Earth System Research Laboratory
Physical Sciences Division

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Colorado WATF,
16 May 2013
Denver

Seasonal Outlook through September 2013

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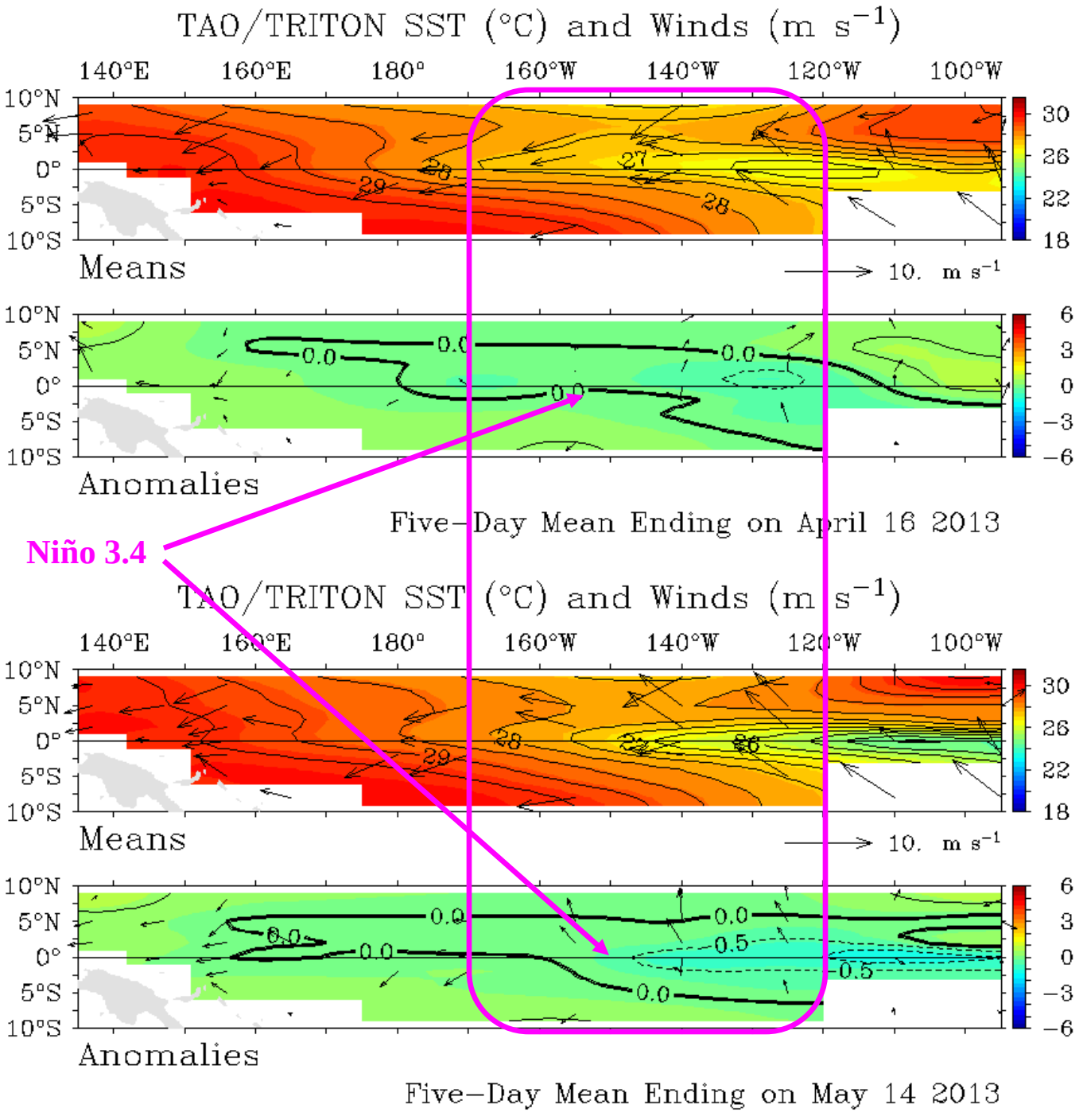
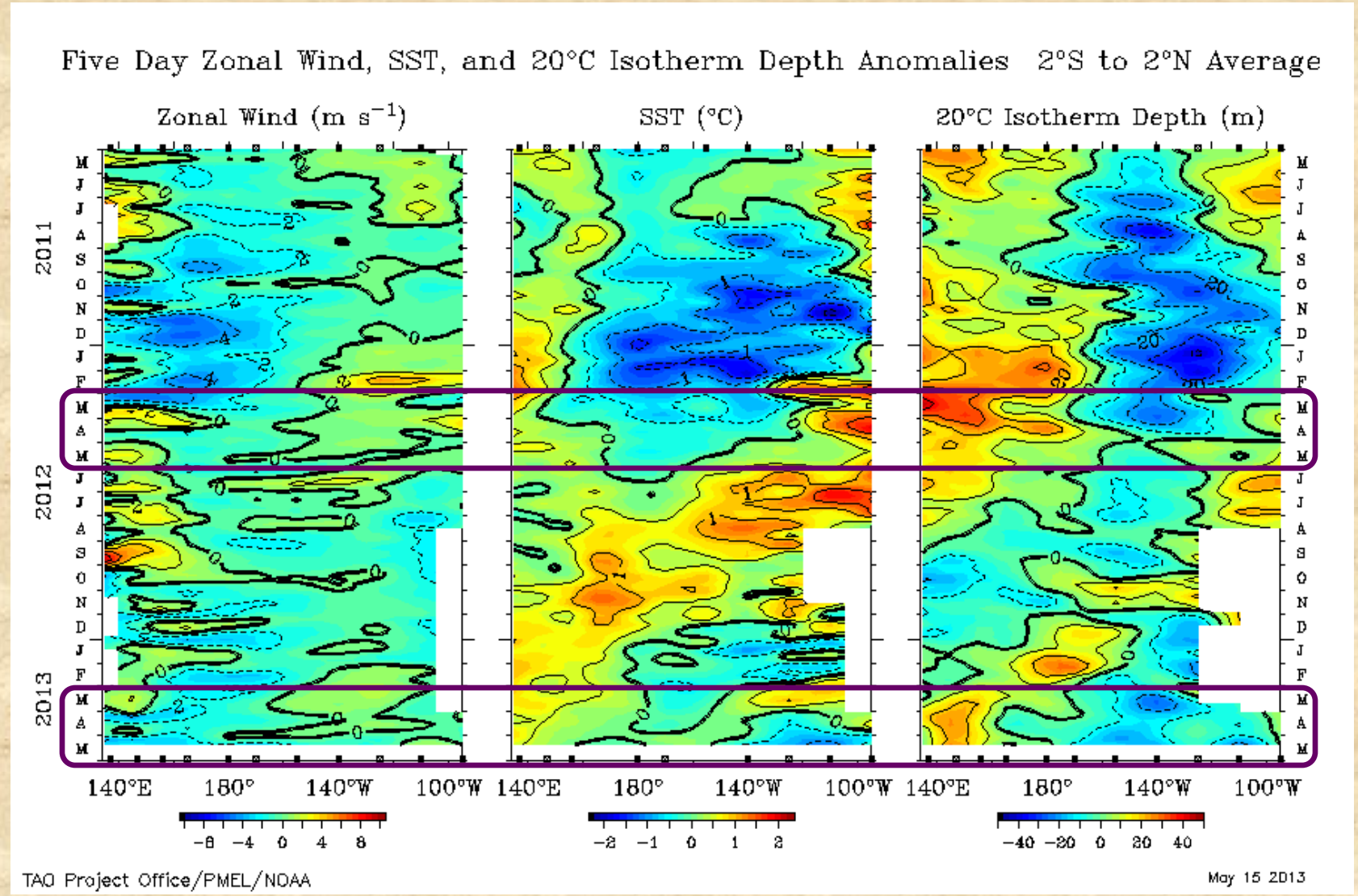
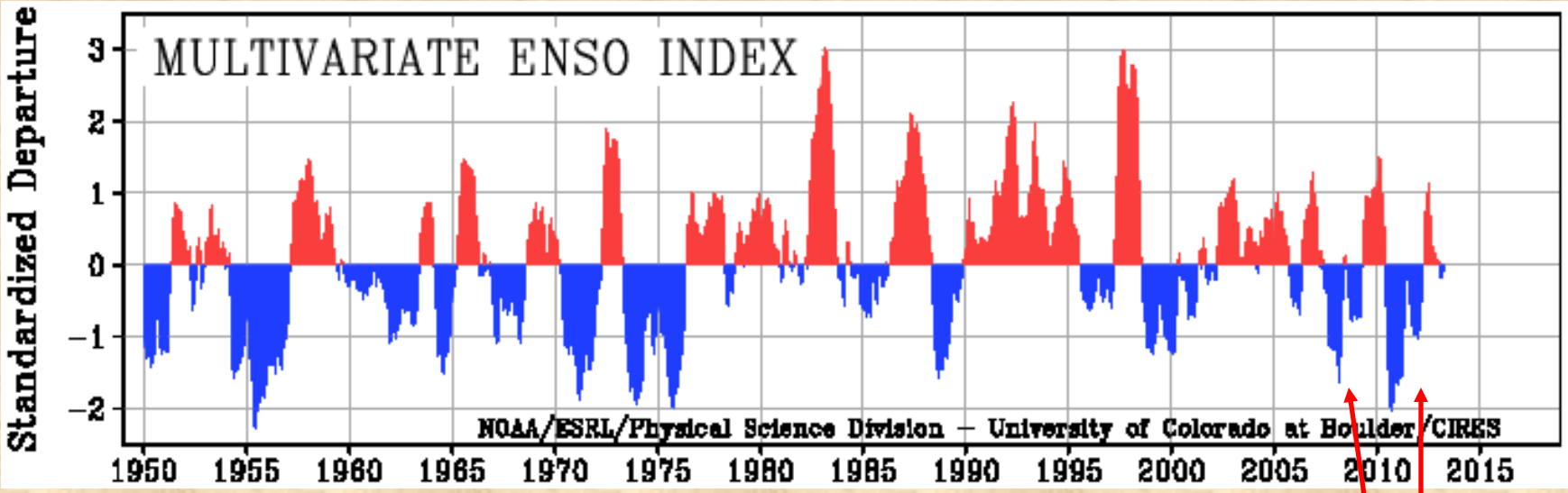
- **What has happened to ENSO, what will happen next, and what does that mean for us ?**
- **Expectations for the next two weeks**
- **CPC forecasts for June through September 2013**
- **My Seasonal Forecast Guidance**
- **Executive Summary**

