



**Earth System Research Laboratory**  
Physical Sciences Division



**CO WATF, 14 April 2011**  
**Denver**

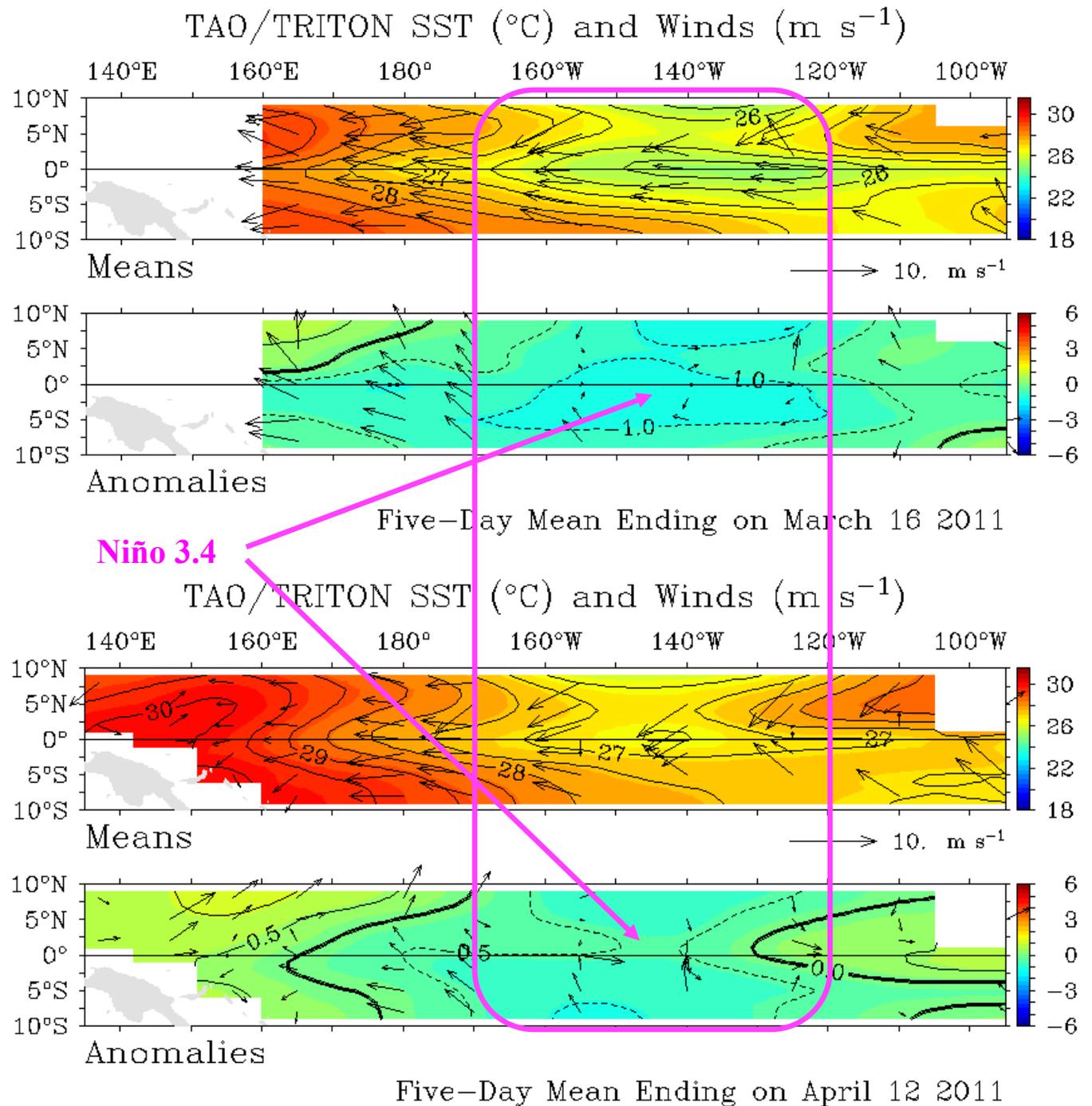
# **Seasonal Outlook into Summer 2011**

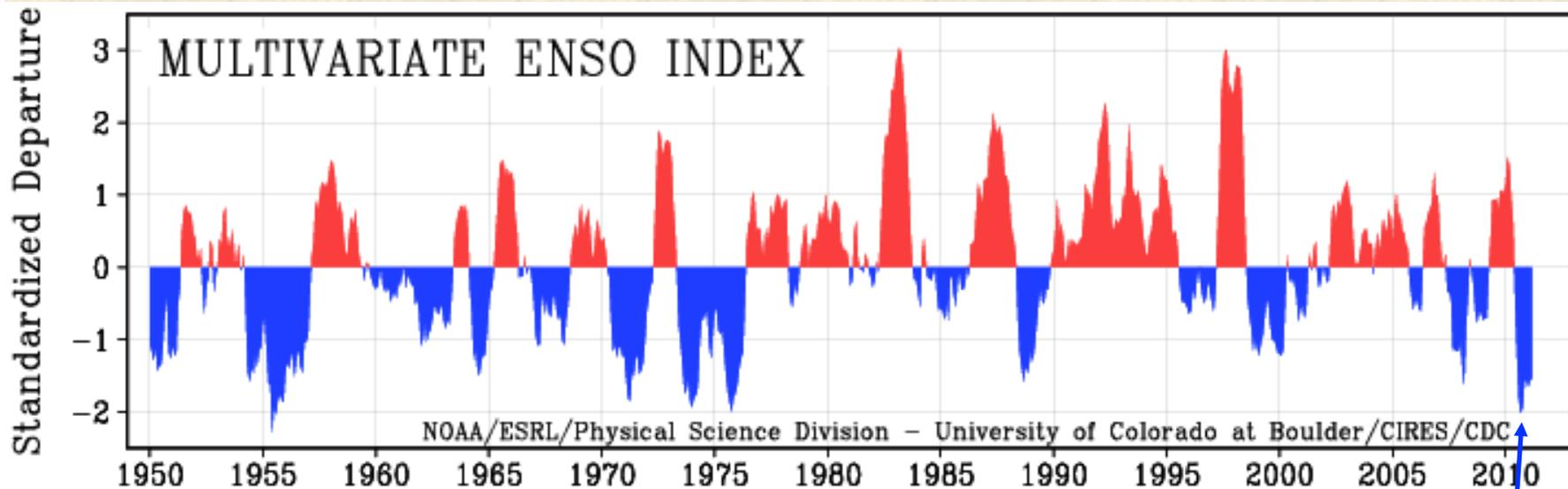
Klaus Wolter

University of Colorado, CIRES & NOAA-ESRL PSD 1, Climate Analysis Branch  
klaus.wolter@noaa.gov

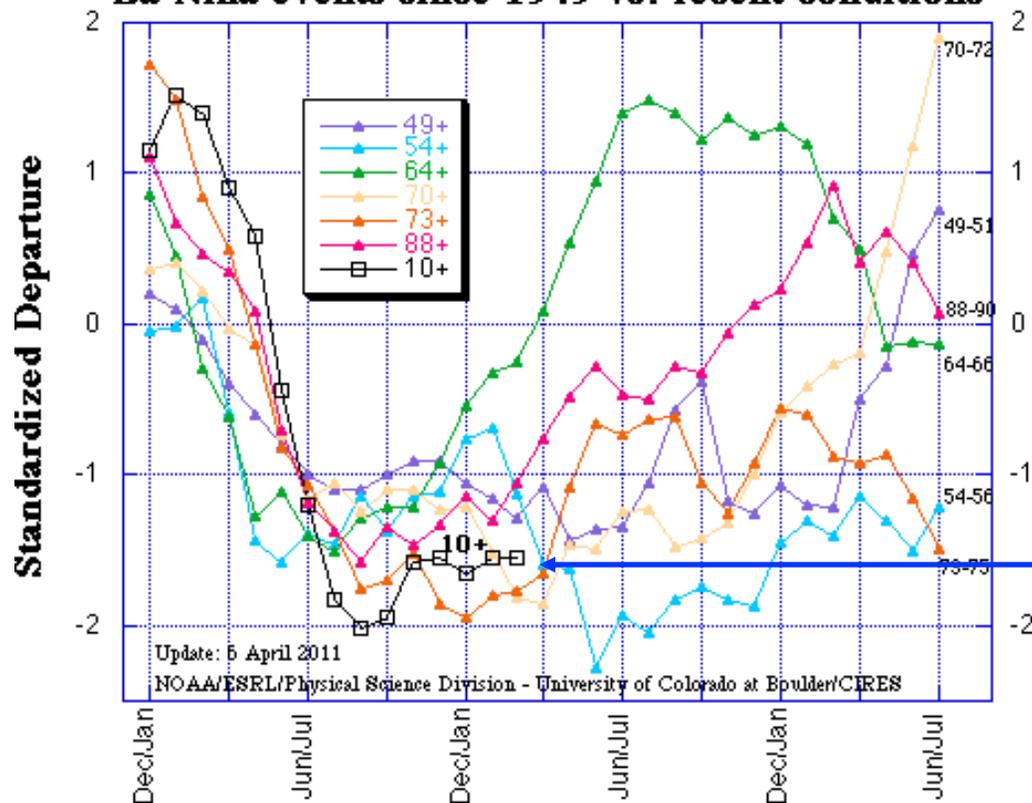
- **La Niña heading for a summer vacation?**
- **What does that mean for us?**
- **Expectations for next two weeks**
- **CPC forecasts for April through September 2011**
- **Experimental Seasonal Forecast Guidance (ditto)**
- **Executive Summary**

**Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to last month (top): La Niña has finally weakened, even if you take normalized data into account. This includes near-normal trade winds east of the dateline, and encroaching positive anomalies in eastern tropical Pacific.**



