Earth System Research Laboratory
Physical Sciences Division

CIRES
Cooperative Institute for Research in Environmental Sciences

NIDIS
NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

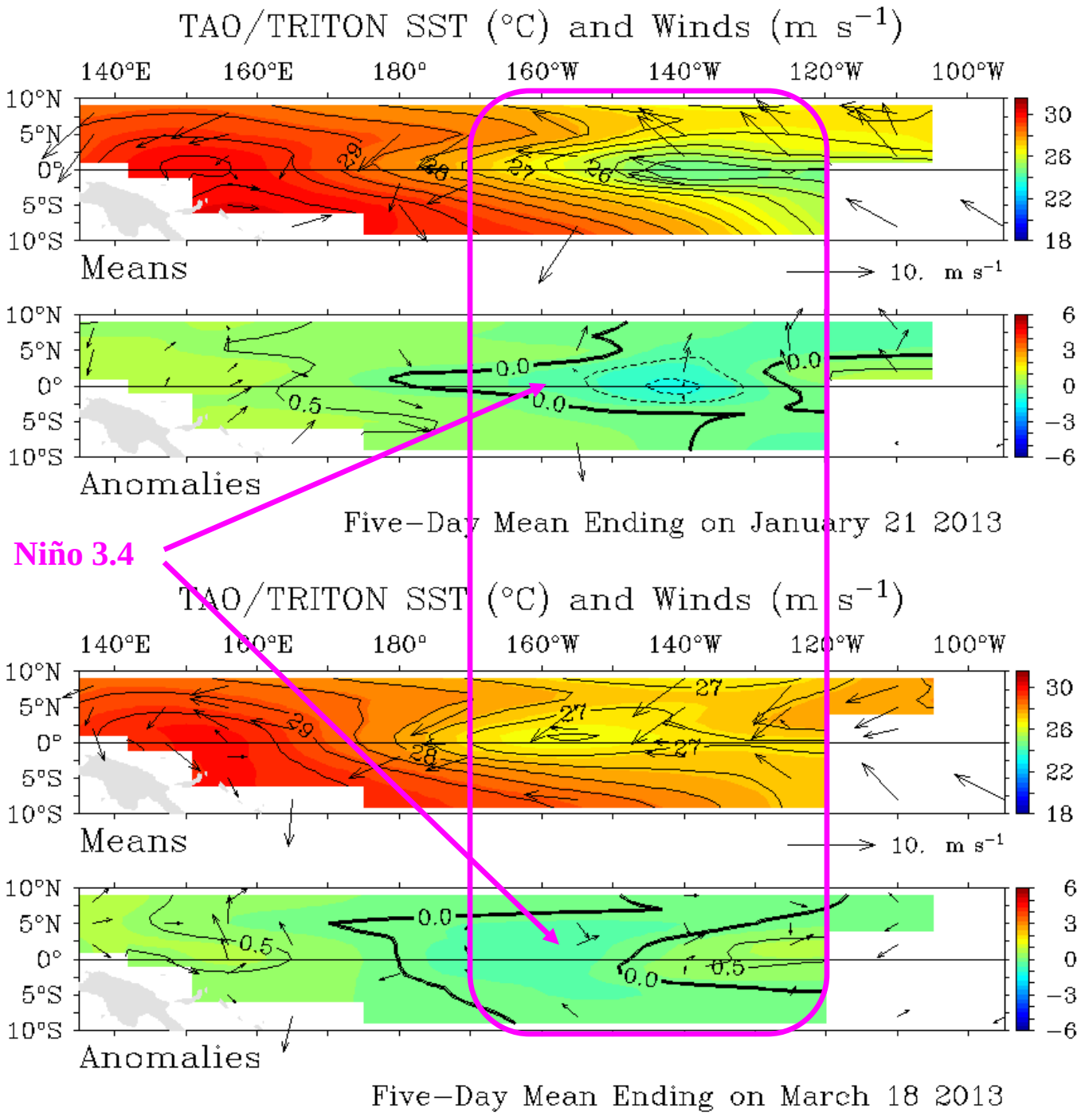
Colorado WA&FTF,
21 February 2013
Denver

Seasonal Outlook through June 2013

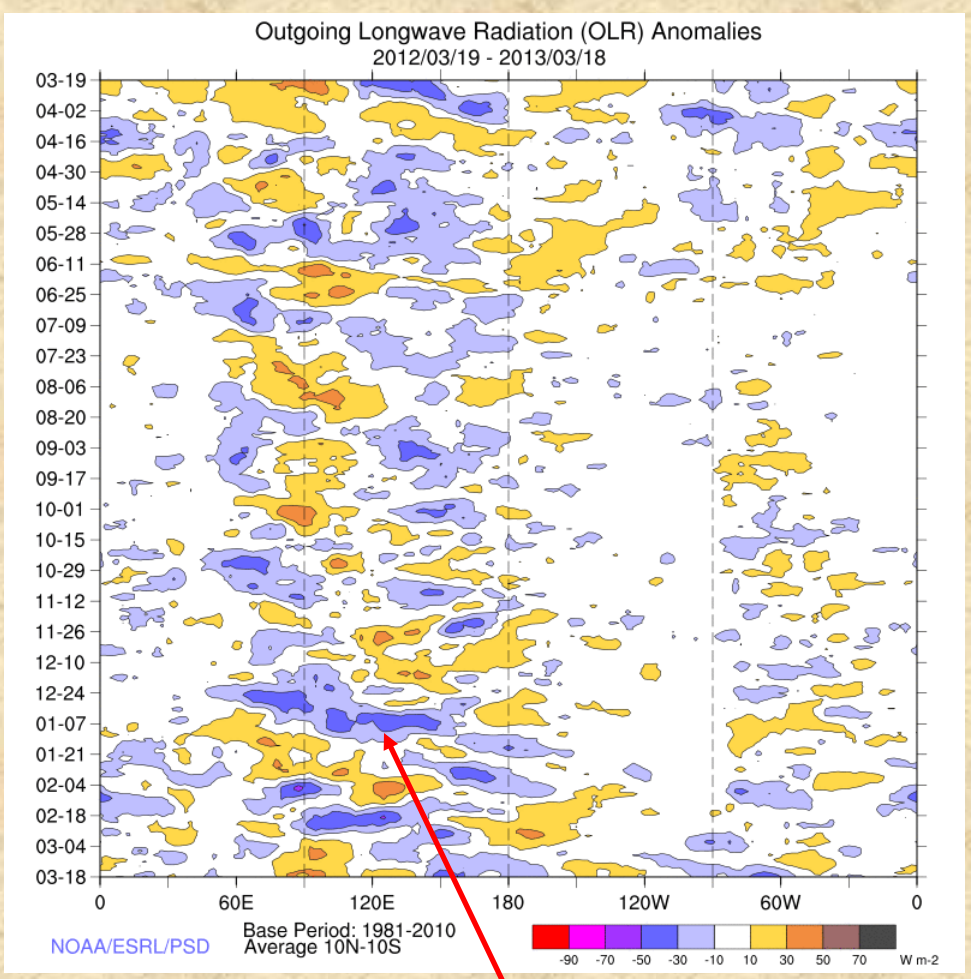
Klaus Wolter
University of Colorado, CIRES & NOAA-ESRL PSD 1, Climate Analysis Branch
klaus.wolter@noaa.gov

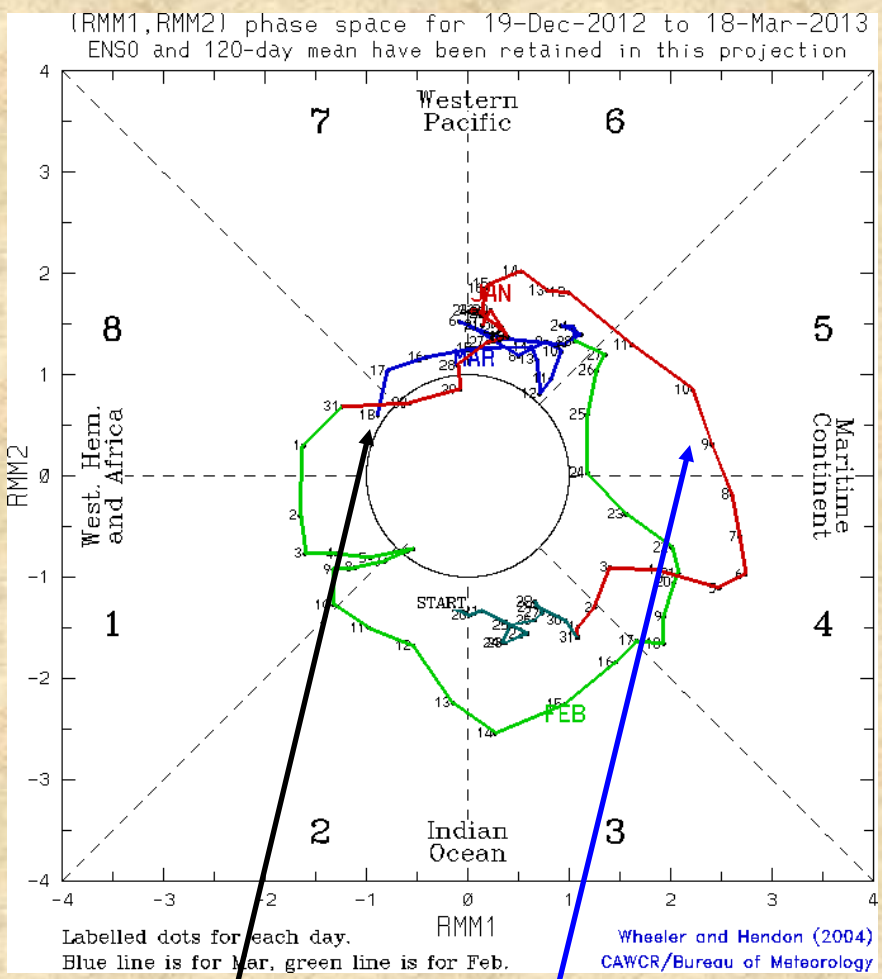
- **1st ENSO-neutral winter since 2003-04, but *PDO-AMO***
- **What will happen next with ENSO, and what does that mean for us ?**
- **Expectations for the next two weeks**
- **CPC forecasts for March through June 2013**
- **Experimental Seasonal Forecast Guidance**
- **Executive Summary**

Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to two months ago (top): La Niña tried to stage a comeback, but did not reach 'critical mass' earlier this year. Current wind (& subsurface) anomalies are too weak to push the system one way or the other...

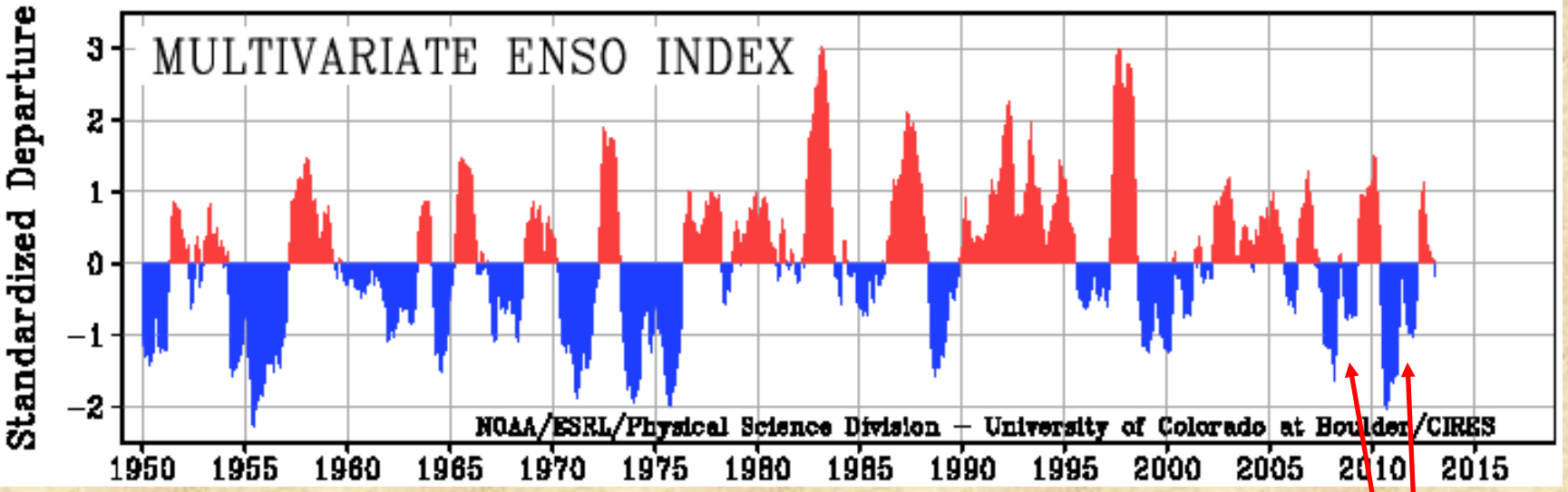


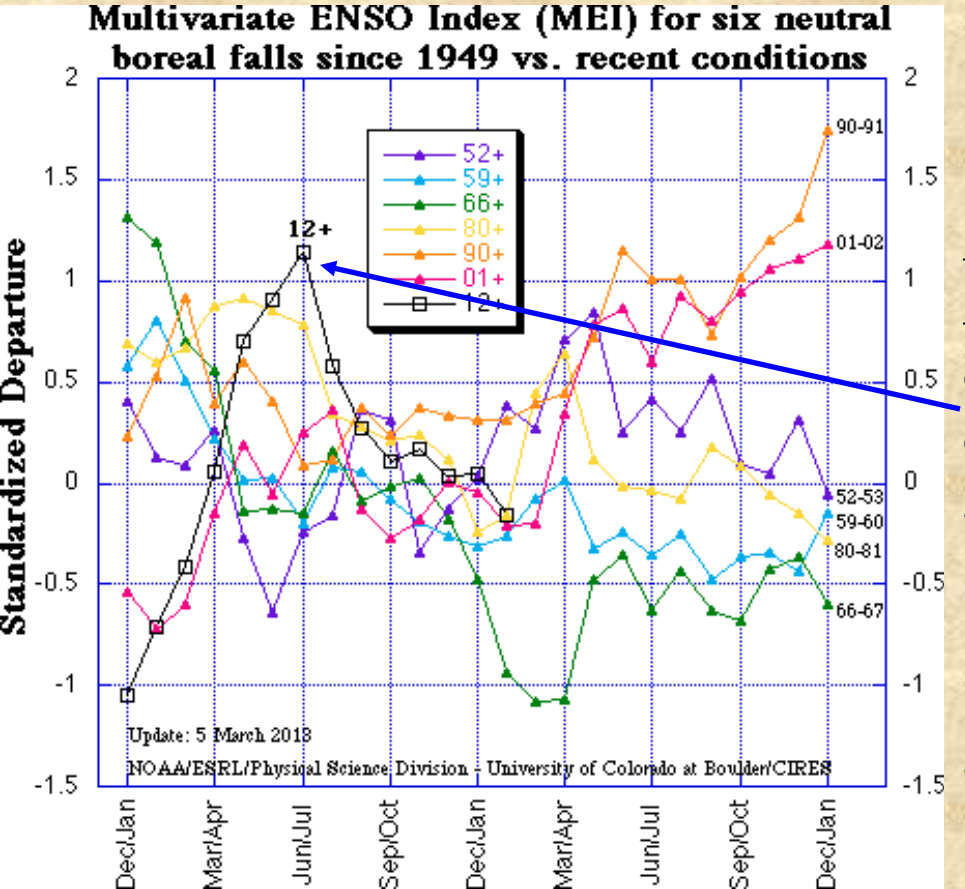
This year's 'Herman Cain' do-over?!





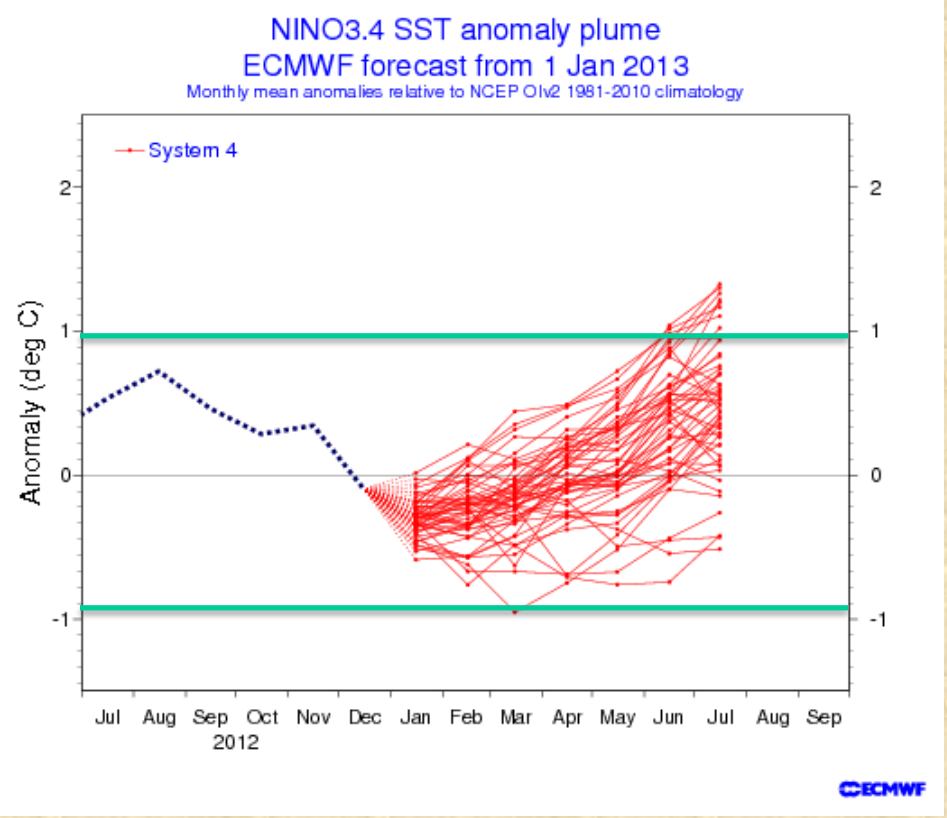
This year's strongest MJO had a decent run back in January – still limping along in Round 2!





