

Crops and Climate

Len Coop, OSU

Integrated Plant Protection Center & Botany Plant Pathology

Feb 28, 2015 Small Farms Conference, Corvallis, OR (minor updates Mar 2, 2015)

Has it been getting warmer in the Pacific NW & how will that affect plant/crop phenology?

A Degree-Day* Study

*1 degree-day occurs when the average daily temperature is 1 degree above a threshold temperature (like 41°F)



2 24	61.00	28.00	0.00	7.12	351.4
2 25	52.00	36.00	0.00	4.23	355.6
2 26	53.10	46.90	0.05	9.00	364.6

DD accumulation on 2-26-15: 365. QA 92%

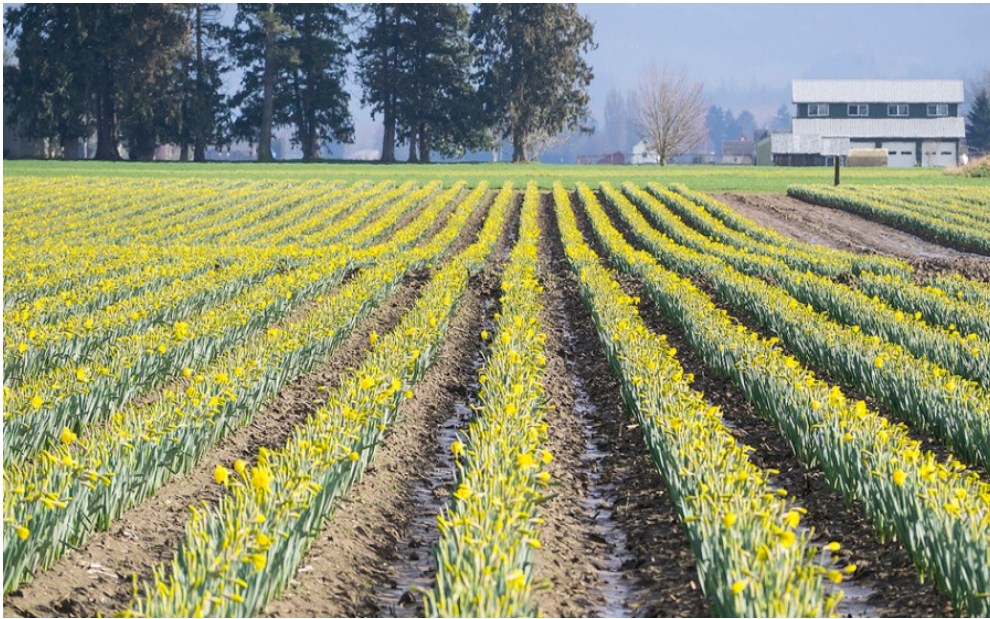
This year is about	versus	QA
15 days ahead	2014	ok
30 days ahead	2013	ok
30 days ahead	30-yr normal	ok

Forecast using: [MWS NDFD 7-day Forecast](#) data

2 27	51.00	46.90	0.00	7.95	372.6	Cloudy_93%_precip
2 28	51.00	37.00	0.00	3.94	376.5	Partly_Cloudy_14%_J
3 1	53.00	30.00	0.00	3.91	380.4	Partly_Cloudy Cui

The daffodils were blooming as early as Valentine's Day (Feb 14th) this year!

Daffodils,
That come before the swallow dares, and take
The winds of March with beauty.
–William Shakespeare, The Winter's Tale



We will look at heat units through today
(Feb 28th as a reference)

Have these past 2 months been the warmest ever?

Is it part of a winter warming trend in the PNW?

