Earth System Research Laboratory
Physical Sciences Division

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Denver

Seasonal Outlook into the Summer of 2014

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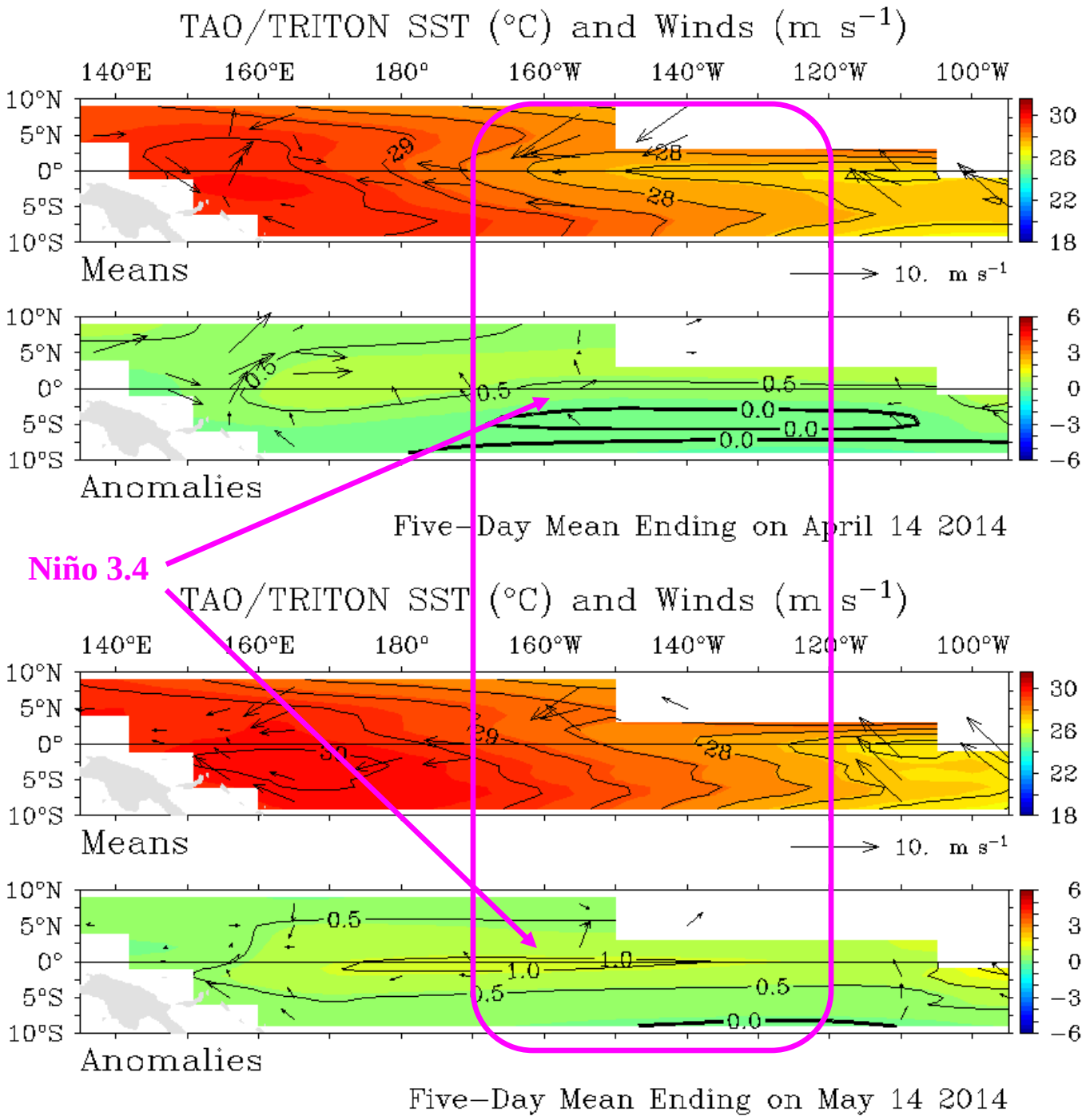
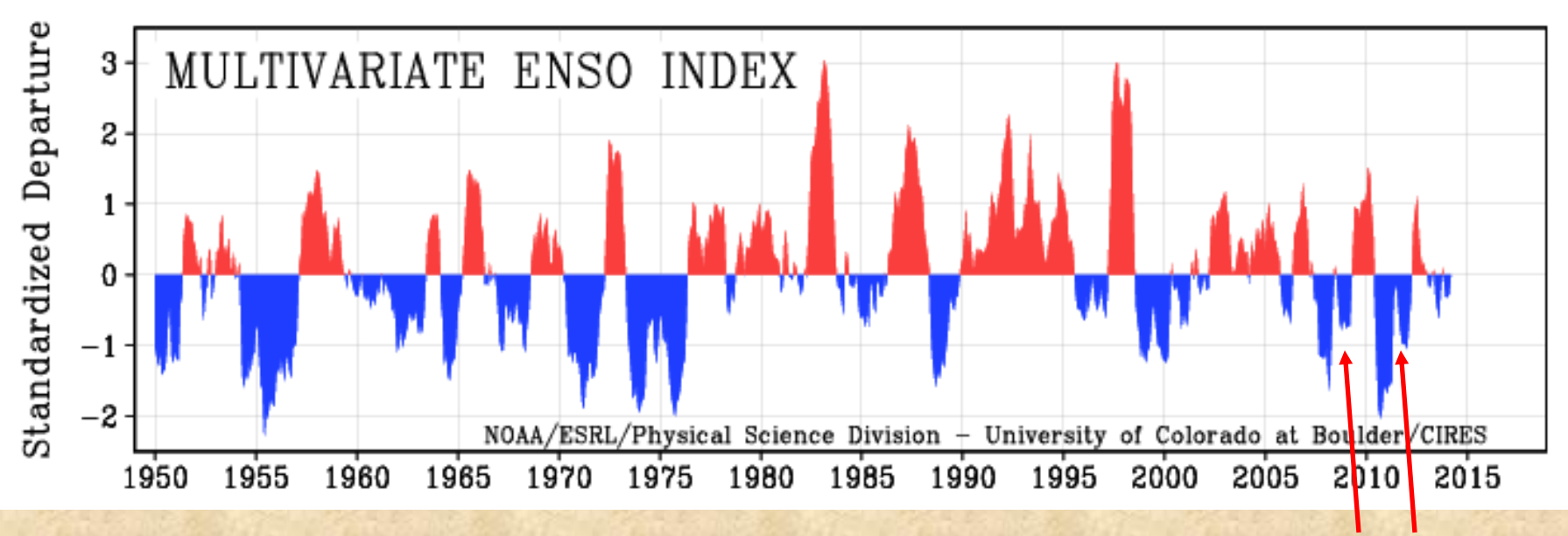
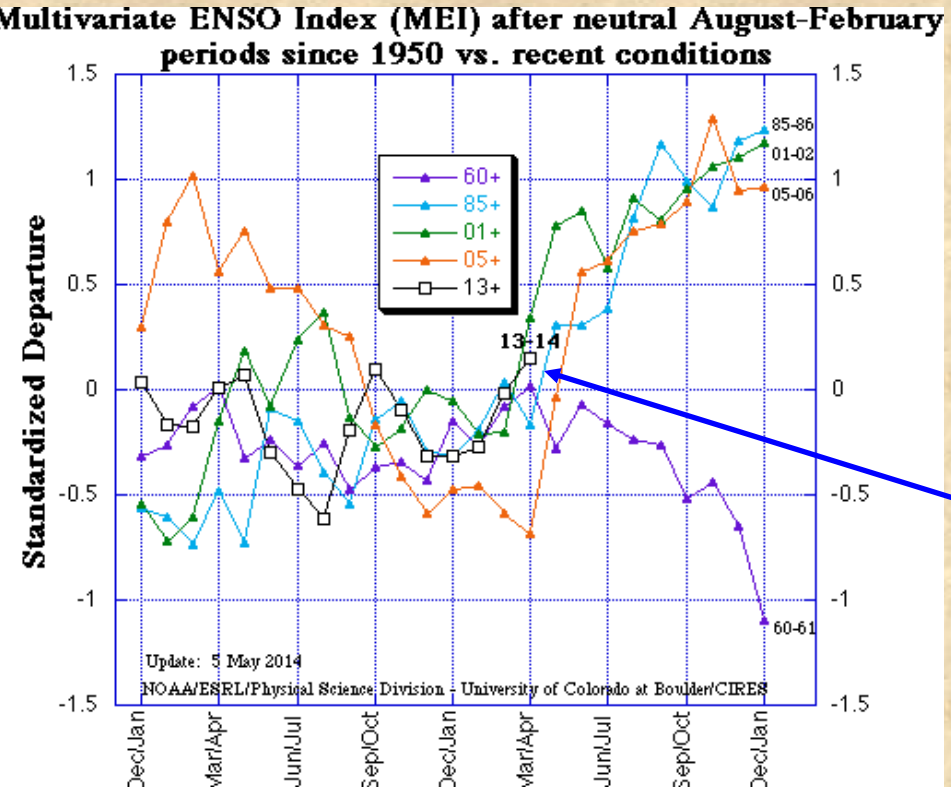
- **What has happened to ENSO(+), what will happen next, and what does that mean for us ?**
- **Expectations for the next two weeks**
- **CPC forecasts for June through September 2014**
- **Seasonal Forecast Guidance for precipitation**
- **Executive Summary**