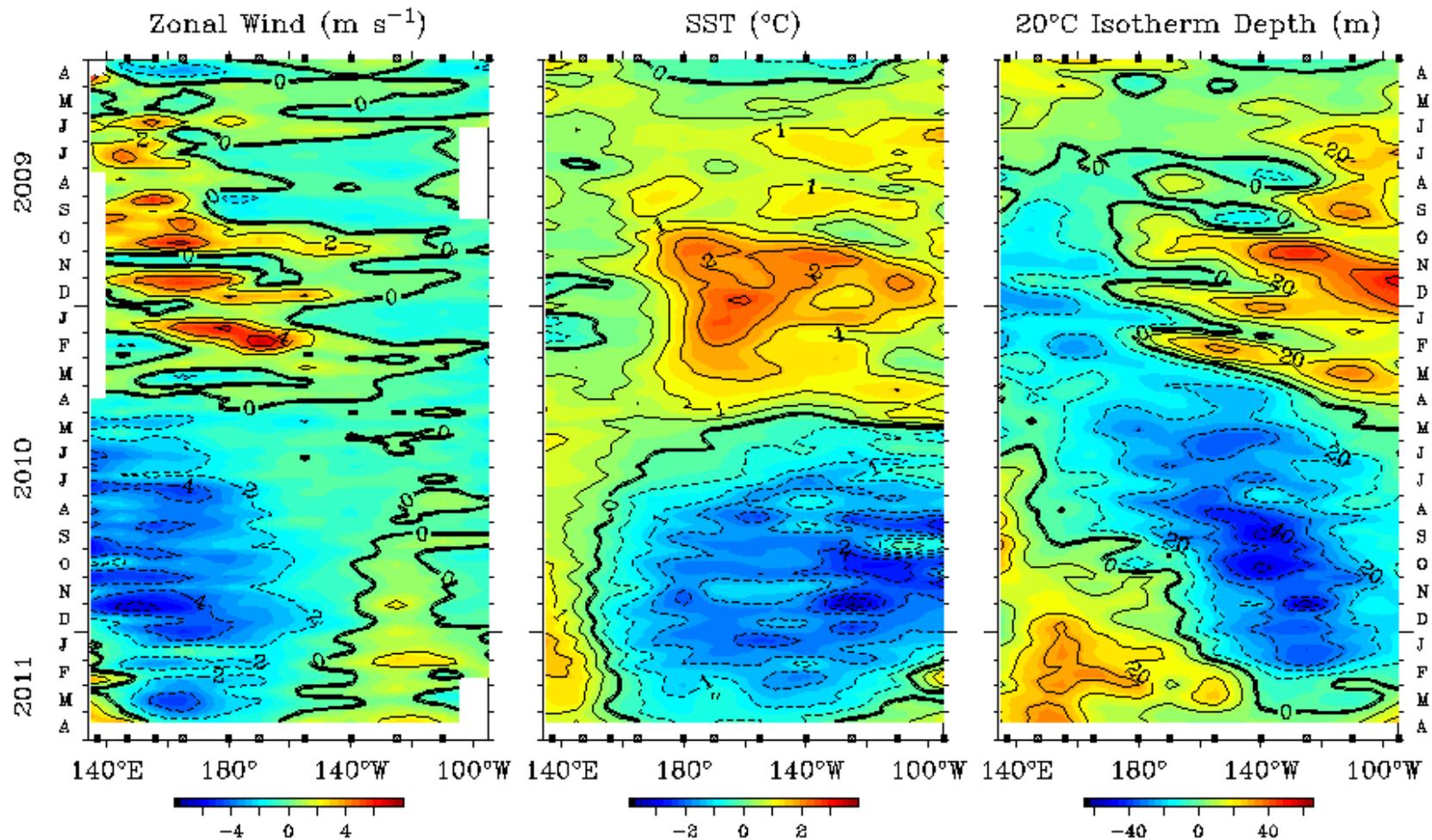


**Multivariate ENSO Index (MEI) for six strong La Niña events since 1949 vs. recent conditions**



**Remarkable drop in 2010 from mid-sized El Niño to biggest La Niña event in 35 years in just half a year; continued at high levels through last month, more due to the atmosphere than the ocean.**

Five Day Zonal Wind, SST, and 20°C Isotherm Depth Anomalies 2°S to 2°N Average



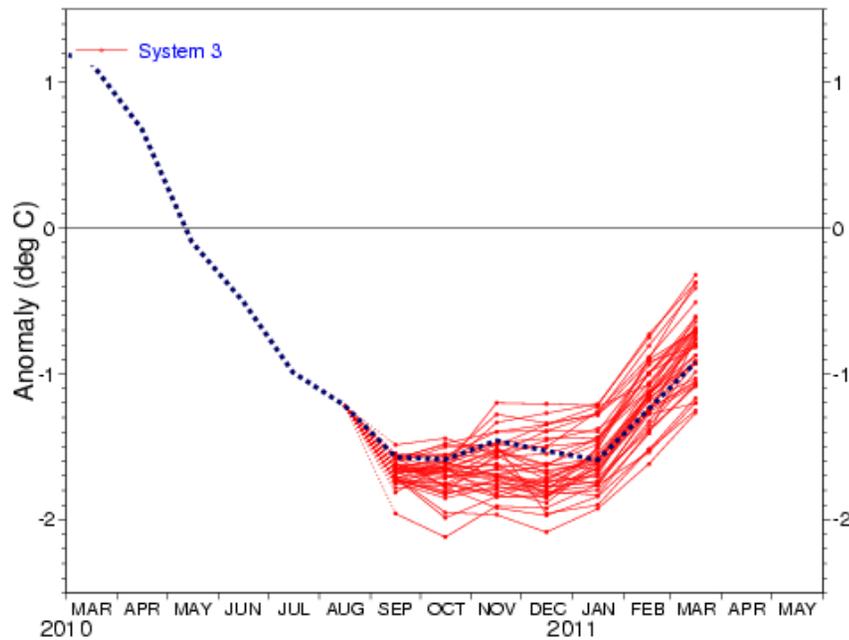
TAO Project Office/PMEL/NOAA

Apr 13 2011

**Zonal cross-section for east-west wind (left), SST (middle), and upper ocean heat content (right) shows the evolution of the 2009-10 El Niño and 2010-11(so far) La Niña.**

NINO3.4 SST anomaly plume  
ECMWF forecast from 1 Sep 2010

Monthly mean anomalies relative to NCEP adjusted Olv2 1971-2000 climatology



Forecast issue date: 15 Sep 2010

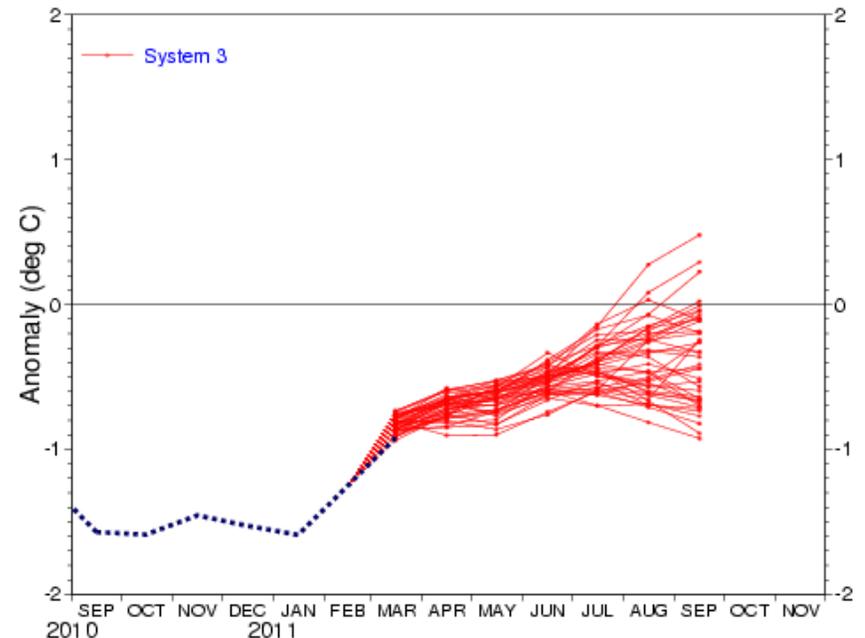
ECMWF

**The European model's September 2010 forecast (left) did a good job in anticipating the evolution of this La Niña event, although simple normalized persistence would have been just about as good...**

**The European March 2011 forecast (right) kept all but 3 of its 50 ensemble members ('spaghetti plot') below 0C; as I said before, once La Niña gets as big as this one, odds are higher than 50% that it ends up being a two-year event, even if it weakens (or disappears) during the summer.**