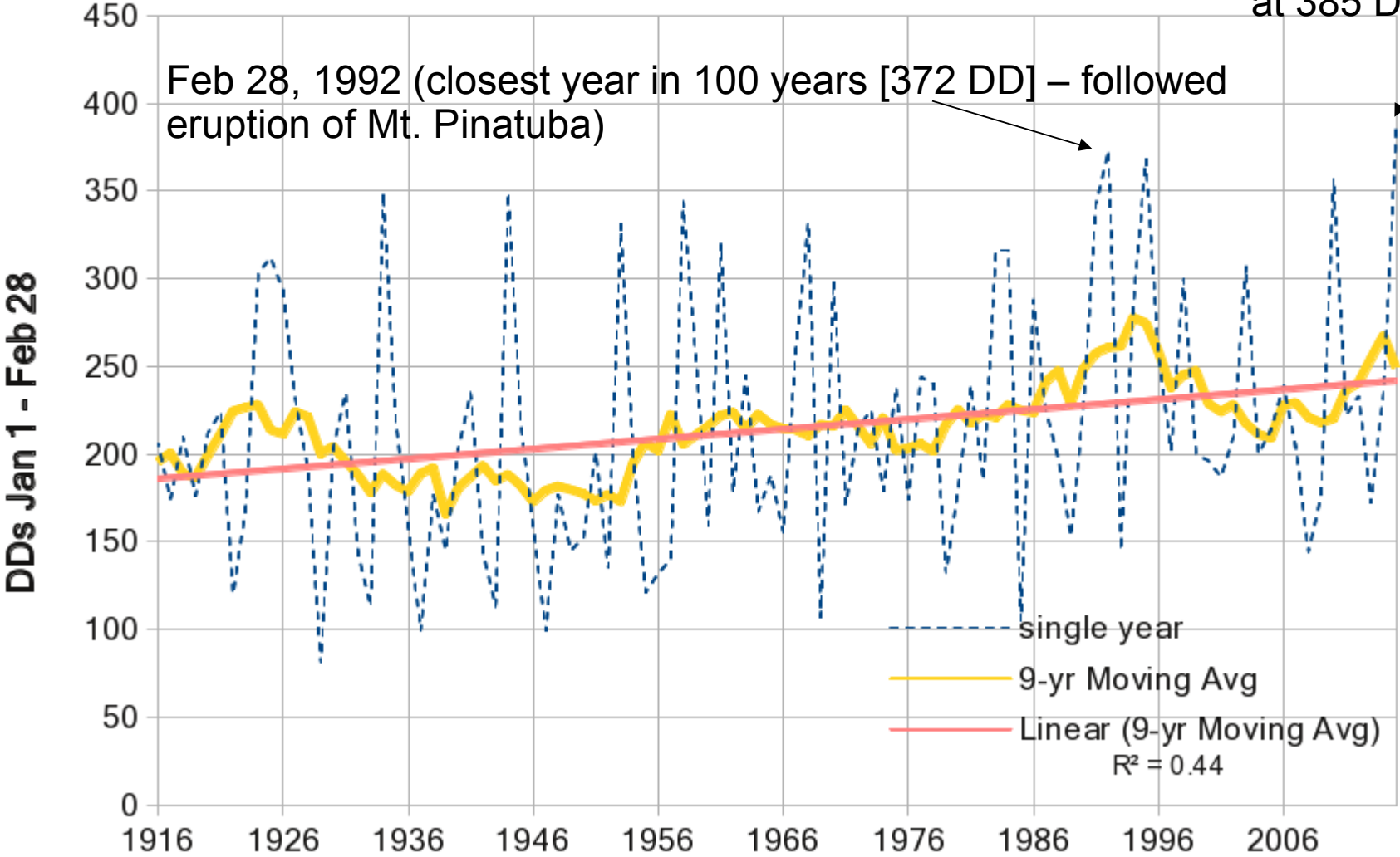
Is global warming caused by humans releasing all
this CO² into the atmosphere?
(97% of Scientists think so...)

Can we forecast these anomalies to help growers
adapt to these trends?

2015 is pretty much the warmest year since 1916!

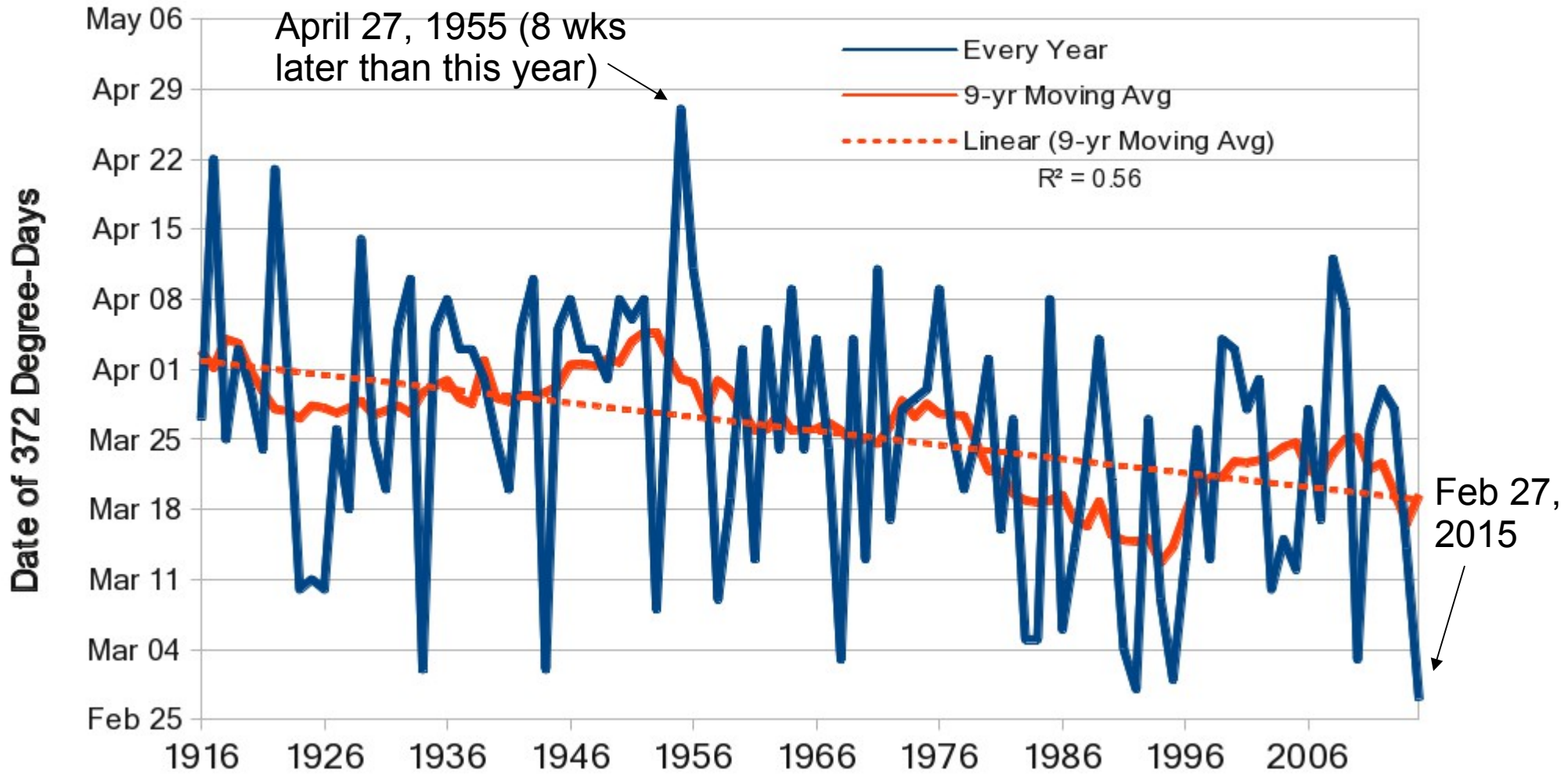
Degree-days Jan 1 - Feb 28 Salem Oregon (KSLE)
1916 - 2015 (100 Years of data)

