Earth System Research Laboratory
Physical Sciences Division

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CO WATF,
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Denver

Seasonal Outlook into early 2013

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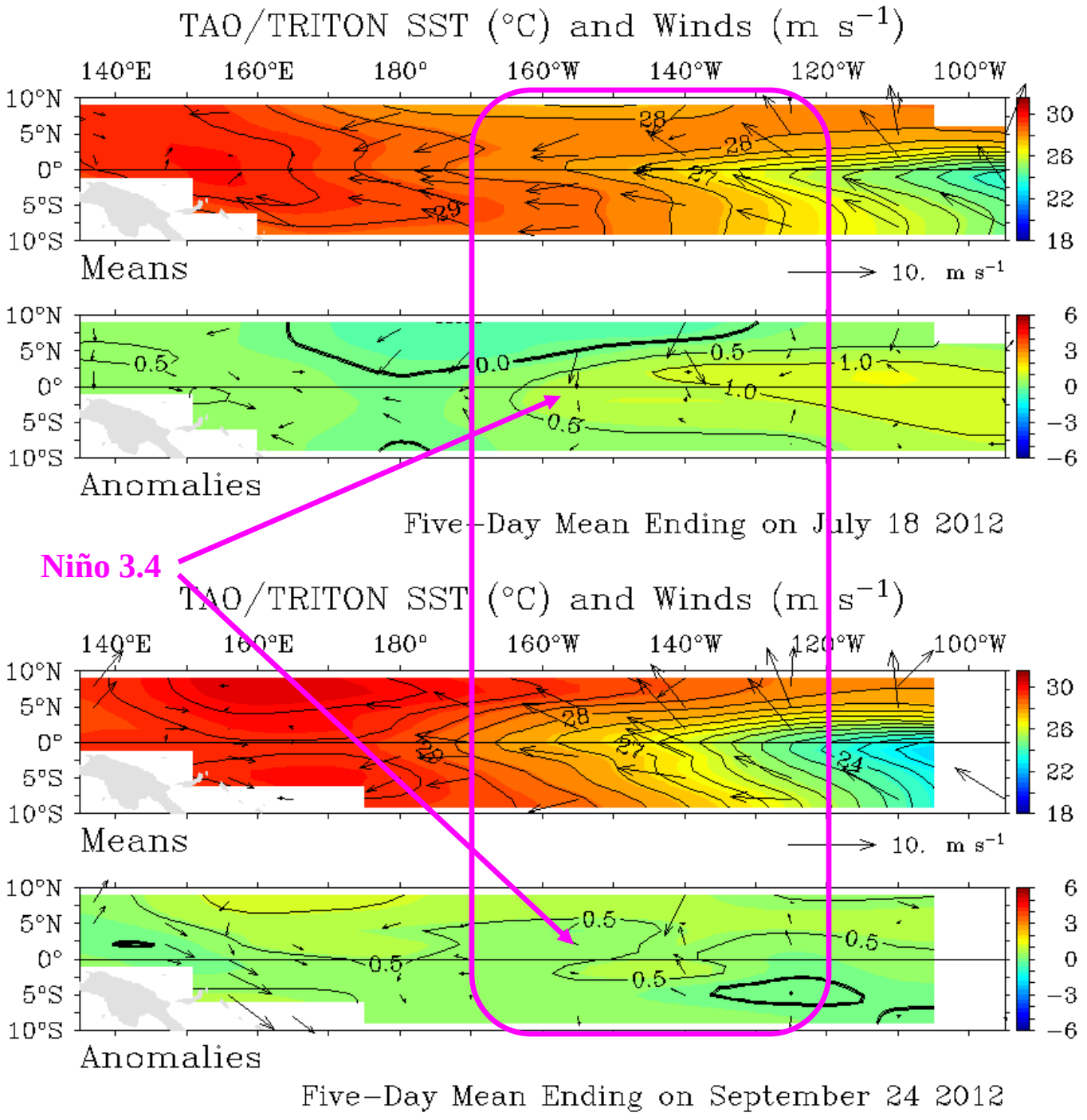
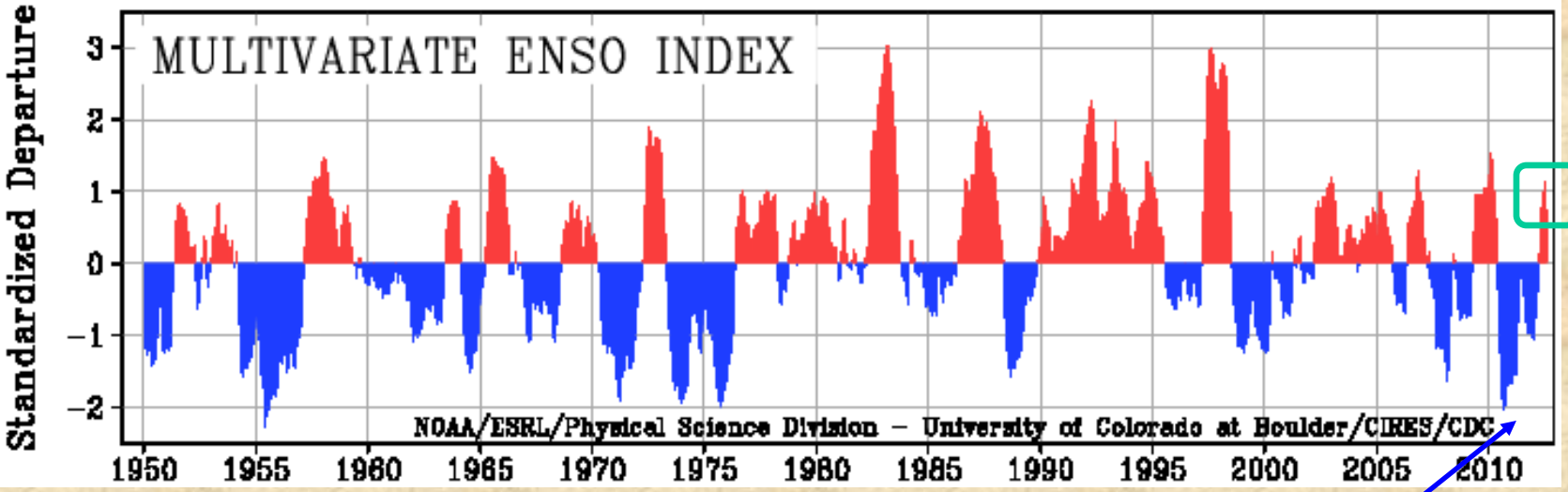
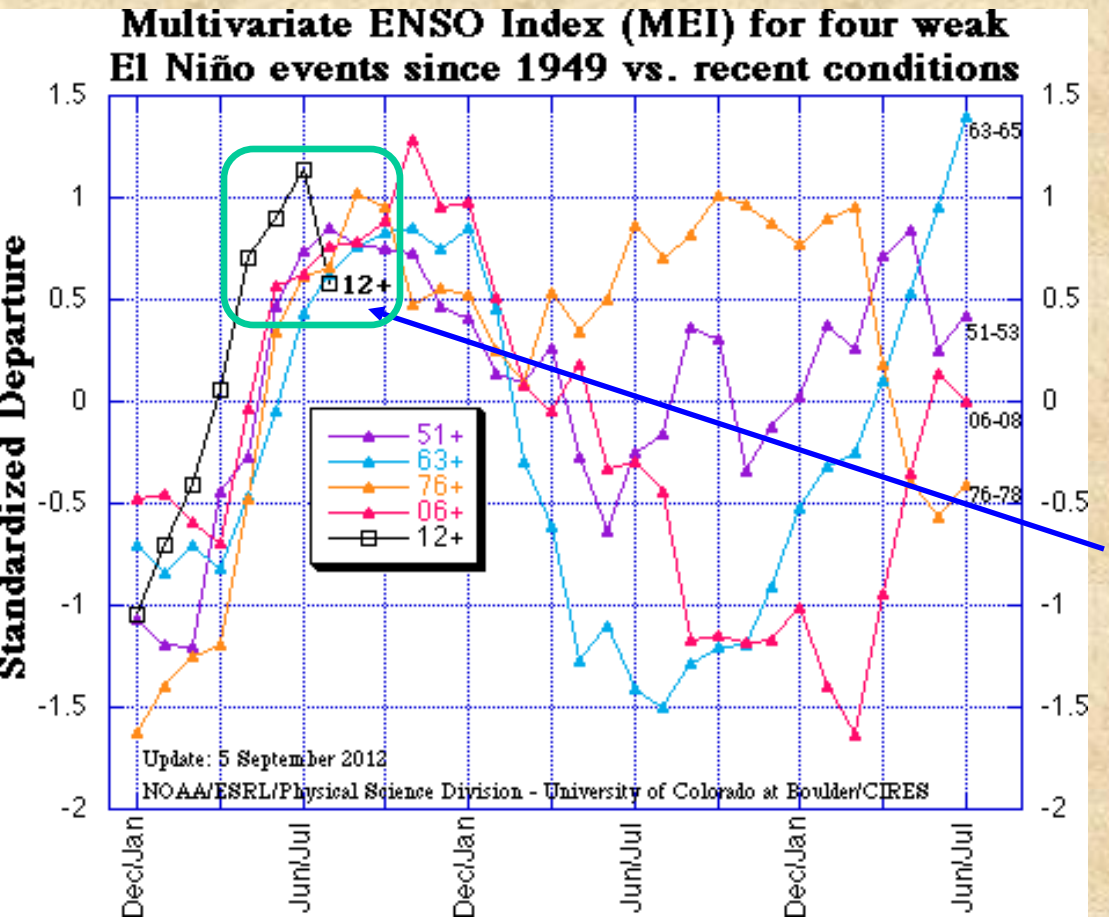
- **Hello El Niño?!**
- **Expectations for the next two weeks**
- **CPC forecasts for Ocotber 2012 through January 2013**
- **Experimental Seasonal Forecast Guidance**
- **Executive Summary**

Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to last time (top): El Niño is not doing so well. Tropical western Pacific wind anomalies are consistent with developing El Niño conditions, but SST anomalies have actually weakened compared to two months ago. *Intra-seasonal activity is too weak to push one way or the other.*

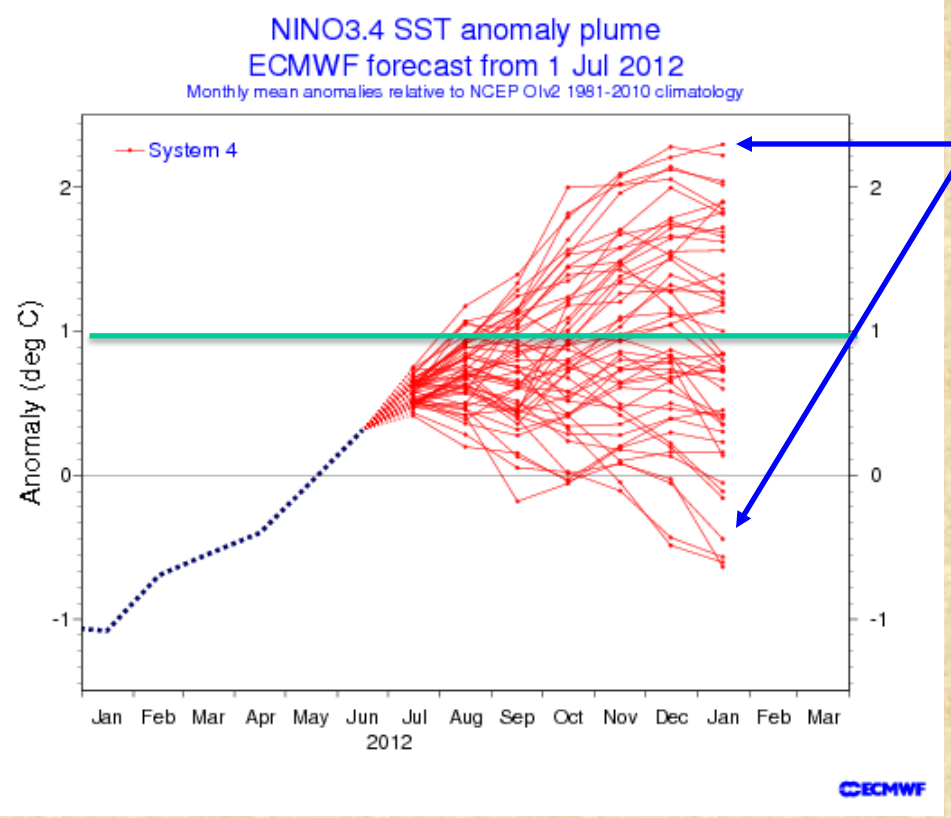






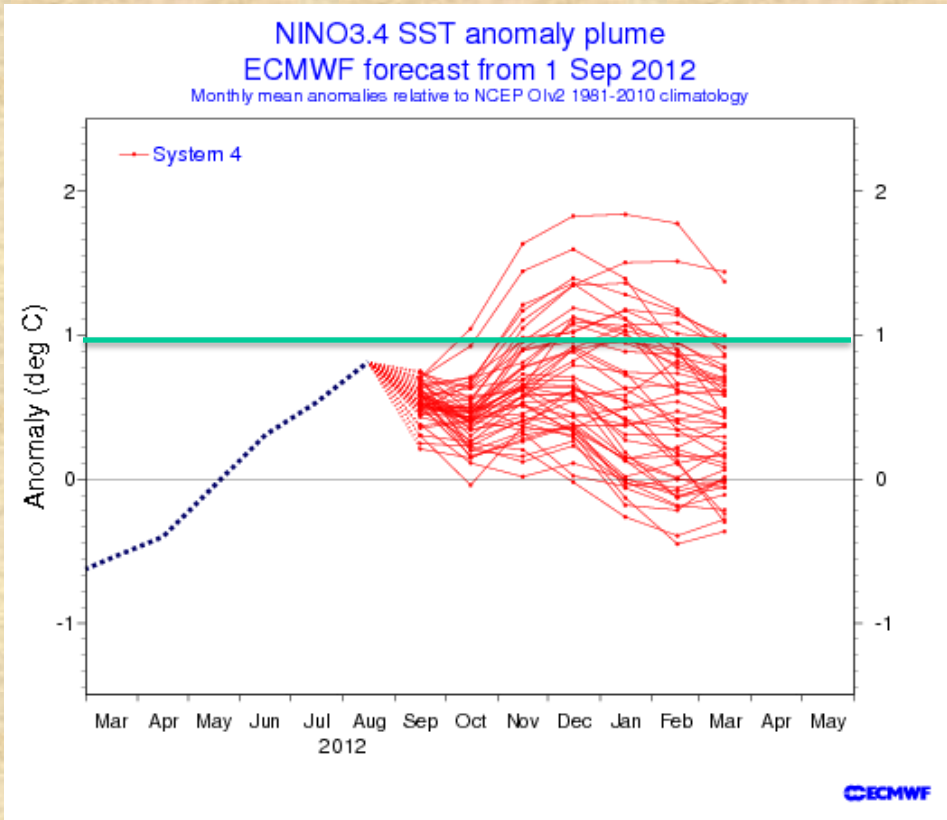
2010-12 La Niña event reached its biggest peak since the mid-70s in late 2010, followed by a brief excursion to ENSO-neutral conditions during mid-2011; it reached a second peak last winter, and is now being followed by a weak El Niño event.

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



The ECMWF July 2012 forecast (left) showed a substantial range – with seven members below 0°C and five members reaching 'Super-*El Niño*-size' of +2°C or by early 2013. The mean outcome (just under +1°C) was a weak El Niño through the remainder of 2012.

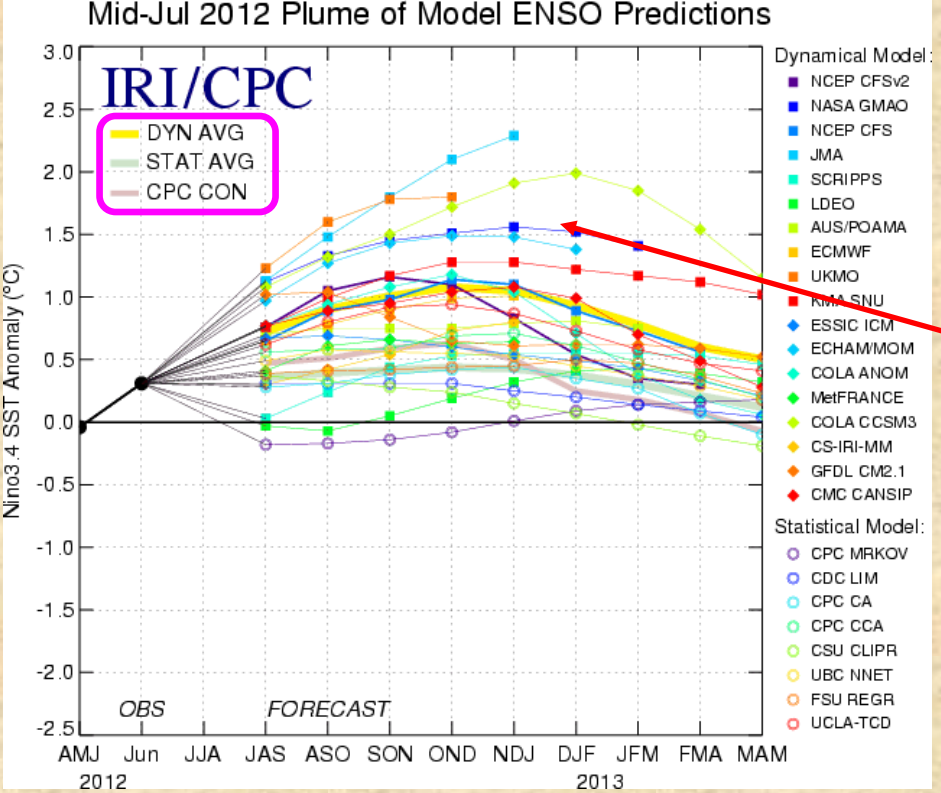
The ECMWF September 2012 forecast (right) shows an *odd* evolution: a weakened El Niño overall, with a peak around the turn of 2012-13, but mostly remaing below 1°C. *Compared to earlier forecasts, this El Niño looks weaker, with no 'Super-El Niño-members'. It also resembles my own MEI forecast from June 2012 (next slide).*