NINO3.4 SST anomaly plume  
ECMWF forecast from 1 Mar 2011

Monthly mean anomalies relative to NCEP adjusted Olv2 1971-2000 climatology

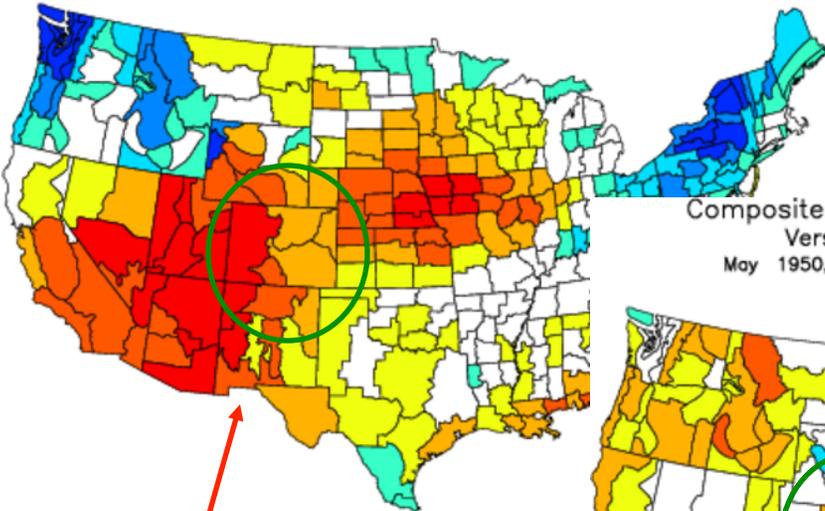


Forecast issue date: 15 Mar 2011

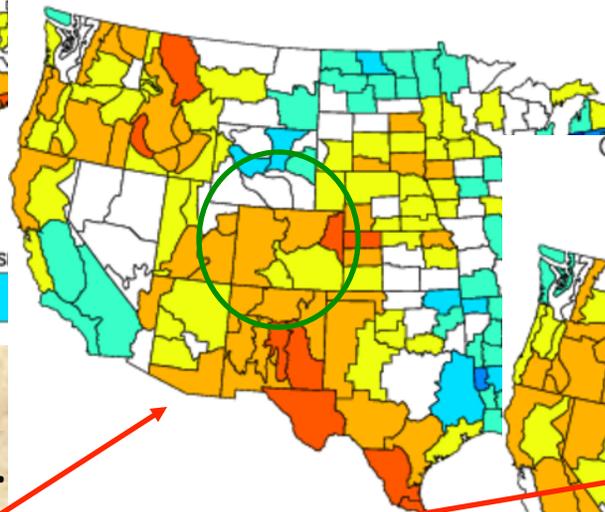
ECMWF

# La Niña springs

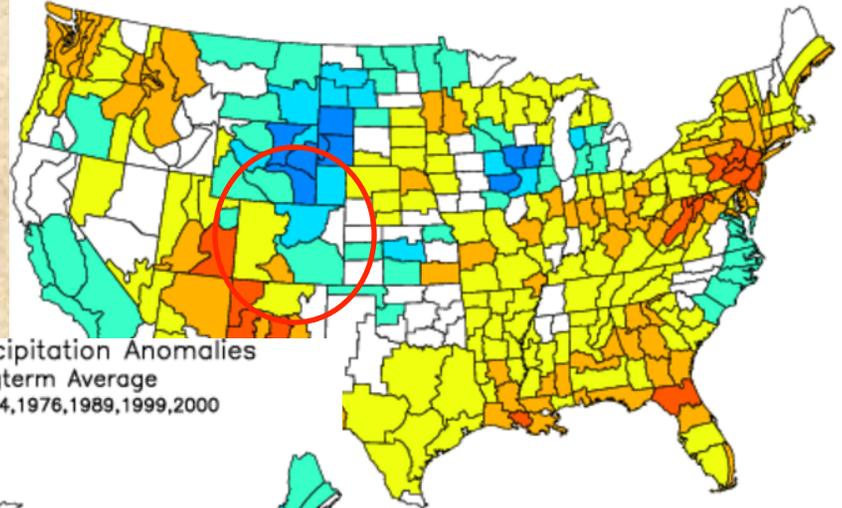
Composite Standardized Precipitation Anomalies  
Versus 1950–1995 Longterm Average  
Mar 1950,1955,1956,1967,1971,1974,1976,1989,1999,2000  
2008



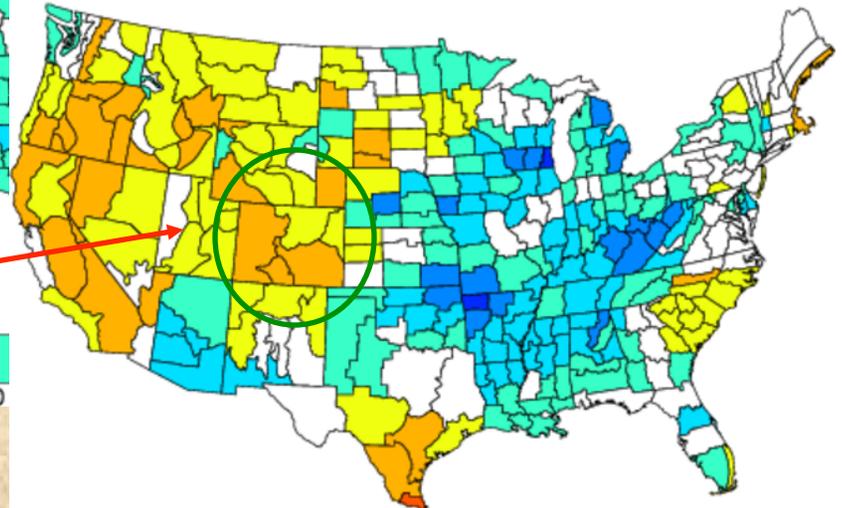
Composite Standardized Precipitation Anomalies  
Versus 1950–1995 Longterm Average  
May 1950,1955,1956,1967,1971,1974,1976,1989,1999,2000  
2008



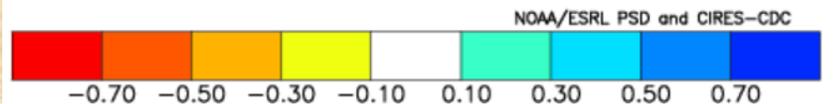
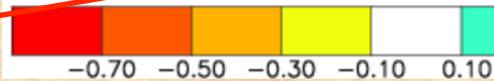
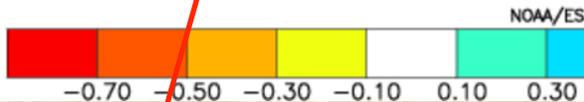
Composite Standardized Precipitation Anomalies  
Versus 1950–1995 Longterm Average  
Apr 1950,1955,1956,1967,1971,1974,1976,1989,1999,2000  
2008



Composite Standardized Precipitation Anomalies  
Versus 1950–1995 Longterm Average  
Jun 1950,1955,1956,1967,1971,1974,1976,1989,1999,2000  
2008



Individual spring months show typically dry behavior in March (top left), May (middle), and June (bottom right) in the wake of a La Niña winter, while April (top right) is another story, most recently in 1999.

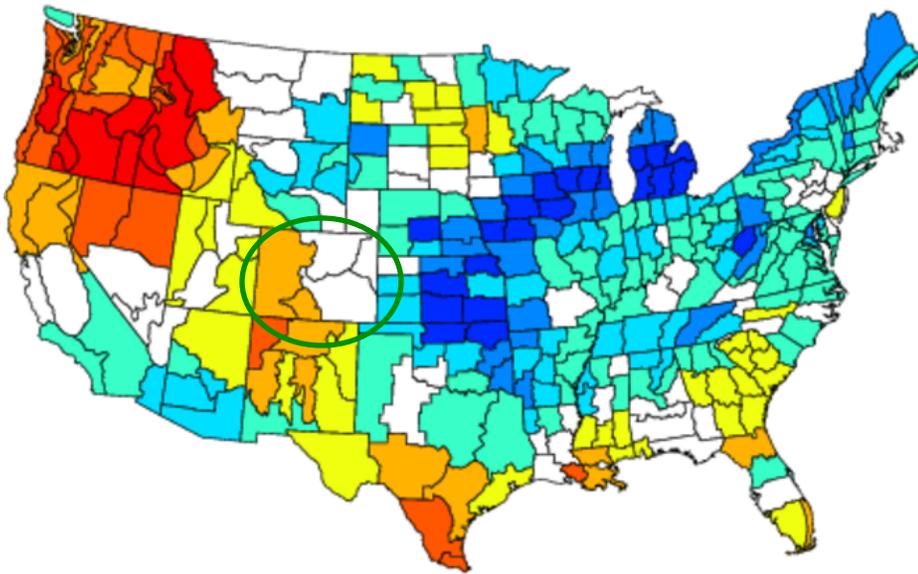


NOAA/ESRL PSD and CIRES-CDC

NOAA/ESRL PSD and CIRES-CDC

# Weakening La Niña spring into summer with PDO-

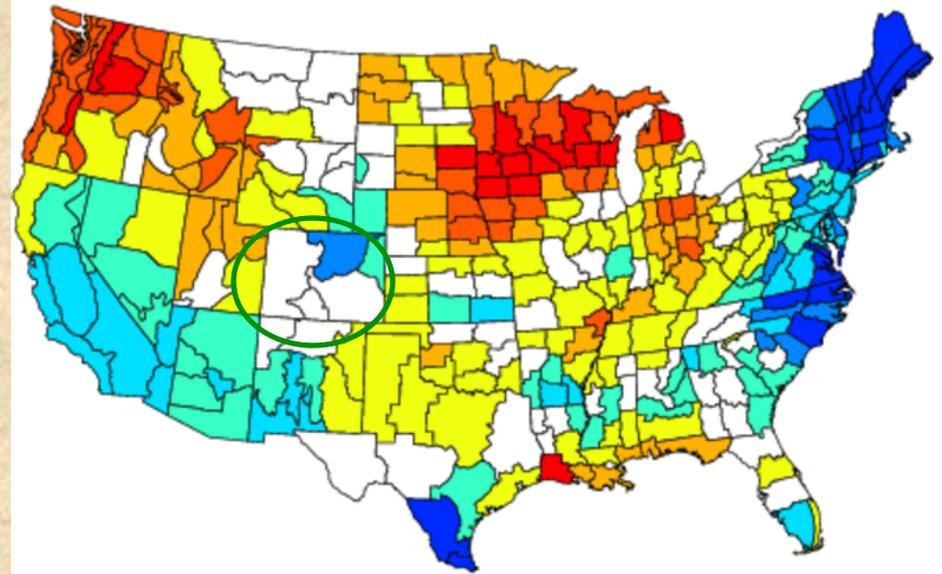
Composite Standardized Precipitation Anomalies  
Apr to Jun 1951,1967,1974,1976,1989,1999,2000,2008  
Versus 1950–1995 Longterm Average



NOAA/ESRL PSD and CIRES-CDC

-0.70 -0.50 -0.30 -0.10 0.10 0.30 0.50 0.70

Composite Standardized Precipitation Anomalies  
Jul to Sep 1951,1967,1974,1976,1989,1999,2000,2008  
Versus 1950–1995 Longterm Average