Current state of El Niño/Southern Oscillation (ENSO) phenomenon (bottom), compared to last month (top): Current SST anomalies are consistent with developing El Niño conditions, *not so much in the wind department*



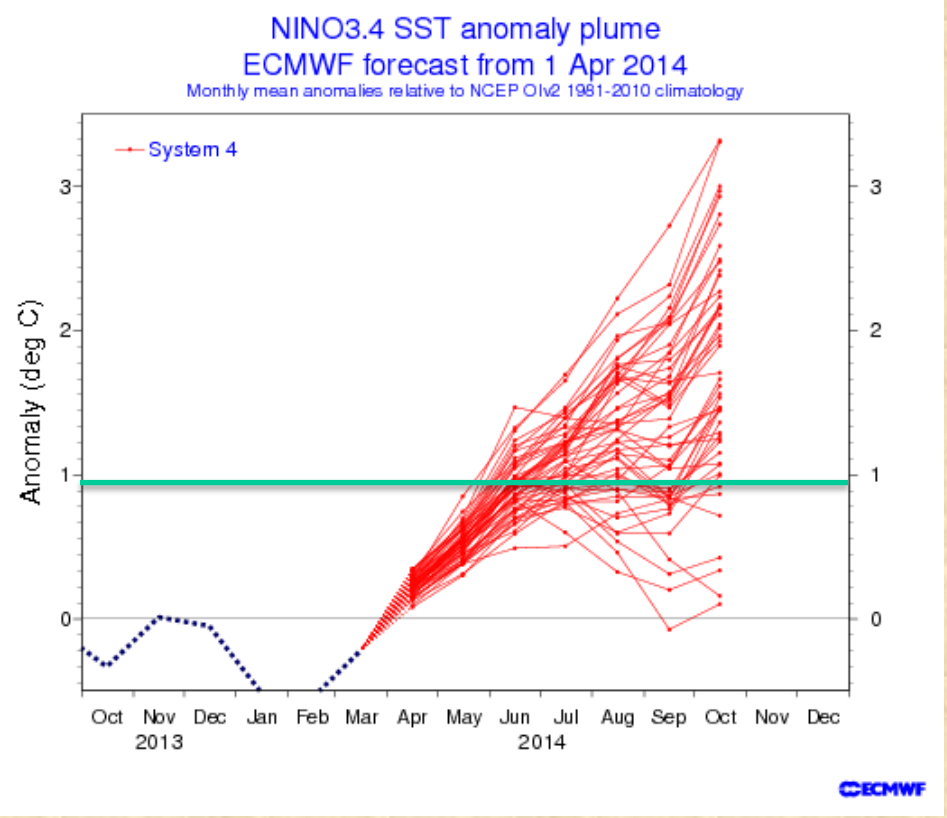




Last seven years have seen two 'double-dip' Las Niñas in a row, followed by a brief excursion to what looked like an El Niño event in 2012, and a return to ENSO-neutral or weak La Niña conditions for much of the last year.

ENSO conditions often change during our spring season. This year most likely towards El Niño, a 80% chance within a few months according to my own model.