Multivariate ENSO Index forecast *(late June 2012)*

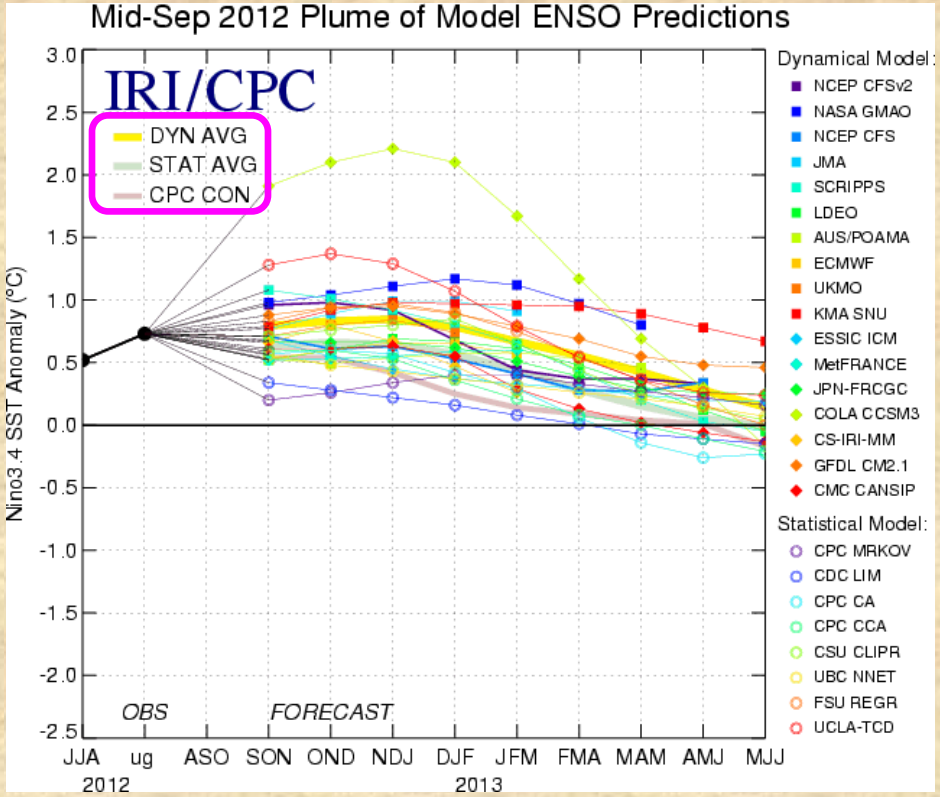
Target Season	P of La Niña / El Niño	Median	Heidke Skill Score
JA'12	10% / 60%	0.73	+47*
SO'12	14% / 43%	0.51	+39*
ND'12	00% / 56%	1.18	+47*
JF'13	08% / 46%	0.41	+22

Compared to my forecasts from April, this one has essentially 'flipped' from the prospect of a 3rd La Niña winter to an El Niño forecast through the next six months. El Niño/La Niña refer to the top/bottom 30% of the historical distribution, with 40% covering ENSO-neutral conditions. Note the weakened El Niño into Sep/Oct 2012, followed by a 2nd peak in Nov/Dec 2012, and a rapid demise in early 2013.

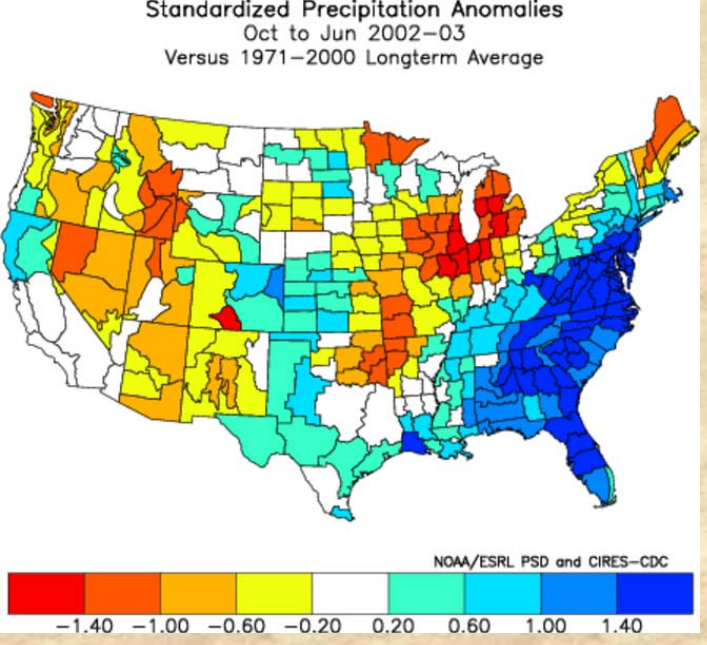


ENSO forecasts from 18dynamical & 8 statistical forecast models from July (left):

Dynamical models (yellow average) showed stronger preference for El Niño than statistical models with about half of the dynamical models reaching the moderate (+1°C) threshold during early winter.

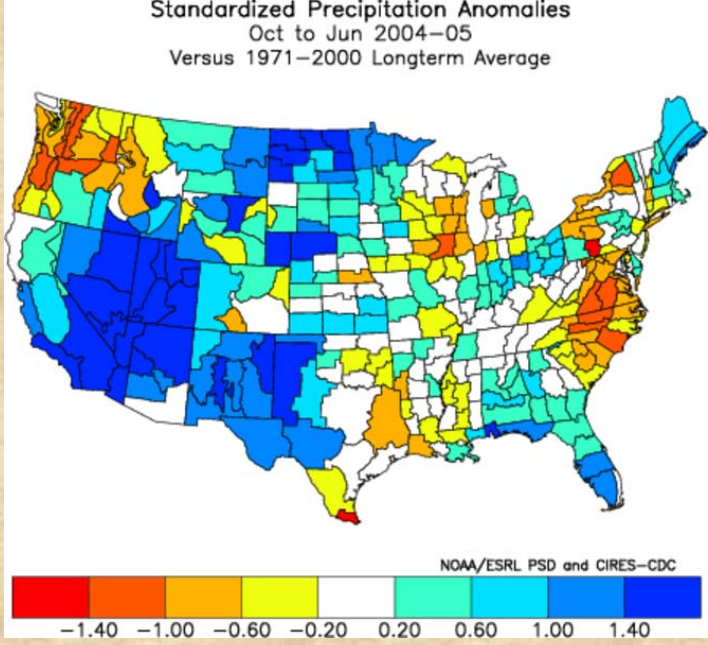


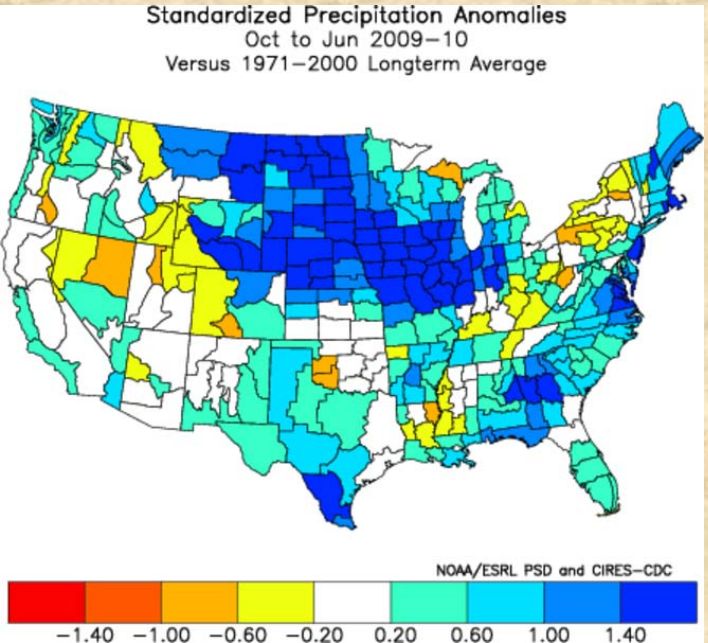
Except for the COLA model, recent <u>dynamical</u> forecasts (right) show a much more subdued El Niño through the end of 2012, with less of a discrepancy between dynamical and statistical models than before (up to 0.3C instead of 0.7C). An early peaking weak El Niño is the most likely outcome. <u>Very questionable whether effects will last beyond winter.</u>