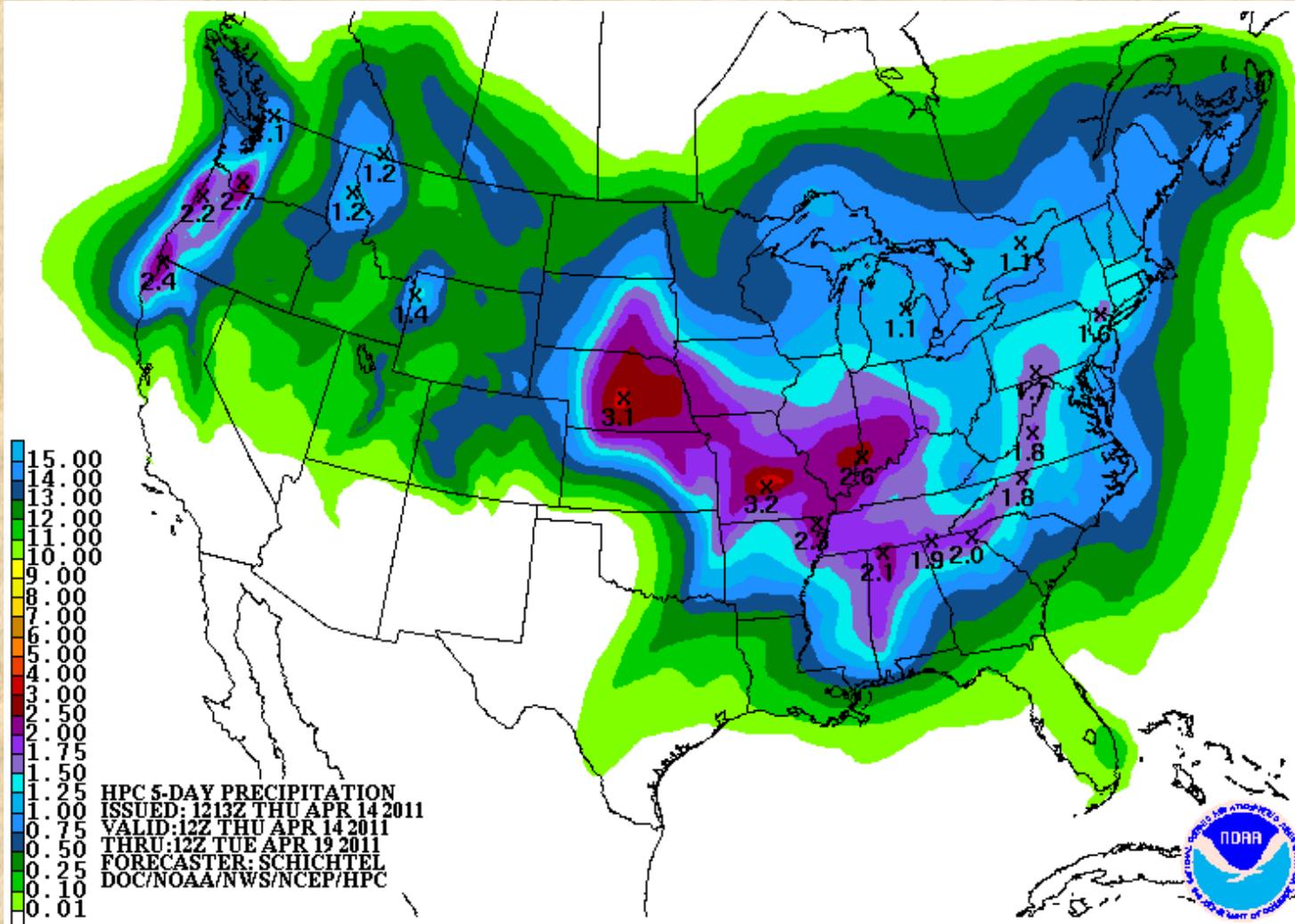


NOAA/ESRL PSD and CIRES-CDC

-0.70 -0.50 -0.30 -0.10 0.10 0.30 0.50 0.70

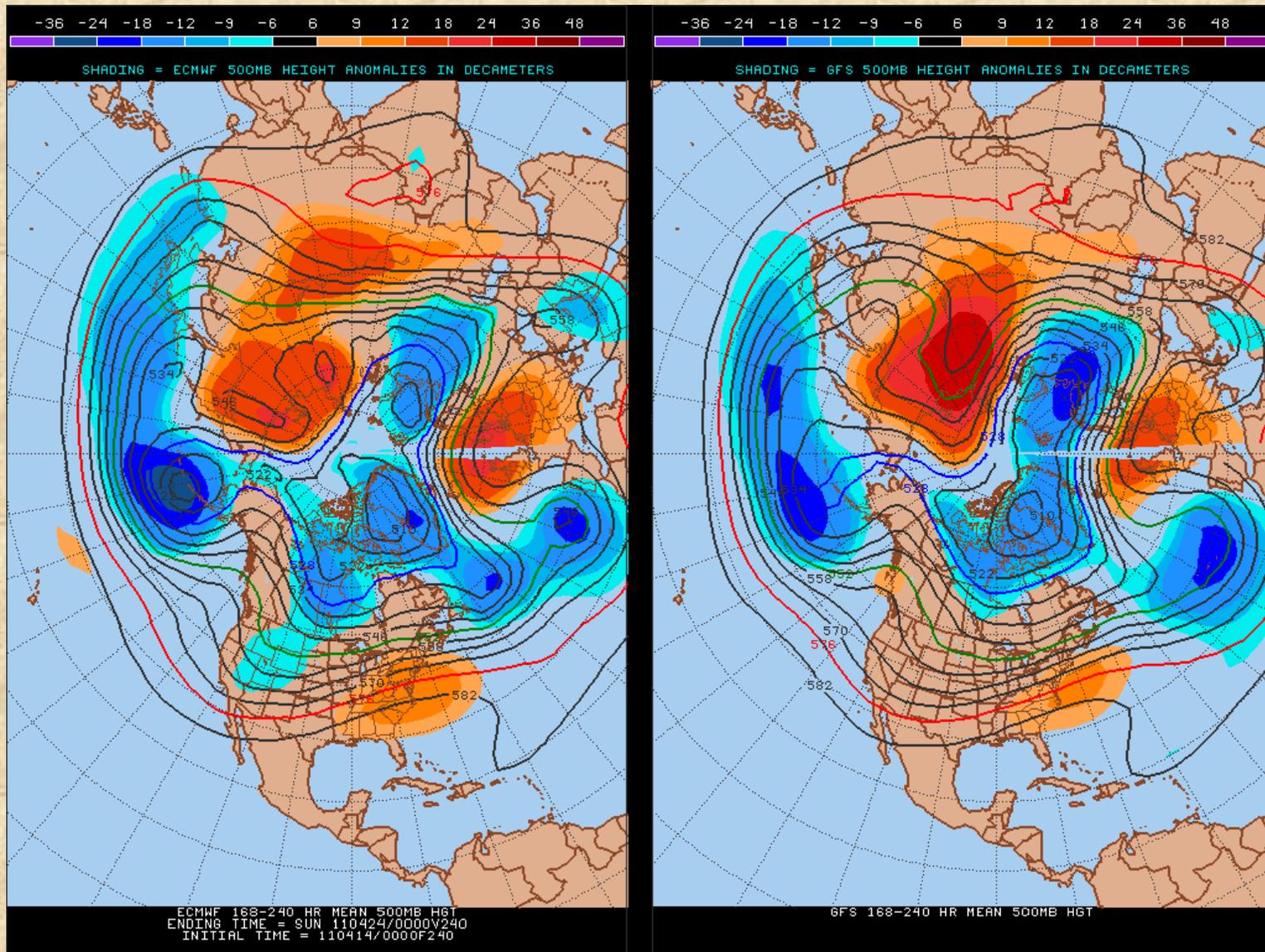
**A modified look at this spring (left) and summer (right) by requiring La Niña conditions to weaken into the summer, while also starting out with negative PDO conditions. This has left western Colorado tending towards dry conditions in the spring and undecided in the summer, while slightly favoring eastern Colorado, especially the South Platte basin.**

# What can we expect in the next five days?



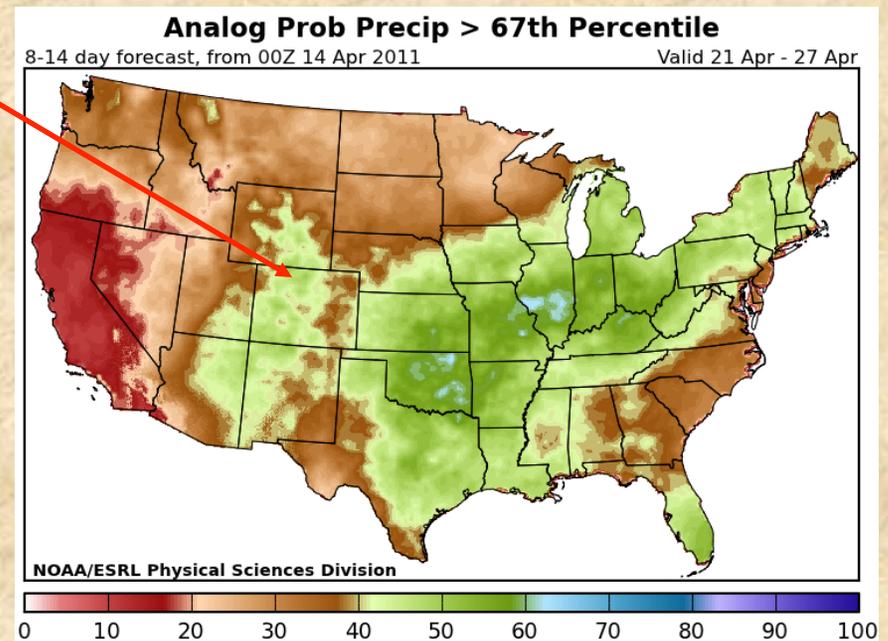
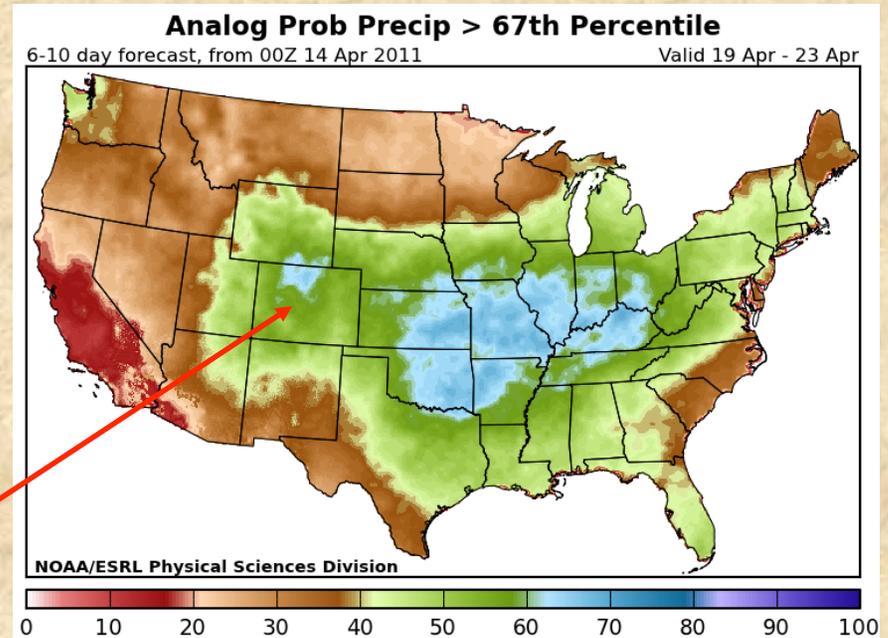
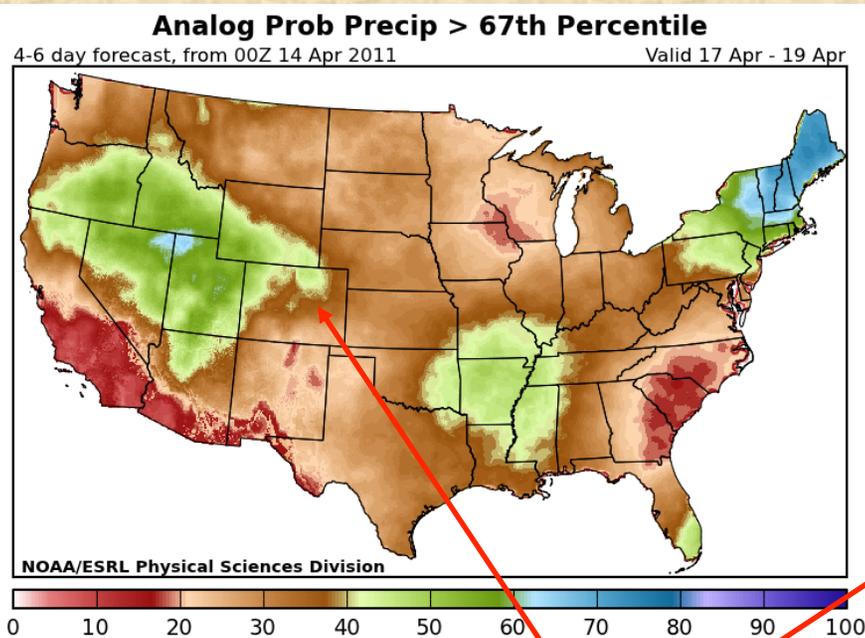
Expected total precipitation, according to Hydrological Prediction Center (NOAA-HPC) – wetter for the eastern plains than in much of this winter, some of it leftover from today’s storm, but most from early next week.