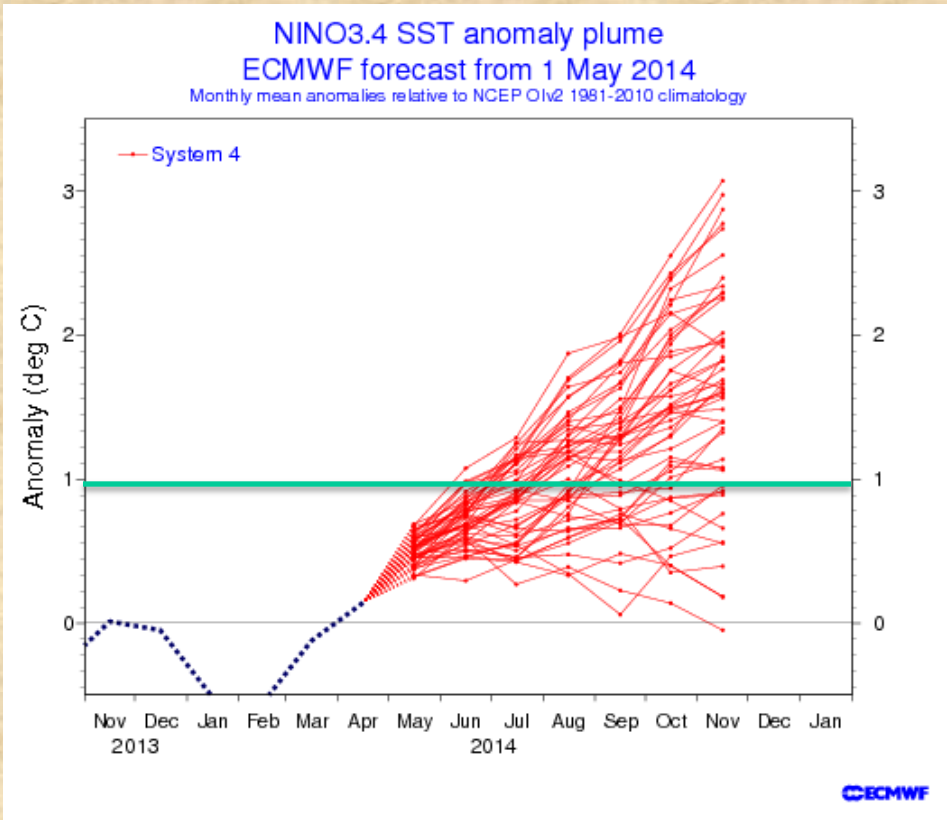
http://www.esrl.noaa.gov/psd/enso/mei



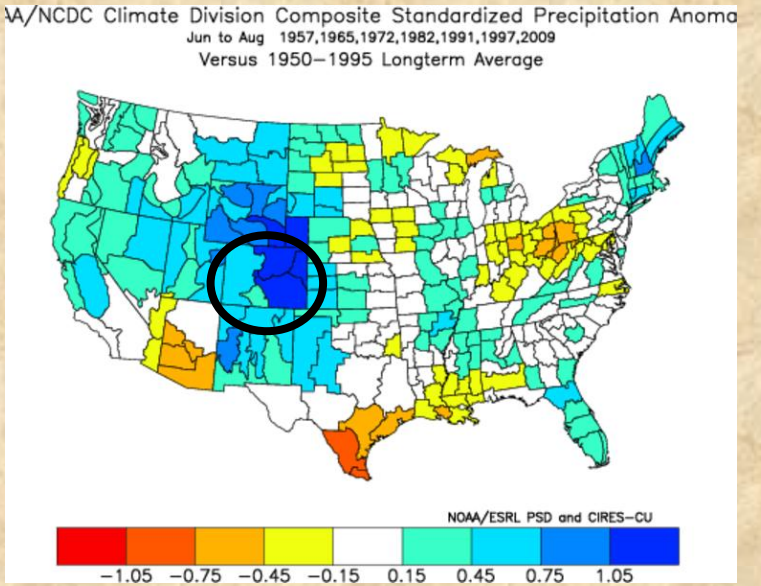
Last month's ECMWF forecast (left) had unanimous support for a transition to El Niño by June 2014, with an 80-90% chance of hitting +1° C, and at least a 30% chance of hitting +2° C (we have never measured more than +3° C anomalies in this region).

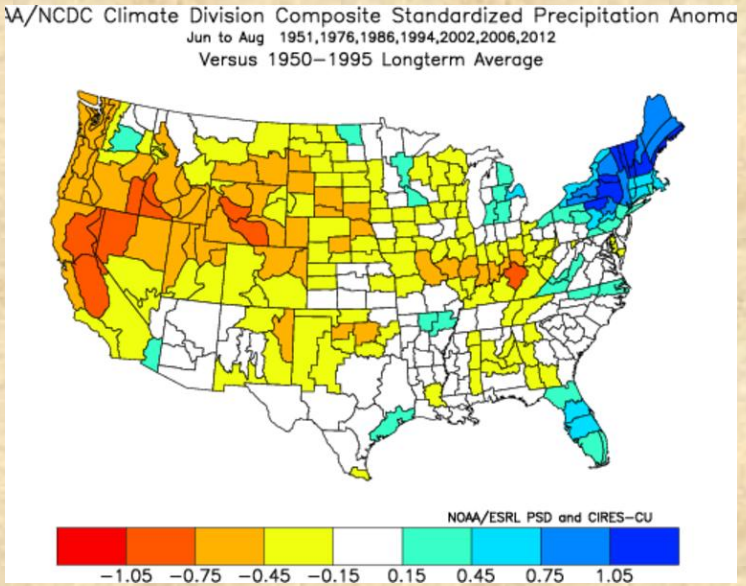
The ECMWF May 2014 forecast (right) is a little less extreme, with perhaps 20% of the members hitting +2° C and the same percentage staying below +1° C. Nevertheless, this model remains one of the most bullish ones within the IRI plume (not shown).

http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/

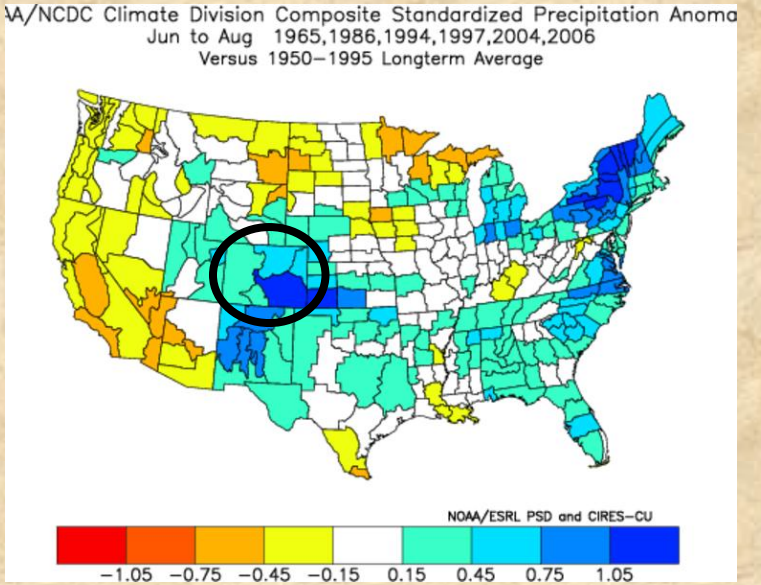


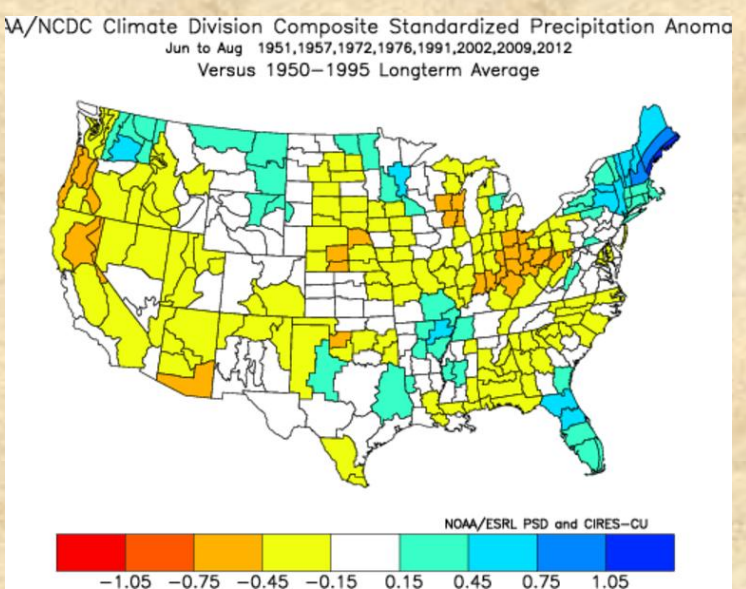
June-August



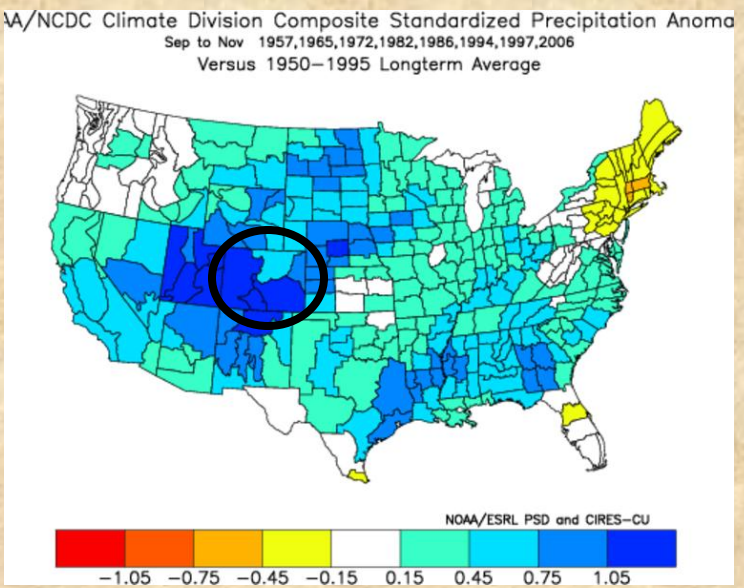


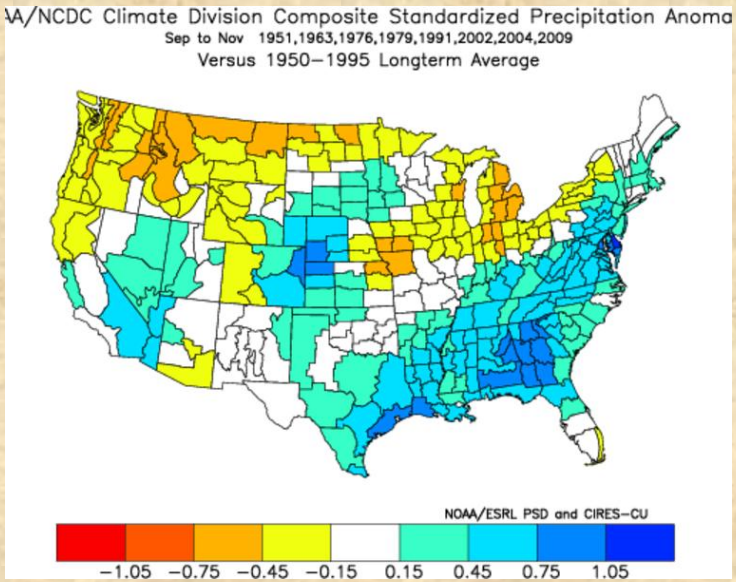
Strong El Niño in JJA (top left); weak El Niño in JJA (top right); positive PDO (bottom left), and negative PDO (bottom right). ***Positive PDO composite favors strong El Niño –like outcome.***