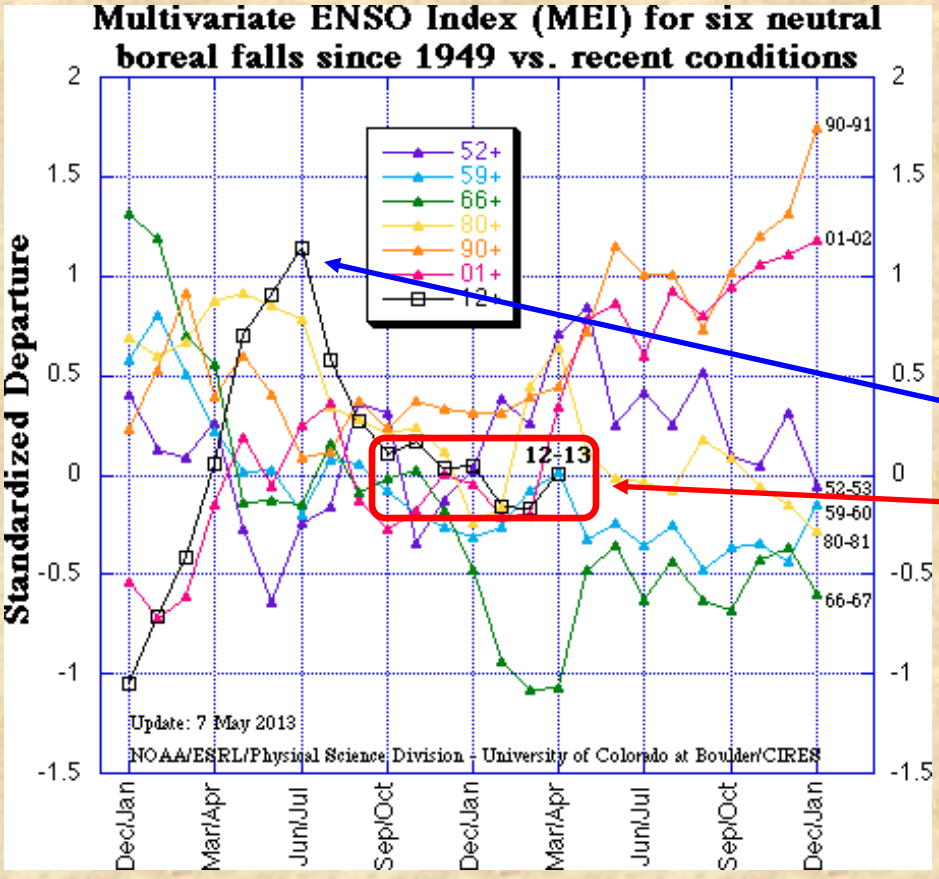
Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to last month (top): looks like we are slowly drifting from ENSO-neutral into La Niña (lite). Recent wind anomalies are weak, but show enhanced trades in the western half/northward shifted ITCZ in eastern Pacific, both in favor of developing La Niña.





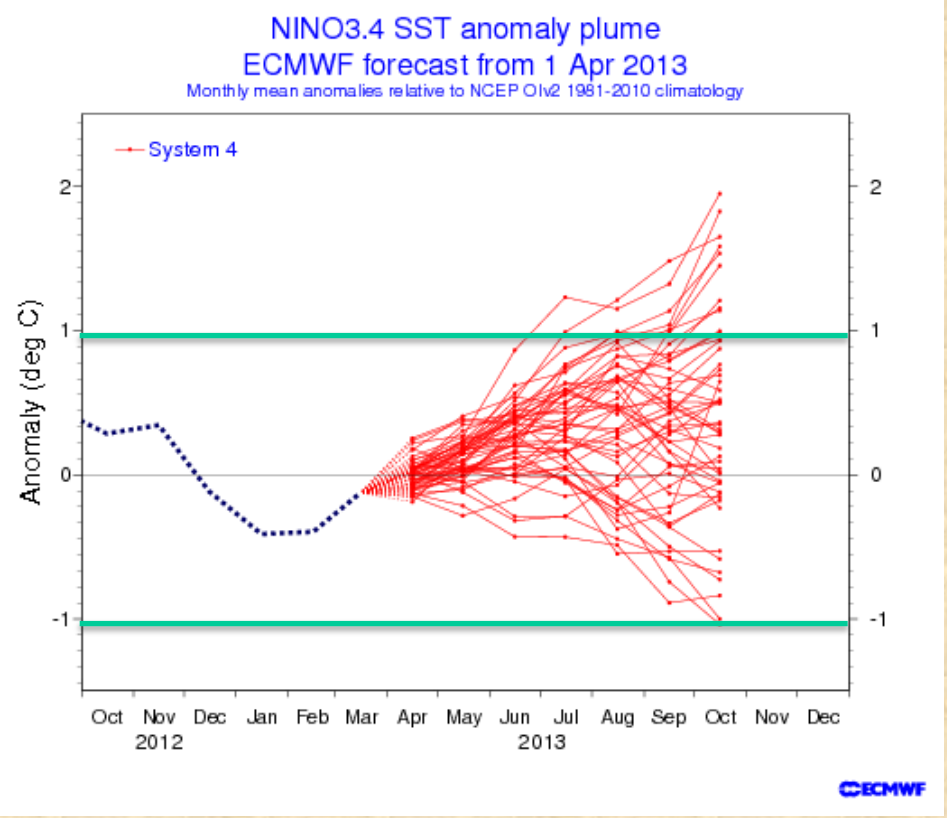
Evolution over last 24 months shows that we were much further along in a transition to a (short-lived) El Niño by this time last year – not really in the cards this year.





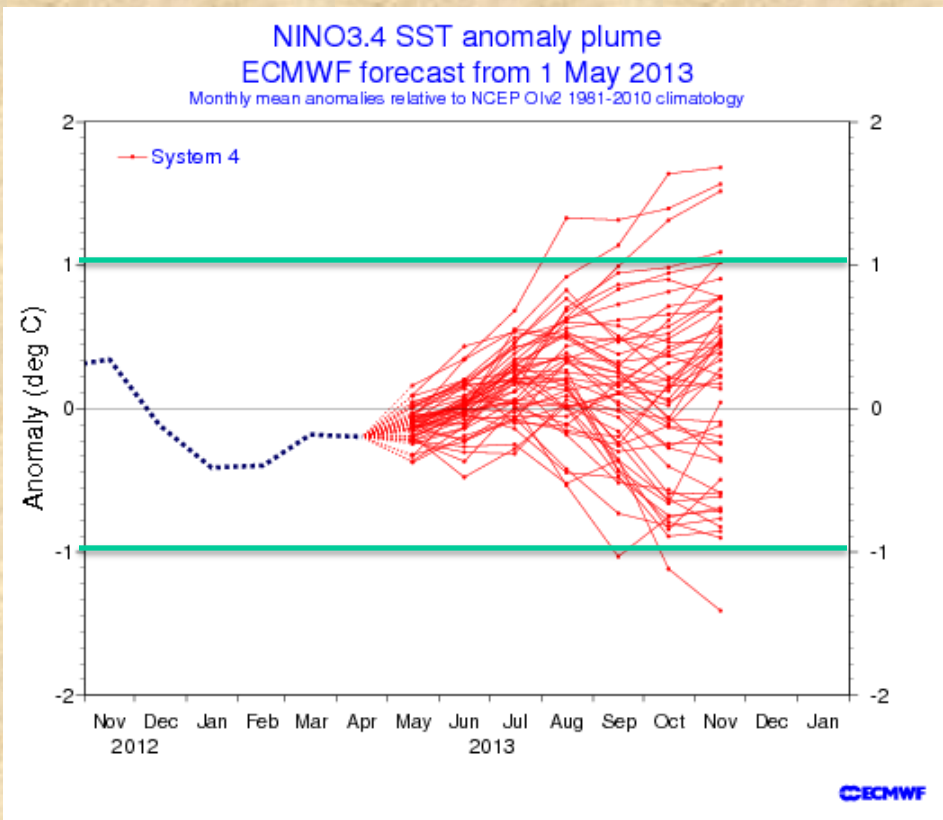
Last five years have seen two 'double-dip' Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in 2012, and a return to ENSO-neutral conditions as of last fall – highly unusual behavior, but not completely unprecedented (for instance in 1953).