Feb 28, 2015
at 385 DD!



2015 is pretty much the warmest year since 1916!

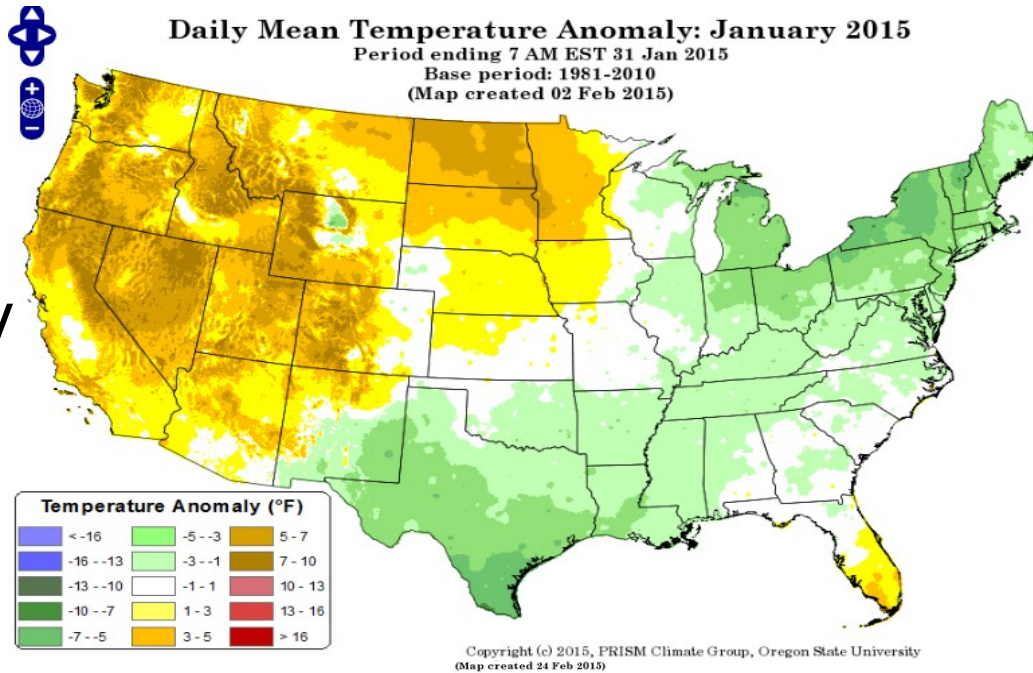
Salem, Oregon 100 years of Temperature Data Jan & Feb
Date at which 372 DD Accumulated (reached on Feb 27, 2015)