# What can we expect next week?



*European & U.S. models show Western U.S. trough in average circulation forecast for 8-10 days out from last night – good news for keeping temperatures from rising too fast!*

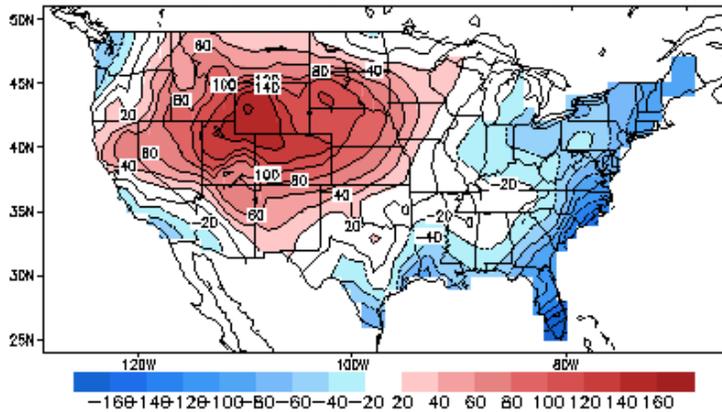
# What can we expect in the next two weeks?



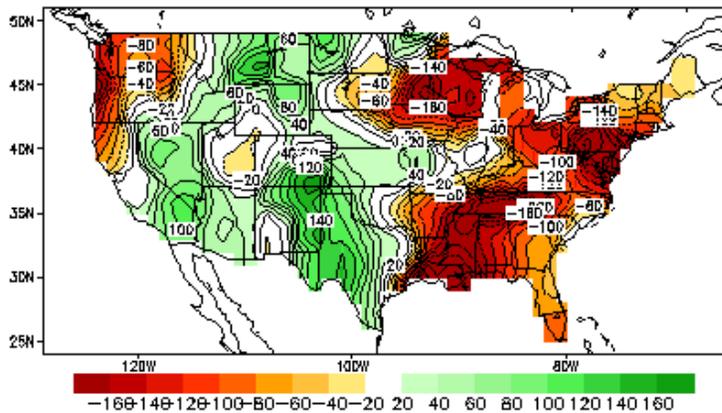
**Precipitation chances for 4-6, 6-10, and 8-14 days from today show with an incoming storm by early next week (top); right under it for next week (top right), and still wetter than 'normal' by "Week 2" (right), finally! Temperatures are expected to oscillate between normal and cooler than normal levels, maintaining or even increasing our high elevation snowpack (more so in northern mountains than in south).**

# Climate Prediction Center 'Analog' Forecasts

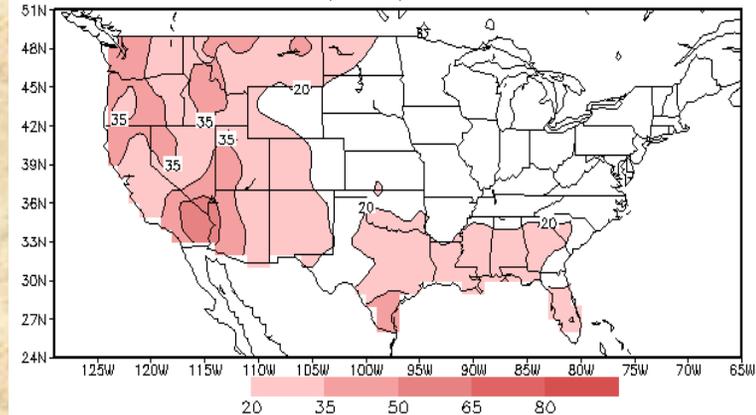
Lagged Averaged Temperature Outlook for MAY 2011  
units: anomaly (sdX100), SM data ending at 20110412



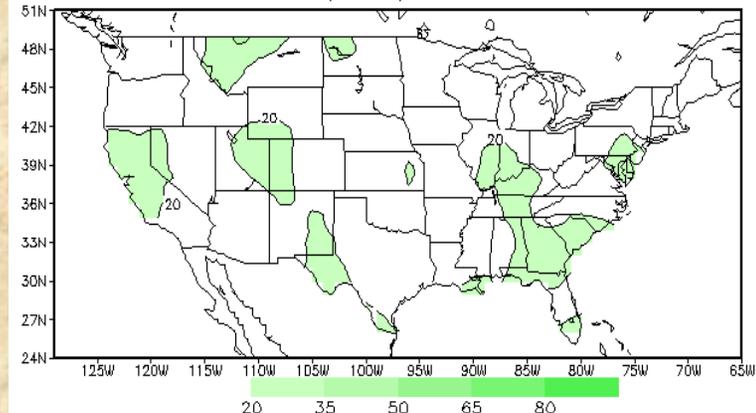
Lagged Averaged Precipitation Outlook for MAY 2011  
units: anomaly (sdX100), SM data ending at 20110412



lead 1 skill of temperature CAS forecast for May  
units: correlation (X100) based on 1981-2005



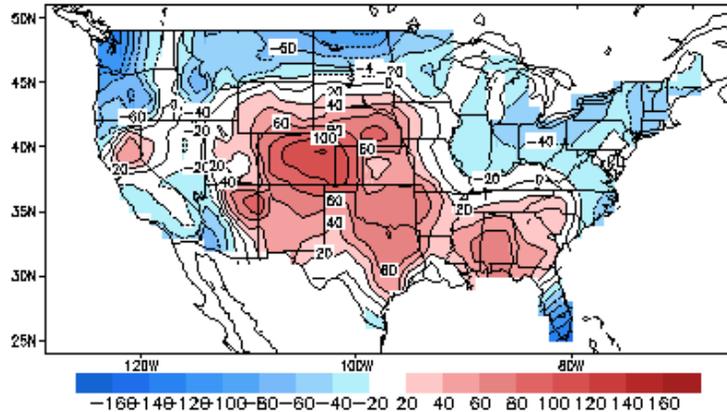
lead 1 skill of precipitation CAS forecast for May  
units: correlation (X100) based on 1981-2005



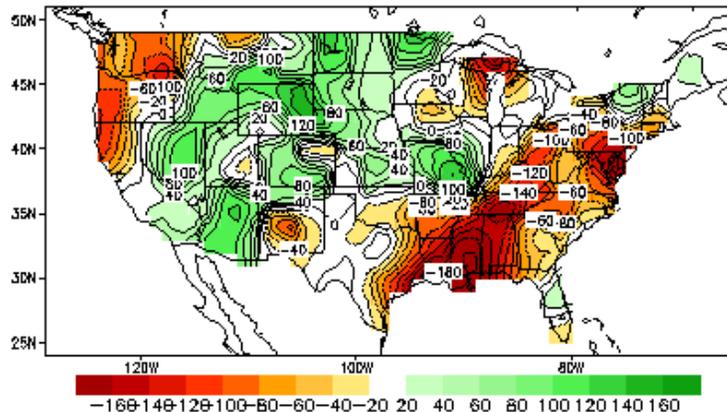
**According to yesterday's soil-moisture analog forecast, much of Colorado can expect a warm and near-normal to moist May 2011 (left), reaching potentially significant wetness in SE Colorado. Unfortunately, typical skill at this lead-time (right) is decent for precipitation exactly where the actual forecast is dry. Source: <http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml>**

# Climate Prediction Center 'Analog' Forecasts

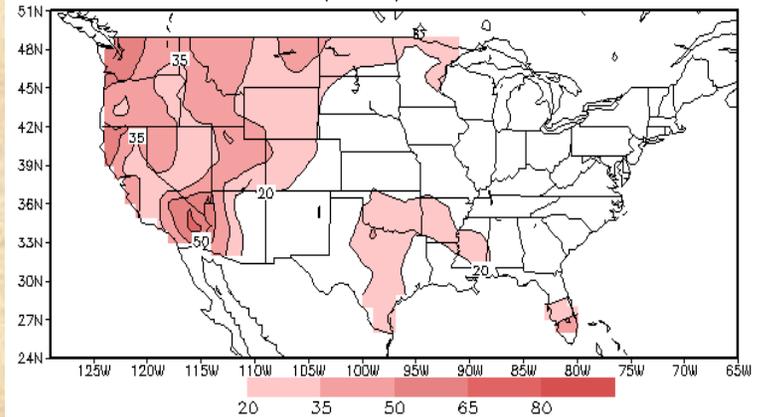
Lagged Averaged Temperature Outlook for MJJ 2011  
units: anomaly (sdX100), SM data ending at 20110412