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



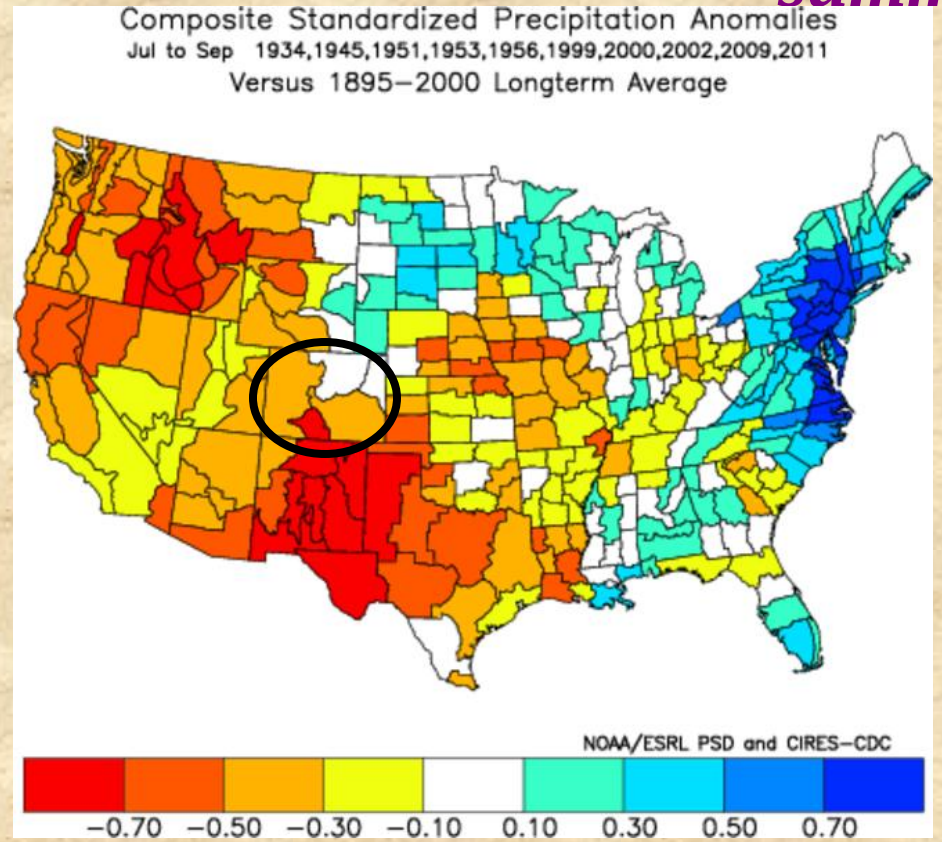
The ECMWF April 2013 forecast (left) showed a drift from neutral conditions towards a weak El Niño by mid-2013. However, there were 'dissenting' ensemble members that favored weak La Niña conditions by early fall.

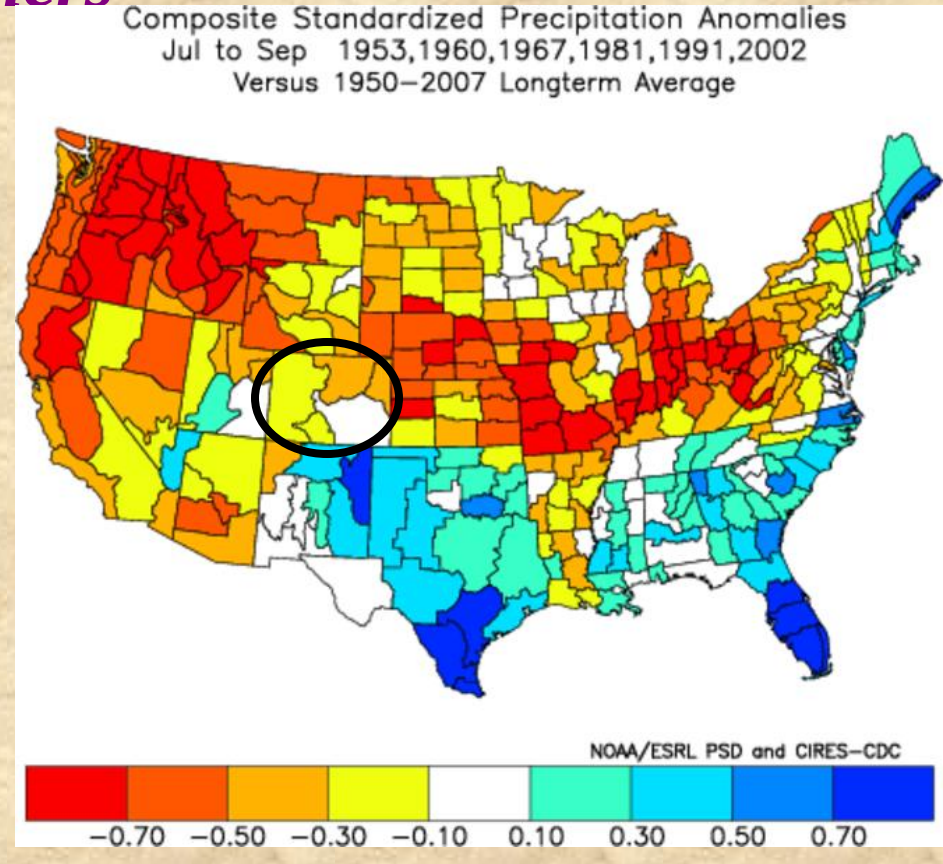
The IRI plume (not yet public) has the majority of dynamical models near-neutral or twice borderline El Niño, while 6 out of 8 statistical models favor weak La Niña!



The ECMWF May 2013 forecast (right) is similar to the above forecast, with fewer ensemble members reaching moderate El Niño status (+1° C) than last month, and average values more than 0.3C lower than before. ***My own MEI forecast shows a clear preference for La Niña by the end of 2013.***

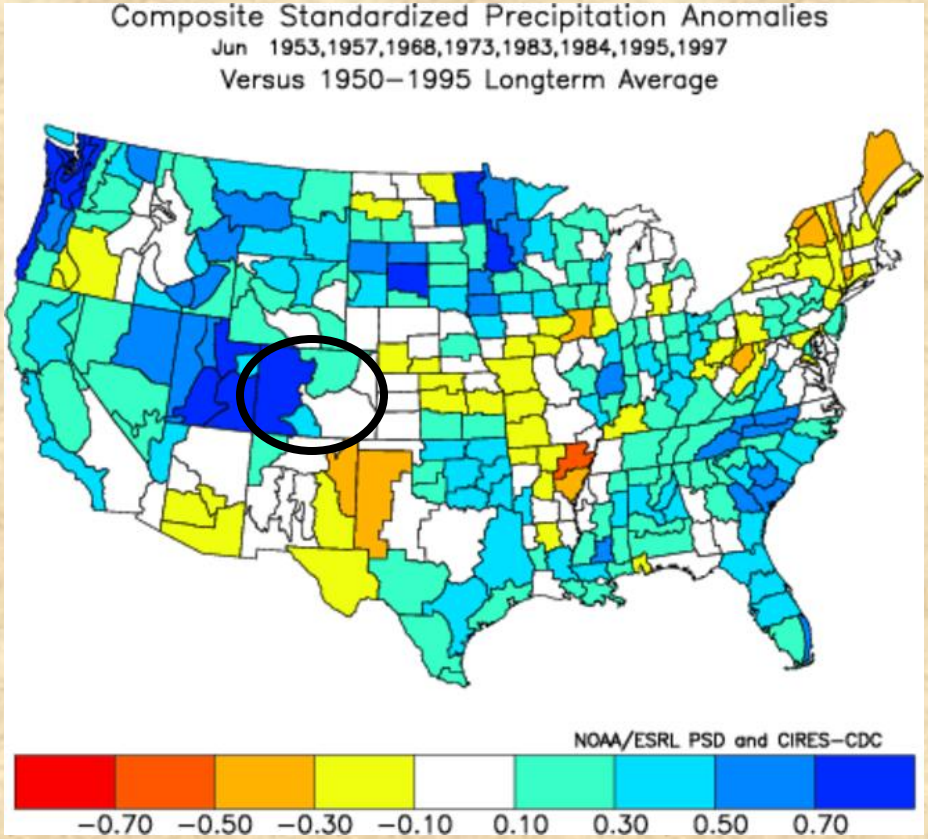
Post-low PDO-AMO and post-neutral ENSO summers