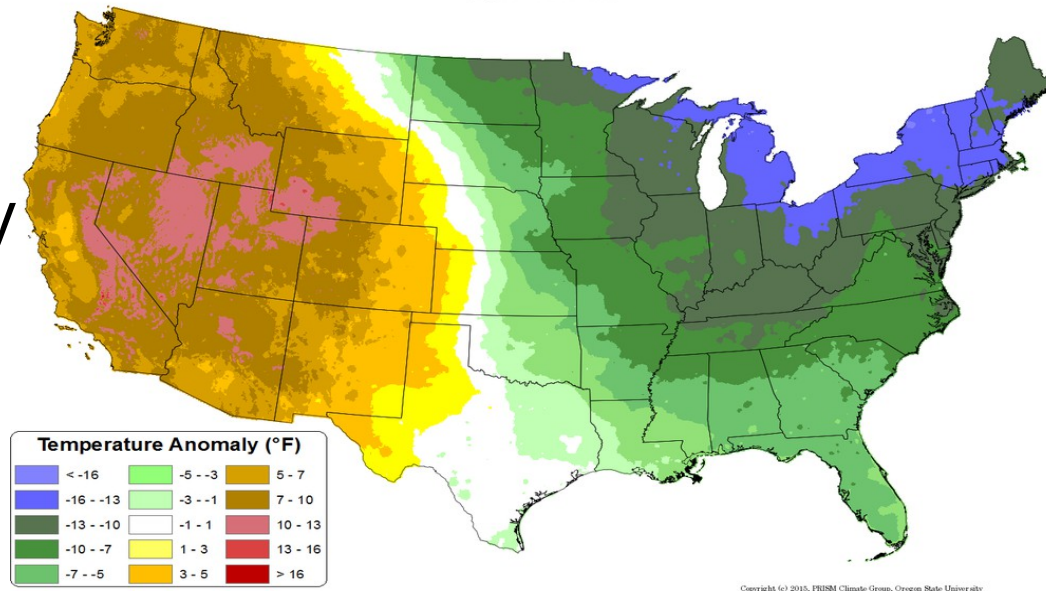
Warm Winter in the West

OSU PRISM Group Climate Data (Feb through the 23rd)

Jan.
temp.
anomaly



Feb.
temp.
anomaly



The most favored explanation for now, though, seems to be the **extremely warm waters across the Pacific ocean**...which can give rise to high pressure systems and hold them in place -
D. Swain,
Stanford Univ.

Many (many) studies linking Sea Surface Temperatures to future climate = one form of “teleconnection” or statistical correlation of climate anomalies at large distances

Geophysical Research Abstracts,
Vol. 11, EGU2009-7434-1, 2009
EGU General Assembly 2009
© Author(s) 2009



Clim Dyn (2011) 37:663–676
DOI 10.1007/s00382-010-0833-z

JOURNAL OF GEOPHYSICAL RESEARCH, VOL. 103, NO. C7, PAGES 1

Predictability of rainfall and teleconnections patterns influencing on Southwest Europe from sea surfaces temperatures

M. N. Lorenzo (1), I. Iglesias (1), J.J. Taboada (2), M. Gómez-Gesteira (1), and A.M. Ramos (1)
(1) Facultad de Ciencias, Física de la Atmósfera y del Océano, Ourense, Spain (isaiglesias@uvigo.es), (2) Meteogalicia. CINAM - Consellería de Medio Ambiente e Desenvolvemento Sostible. Xunta de Galicia. Santiago de Compostela, Spain

Teleconnected influence of North Atlantic sea surface temperature on the El Niño onset

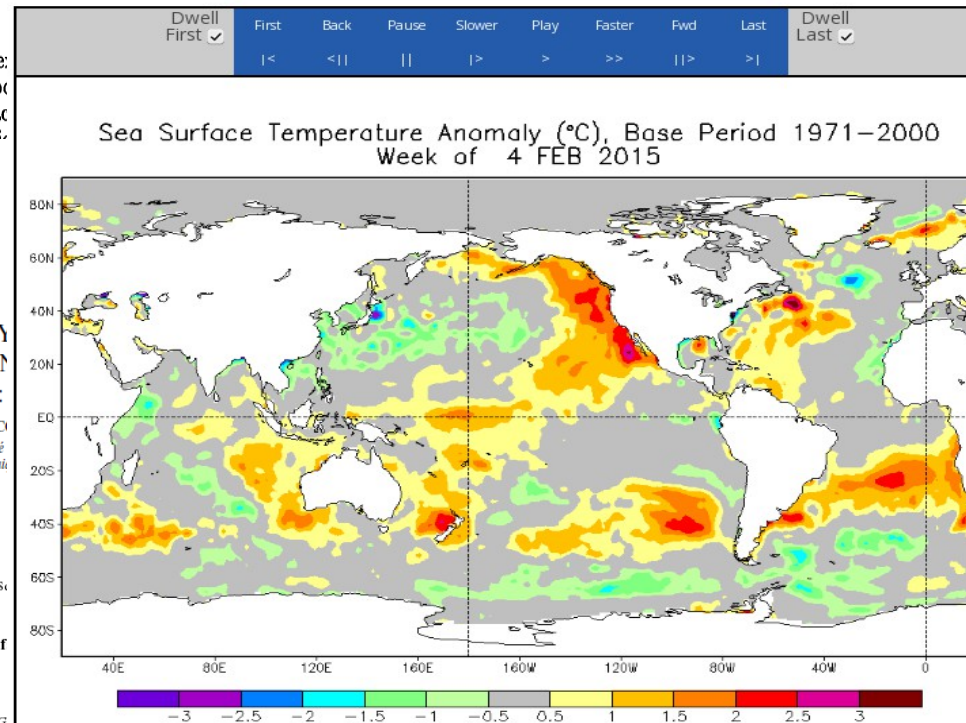
Yanzai Wang · Wen Zhou · Jie Song

Progress during TOGA in understanding and global teleconnections associated with tropical sea surface temperatures

Kevin E. Trenberth,¹ Grant W. Branstator,¹ David Keen,¹ Ngar-Cheung Lau,⁴ and Chester Ropelewski³

February 1 - 18, 2015

Images are in 7-day increments.