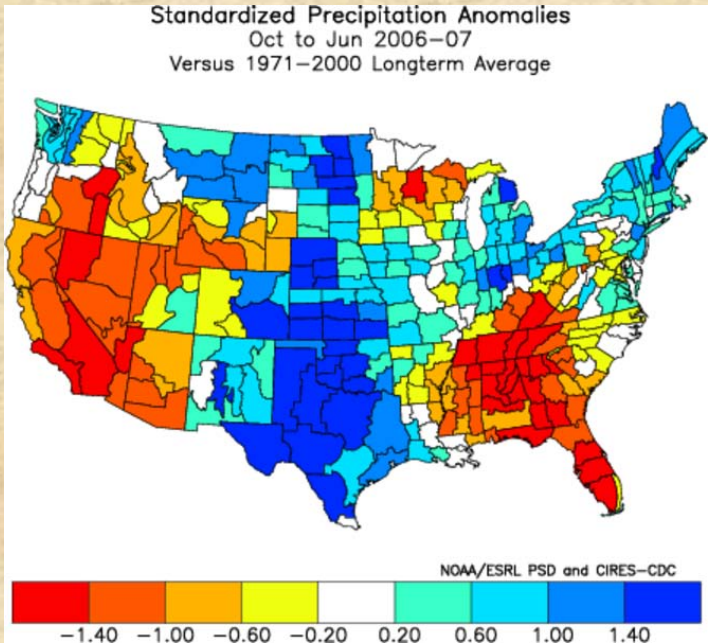
Los Niños since 2002

Last decade had many El Niño events, in 2002-03 (top left), 04-05 (top right), 06-07 (bottom right), and 09-10 (bottom left). Somewhat erratic impacts in the U.S., except for *TX where every single one of them ended up on the wet side* –

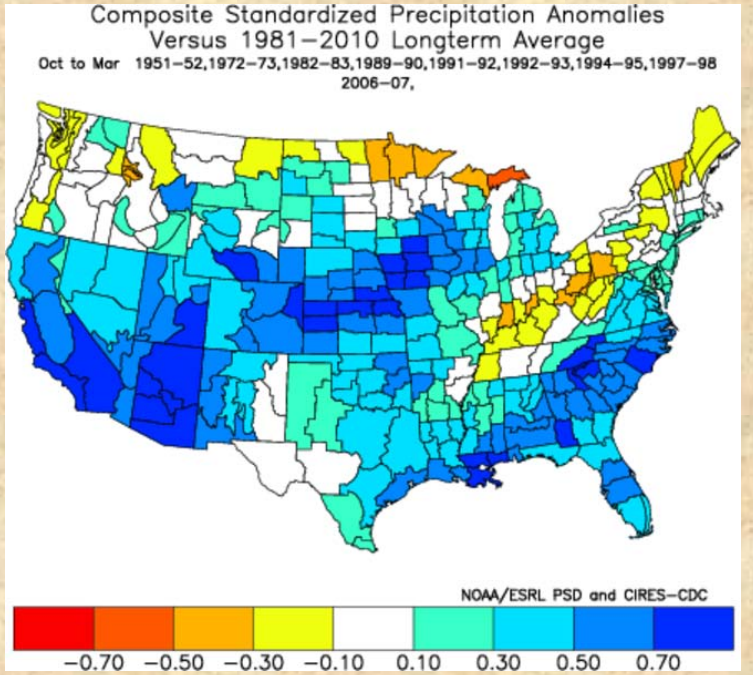


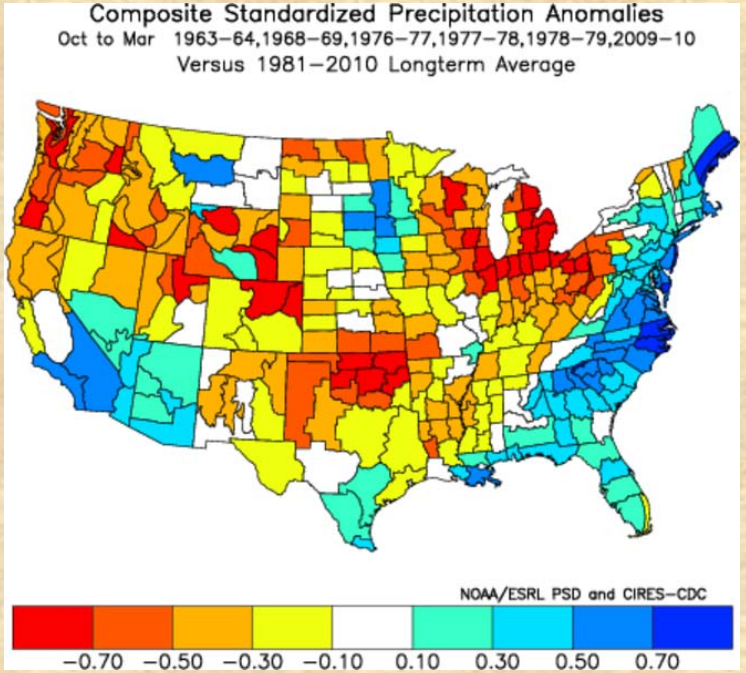


In CO, the eastern plains have the best chances of moisture from October ‘12 to June ‘13, while western CO had 3 of 4 recent cases that ended up on the dry side.