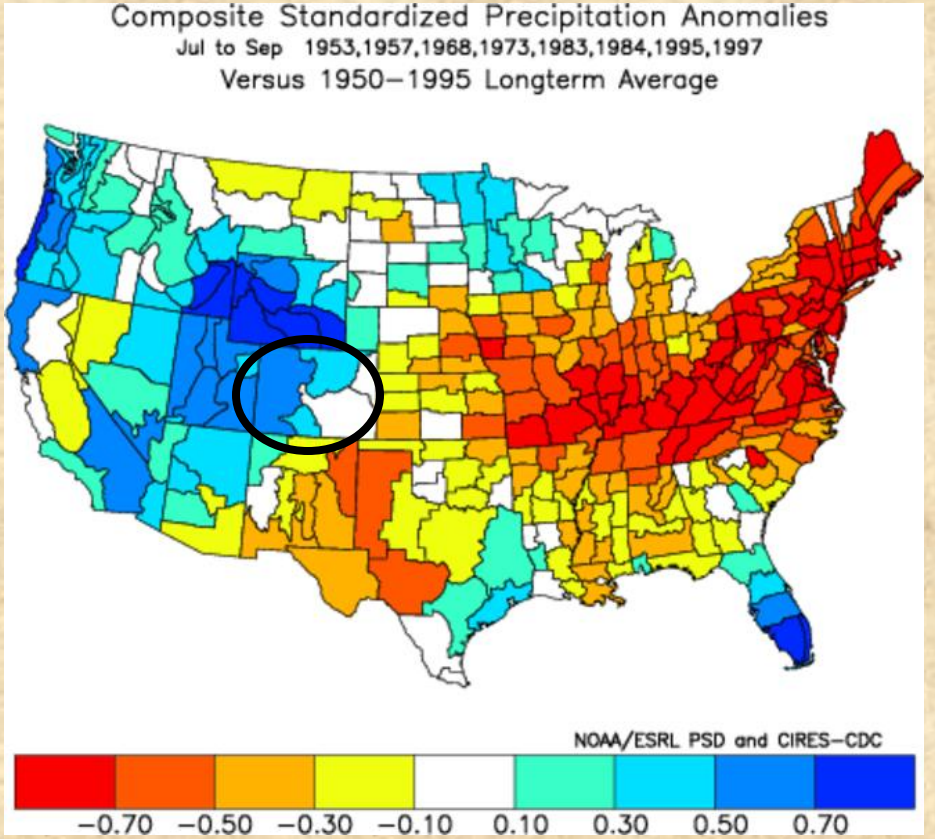




Using the same set of 10 years based on last summer's low <PDO-AMO> conditions, late summer (Jul-Sep; left), precipitation odds remain unfavorable over much of our state. ENSO-neutral patterns in the fall and early winter have often 'produced' dry summers in our state (right), especially over the northeastern plains.