Observed Nonlinearities of Monthly Teleconnections between Tropical Pacific Sea Surface Temperature Anomalies and Central and Eastern North American Precipitation

DAVID L. MONTROY, MICHAEL B. RICHMAN, AND PETER J. LAMB

School of Meteorology and Cooperative Institute for Mesoscale Meteorological Studies, University of Oklahoma, Norman, Oklahoma

(Manuscript received 19 July 1996, in final form 23 May 1997)

ABSTRACT

Received: 28 April 2010 / Accepted: 28 April 2010 / Published online: 18 May 2010

...ence of North Atlantic sea surface anomalies on tropical Pacific SST anomalies. Both summer and winter North Atlantic are negatively related to central-eastern SST anomalies in the subsequent months cyclonic circulations over the North Atlantic and near Caspian Sea. The anticyclonic circulation near Lake Baikal enhances the continent northerlies, and strengthens East-Asian winter monsoon. These are also associated with an off-equatorial cyclonic circulation in the western Pa...

Induced Changes in El Niño Teleconnections over the North Pacific and North America

Zhen-Qiang Zhou

Laboratory/Qingdao Collaborative Innovation Center of Marine Science and Technology, Key Laboratory of Marine Atmosphere Interaction and Climate in Universities of Shandong, Ocean University of China, Qingdao, China

Shang-Ping Xie

Laboratory/Qingdao Collaborative Innovation Center of Marine Science and Technology, Key Laboratory of Marine Atmosphere Interaction and Climate in Universities of Shandong, Ocean University of China, Scripps Institution of Oceanography, University of California at San Diego, La Jolla, California

Xiao-Tong Zheng, Qinyu Liu, and Hai Wang

Laboratory/Qingdao Collaborative Innovation Center of Marine Science and Technology, Key Laboratory of Marine Atmosphere Interaction and Climate in Universities of Shandong, Ocean University of China, Qingdao, China

Abstract

El Niño–Southern Oscillation (ENSO) induces climate anomalies around the globe. Atmospheric general circulation model simulations are used to investigate how ENSO-induced teleconnection patterns during boreal winter might change in response to global warming in the Pacific–North American sector. As models disagree on changes in the

INTERNATIONAL JOURNAL OF CLIMATOLOGY
Int. J. Climatol. 21: 973–1005 (2001)
DOI: 10.1002/joc.673

SEASONALITY AND ATMOSPHERIC DYNAMICS OF TELECONNECTION BETWEEN AFRICAN AND TROPICAL SEA-SURFACE TEMPERATURE:

P. CAMBERLIN^{a,*}, S. JANICOT^b and I. POCEAN

^a Centre de Recherches de Climatologie/CNRS UMR 5080, Université de Bourgogne, Dijon, France
^b Laboratoire de Méétéorologie Dynamique du CNRS, Ecole Polytechnique, Paris, France

Received 24 March 2000
Revised 14 March 2001
Accepted 16 March 2001

ABSTRACT

Ruiqiang Ding and Jianping Li, 2012: Influences of ENSO Teleconnection on the Persistence of Sea Surface Temperature in the Western Tropical Indian Ocean. *J. Climate*, 25, 8177–8195.
doi: <http://dx.doi.org/10.1175/JCLI-D-11-00739.1>

Influences of ENSO Teleconnection on the Persistence of Sea Surface Temperature in the Western Tropical Indian Ocean