El Niño with positive vs. negative NAO

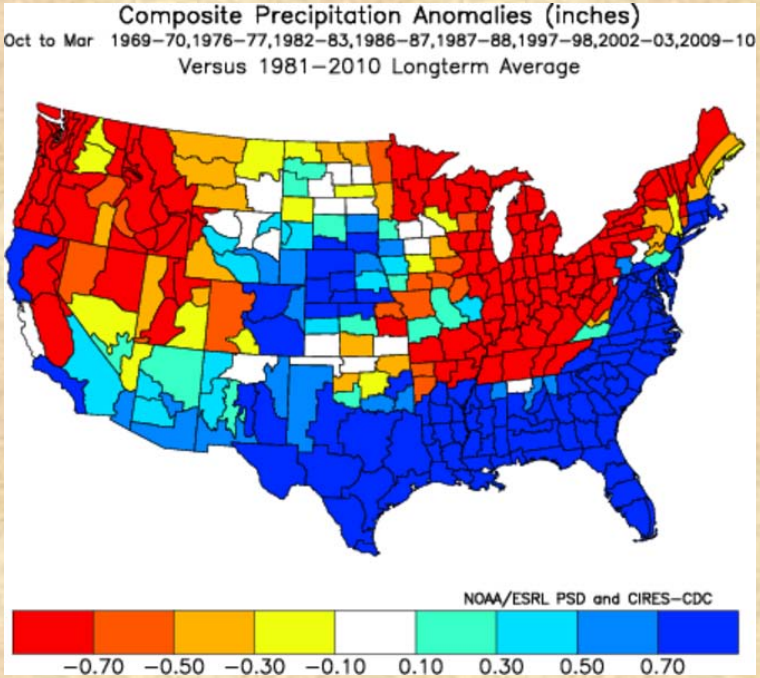


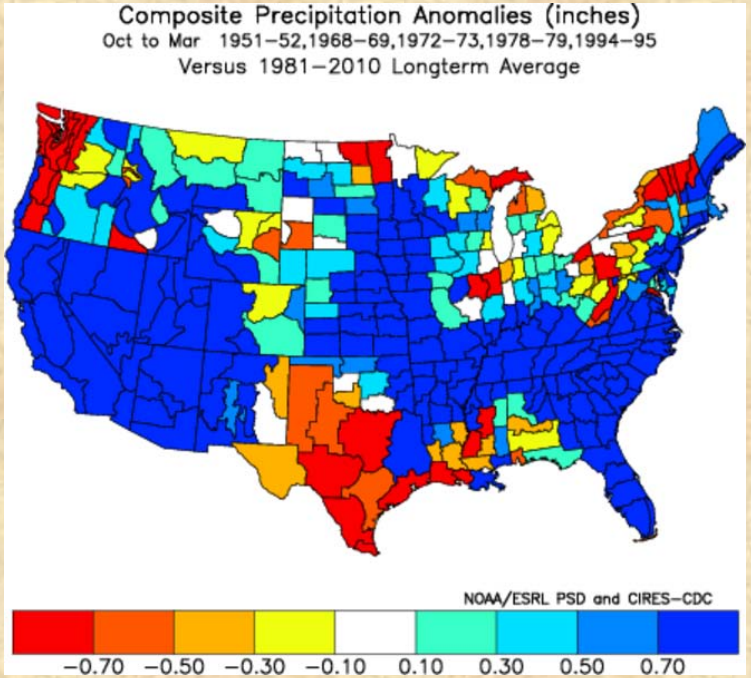


During an El Niño event, the winter half-year (Oct-Mar) tends to be wetter than average when the NAO is positive (left) rather than negative (right), here defined as DJF averages above +0.5 (left) or below -0.5 (right), respectively. This is not just true for Colorado, but much of the central U.S.

At least one precursor of the NAO indicates positive conditions for this winter!

El Niño with positive vs. negative PDO

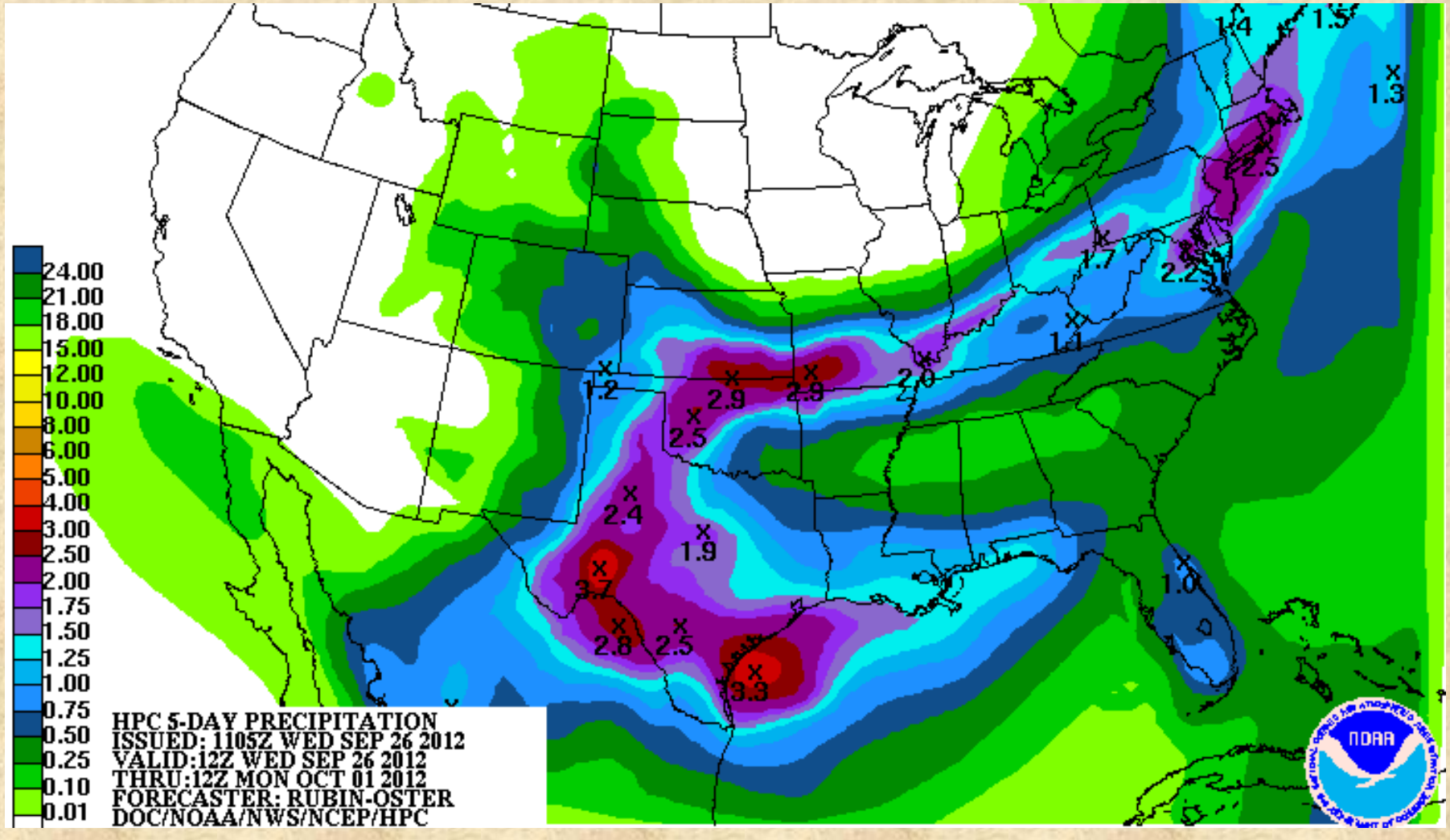




During an El Niño event, the winter half-year (Oct-Mar) tends to be wetter than average over eastern CO when the PDO is positive (left) rather than negative (right), here defined as DJF averages above +0.5 (left) or below -0.5 (right), respectively. If the PDO stays negative, it seems to be more beneficial to the western slope instead (right).

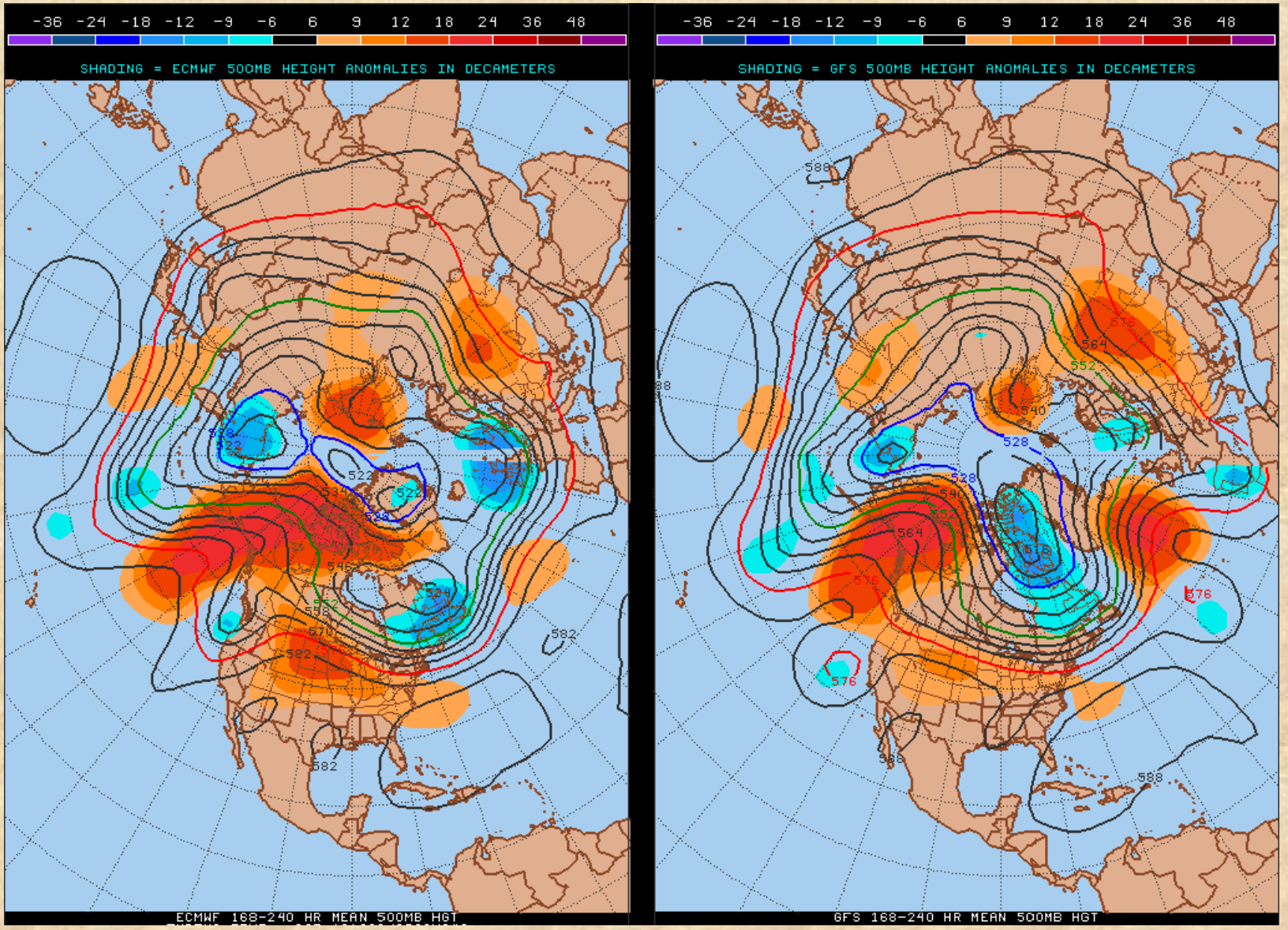
PDO is currently the most negative (-1.93) it has been in 57 Augusts!