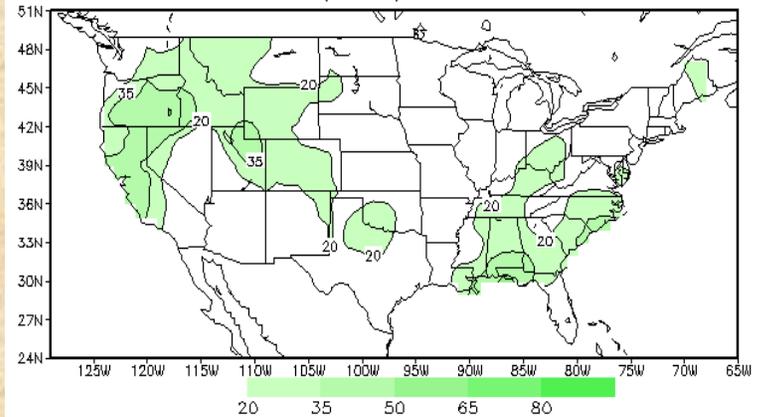
Lagged Averaged Precipitation Outlook for MJJ 2011  
units: anomaly (sdX100), SM data ending at 20110412



lead 1 skill of temperature CAS forecast for MJJ  
units: correlation (X100) based on 1981-2005



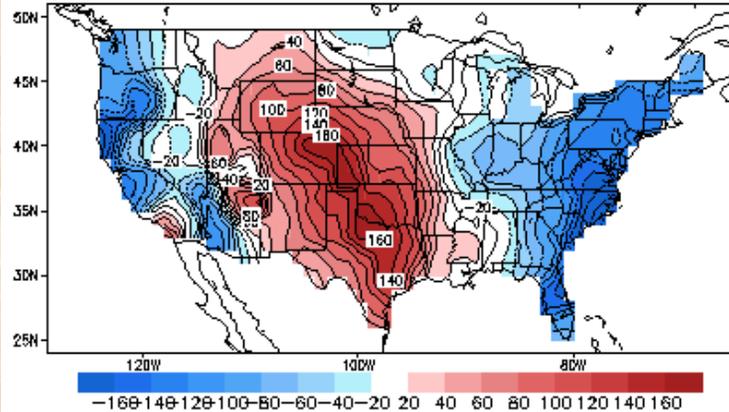
lead 1 skill of precipitation CAS forecast for MJJ  
units: correlation (X100) based on 1981-2005



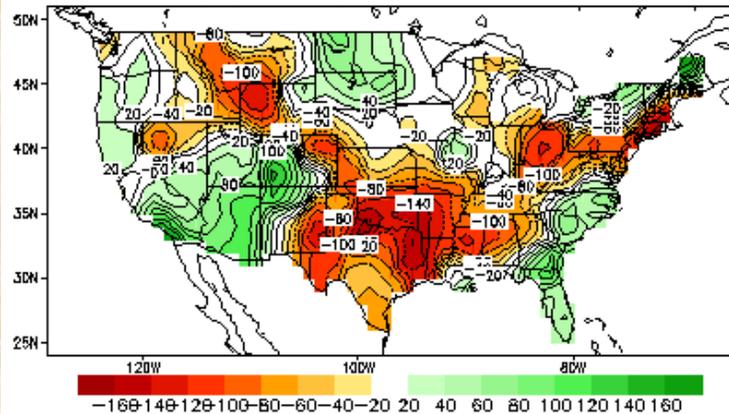
**According to yesterday's soil-moisture analog forecast, all but northeastern Colorado can expect near-normal moisture in May-July 2011 (left), along with above-normal temperatures. Typical skill at this lead-time (right) is moderate for our state at this time of year.**  
Source: <http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml>

# Climate Prediction Center 'Analog' Forecasts

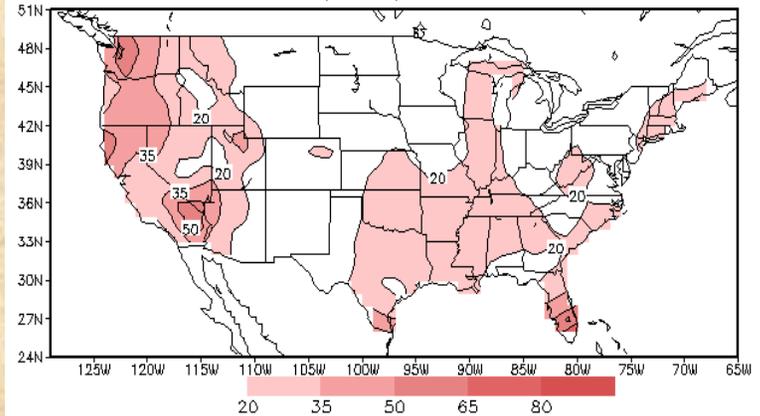
Lagged Averaged Temperature Outlook for JAS 2011  
units: anomaly (sdX100), SM data ending at 20110412



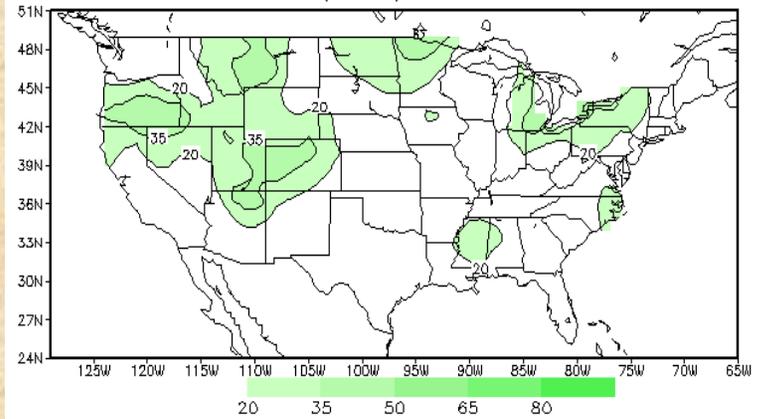
Lagged Averaged Precipitation Outlook for JAS 2011  
units: anomaly (sdX100), SM data ending at 20110412



lead 3 skill of temperature CAS forecast for JAS  
units: correlation (X100) based on 1981-2005

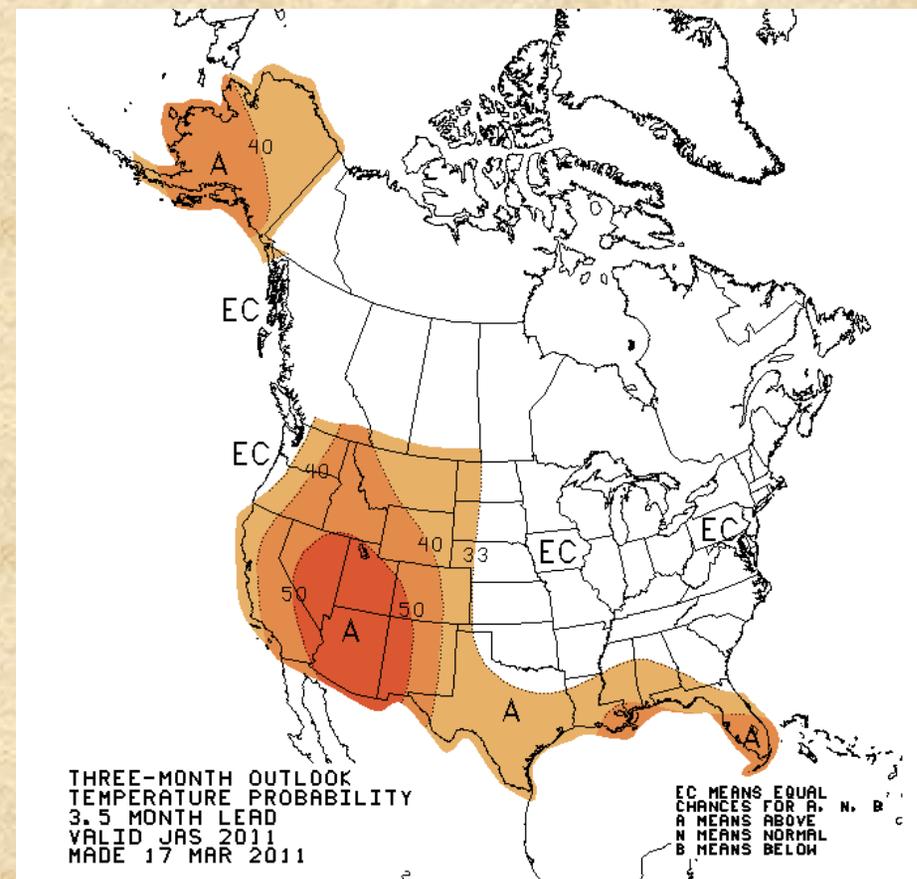
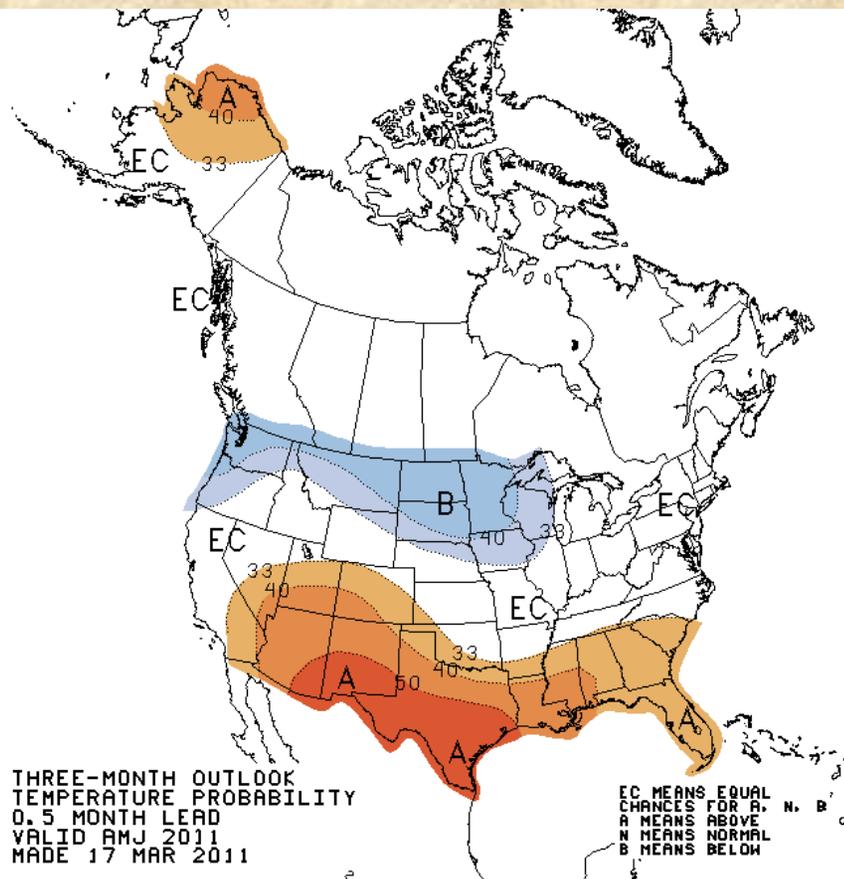


lead 3 skill of precipitation CAS forecast for JAS  
units: correlation (X100) based on 1981-2005