Last five years have seen two 'double-dip' Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in 2012, and a return to ENSO-neutral conditions as of last fall – highly unusual behavior, but not completely unprecedented (for instance in 1953).

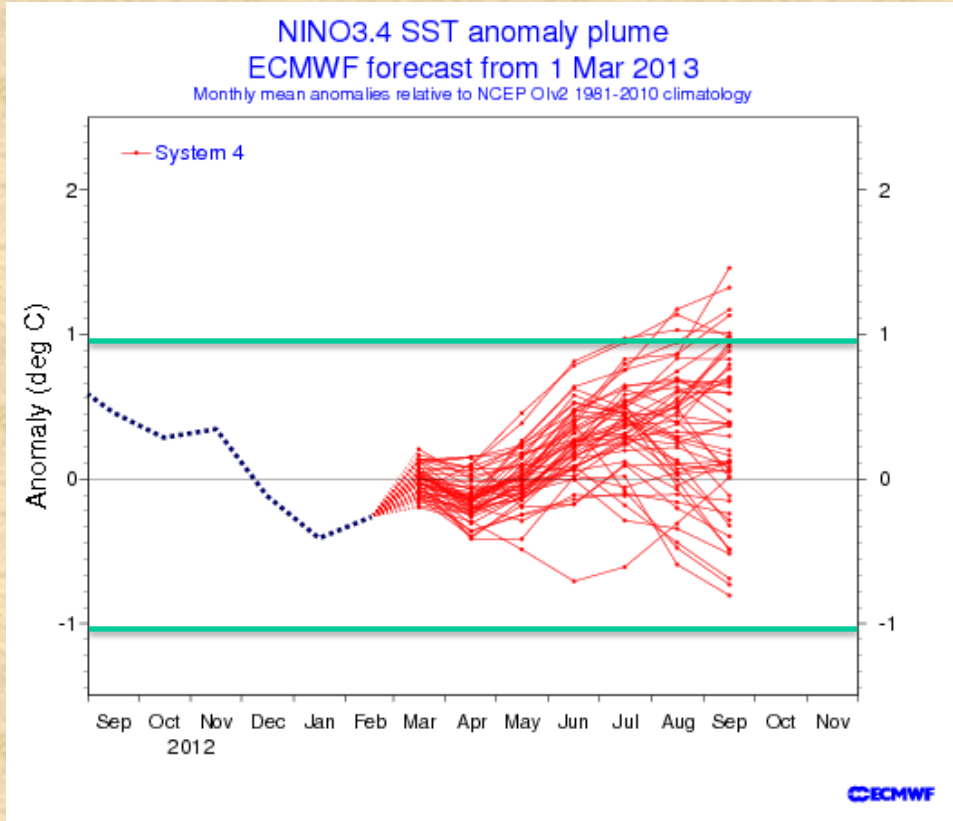
http://www.esrl.noaa.gov/psd/enso/mei



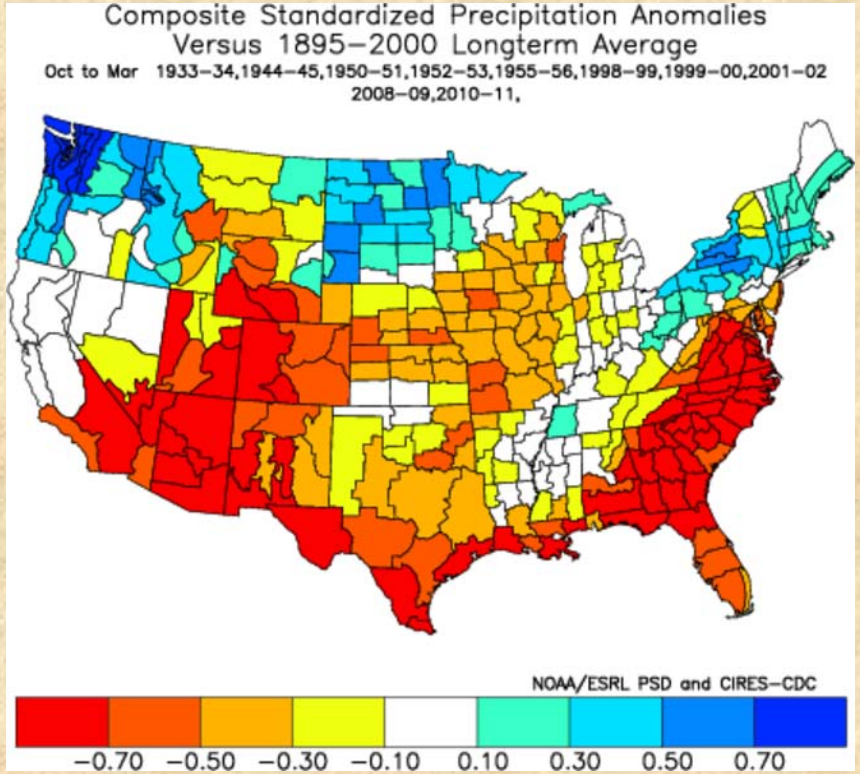
The ECMWF January 2013 forecast (right) showed a drift from weakly-negative / neutral conditions towards El Niño by mid-2013. However, there were still a few ensemble members that showed weak La Niña conditions to persist into the summer.

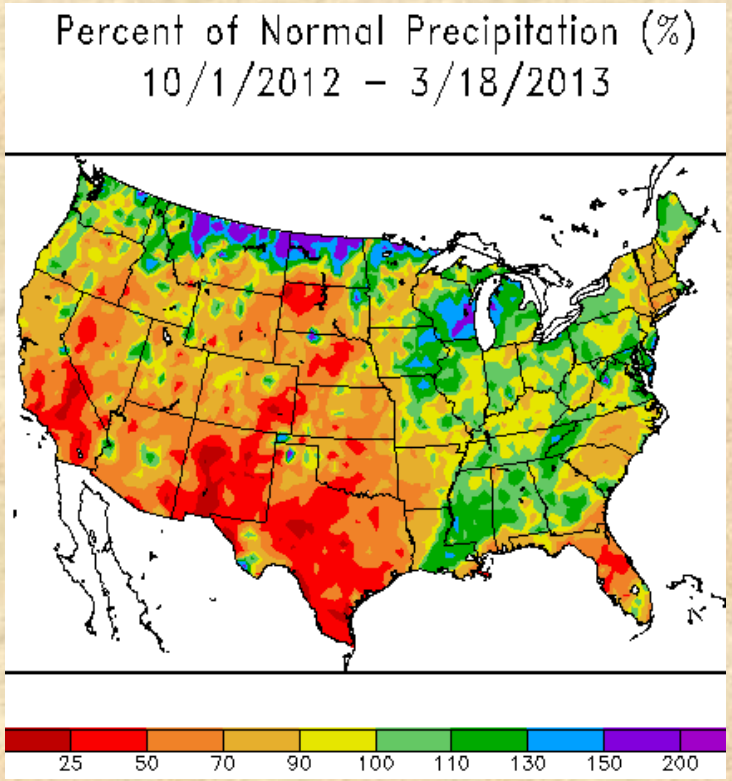
The ECMWF March 2013 forecast (right) is somewhat similar to the above forecast, with a smaller likelihood of drifting into La Niña in the next few months, but also more ensemble members drifting back to negative territory by late summer/early fall.

My own forecast drifts towards La Niña by September 2013.