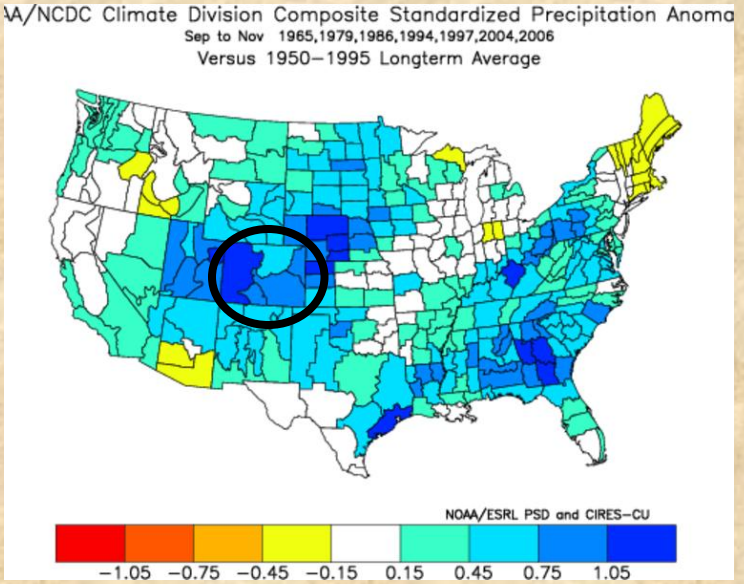


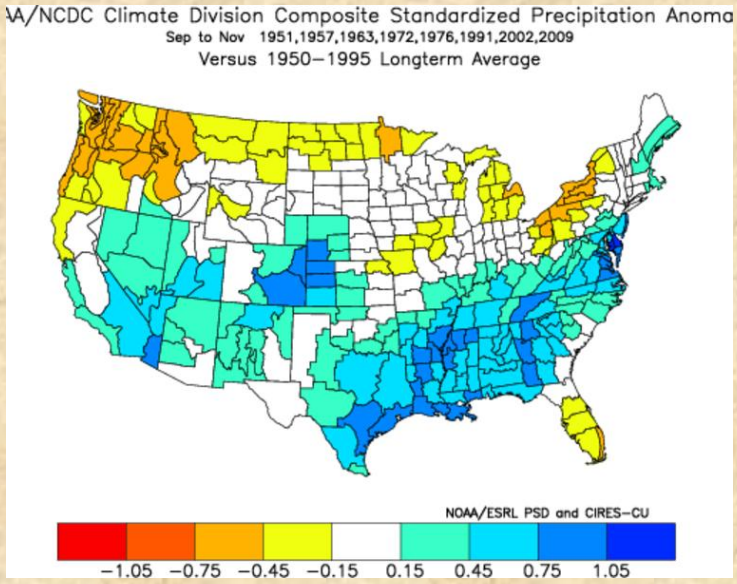
September-November (based on SON ENSO conditions)



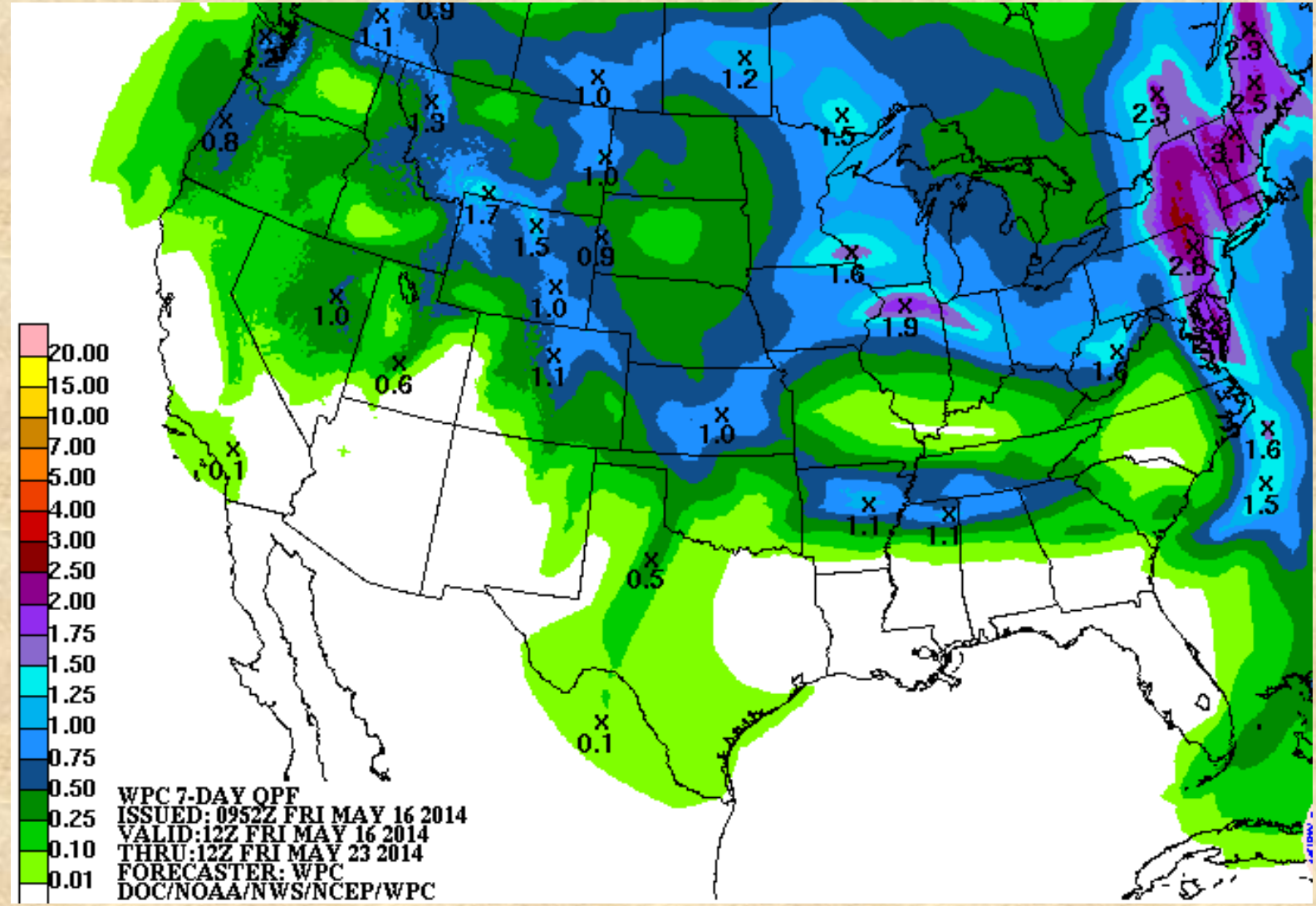


Strong El Niño in SON (top left); weak El Niño in SON (top right); positive PDO (bottom left), and negative PDO (bottom right). ***Again, note similarity of left panels!***