What can we expect in the next five days?



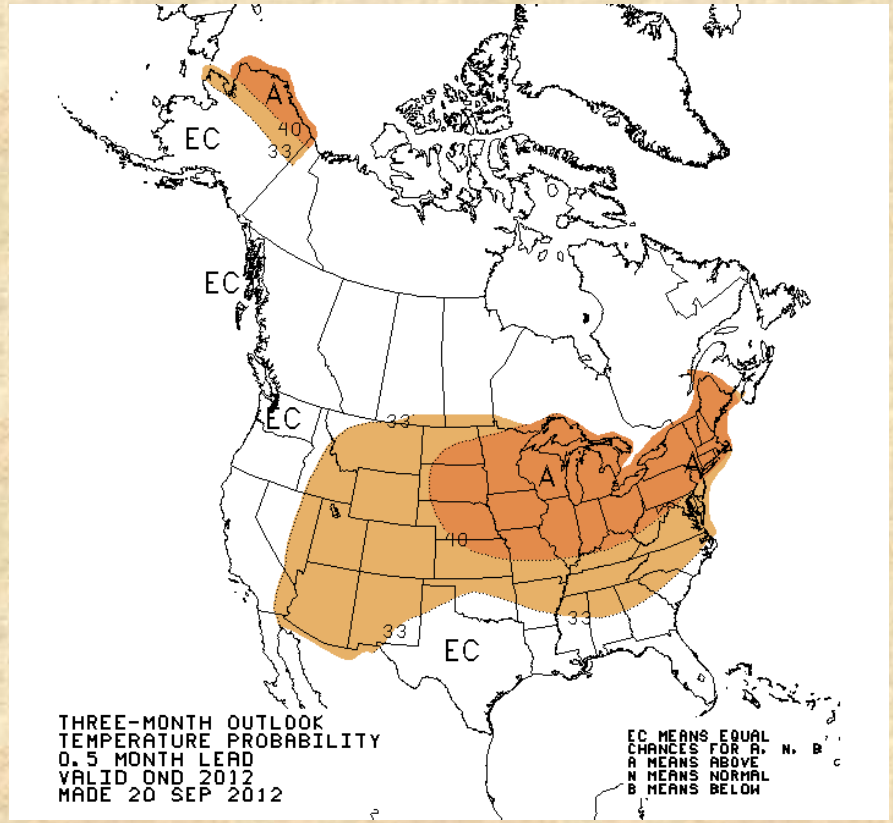
Expected total precipitation thru Monday morning, according to the Hydrological Prediction Center (HPC): Current storm should be winding down, but not before dropping some more moisture on the eastern plains in particular.

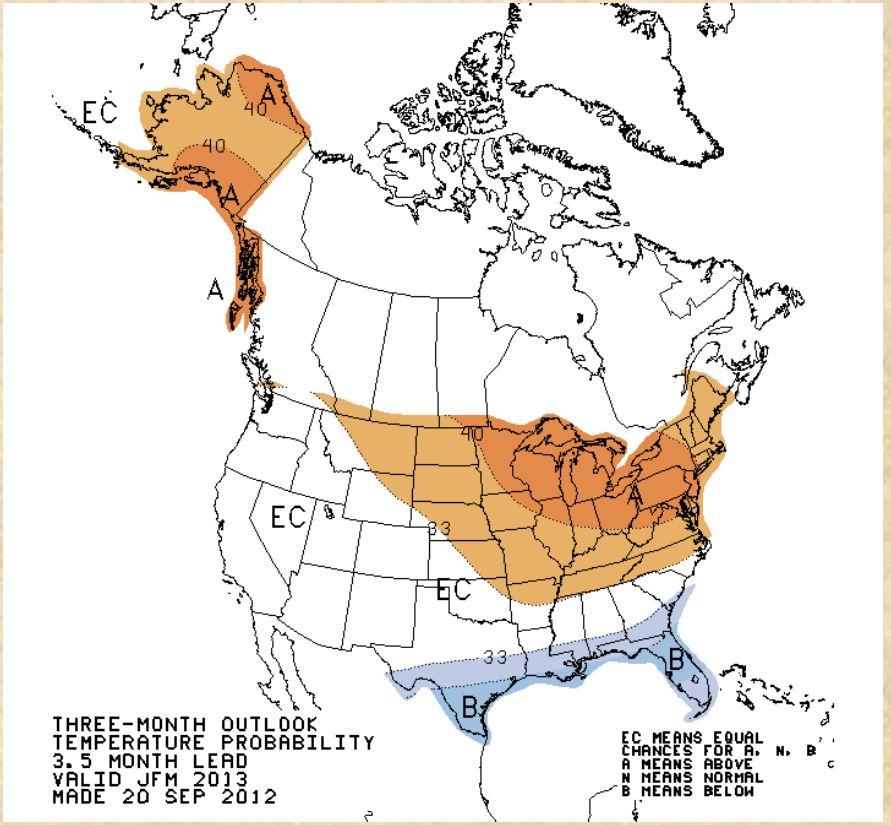
What can we expect at the beginning of October?



Both ECMWF and GFS show a less than favorable flow pattern over Colorado, however, this could lead up to an early wintery pattern beyond 10 days...