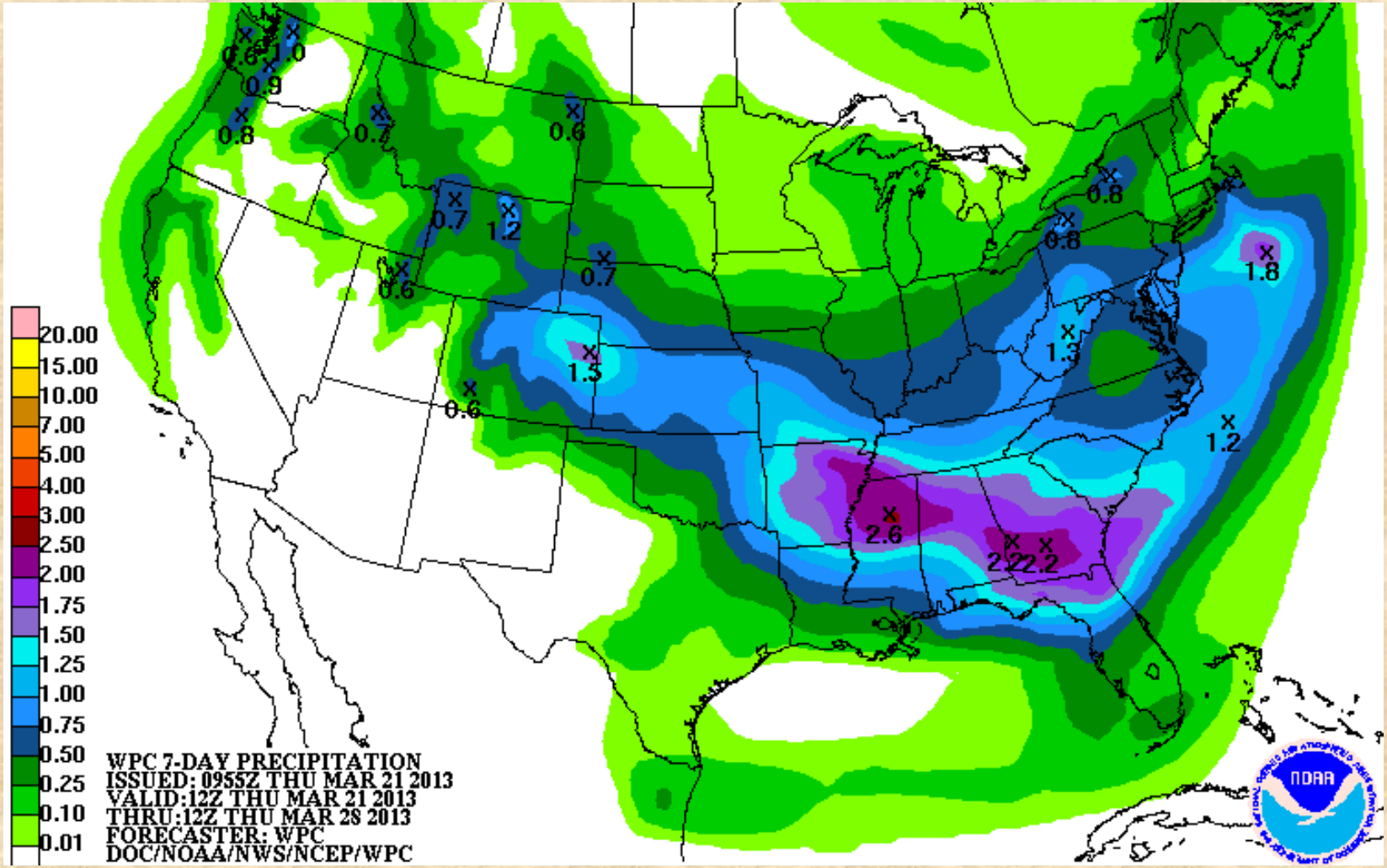
How did the low PDO-AMO composite work out since October?





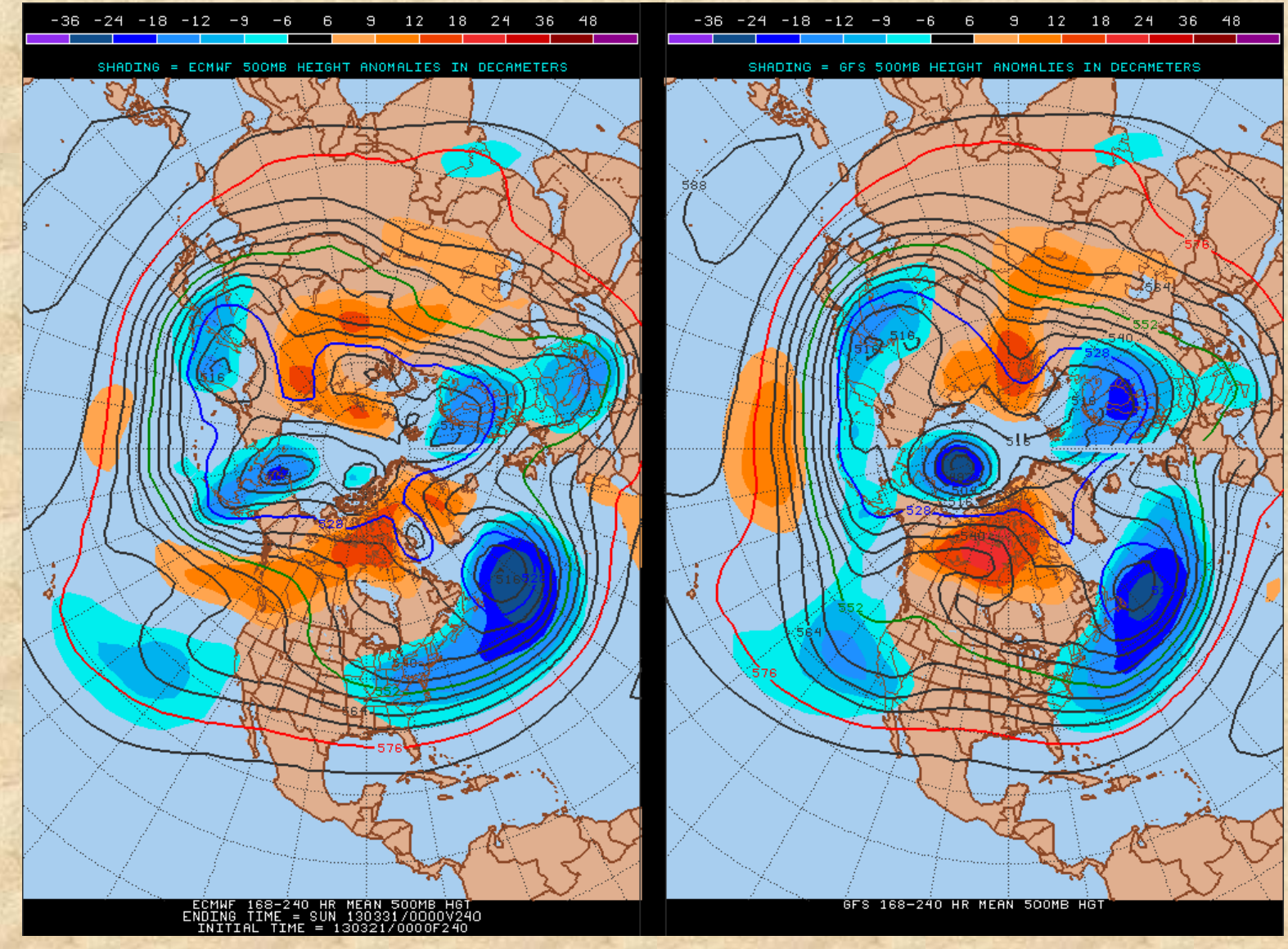
After being consistently low for much of the last decade, the difference in normalized anomalies between a cold Northeast Pacific (negative PDO) and a warm North Atlantic (positive) AMO reached its lowest value on record last summer. Using the same years as specified by last summer's PDO-AMO index, the outlook for the last six- months was to be dry in our state (left) which unfortunately verified all too well (right).

What can we expect in the next seven days?



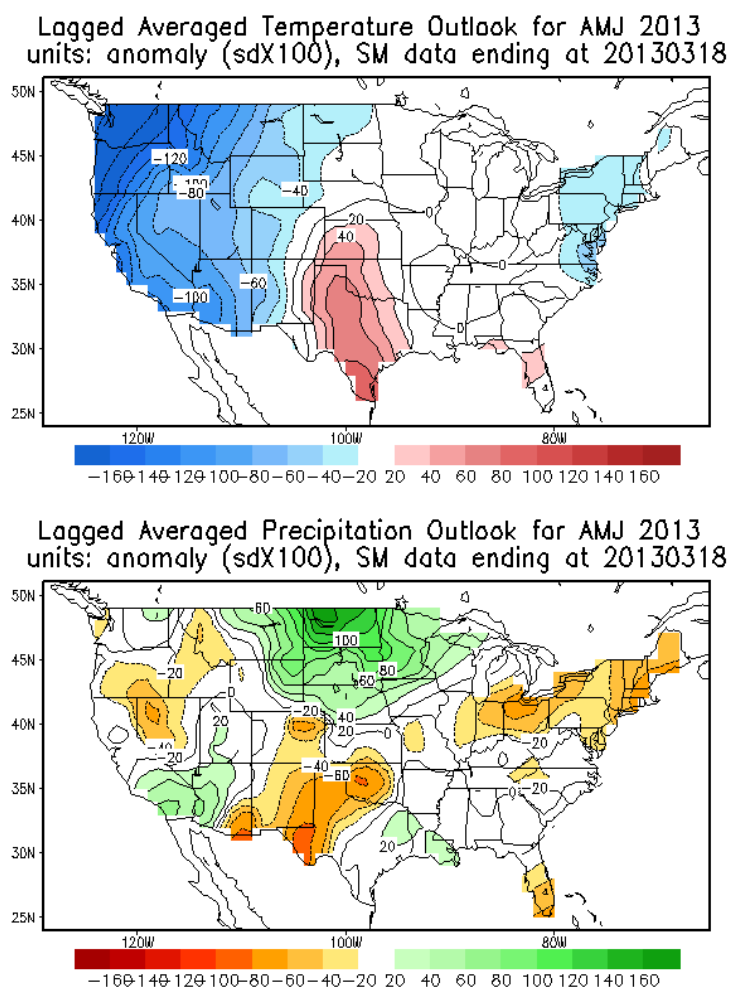
Expected total precipitation, according to the Hydrological Prediction Center (NOAA): a decent pattern of storminess, focused on Friday night into Saturday, just in time to 'ruin' another weekend (canceled SAT tests on March 9th were rescheduled on the 23rd).