According to yesterday's soil-moisture analog forecast, SW Colorado looks to be favored moisture-wise over NE Colorado in July-September '11 (left), along with above-normal temperatures, especially over eastern plains. Skill level at this lead-time (right) is surprisingly good for precipitation. Source: <http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml>

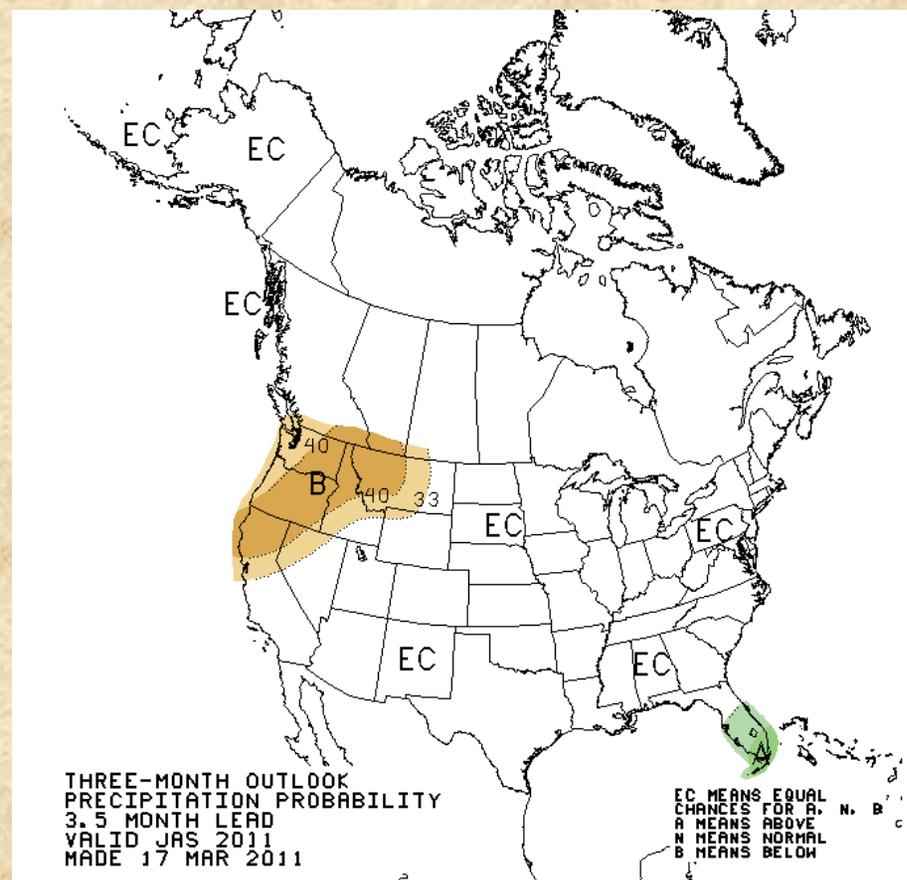
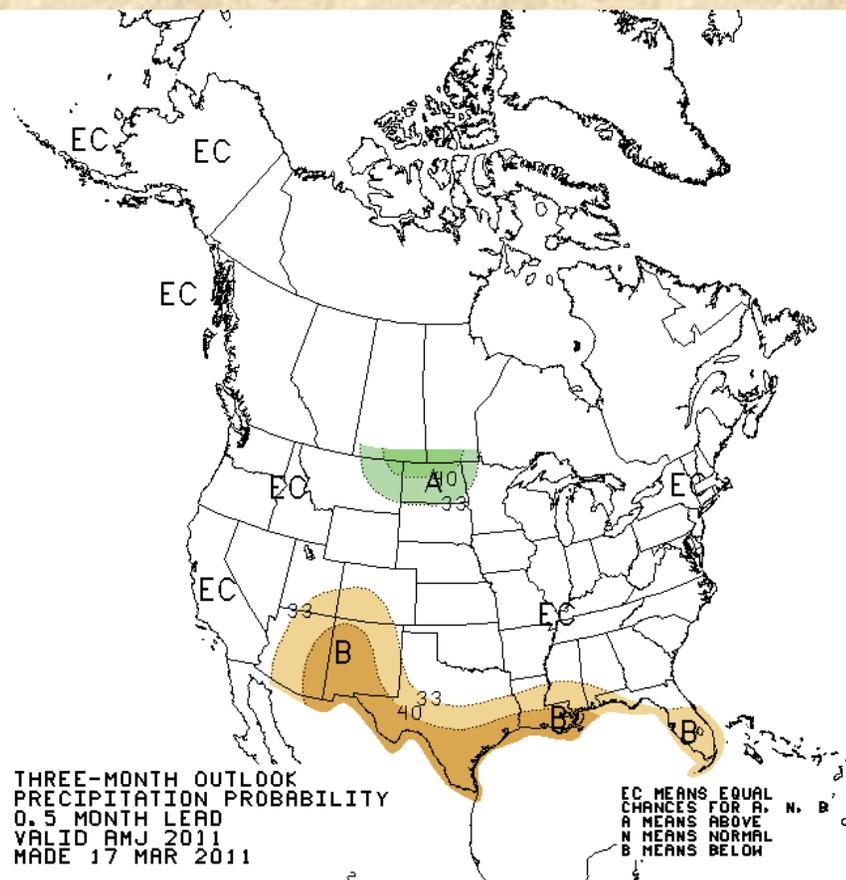
# Climate Prediction Center Temperature Forecasts



CPC's April-June (left) temperature forecast show typical La Niña-based expectations, leaving Colorado with higher than average chances for a warm spring. Their temperature forecast for July-September (right) reverts back to long-term trends (WARMING) as its main tool, since ENSO-neutral conditions are anticipated. *This forecast will get updated next week.*

Source: <http://www.cpc.ncep.noaa.gov/products/predictions/>

# Climate Prediction Center Precipitation Forecasts



CPC's April-June (left) precipitation forecast show typical La Niña-based expectations, leaving southwestern Colorado with higher than average chances for a dry spring. Their precipitation forecast for July-September (right) reverts back to long-term trends (dry in Pacific Northwest, but 'EC' for us) as its main tool, given ENSO-neutral expectations. *This forecast will get updated next week.*

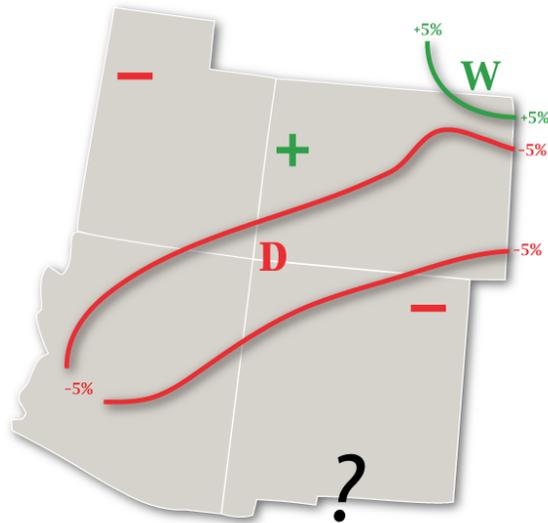
Source: <http://www.cpc.ncep.noaa.gov/products/predictions/>

# Statistical Forecast for April-June 2011



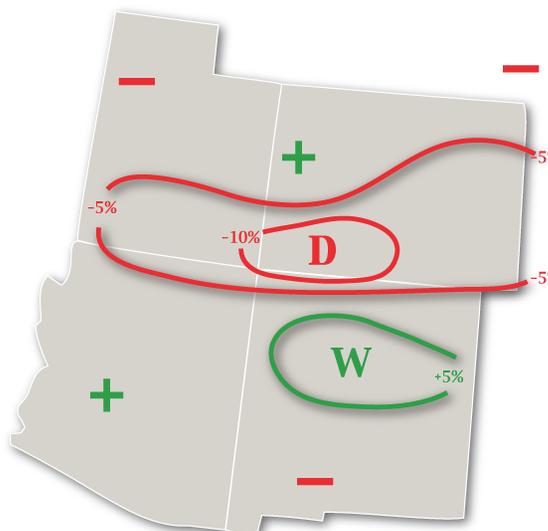
## Experimental PSD Precipitation Forecast Guidance

APR - JUN 2011 (Issued February 15, 2011)



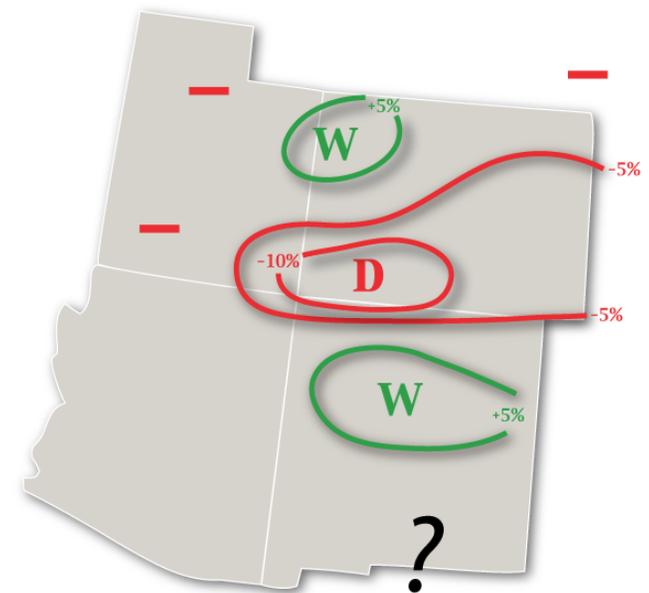
## Experimental PSD Precipitation Forecast Guidance

APR - JUN 2011 (Issued March 11, 2011)