Climate Prediction Center Temperature Forecasts

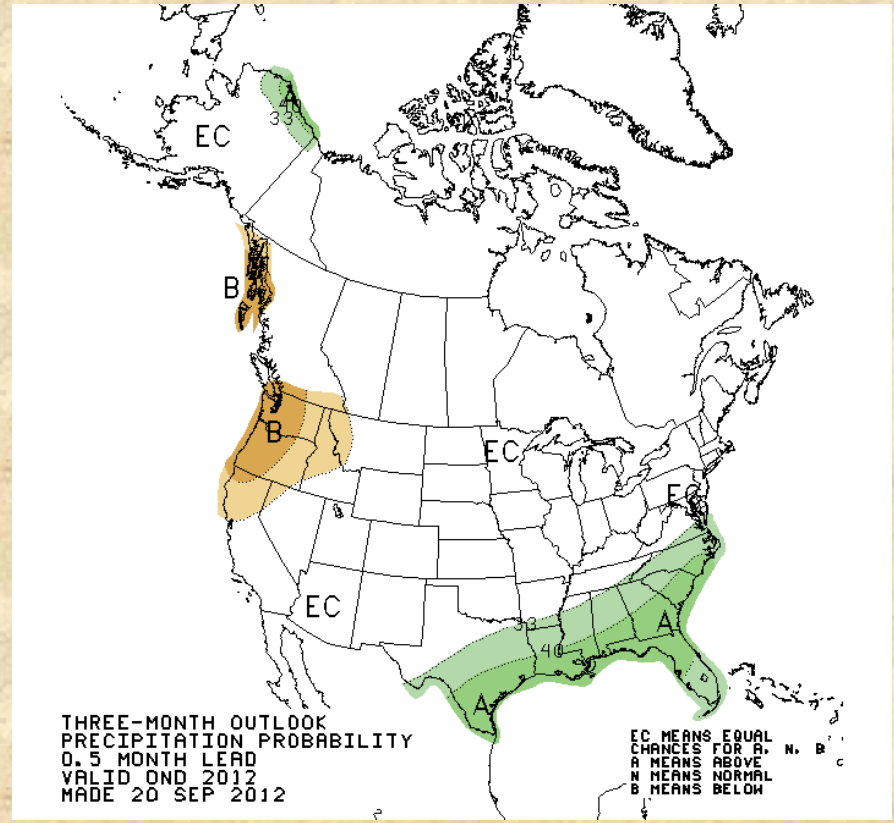


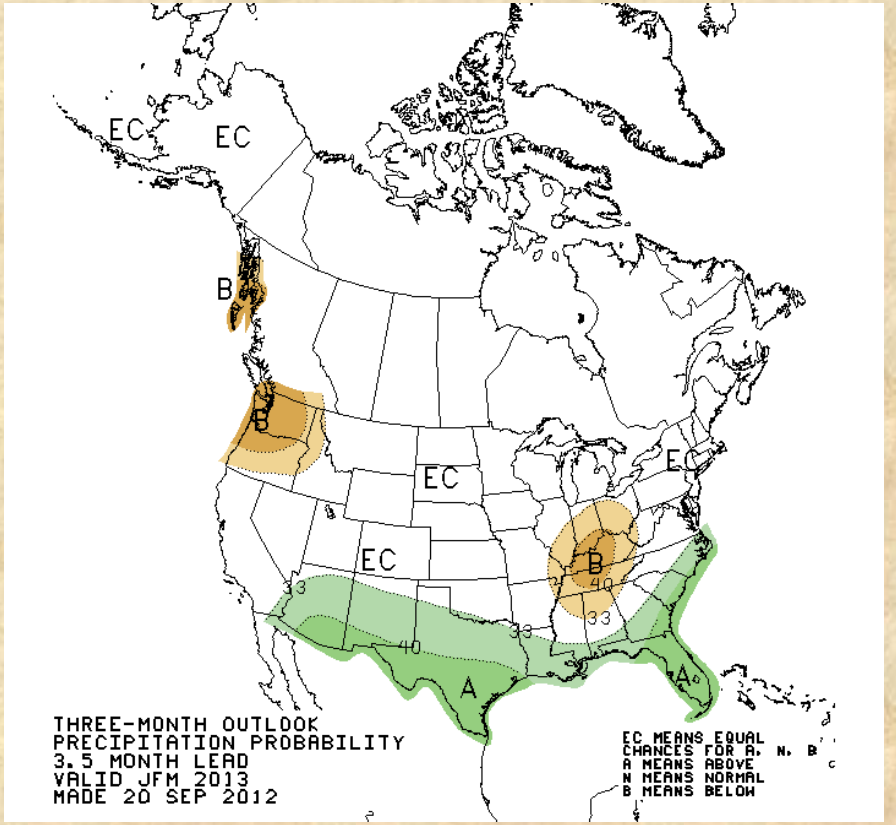


CPC's temperature forecasts for October-December (left) and January-March (right) reflect recent warming trends plus weak El Niño which favors a cool Gulf Coast and warmth over Midwest. Colorado is expected to be warmish this fall (trend), but 'EC' in winter when presence of snowcover is one of the bigger factors not settled yet.

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

Climate Prediction Center Precipitation Forecasts

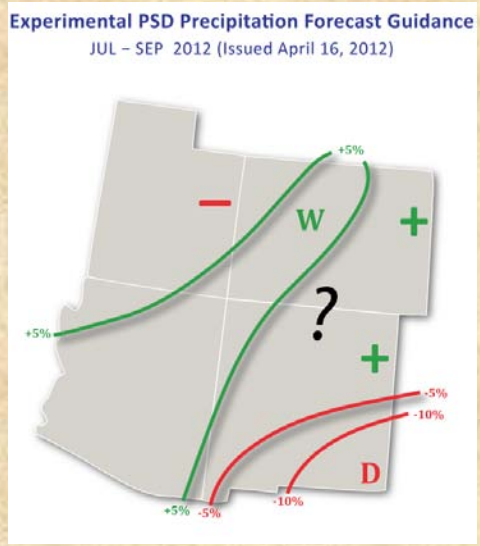


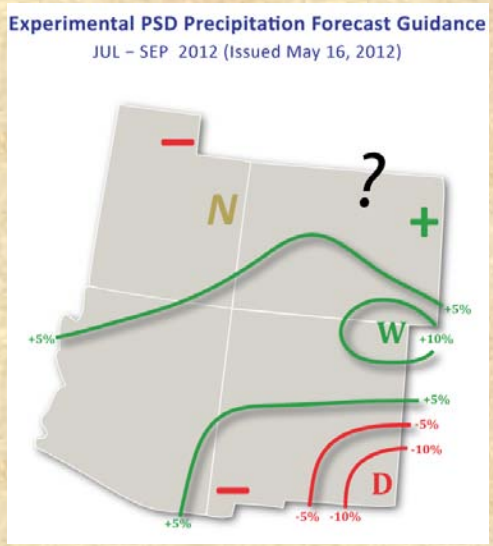


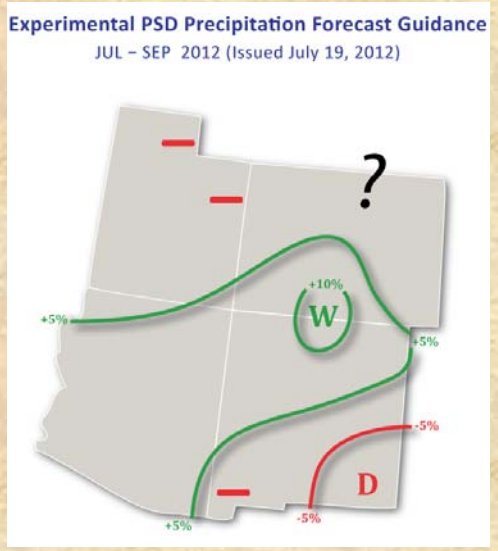
CPC's precipitation forecasts for October-December (left) and January-March (right) reflect recent trends PLUS weak El Niño, leaving Colorado mostly with climatological odds ('EC'), and an enhanced storm track to our south.