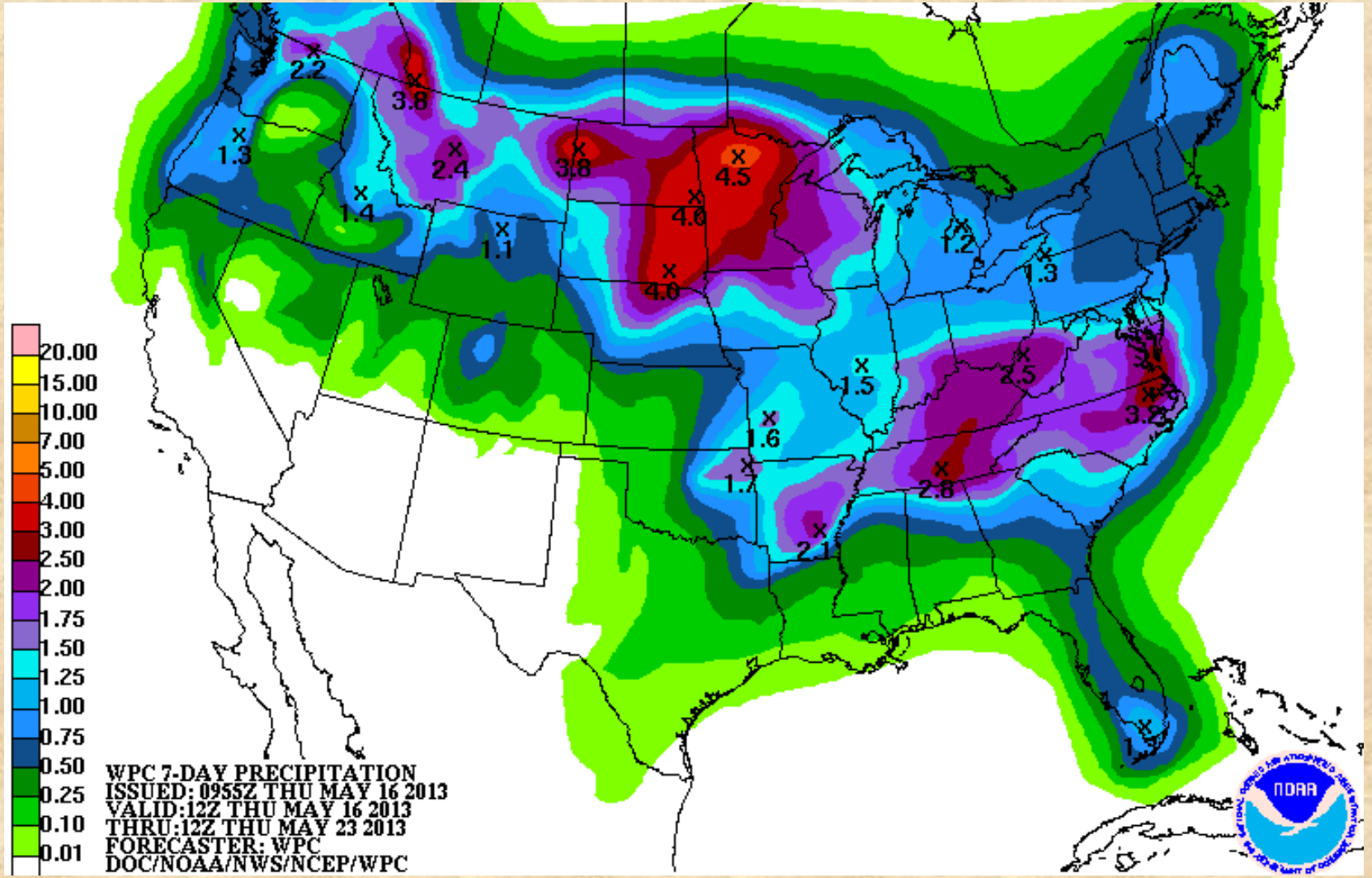
Post-cold April summer





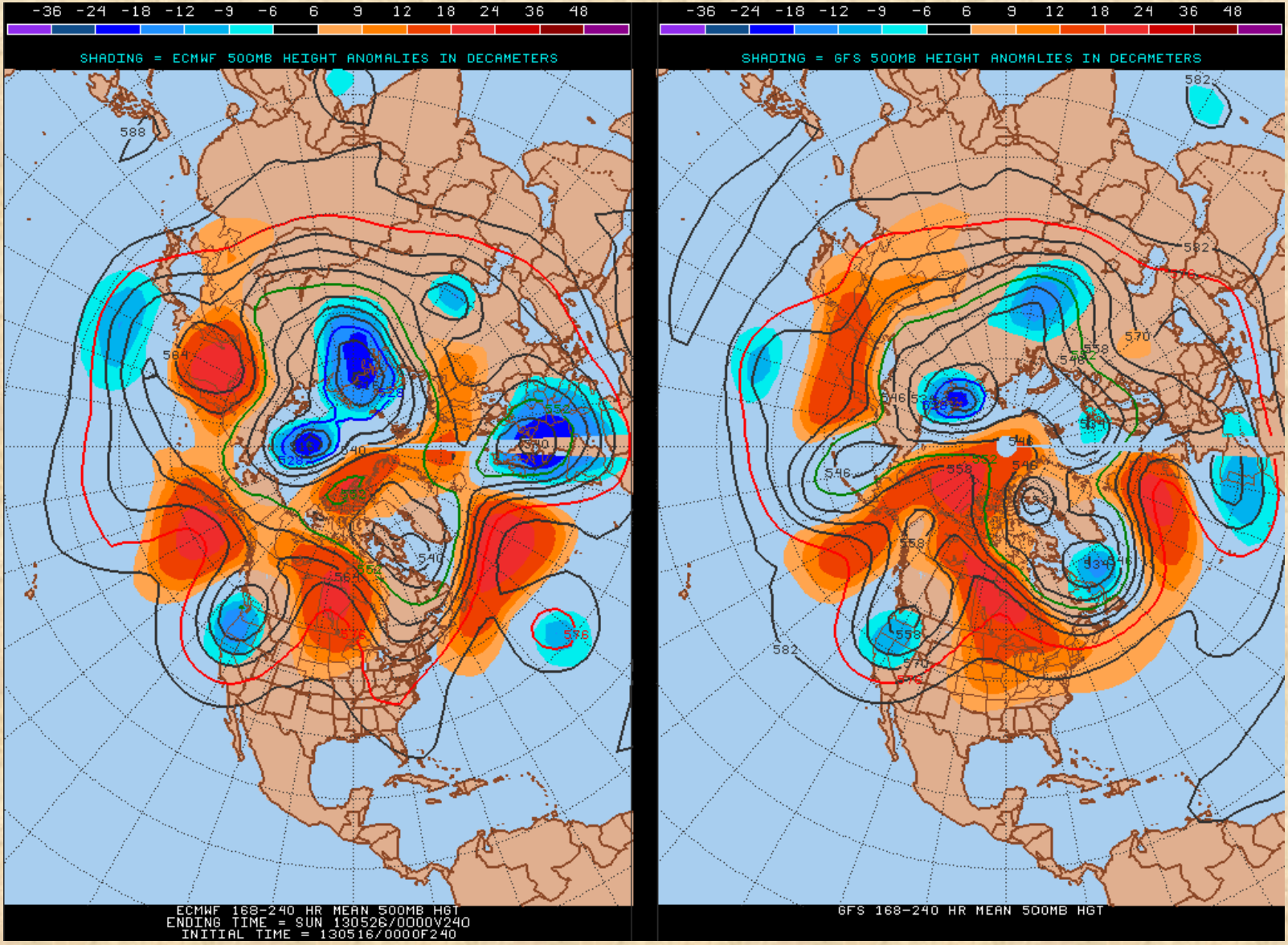
(Not only) Denver posted one of its coldest Aprils on record – similar April anomalies were recorded in 8 cases since 1950, often in the wake (73, 83, 95), or at the beginning of El Niño events (53, 57, 97). With that 'grain of salt' in mind, summers have often been leaning towards the wet side in CO, especially on the west slope. This is in stark contrast to the composites shown one slide ago!

What can we expect in the next seven days?



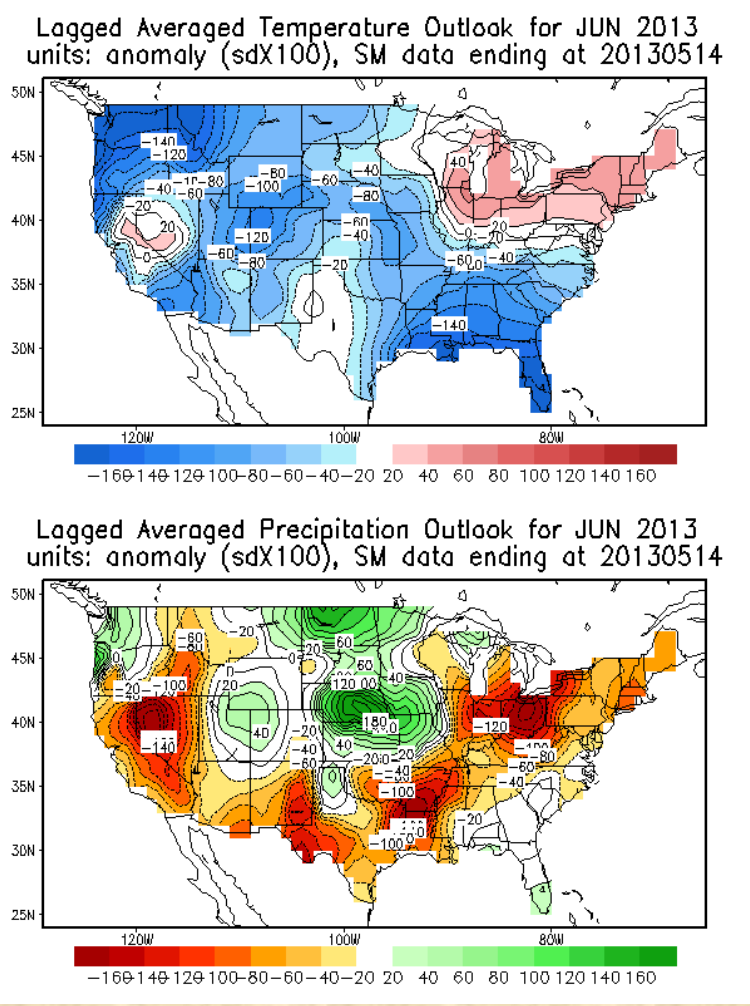
Expected total precipitation, according to the Hydrological Prediction Center (NOAA): Stormtrack has shifted northward, leaving CO drier than most weeks this spring, with the northwestern part of the state being the only region close to 'normal'.

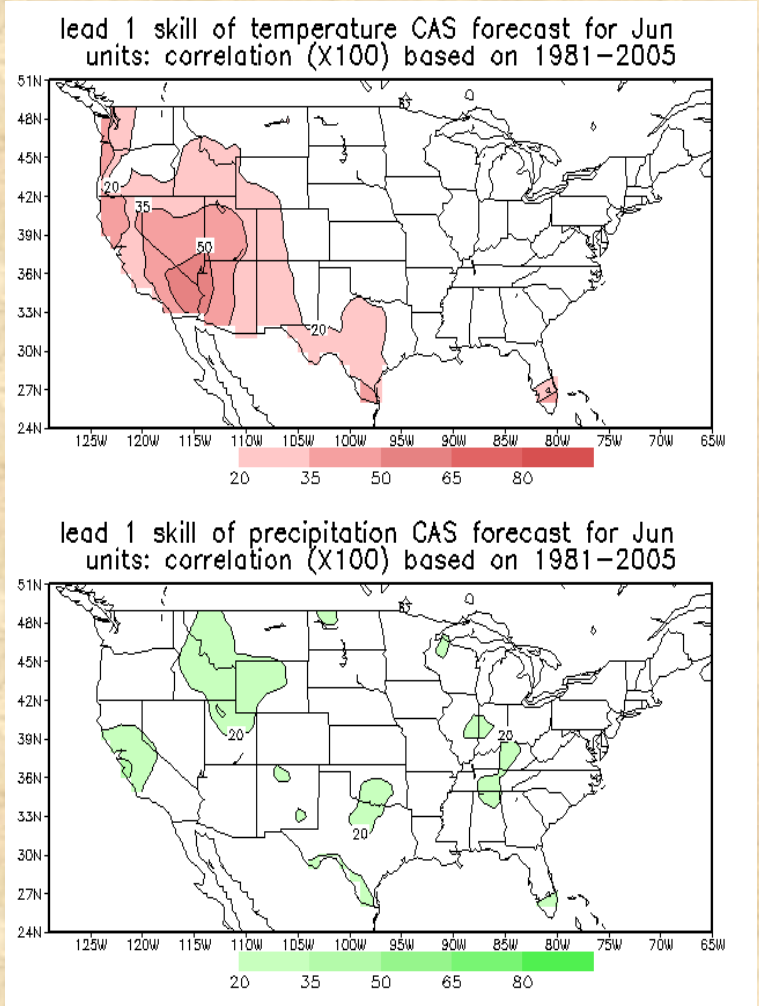
What can we expect next weekend?



European & U.S. models show West Coast trough for the average forecast 7-10 days out: CO sits in transition zone between cool&unsettled and warm&dry...