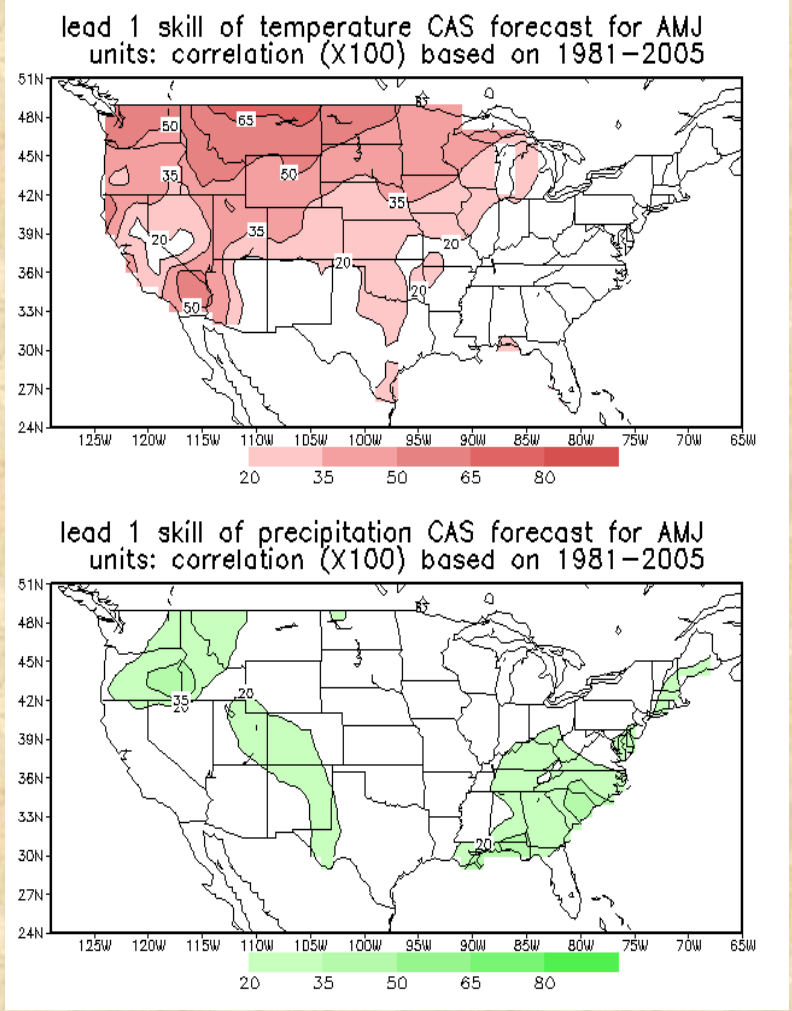
What can we expect next week?



European & U.S. models show West Coast trough for the average circulation forecast 7-10 days out: near-normal heights for us are much better than last year's disaster...

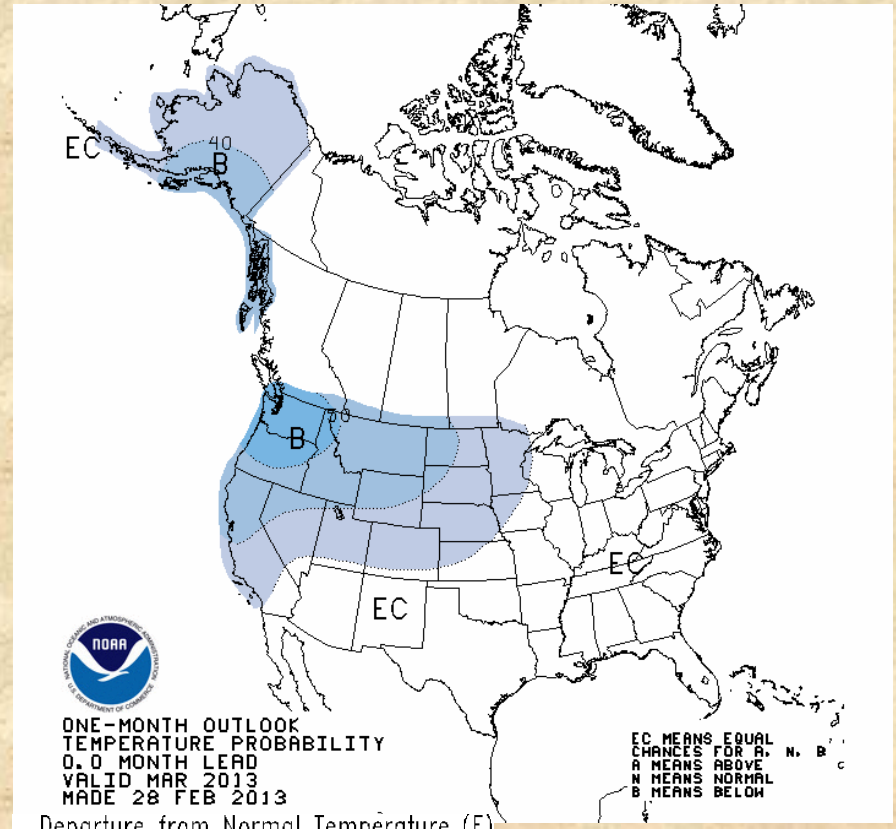
Climate Prediction Center 'Analog' Forecasts

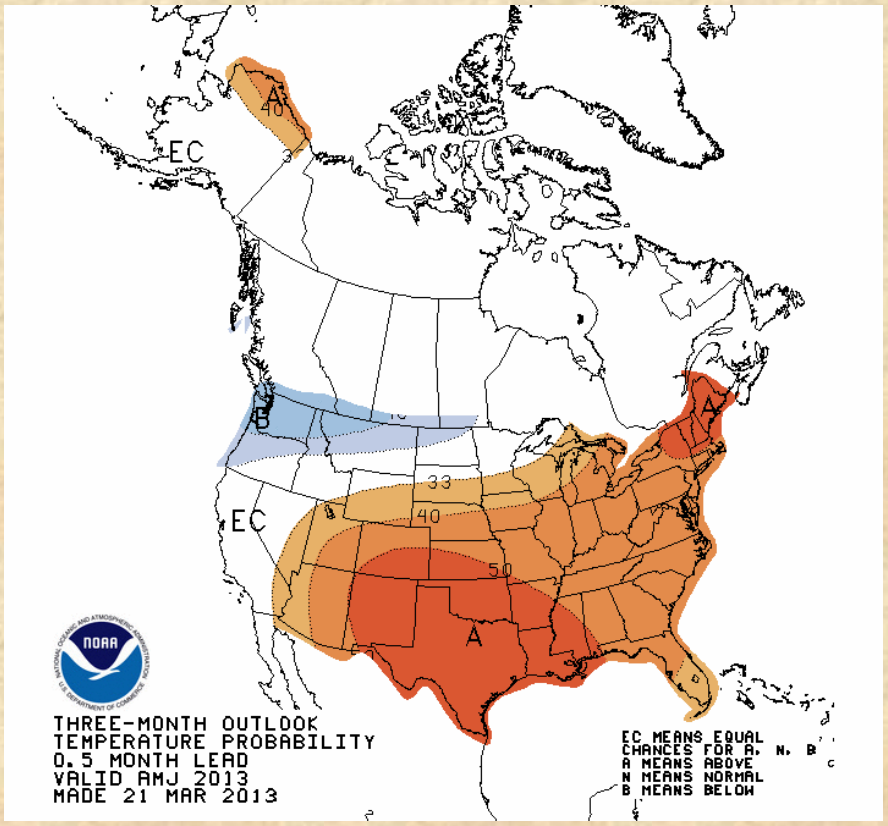




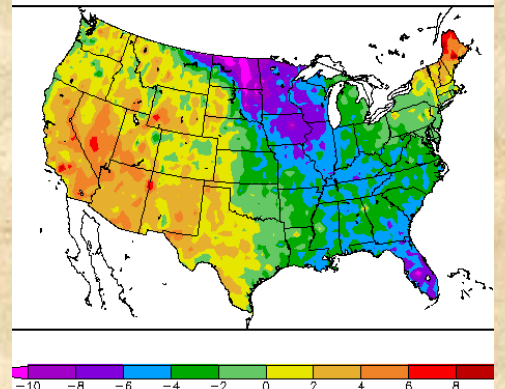
According to the soil-moisture analog forecast, western Colorado is favored over eastern Colorado in April-June '13 (left), reversing recent storm track behavior. The temperature forecast matches this east-west gradient. Skill at this lead-time (right) is marginal for precipitation, better for temperatures. **Source**: ***http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml***