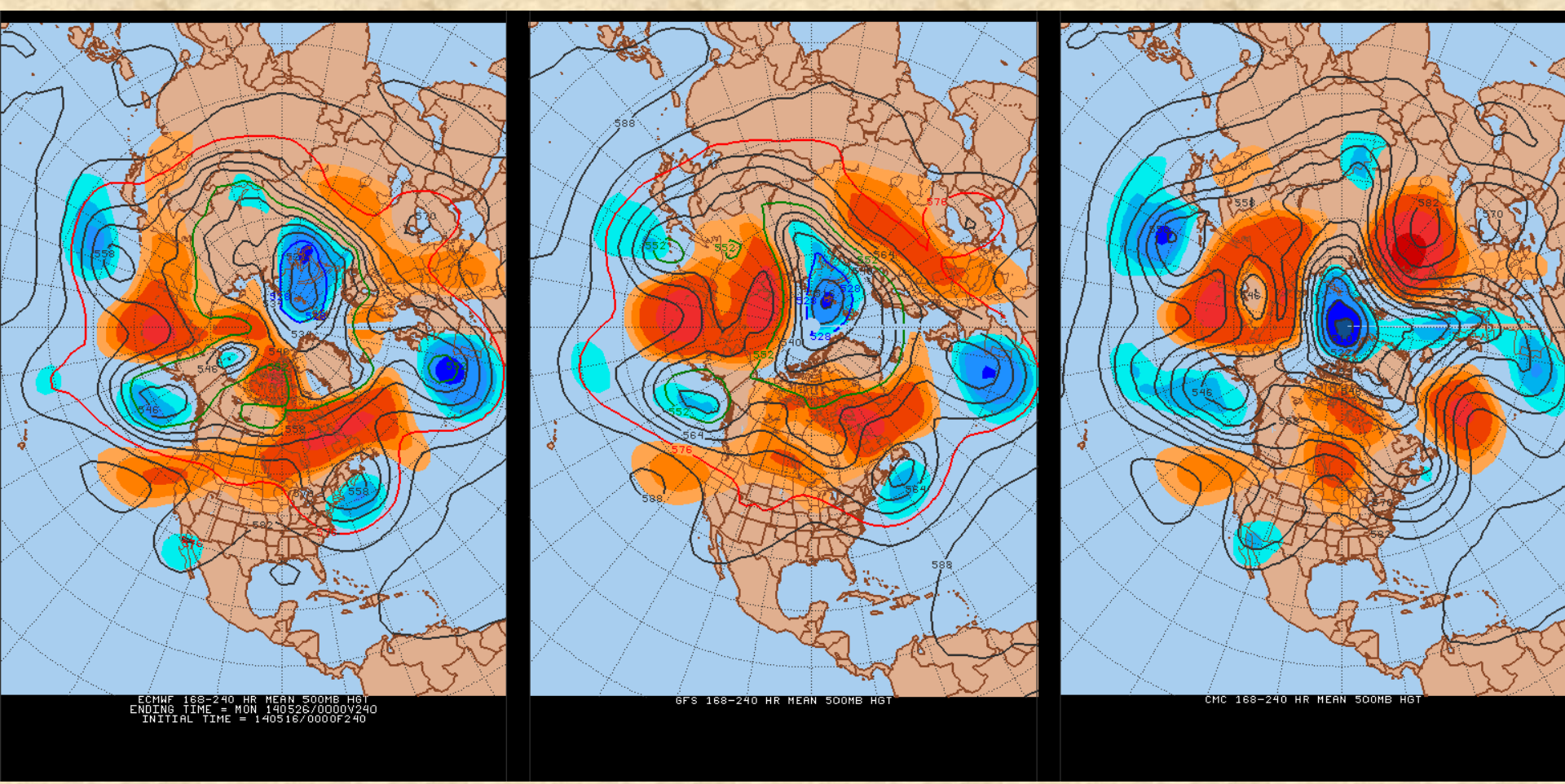


What can we expect in the next seven days?



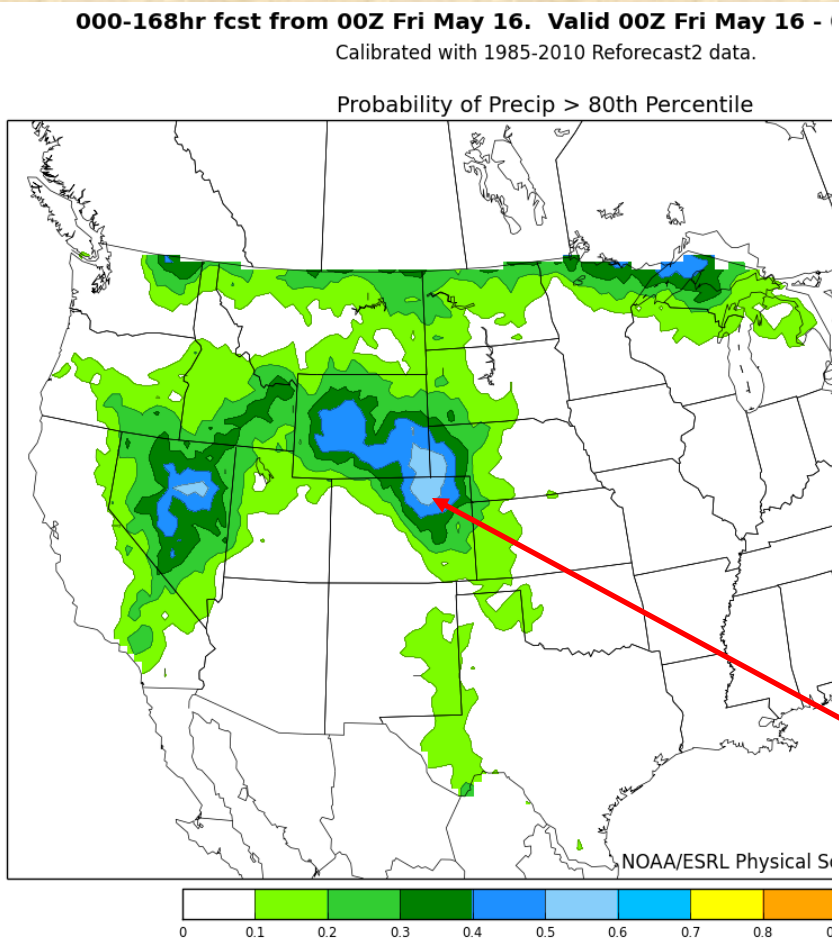
Expected total precipitation, according to the Hydrological Prediction Center (NOAA): More precipitation where we don't really need it (right here), a bit of hope for SE Colorado, and none for the Four Corners.