Climate Prediction Center 'Analog' Forecasts

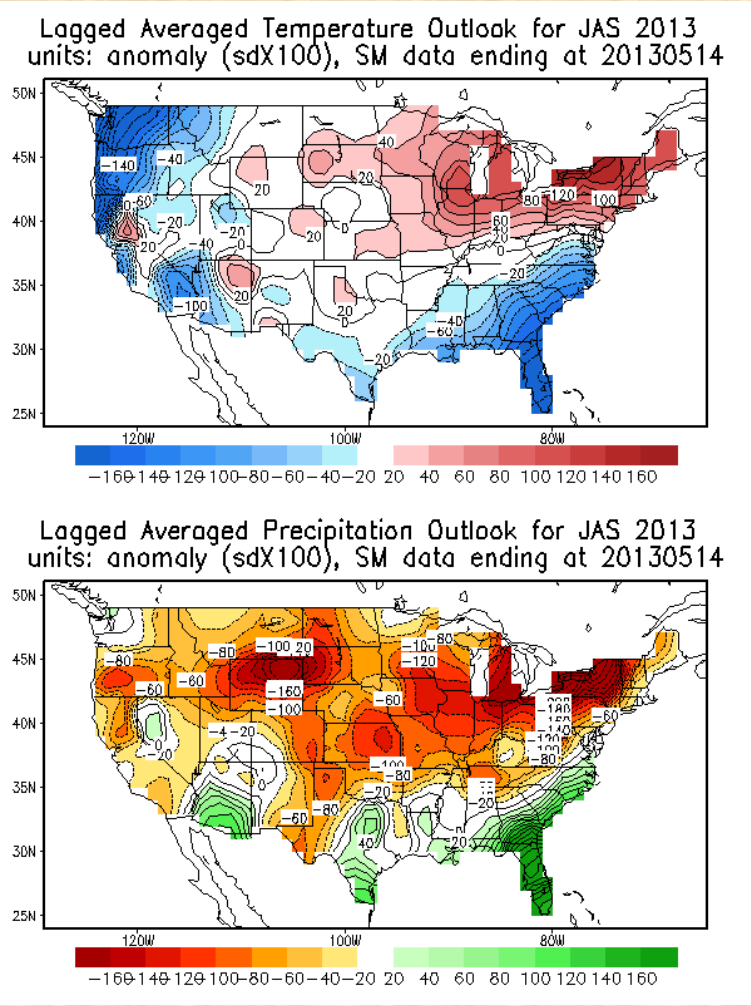


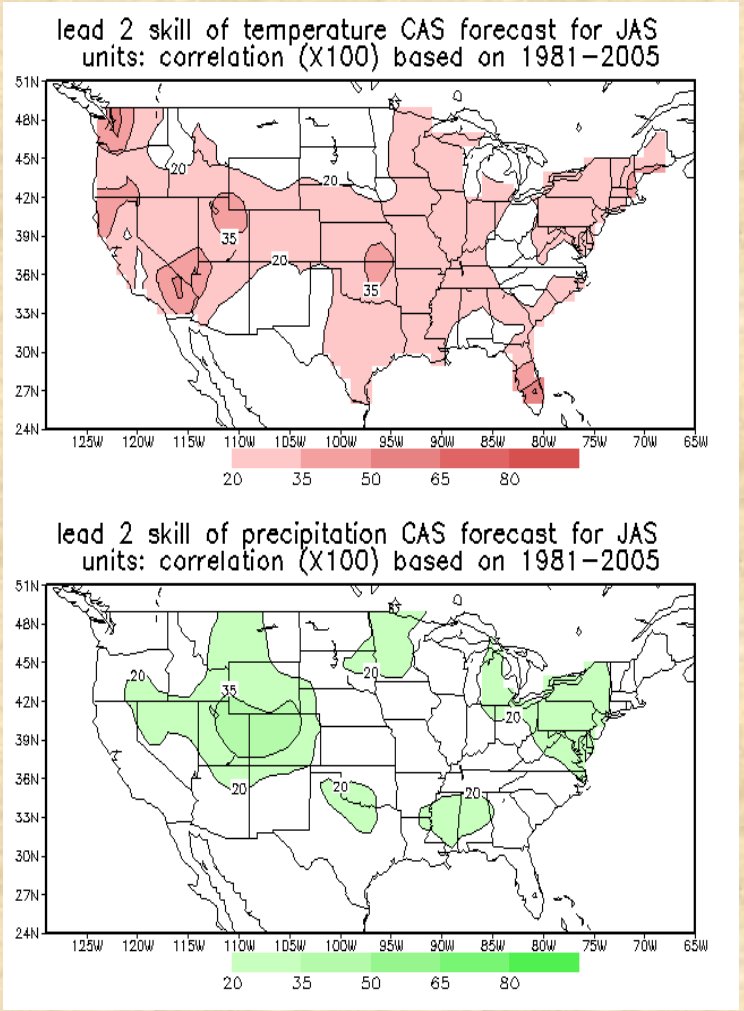


According to the soil-moisture analog forecast, Colorado is not facing an immediate return of drought conditions next month (left). However, skill at this lead-time (right) is amazingly low, showing how unpredictable June remains.

Source: ***http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml***

Climate Prediction Center 'Analog' Forecasts

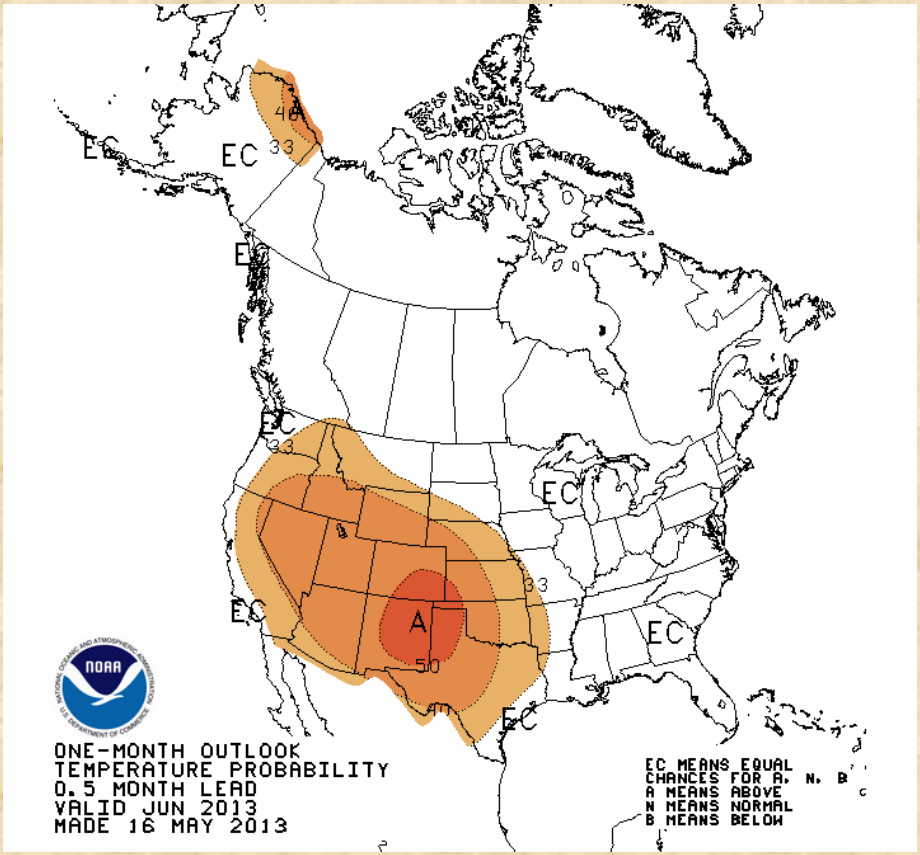


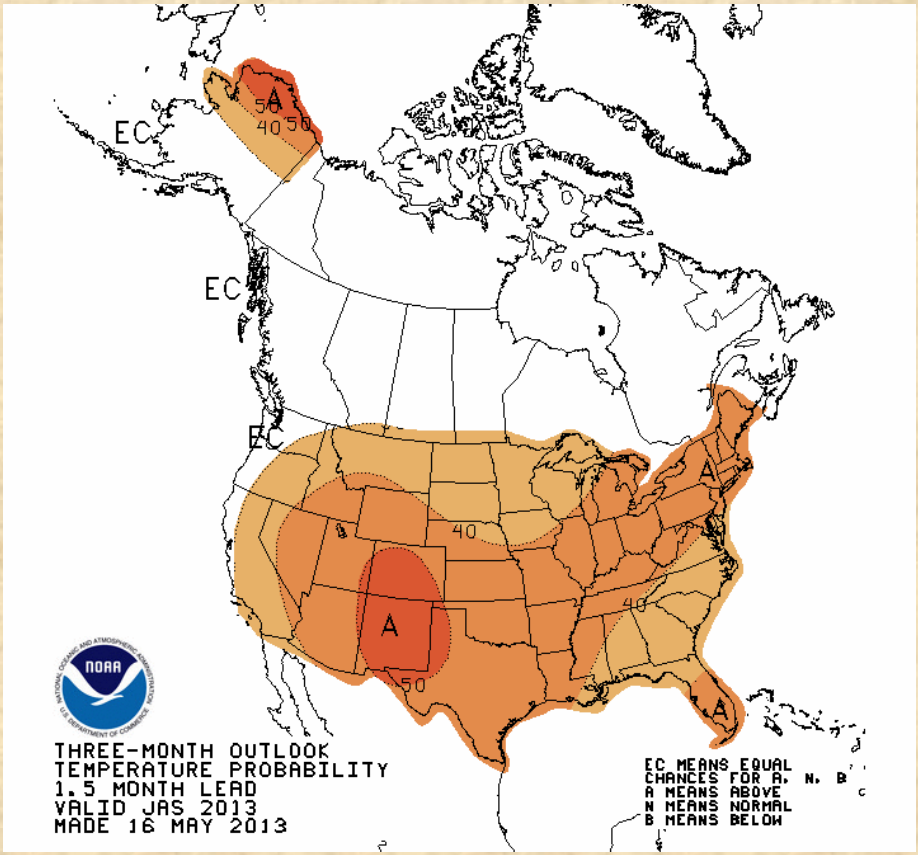


According to the soil-moisture analog forecast, eastern CO has the highest odds for returning to drought conditions this summer (left). Skill at this lead-time (right) is much better than for June, in this case unfortunately.

