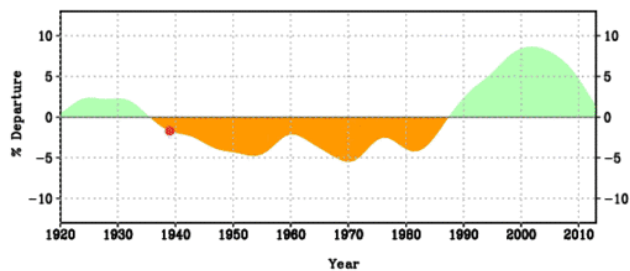


CMIP

OBS

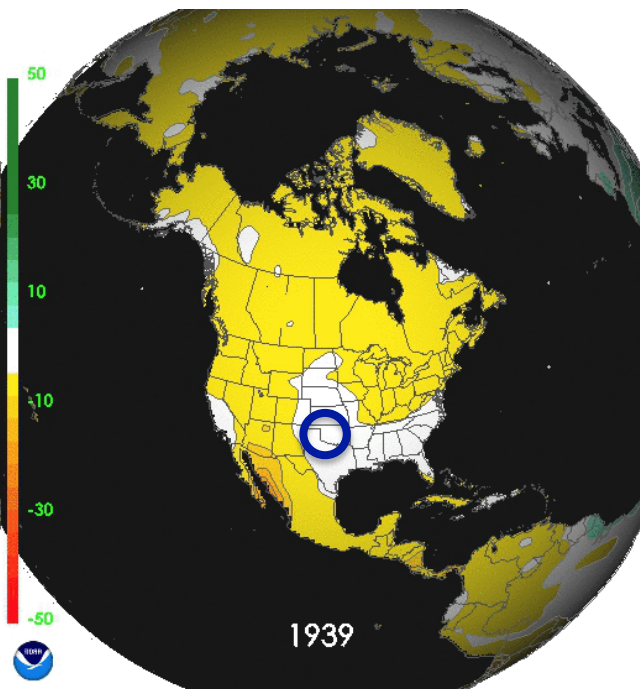


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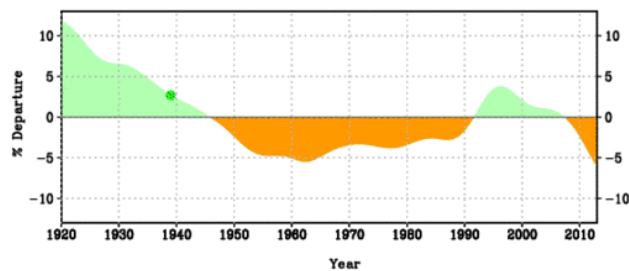


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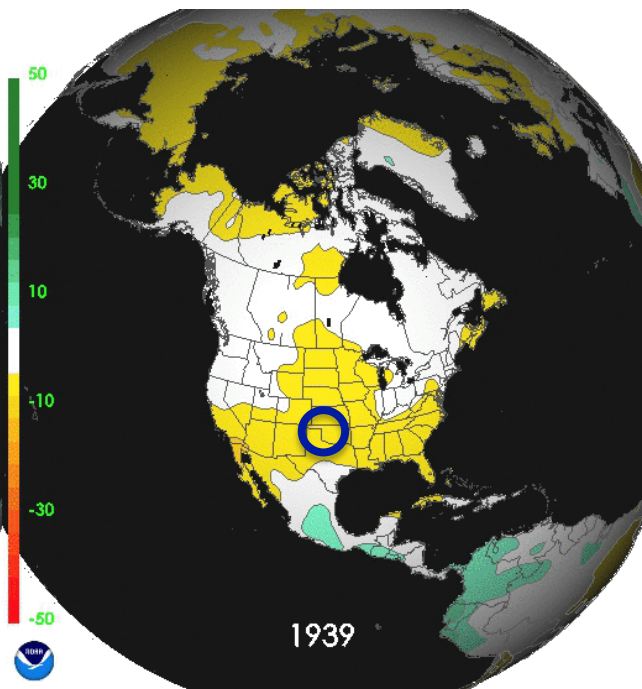