Climate Prediction Center Temperature Forecasts





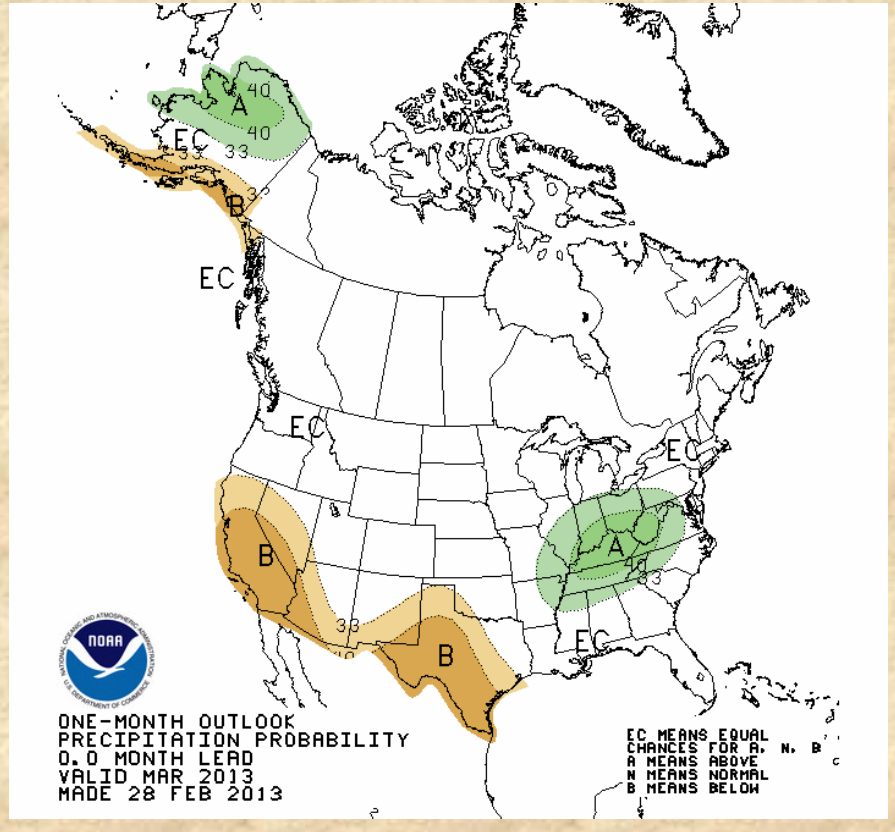
Departure from Normal Temperature (F)
3/1/2013 – 3/20/2013

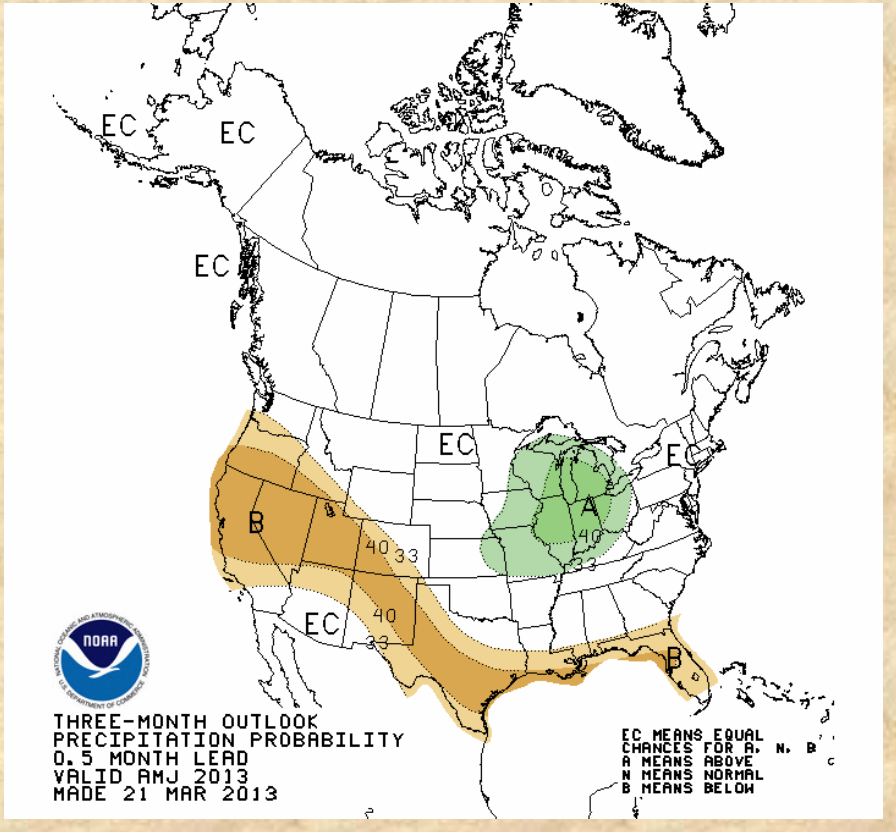


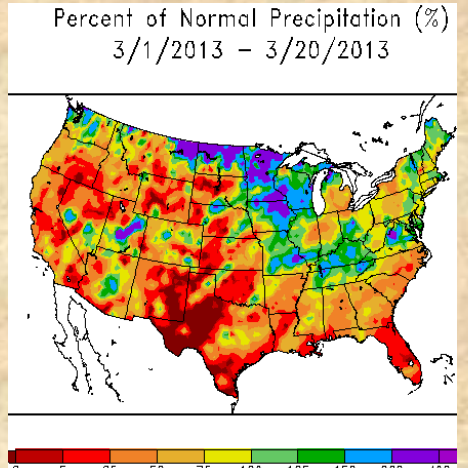
While last year's (*warm*) March forecast was unusually successful, this year's (*cold*) forecast (left vs. top left) has not panned out so far, except in Upper Midwest; today's April-June temperature forecast (right) reverts back to typical spring (and La Niña-ish) patterns that include above-average temperatures around here.

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

Climate Prediction Center Precipitation Forecasts



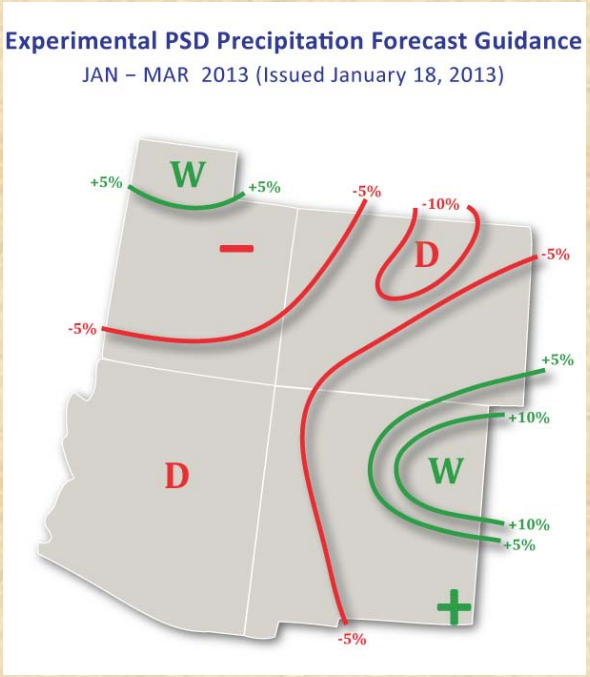


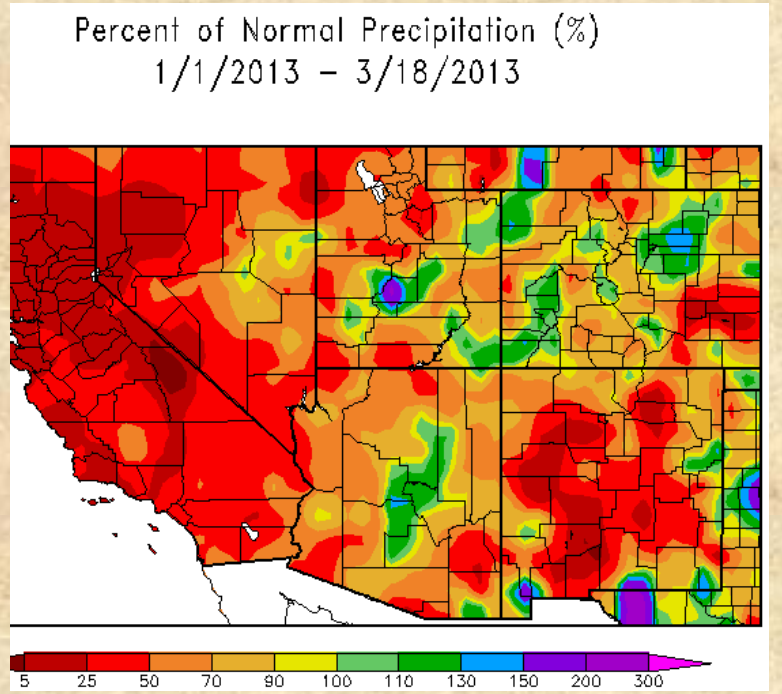


While last year's (*dry*) March forecast was quite successful, this year's 'EC' forecast (left vs. top left) for us will probably 'verify' near-normal; CPC's April-June (right) precipitation forecast repeats last year's call for dryness over much of UT and CO. *Are they possibly hindcasting last year's events?!*