Source: ***http://www.cpc.ncep.noaa.gov/soilmst/cas.shtml***

Climate Prediction Center Temperature Forecasts

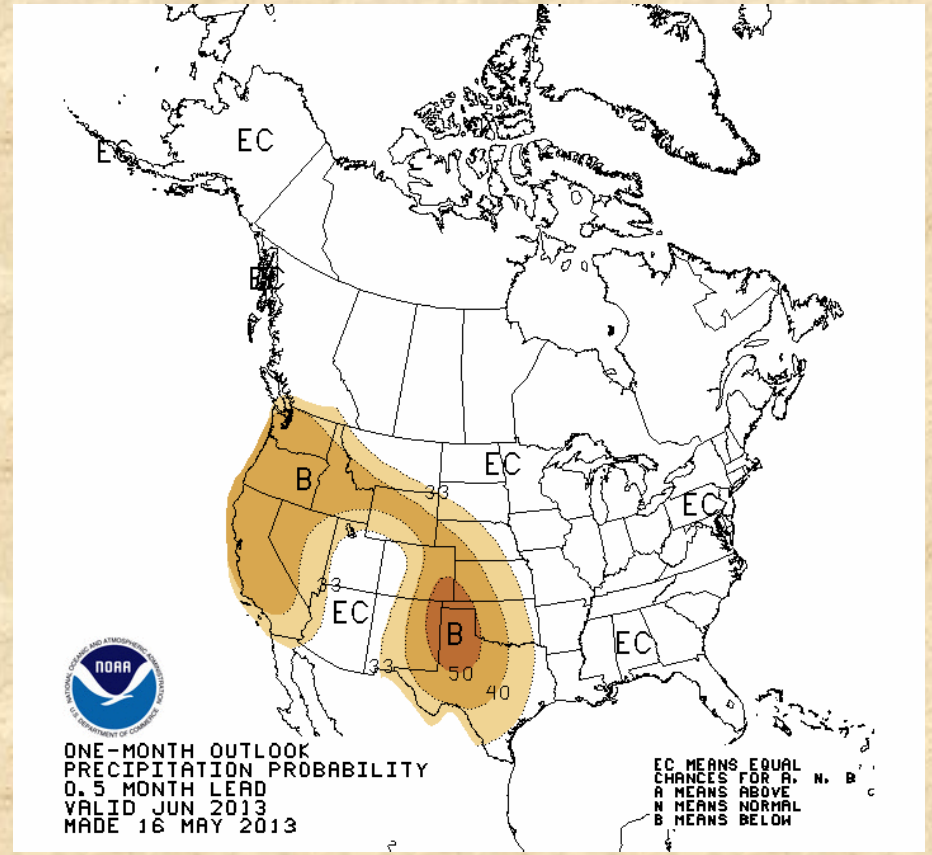


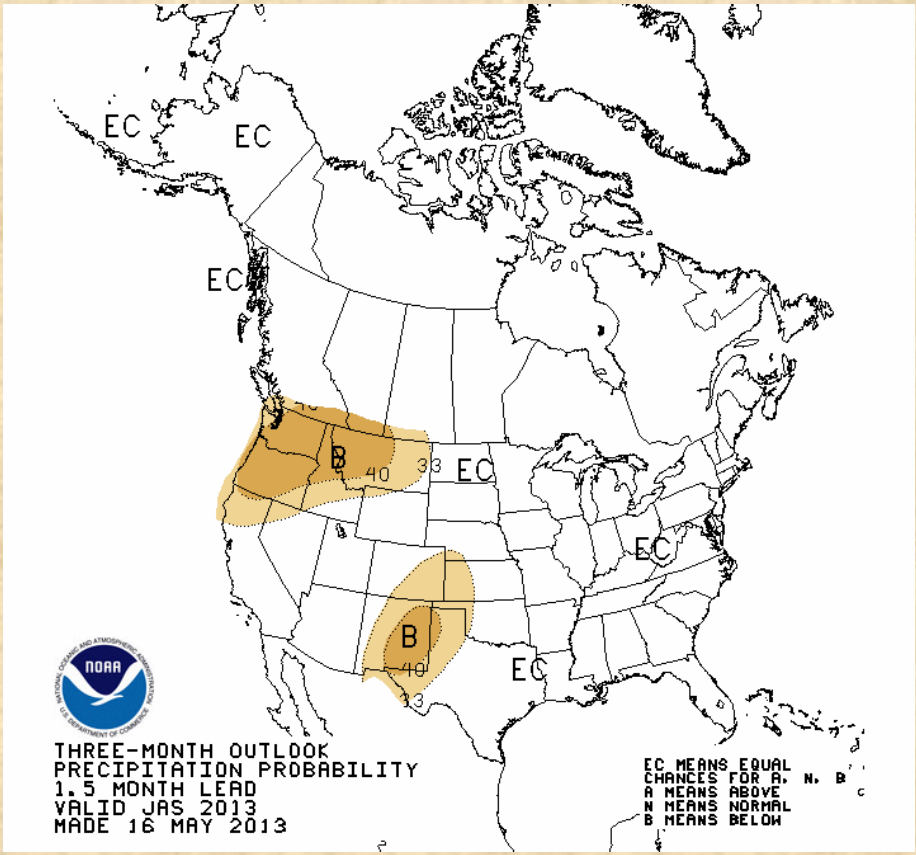


CPC's temperature forecasts for June (left) and July-September (right) flood almost all of the Western U.S. with above-normal temperatures, consistent with recent trends, and coupled-model forecasts. ENSO-neutral conditions were considered, but did not tilt the odds one way or the other.