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

Verification for July-September 2012

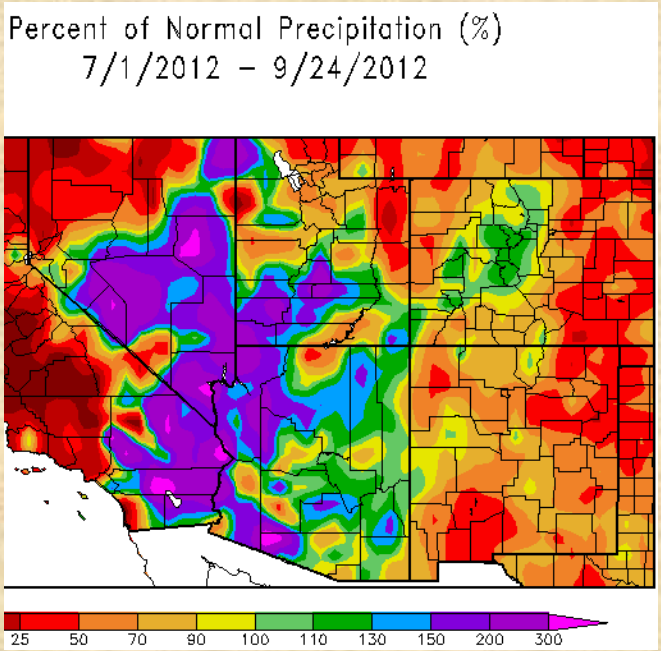




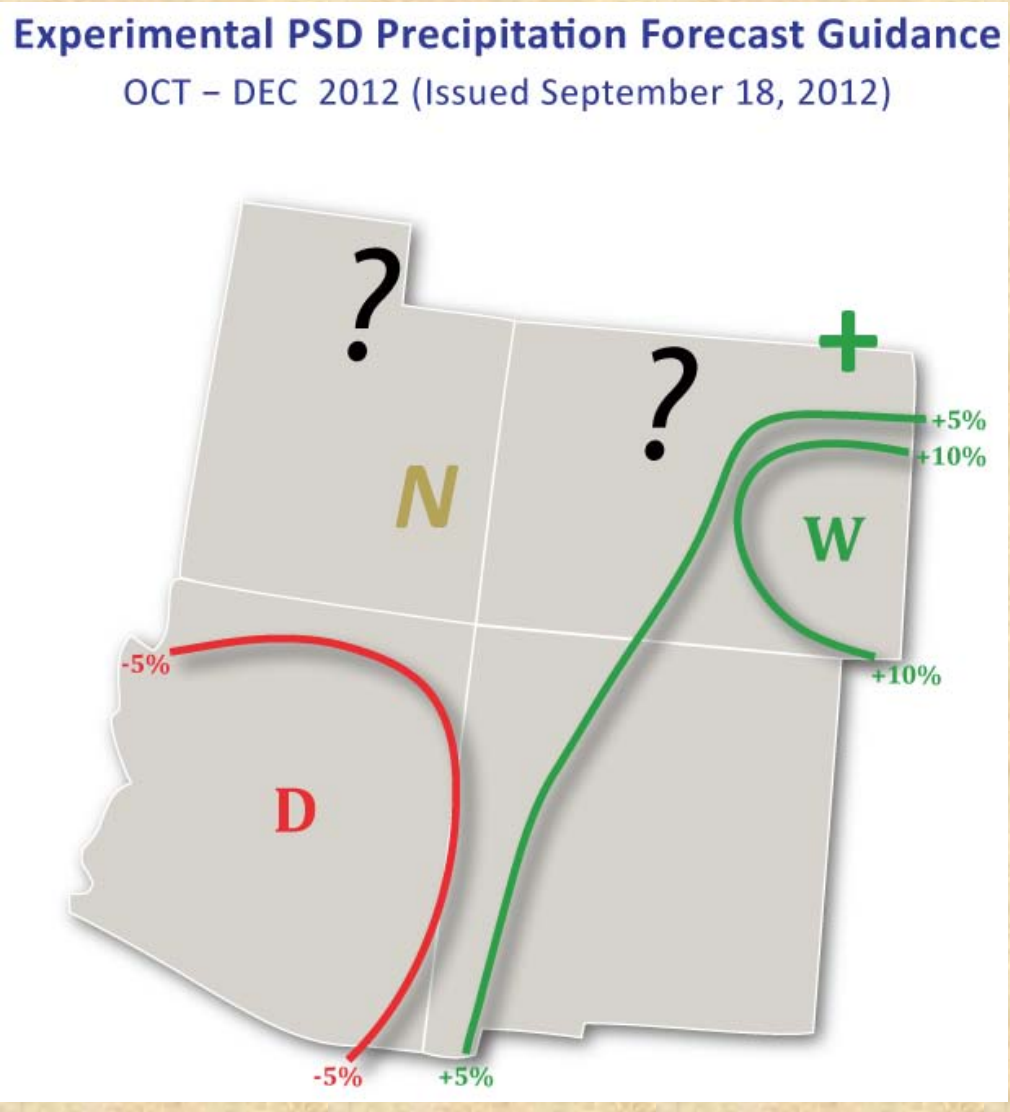


April forecast for JAS'12 (left) was optimistic from AZ into CO, and pessimistic for eastern UT and southern NM. May (middle) and July (right) forecasts kept the same overall pattern. ***Through September 24th, the monsoon delivered above-normal precipitation from AZ into the north-central mountains of CO (√), staying dry to the northwest & southeast of that enhanced moisture tongue (more so than anticipated).***

Possible culprit for suppressed precipitation in CO and NM: smoke from wildfires that lingered through the summer!



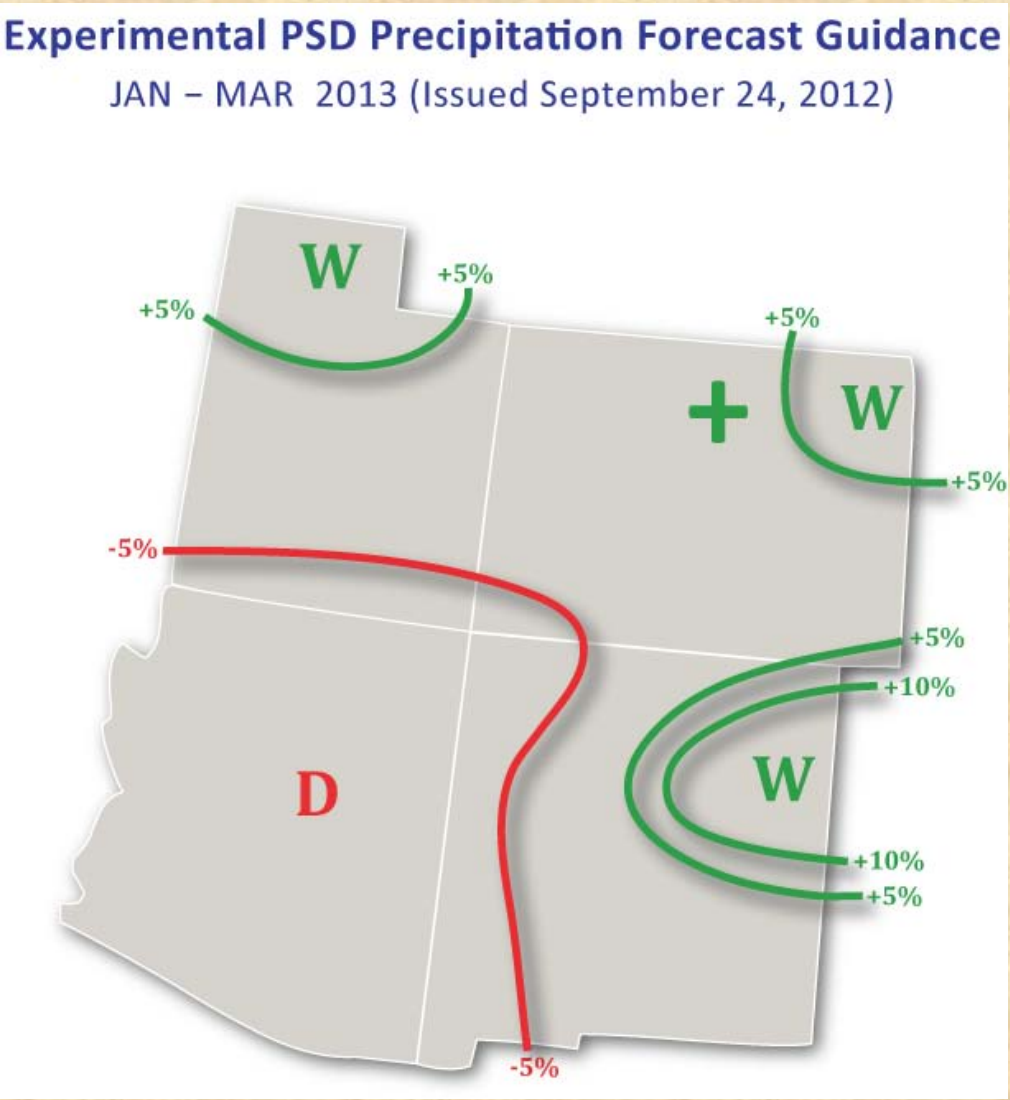
Statistical Forecast for OND'12



Fall (left) remains the hardest season to predict for this region. In particular, "?" over the mountains of northern UT and CO denote an uncertain outcome. *Unfortunately, a closer look at the performance of similar forecasts in the past shows a preference for dry outcomes over north-central CO, which does not bode well for the first half of our snowpack season.*

Eastern CO has a tilt towards wetness exactly where *operational skill has been best (most reliable) since 1999*.

Statistical Forecast for JFM'13



In September, winter (left) is fairly predictable in much of this region, except for the eastern half of CO and SE NM. At least we are not seeing a pronounced tilt towards dryness in our state, except or the 4 corners region.

While slightly tilting towards above-average moisture, our northern mountains show a wide spread of outcomes in similar situations in the past. IF the PDO were to stay negative, the mountains would do better than with a negative PDO, while a positive NAO would help out more evenly across the state.

The most surprising portion of this forecast is the dry tilt for AZ – highly unusual for El Niño, but then again, this is not your average El Niño.

Executive Summary (26 Sep 2012)

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1. **La Niña ended up weaker in 2011-12 than in 2010-11, and did not leave all the typical footprints (lucky Texas!). For Colorado, an overall drier Water Year was correctly anticipated based on typical 2nd year La Niña outcomes. El Niño has materialized, but will probably remain anemic into the winter.**
2. **As expected, fire danger remained seasonal (low) for the duration of the monsoon. While a dry spell in much of August and September did raise fire danger again, the lack of wind storms (El Niño!) helped to reduce this threat.**
3. **My forecast for late fall (October-December) shows a tilt towards wet conditions covering most of eastern CO, with little information away from climatology further west. If El Niño were to strengthen, it would improve our chances for moisture statewide, especially in October. A first peek at late winter (January-March) shows above-normal odds for moisture in north-central and northeast CO where operational skill has been minimal at this lead-time. There is currently no strong threat of dry conditions in our state, except for the Four Corners region.**
4. **Bottomline: El Niño is here, but about as weak as it comes. Some people might even say that it is not strong enough to qualify, and may never reach their certificate. In any case, our mountains tend to be the least favored by El Niño compared to lower elevations, but other factors need to be considered. Negative PDO conditions would favor the mountains over the eastern plains this winter. A positive NAO would increase our chances for moisture statewide. *Both of these conditions are more likely than not this winter – stay tuned!***