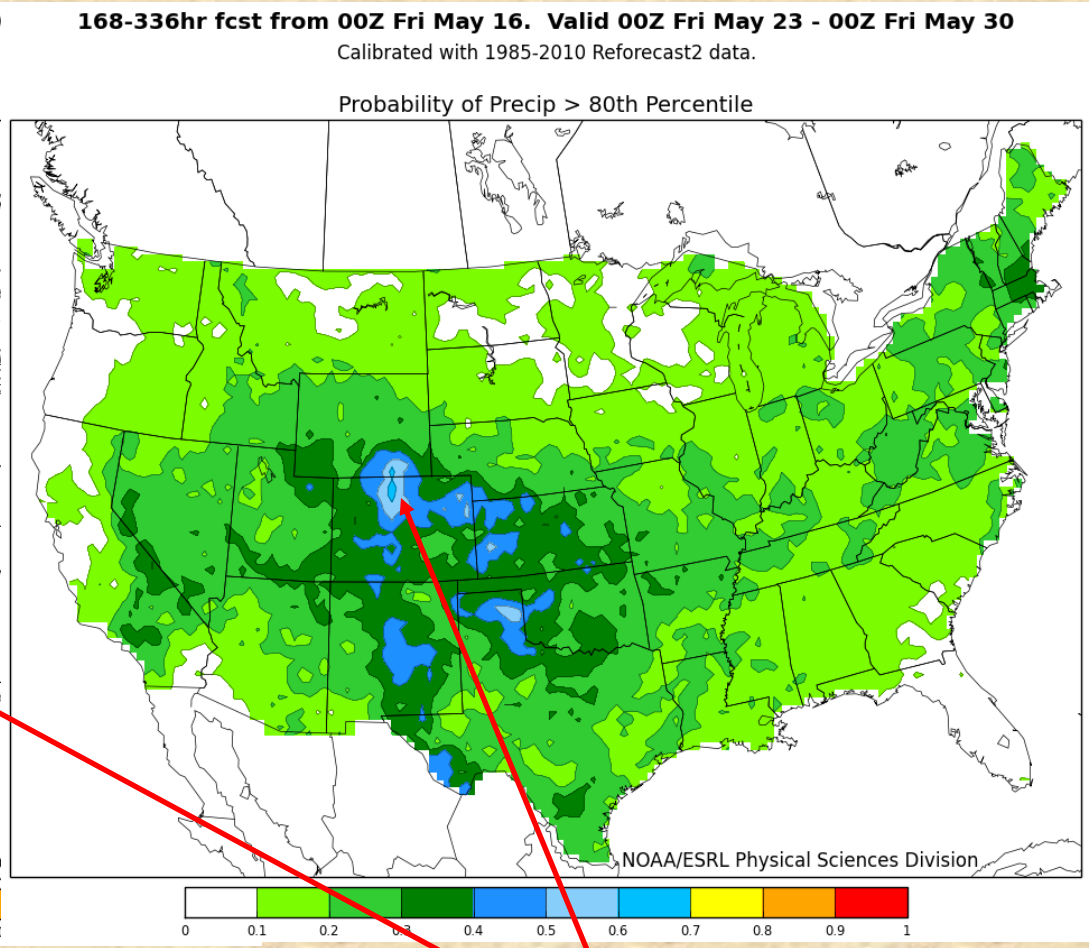
What can we expect later next week?



No major anomalies for us 7-10 days from now, but a trough is predicted either further to the southwest (left) or closer (Canadian model, right). The latter forecast bears some resemblance to the September flooding situation.

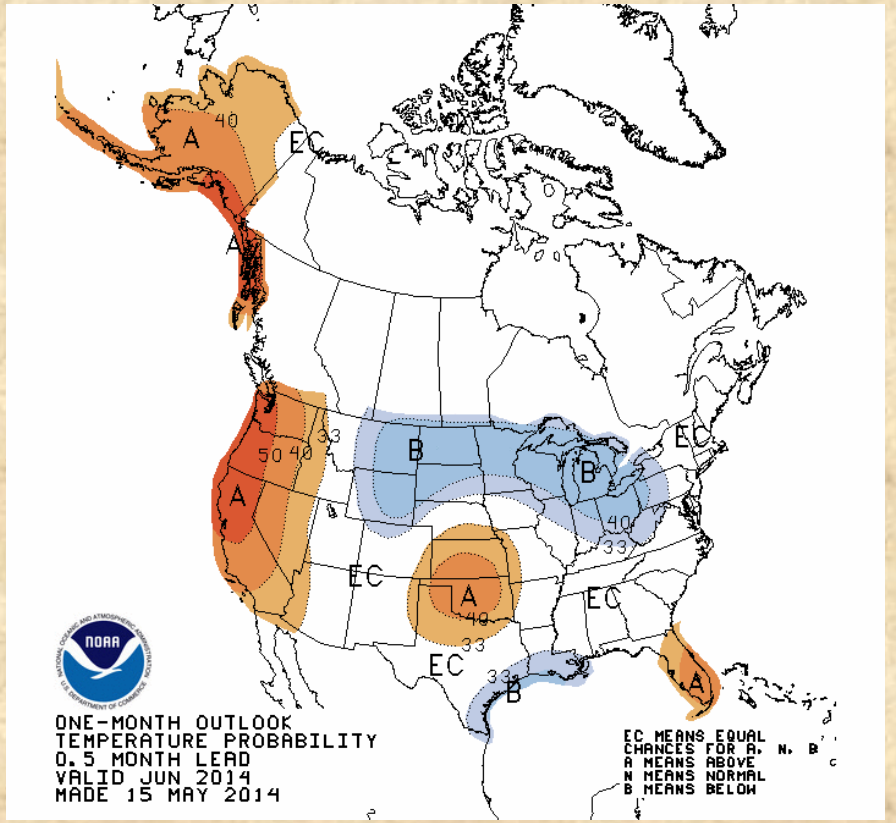
What do the ‘Reforecasts’ say?

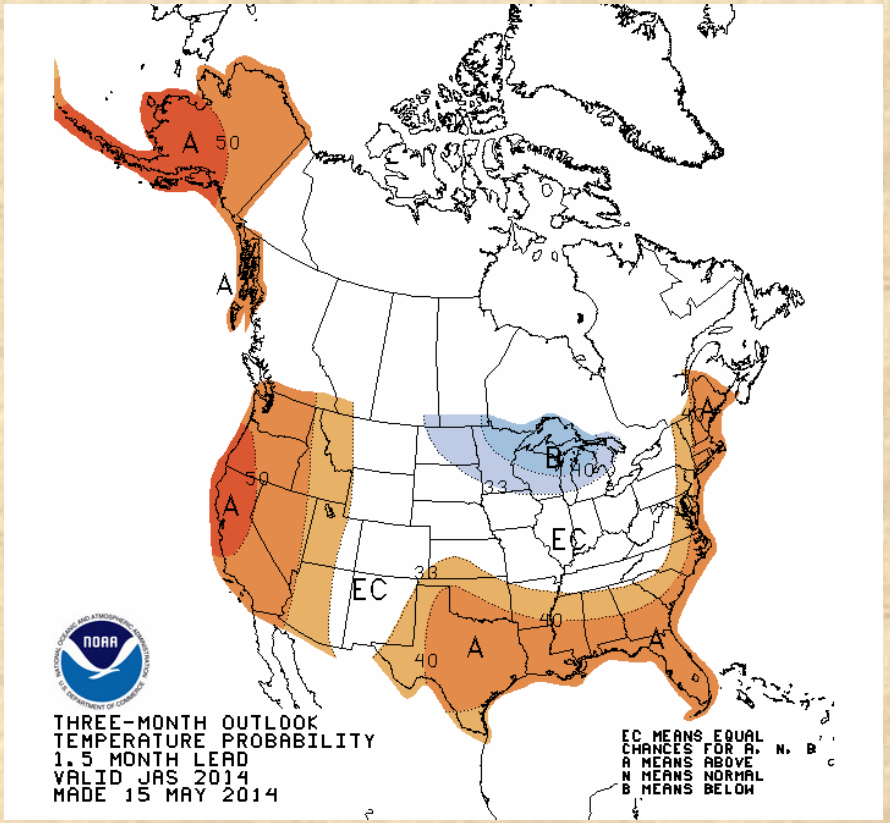




The next two weeks appear to repeat the pattern of the ‘wet’ getting ‘wetter’ (i.e., us), with a 50/50 chance of getting precipitation amounts typical for the wettest 20% of the historical record (this is consistent with the Canadian model).