## Experimental PSD Precipitation Forecast Guidance

APR - JUN 2011 (Issued April 8, 2011)



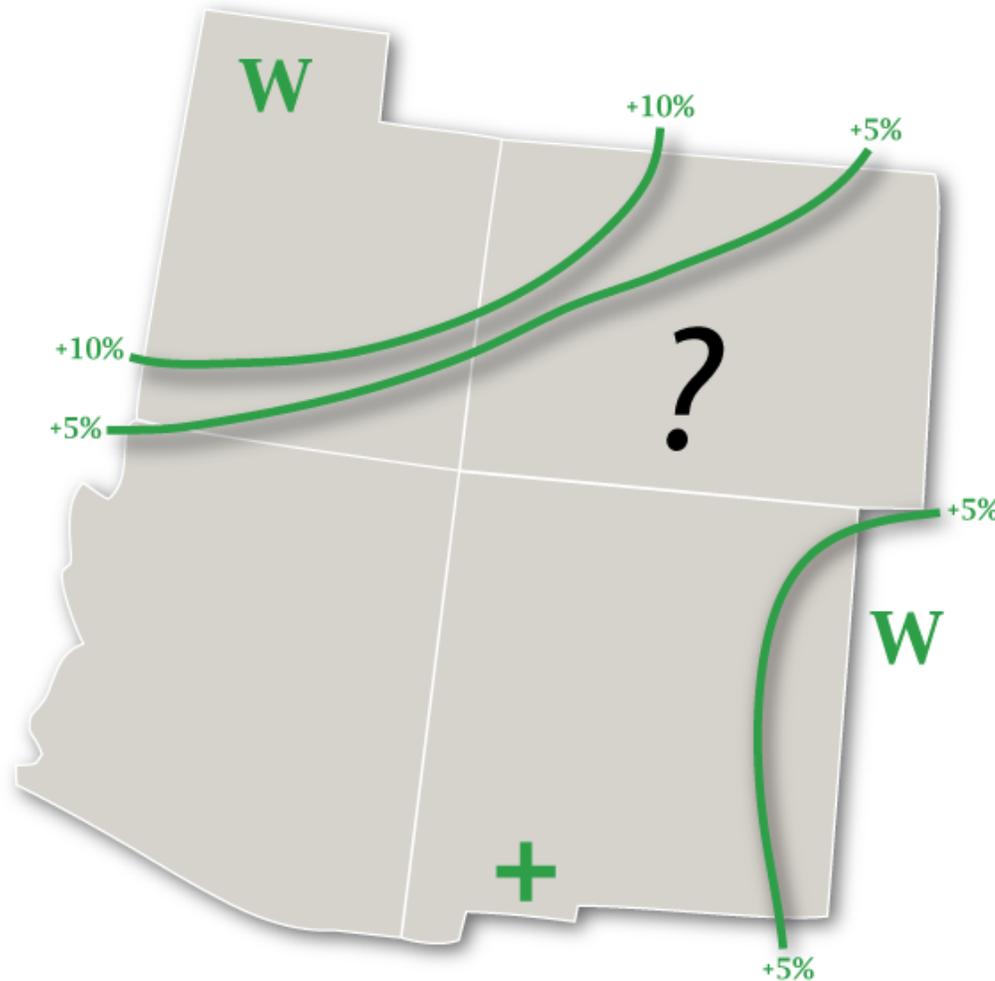
February's (left), March's (middle), and current (right) forecasts for April-June 2011 are fairly confident that southern Colorado will see below-normal moisture. The northwestern third of our state has slightly increased chances of being wetter-than-average. *Historical skill since 2000 has been better over Utah and Colorado than over New Mexico, or for most of the dry forecast regions rather than the wetter ones, except for the latest "wet" forecast for NW CO.*

# Statistical Forecast for July-September 2011



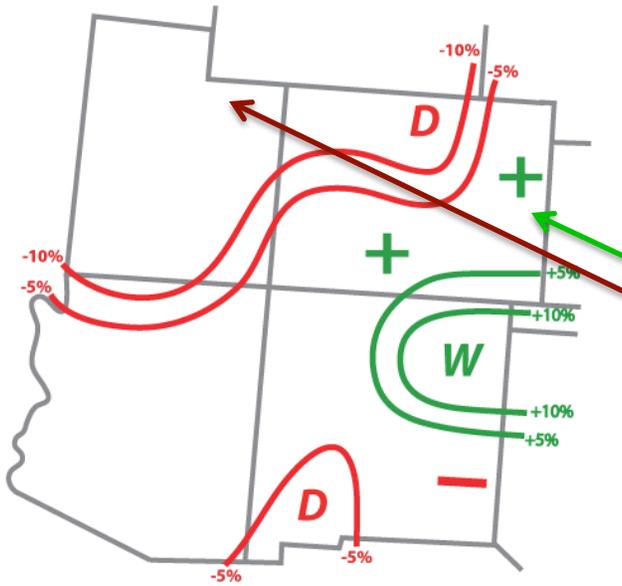
## Experimental PSD Precipitation Forecast Guidance

JUL - SEP 2011 (Issued April 8, 2011)



The first forecast of the year for July-September 2011 is optimistic for the northwestern half of Colorado, and undecided for the rest of the state. *At this long-lead time, historical skill performance has been quite poor for UT and AZ, but better-than-chance for southwest NM as well as the eastern half of CO (sort of wasted this time around).*

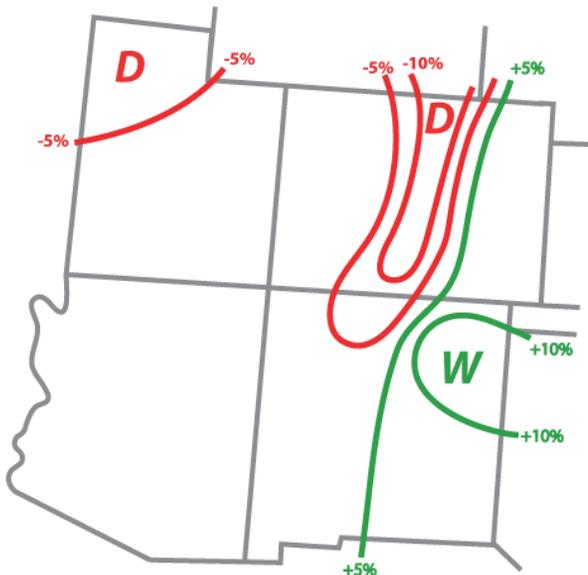
EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE  
JUL-SEP 2010 (issued April 19, 2010)



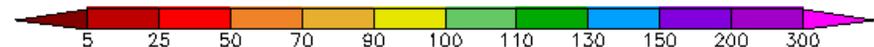
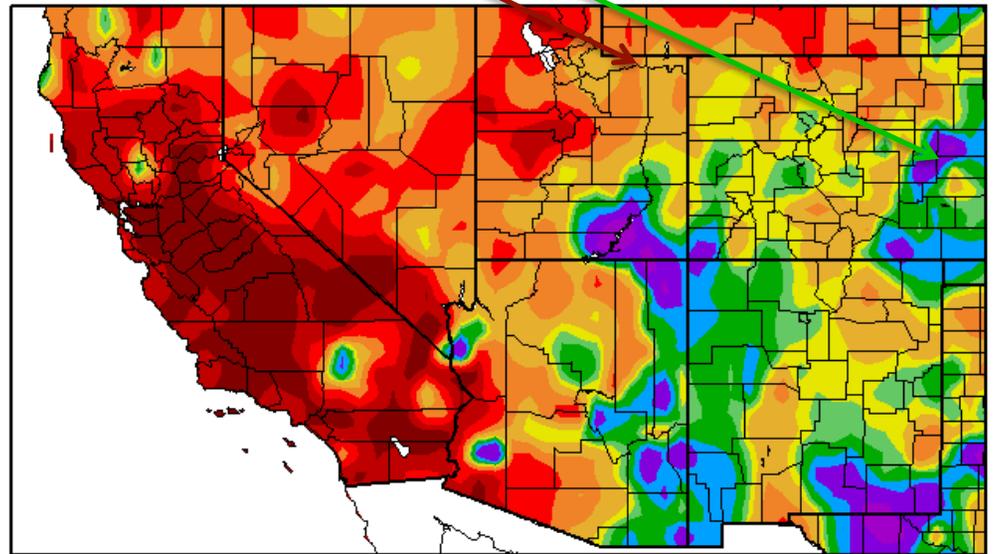
# 'Flashback' to July-September'10

Forecasts for July-September 2010 from April (left) showed an increased risk of dry conditions for the northwestern half of CO, in contrast to a positive tilt for the rest of the state. This forecast verified reasonably well in CO (and UT), but not in NM. *The updated forecast in June (bottom left) was only marginally better than the prior forecast.*

EXPERIMENTAL PSD PRECIPITATION FORECAST GUIDANCE  
JUL-SEP 2010 (issued June 28, 2010)



Percent of Normal Precipitation (%)  
7/1/2010 - 9/30/2010



## **Executive Summary (14 April 2011)**

- 1. After reaching levels not seen in 35 years, La Niña has finally turned a corner to weaken more rapidly just in the last month. It will probably take a 'leave of absence' this summer, but odds are still better than 50/50 that it will return later this year.**
- 2. In the Front Range, March ended up dry, windy, and warm, as is typical for La Niña. It stayed wetter than expected in our mountains. April started out in the same fashion, with last night's storm a decisive return to 'near-normal' for the next week or two. I stated last month that April has the best odds of deviating from a general dry spring pattern in Colorado with La Niña. This will curb fire danger in the next two weeks.**
- 3. My forecast for late spring (April-June) shows a tilt towards dryness covering the southern and eastern parts of our state, while near-normal or even wetter-than-normal conditions might linger over northwestern Colorado. The latter forecast is now supported by better skill than in previous months. The first forecast for the summer (July-September) is fraught with uncertainty this far out, but fairly benign (mostly near-normal or even wet), for what it's worth. The expected break in La Niña conditions should help in that respect.**
- 4. Since our last meeting, there have been a couple of dust storms in the San Juans, but not at the frequency of the last two years. Given their low snowpack, we may see an accelerated snowmelt in that part of our state next month.**
- 5. Bottomline (unchanged): Count your blessings, this La Niña winter has delivered decent amounts of snow in our mountains which will lead to a good runoff season in much of our state. I am much less optimistic for local conditions over the eastern plains, nor do I expect a repeat performance for our mountains next year.**