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

Climate Prediction Center Precipitation Forecasts

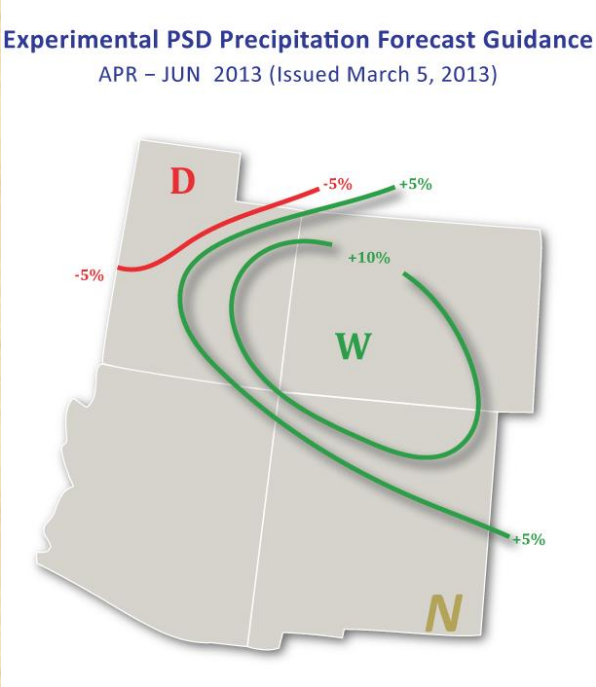


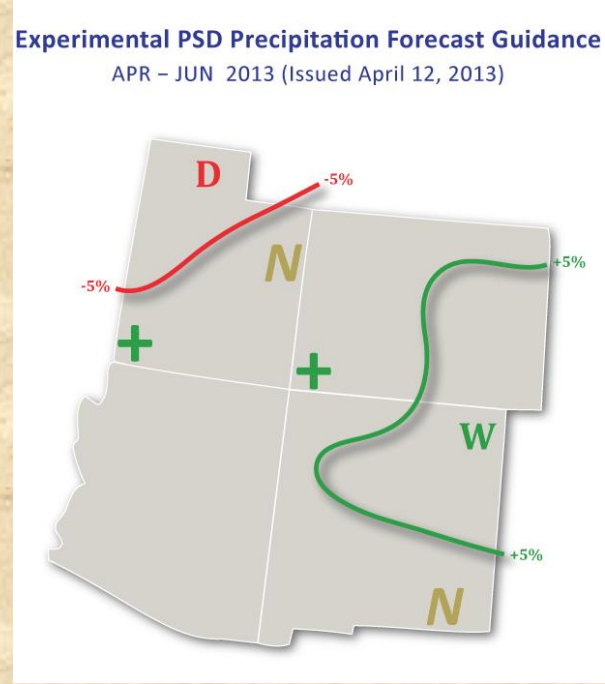


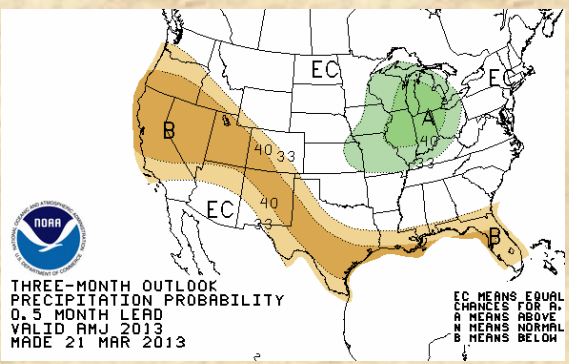
CPC's precipitation forecasts for June (left) and July-September (right) focus a dry forecast on eastern New Mexico, and into eastern Colorado. ENSO-neutral conditions were considered, but did not tilt the odds one way or the other. Disclosure: the July-September forecast was not independent of mine.

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

Statistical Forecast for April-June 2013

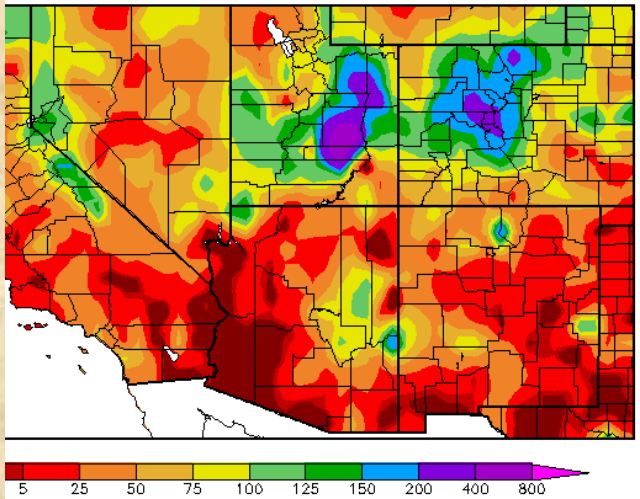




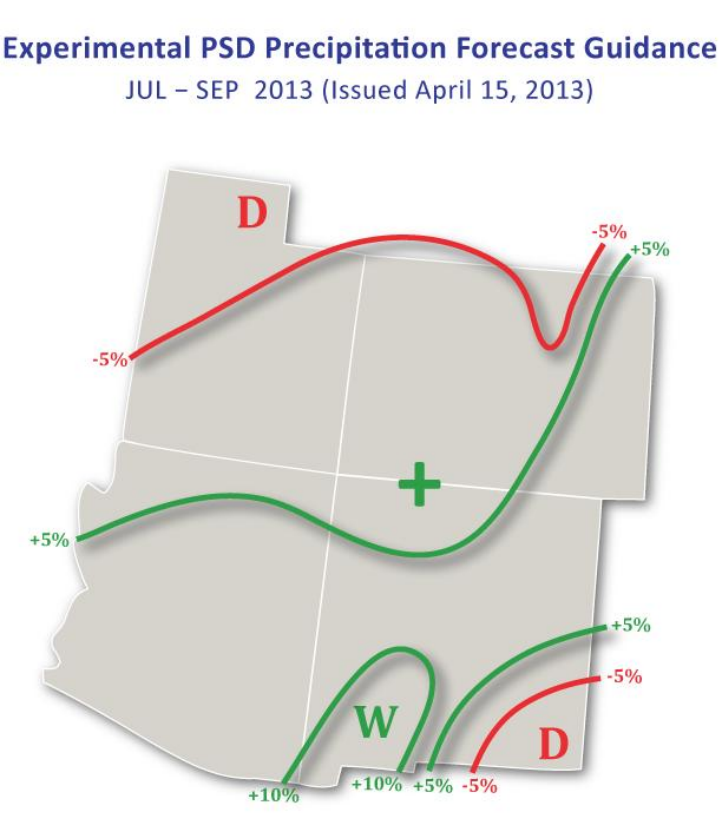


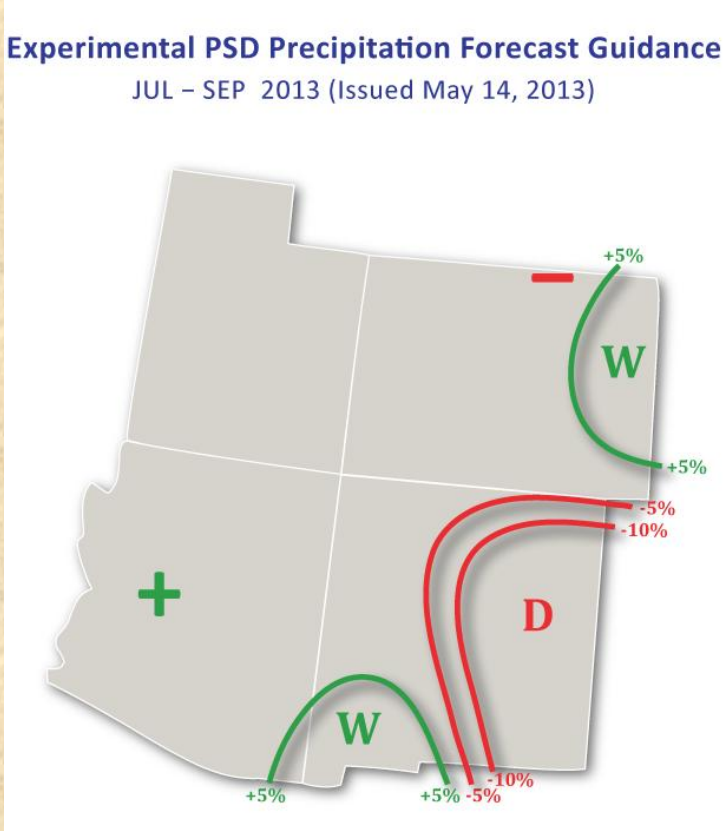
My March forecast for April-June 2013 (left) was confident that most of CO would see above-normal moisture, especially towards the Four Corners region. This is in stark contrast to 2012, and was backed up by operational skill over the last decade (not shown). Last month's update (right) reduced the tilt in the wet forecast regions and moved their center of gravity to the east. So far, the observed precipitation (bottom right) confirms the original forecast more than the updated map. ***CPC predicted a dry spring for southwestern CO (top right).***

Percent of Normal Precipitation (%)
4/1/2013 – 5/14/2013



Statistical Forecast for July-September 2013





The April forecast for July-September 2013 (left) was fairly confident that the monsoon axis would be shifted eastward, from NM into eastern CO. The updated forecast (right) reduces tilts in the odds pretty much across the board, except for increased dry probabilities in eastern NM. Not good for them, but not exactly wet for us. If La Niña were to emerge this summer, it would tilt the odds more towards wet from AZ into the mountains of northern CO, but more towards drought for the eastern plains of CO.

Executive Summary (16 May 2013)

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- **While El Niño/La Niña can provide decent guidance for climate outlooks around here, this is less true for ENSO-neutral situations. A cold NE Pacific combined with a warm North Atlantic stacked the deck towards dry conditions in the southwestern U.S. in the current water year, similar to other cases in this regime.**
- **This year's snowpack was handicapped by a dry fall in 2012, confirming the critical role of that season in setting the stage for a 'good' or 'bad' runoff season. However, a snowy spring has almost wiped out this deficit in northern CO. Unfortunately, the storm track appears to have shifted northward for good, denying us a repeat of 1995.**
- **My statistical forecast for late summer (July-September) favors the eastern plains of CO over the rest of the state, with higher skill than last month, but also with no significant tilts either way for most of our state.**
- **The odds for a switch to El Niño this summer are nil. In fact, a switch back to La Niña conditions by late 2013 has become more likely. A 1st year La Niña season is not necessarily dry for Colorado.**
- **Bottomline: Spring has been cool and wet in northern Colorado, making water restrictions much more bearable than last year, and reducing fire danger (in north-central Colorado) to levels much lower than last year's. Given the state of Colorado's reservoirs, a dryish outlook for the next two weeks, and a 'near-normal' monsoon outlook, we will probably have to deal with drought conditions in our state, especially in the south, for much of 2013.**