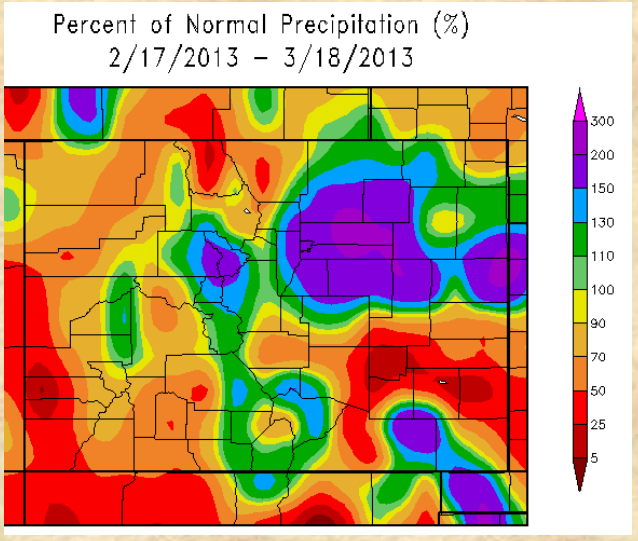
Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/***

Statistical Forecast for January-March 2013

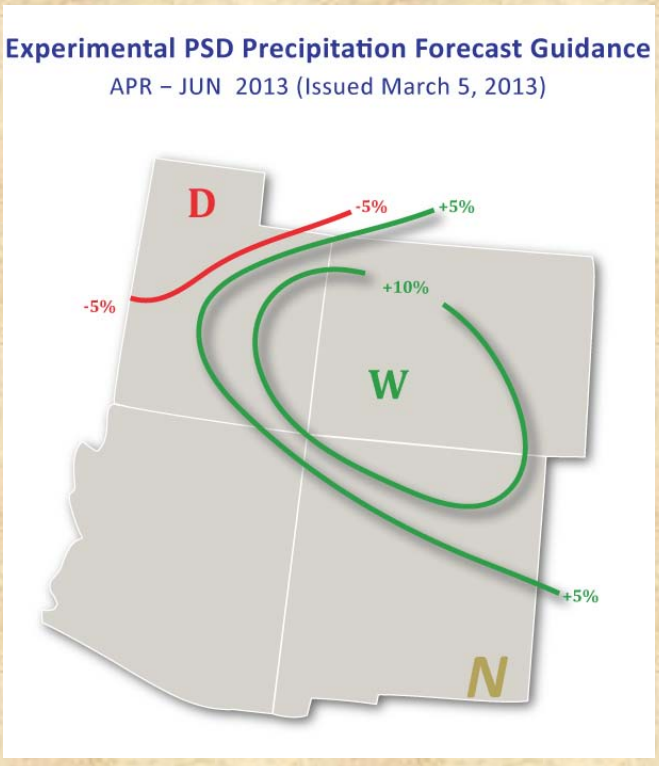


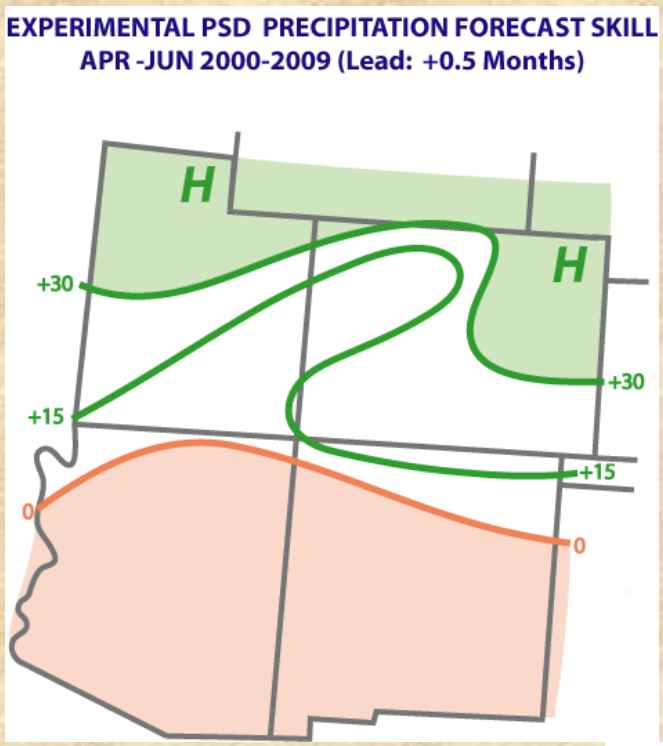


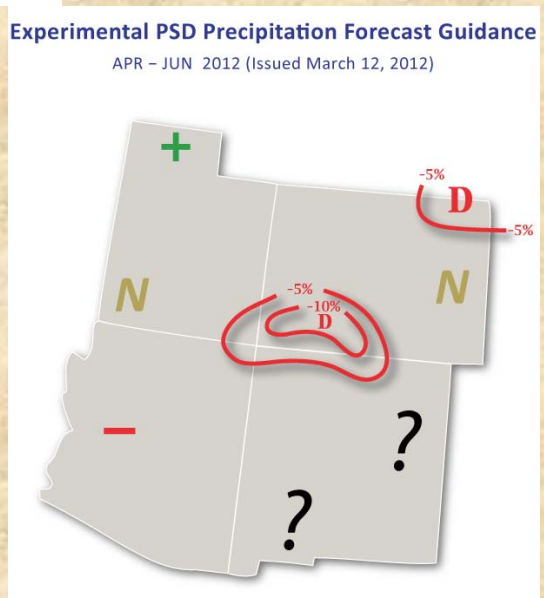
The most recent forecast season (left) & observations so far (top right) for January-March 2013 verified wetter than expected from AZ into CO. The most recent five weeks (starting around February 10th; last 30 days on the right) have been quite wet in the Front Range, marking the wildfire near Fort Collins as less relevant for areas south of there than last year. ***Skill is lowest in northern and northeastern Colorado, so the dry forecast was not 'reliable'.***



Statistical Forecast for April-June 2013

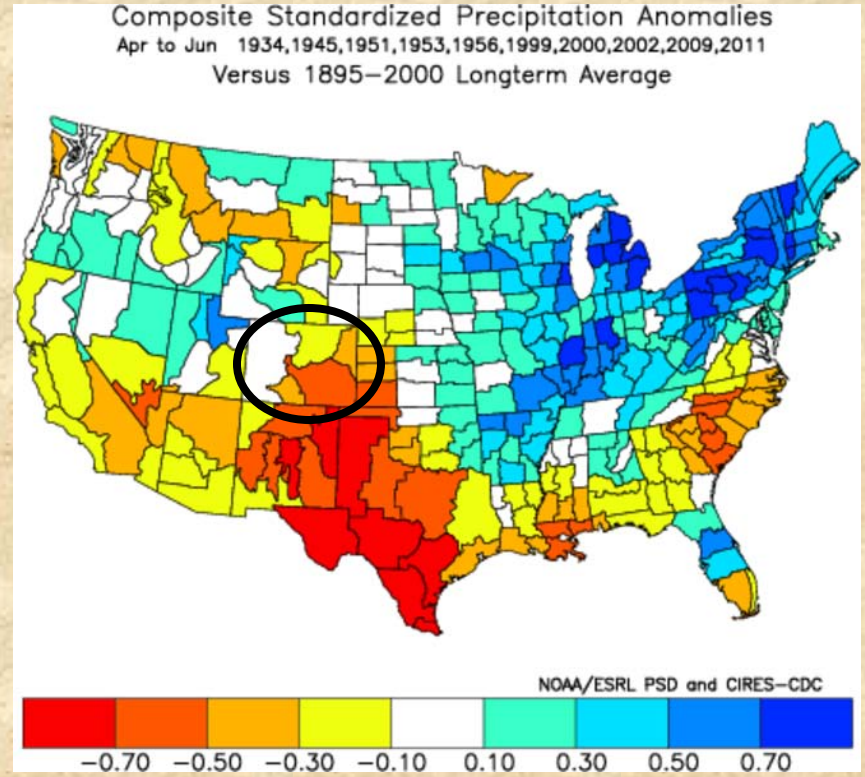


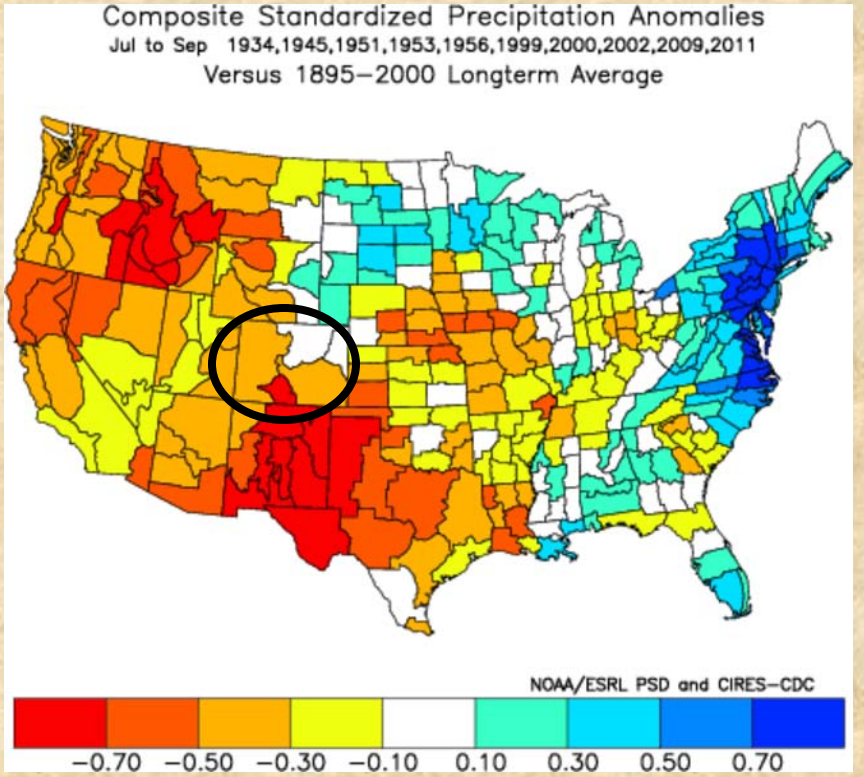




My forecast for April-June 2013 (left) is fairly confident that most of Colorado will see above-normal moisture, especially towards the Four Corners region. This is in stark contrast to 2012 (lower right), and supported by skillful forecasts over the last decade (top right).