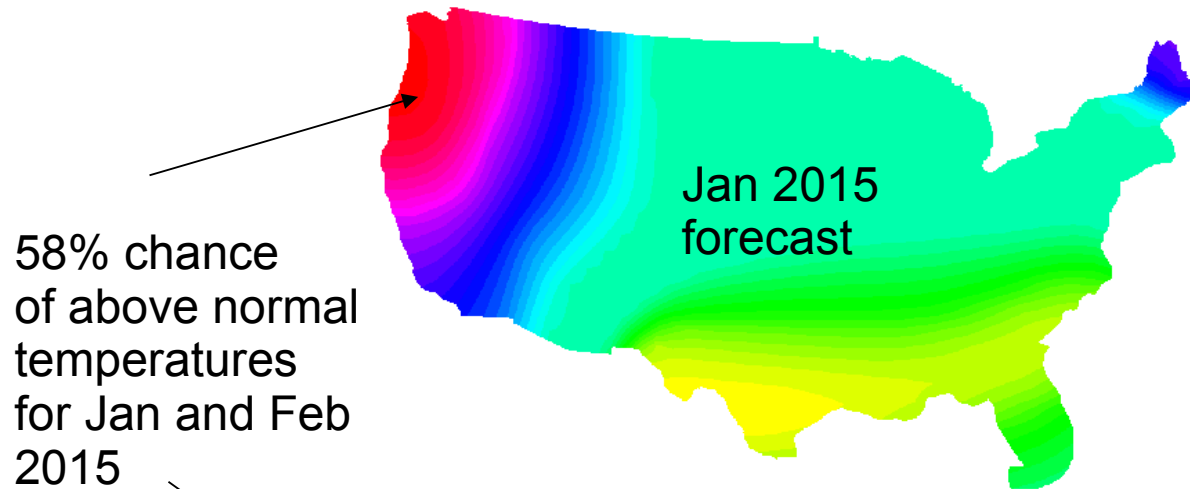
Ruiqiang Ding and Jianping Li

State Key Laboratory of Numerical Modeling for Atmospheric Sciences and Geophysical Dynamics, Institute of Atmospheric Physics, Chinese Academy of Sciences

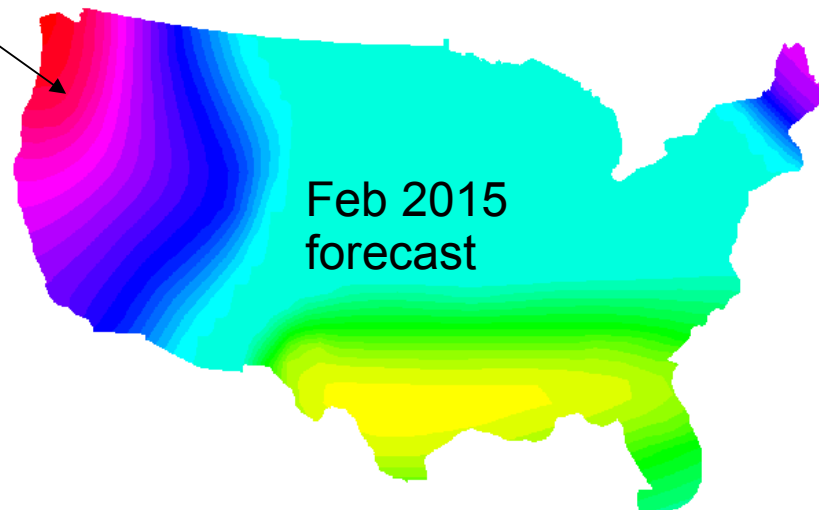
Abstract

This study confirms a weak spring persistence barrier (SPB) of sea surface temperature in the western tropical Indian Ocean (WIO), a strong fall persistence barrier (FPB) in the strongest winter persistence barrier (WPB) in the southeastern tropical Indian Ocean. A less abrupt sign reversal of SSTAs occurs in the WIO during spring, an abrupt reversal

Was Our Warmer-Than Normal Trend Forecasted well in Advance?



58% chance of above normal temperatures for Jan and Feb 2015



NOAA forecast on

Nov. 21, 2014

Blended from:

- Sea Surface Indices & Models
- Numerical Models
- Statistical Models

We are saying that these forecasts are “increasingly skillful”

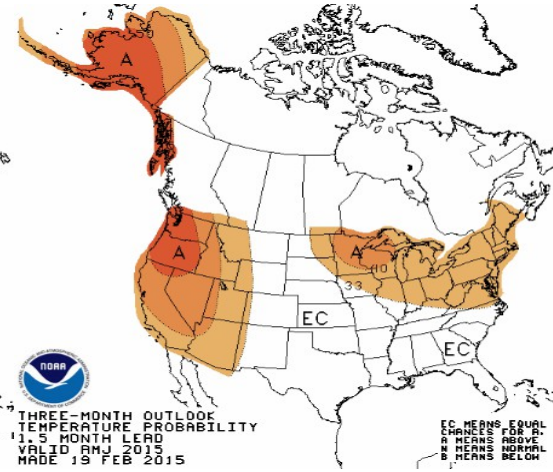
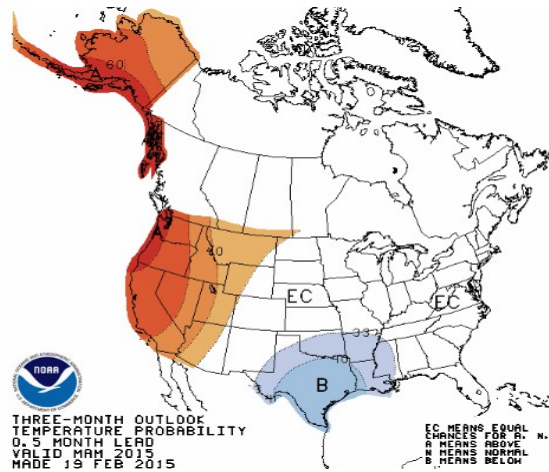
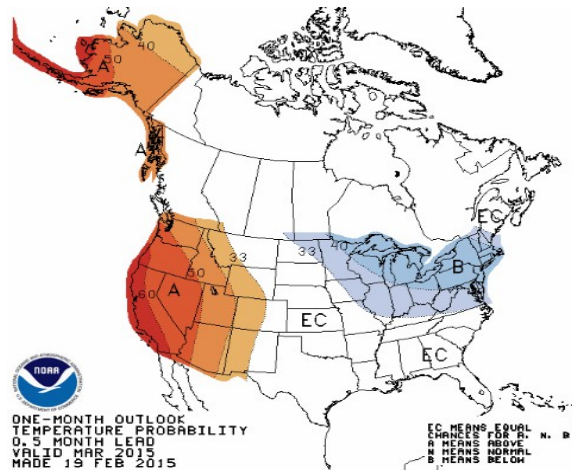
If we think of these as “climate forecasts” rather than “weather forecasts” they can be very useful, not only to plan for effects (such as early bloom or early pest attacks and so on), but to gauge the short term effects of climate change.