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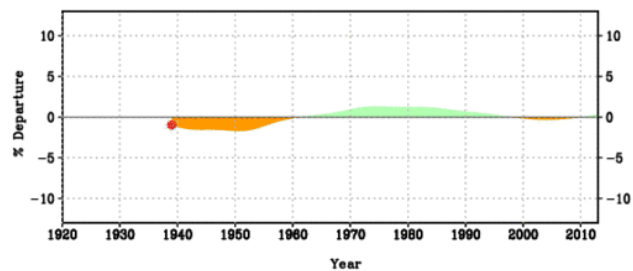


AMIP

CMIP



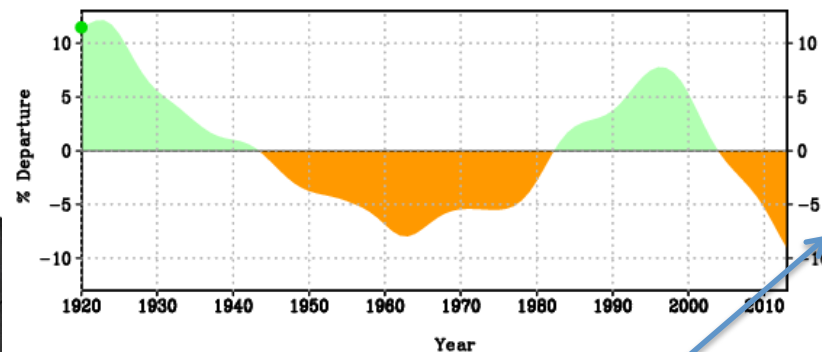
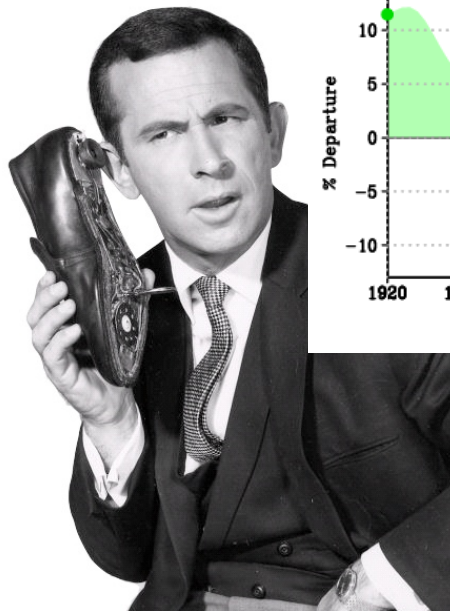
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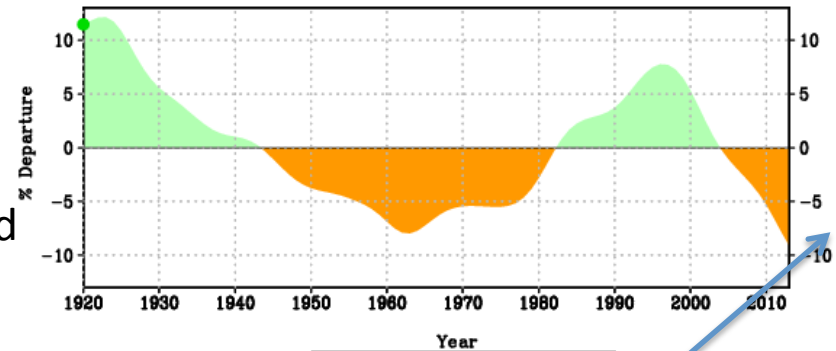
CMIP

Southern Great Plains Precipitation Regimes of Last Century Have Been More Strongly Forced





What's Next?



What's Next?

- ° It's likely that sea surface temperatures have forced multi-decadal trends in NA precipitation during the last century, especially over the southern GPlains.

- ° The consequential SST forcing has mostly been due to natural internal variability.

(Contrast with Hoerling et al. 2012 for Mediterranean Pcpn trends)

- ° The particular history of SST variations has very likely been more important than the particular history of external radiative forcing.

(Is this true for East Africa drying? See Liebmann et al. 2014)

- ° Appreciable precipitation trends arise without forcing, via atmospheric noise/land coupling alone.

(Is this the paradigm for Mega-droughts of the American Southwest?)