Climate Prediction Center Temperature Forecasts

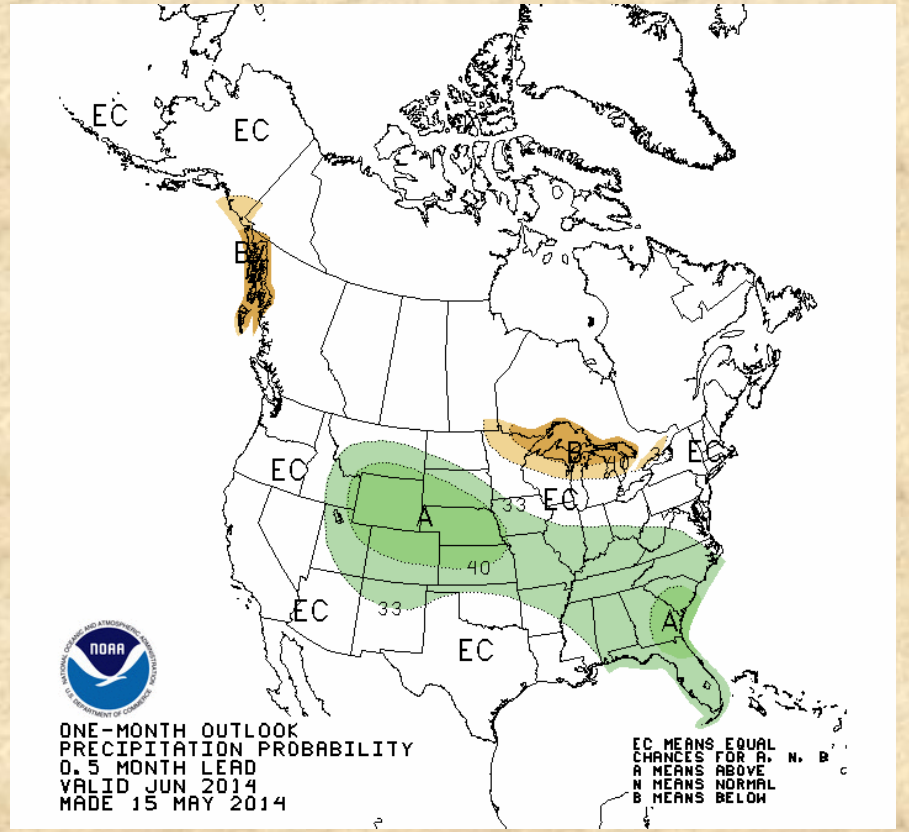


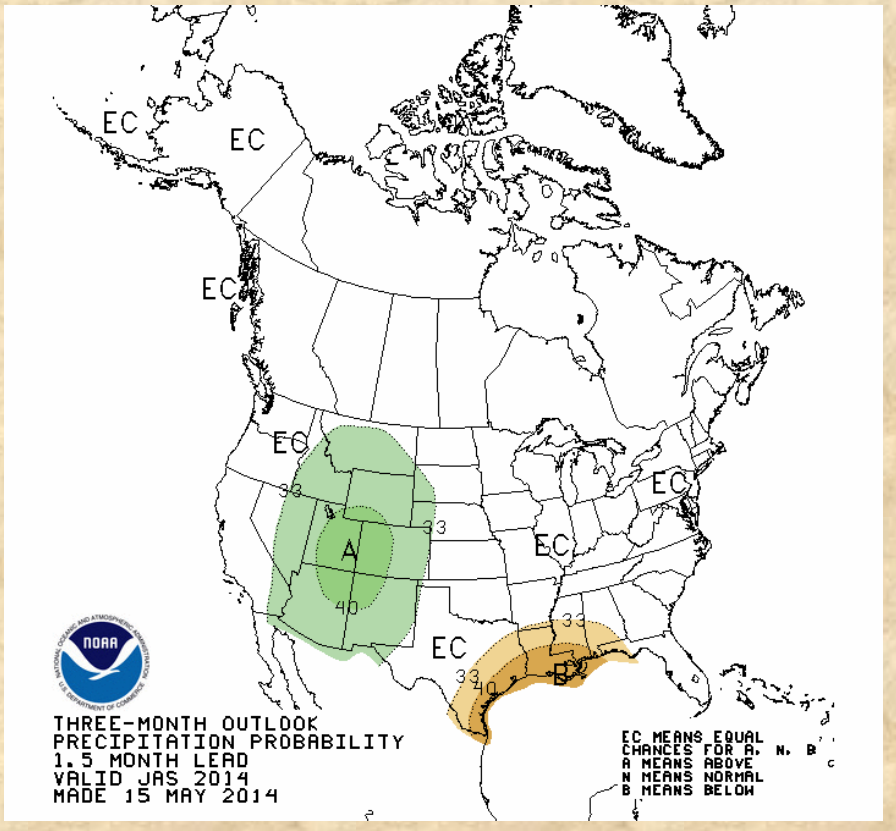


Colorado is less likely to be warmer-than-average this summer…

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

Climate Prediction Center Precipitation Forecasts

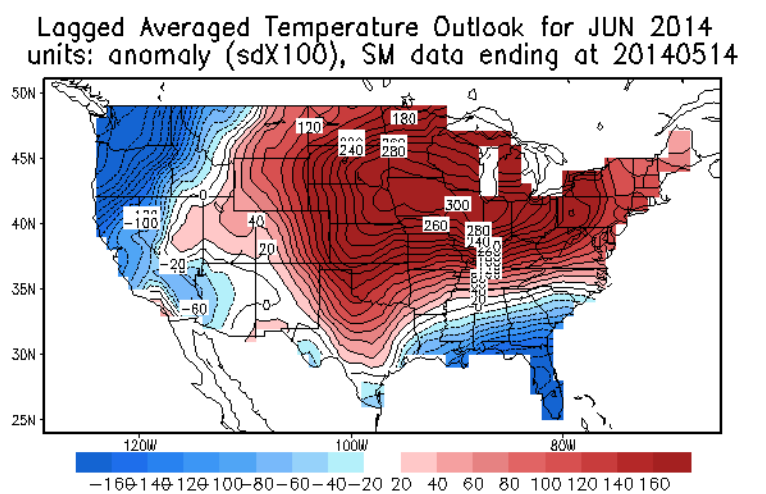


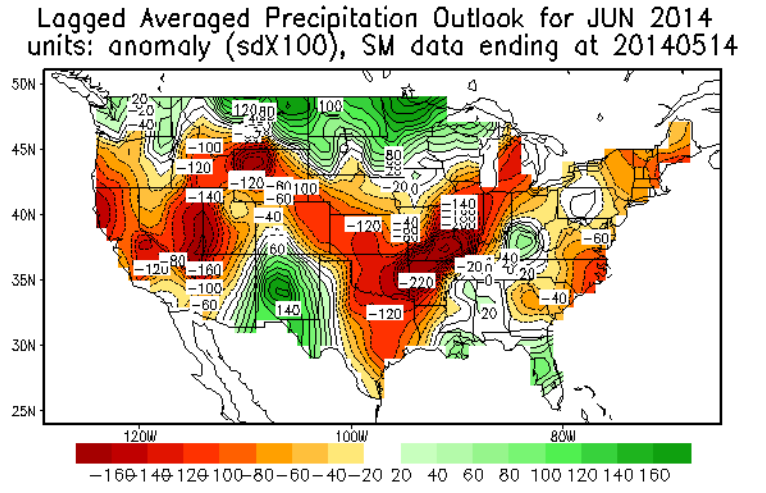


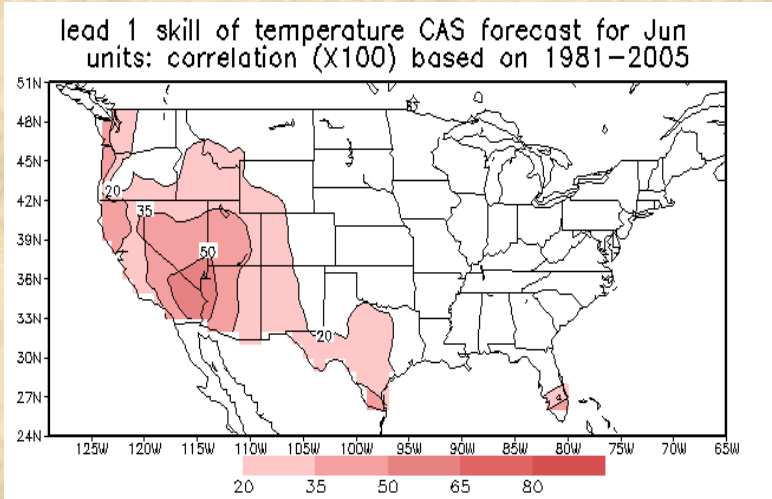
Unusual wetness is predicted in CO both in June and during July-September in the new CPC forecasts. This is driven by their coupled forecast model (CFS).