March 2015

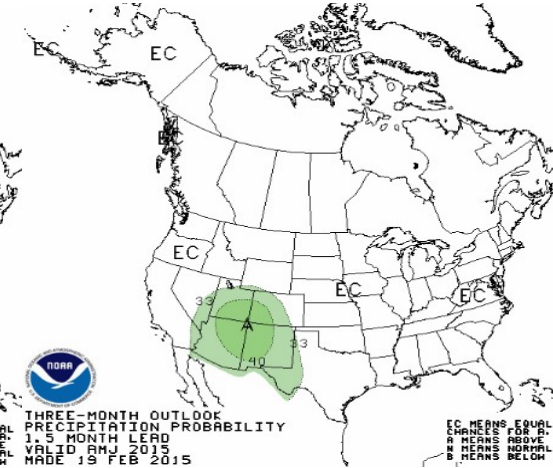
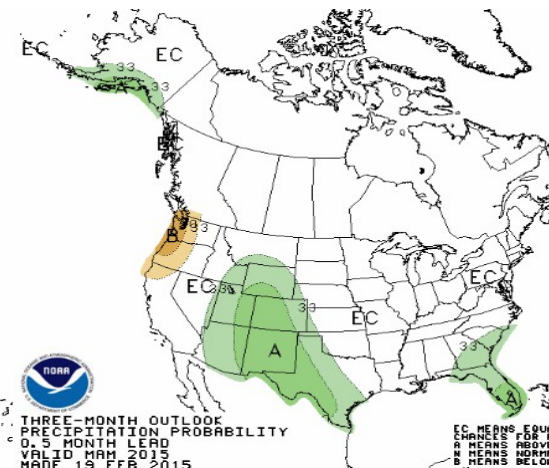
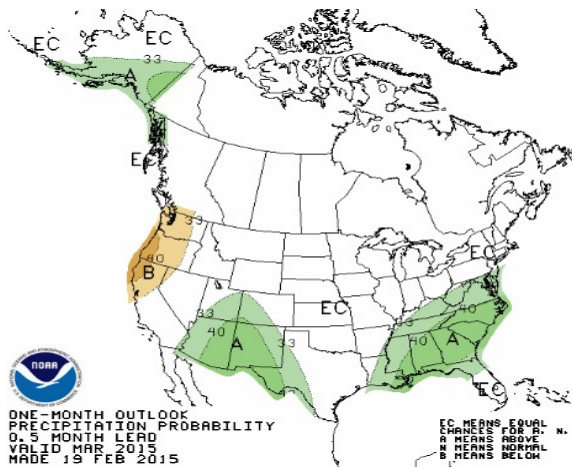
April 2015