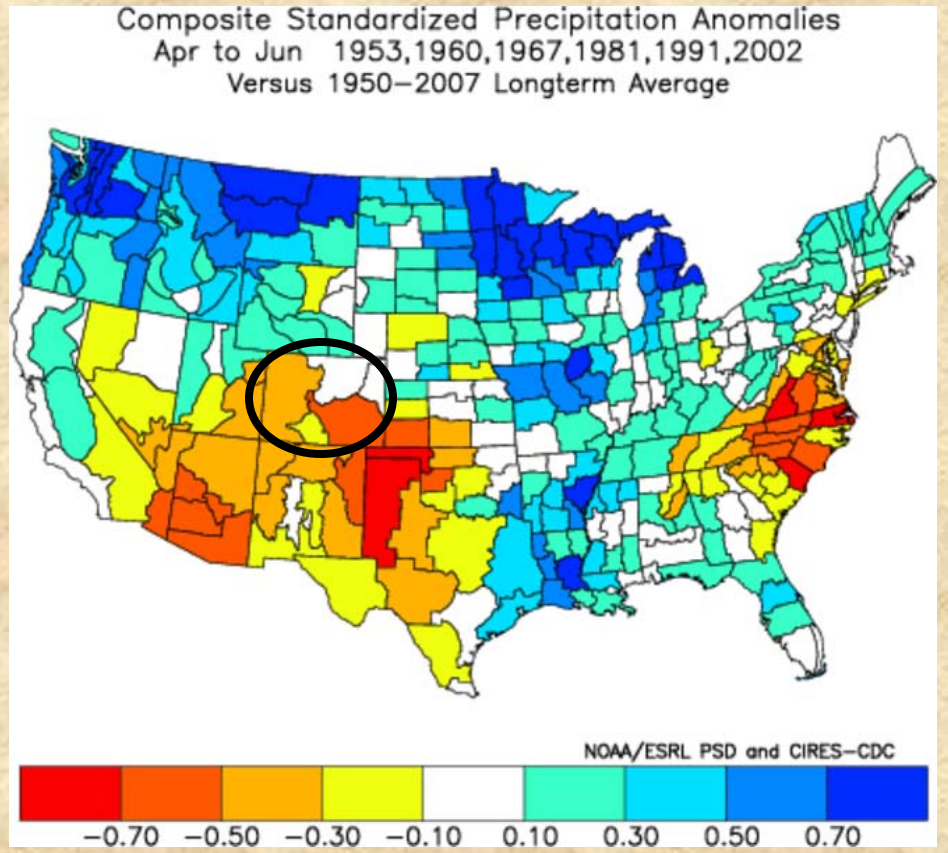
What might happen in the next six months if we use the same years?

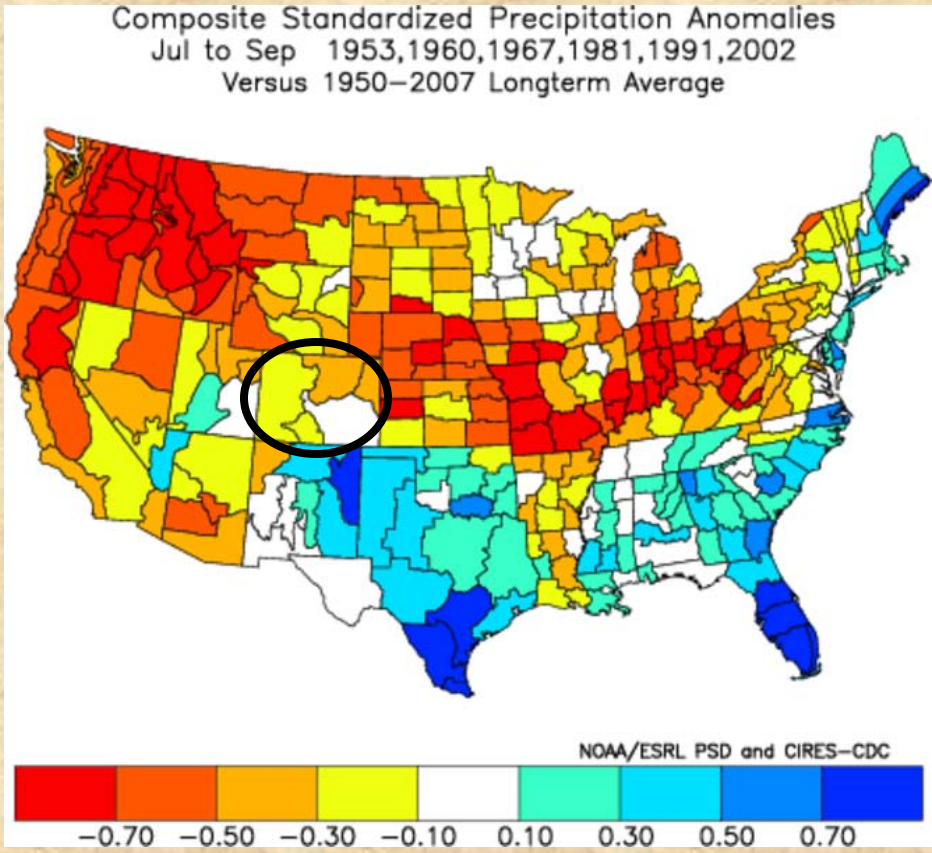




Using the same set of 10 years based on last summer's low <PDO-AMO> conditions, late spring precipitation (Apr-Jun; left) is facing uphill odds over southeast Colorado in particular. In late summer (Jul-Sep; right), precipitation odds remain unfavorable over much of our state.

Post-Neutral ENSO springs





Similar ENSO-neutral patterns in the fall and early winter have often 'produced' dry springs in our state (left), especially for the Arkansas valley. Summers fare not much better (right). ***<1953 and 2002 overlap with PDO-AMO composites>***

Hope for the wettest outcome, prepare for the driest – especially if we get another hot growing season (the one saving grace of 2013 so far is much cooler weather than last year).

Notes on flooding risks in 2013

SNOWMELT-RELATED:

- ***Poor snowpack decreases snowmelt-related flooding potential around our state***
- ***Fairly low dust load so far does not currently pose a threat in terms of increasing the speed of snowmelt (tentative), and is much less than in 2009 and 2010***
- ***Active storm track so far this winter and early spring poses less risk of stationary 'heat waves' that would trigger an early melt surge.***

FLASHFLOOD-RELATED:

- ***Some of the most prominent examples of flashflooding occurred during El Niño onset years ('65, '76, '97), while others did not ('99) – I believe the odds for that scenario are lower than last year (but stay tuned!)***
- ***Recent wildfires in Front Range have lowered the threshold for flashflooding and mudslides – it will take several years to overcome this (Jamestown fire of October 2003 kept us busy for at least five years). However, the highest risk for this will be over the watersheds that were hit last year (El Paso and Larimer County).***

Executive Summary (21 March 2013)

klaus.wolter@noaa.gov

- **While El Niño/La Niña can provide decent guidance for climate outlooks around here, this is not very helpful in our current ENSO-neutral situation. A cold Northeast Pacific combined with a warm North Atlantic stacked the deck towards dry conditions in the southwestern U.S. in 2012-13 as in other recent years.**

- **Much of this year's low snowpack was 'precipitated' by a dry fall in 2012, confirming the critical role of that season in setting the stage for a 'good' or 'bad' runoff season. The next two weeks hold the promise of an active stormtrack and 'normal' to much-below normal temperatures (especially over the next five days).**

- **My statistical forecast for late spring (April-June) shows a healthy tilt towards wetness covering much of our state. Given that this forecast is not driven by a strong ENSO signal, and that other tools are more pessimistic, one should not 'bet the farm' on a wet spring. I will have a summer forecast by next month.**

- **The odds for a switch to El Niño this summer are lower than last year. In fact, we live in a decade that appears to favor La Niña over El Niño, so it would not be surprising if we ended up back in La Niña conditions by 2014.**

- **Bottomline: Since about 2000, we appear to be stuck in a regime of mostly drier and warmer years than 'normal'. While the jury is still out on how much of that is due to 'natural variability' vs. Greenhouse gas changes, I do not see any promising signs of a 'regime change' on the horizon.**