May 2015

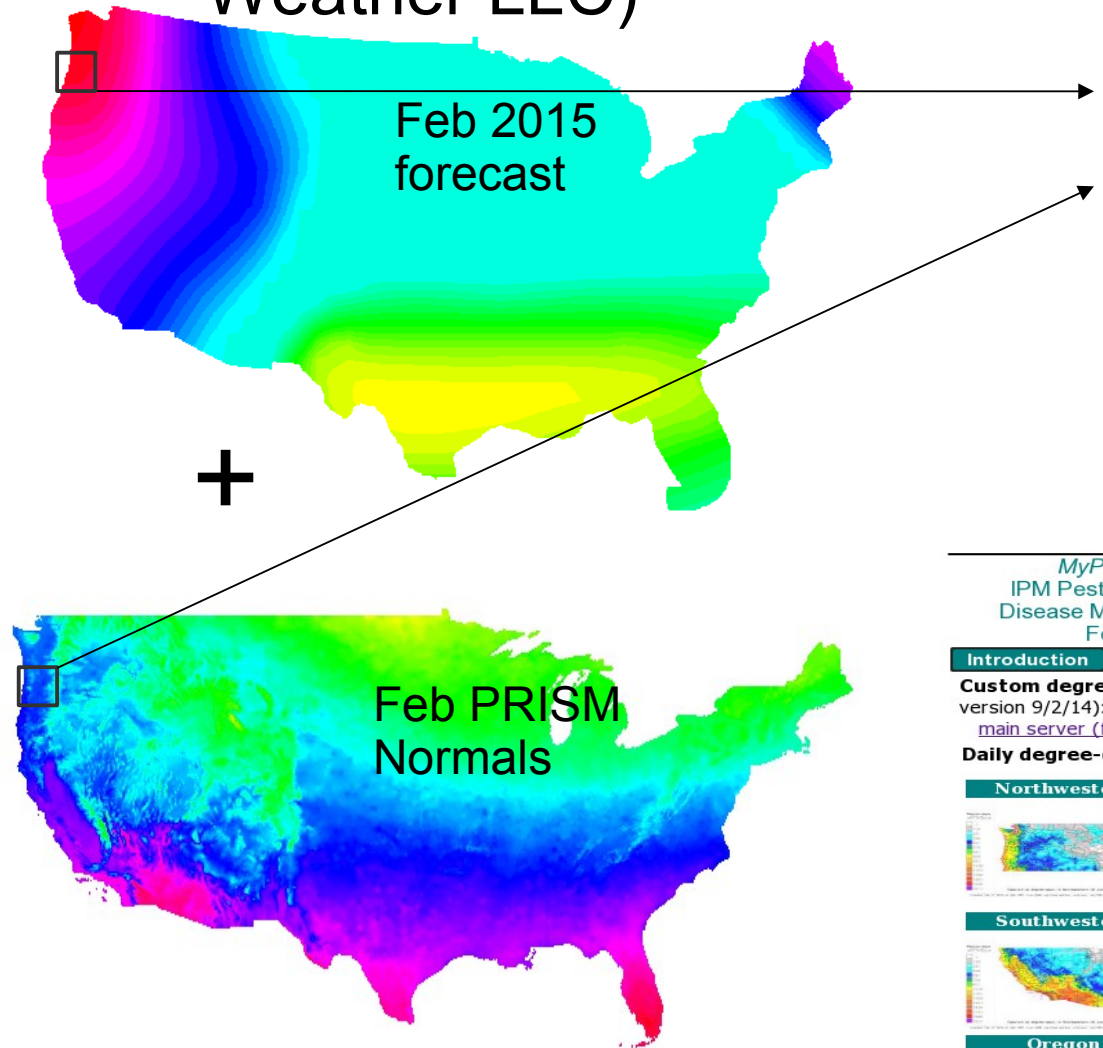
Temps



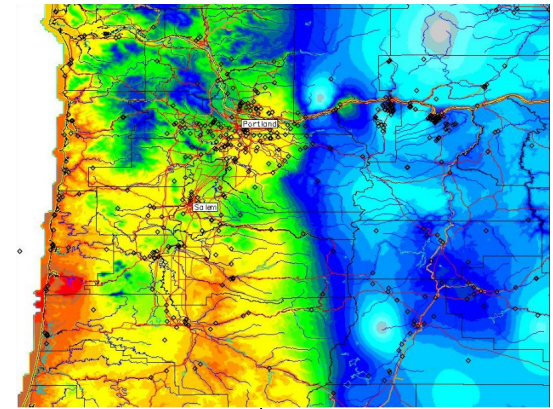
Precip



New USDA NIFA ARDP grant project to “harvest” these forecasts for use in crop and pest decision support (OSU IPPC, WSU, Fox Weather LLC)



Localized forecast



For pest & crop models at uspest.org

MyPest Page - IPM Pest and Plant Disease Models and Forecasting

USPEST.ORG for Agricultural, Pest Management, and Plant Biosecurity Decision Support in the US

Introduction Quick Start Map Index Shortcut Links Degree-day Maps

Custom degree-day mapmaker for 48 US states - use your own settings (new version 9/2/14):
[main server \(fastest\)](#), [new server \(about as fast\)](#)

Daily degree-day accumulation maps - click on a region for more maps:

Northwestern	North Central	Great Lakes Central	Northeastern
Southwestern	South Central	Southeastern	48 State USA
Oregon	Washington	Idaho	Montana

Use these maps to track heat unit build-up using the temperature thresholds 32°, 41°, and 50° F, and for GIS interface to calculate degree-days at specific locations.

Take-home Messages

- The recent warm temperatures are part of a general warming trend
- Crops have been blooming earlier over time (about 1 week per 4 decades on average)
- We can now begin to forecast short term trends (perhaps out 60-90 days)
- Growers can adapt and better prepared

```
2 24 61.00 28.00 0.00 7.12 351.4
2 25 52.00 36.00 0.00 4.23 355.6
2 26 53.10 46.90 0.05 9.00 364.6
```

DD accumulation on 2-26-15: **365**. QA 92%

This year is about	versus	QA
15 days ahead	2014	ok
30 days ahead	2013	ok
30 days ahead	30-yr normal	ok

Forecast using: [MWS NDFD 7-day Forecast](#) data

```
2 27 51.00 46.90 0.00 7.95 372.6 Cloudy_93%_precip
2 28 51.00 37.00 0.00 3.94 376.5 Partly_Cloudy_14%_
3 1 53.00 30.00 0.00 3.91 380.4 Partly_Cloudy Cui
```