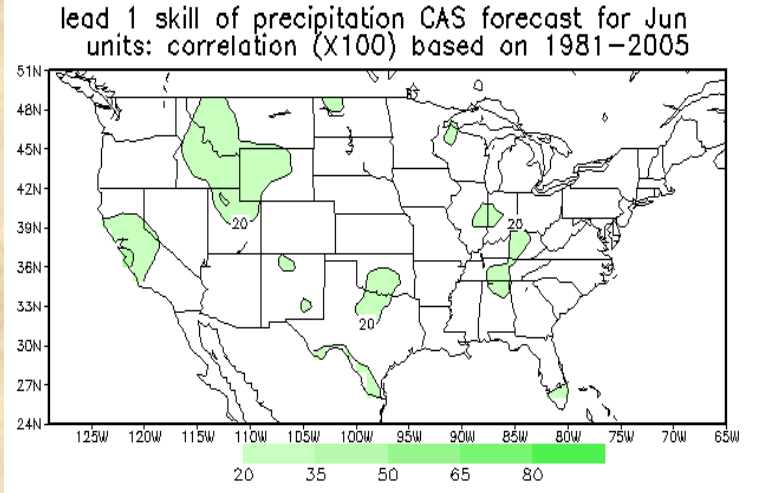
Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/***

Soil Moisture Analogue Forecasts





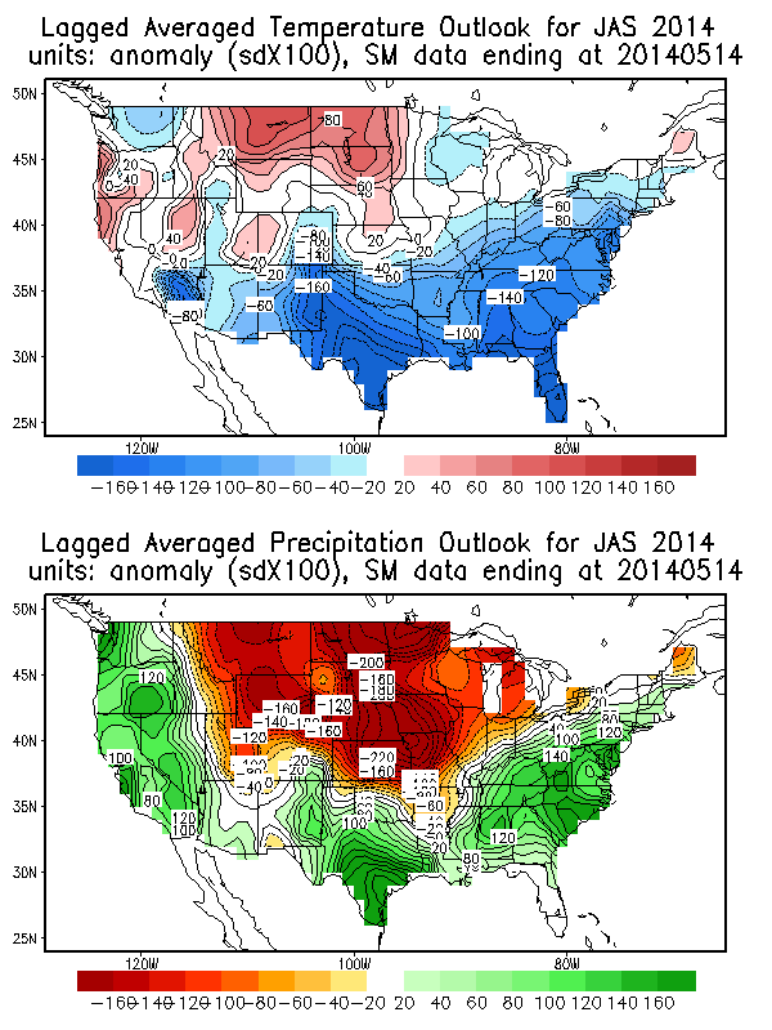


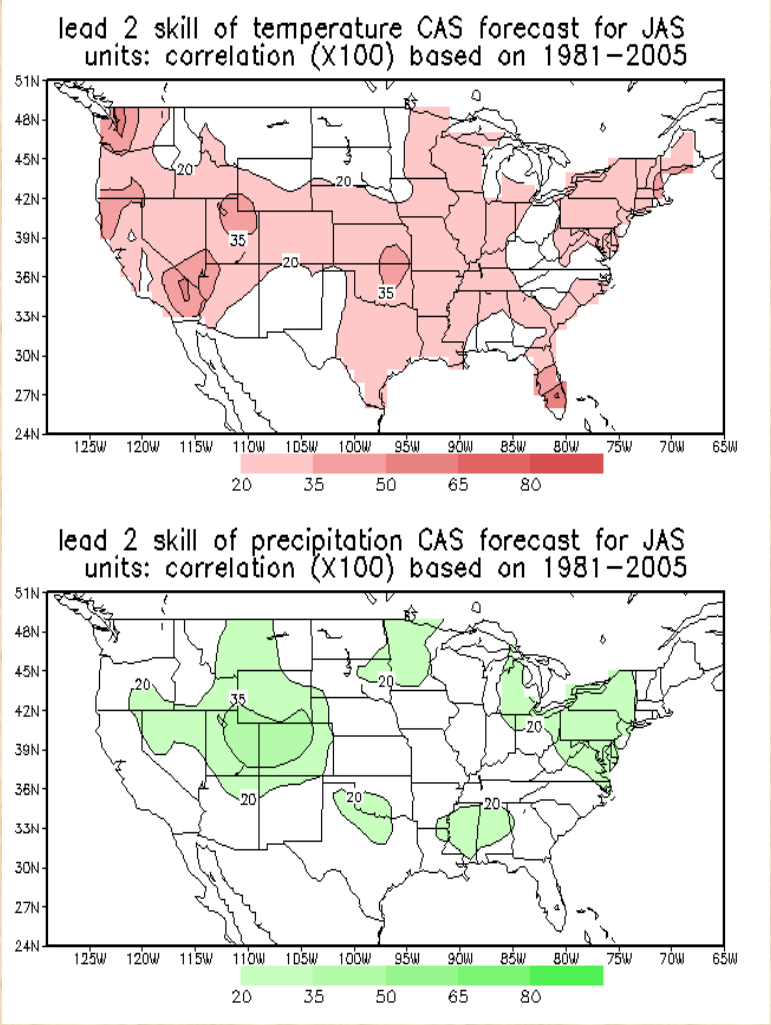


The soil moisture tool anticipates a warm and mostly dry *June* for much of CO, but has shown little skill in recent years for this region.

Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/***

Soil Moisture Analogue Forecasts

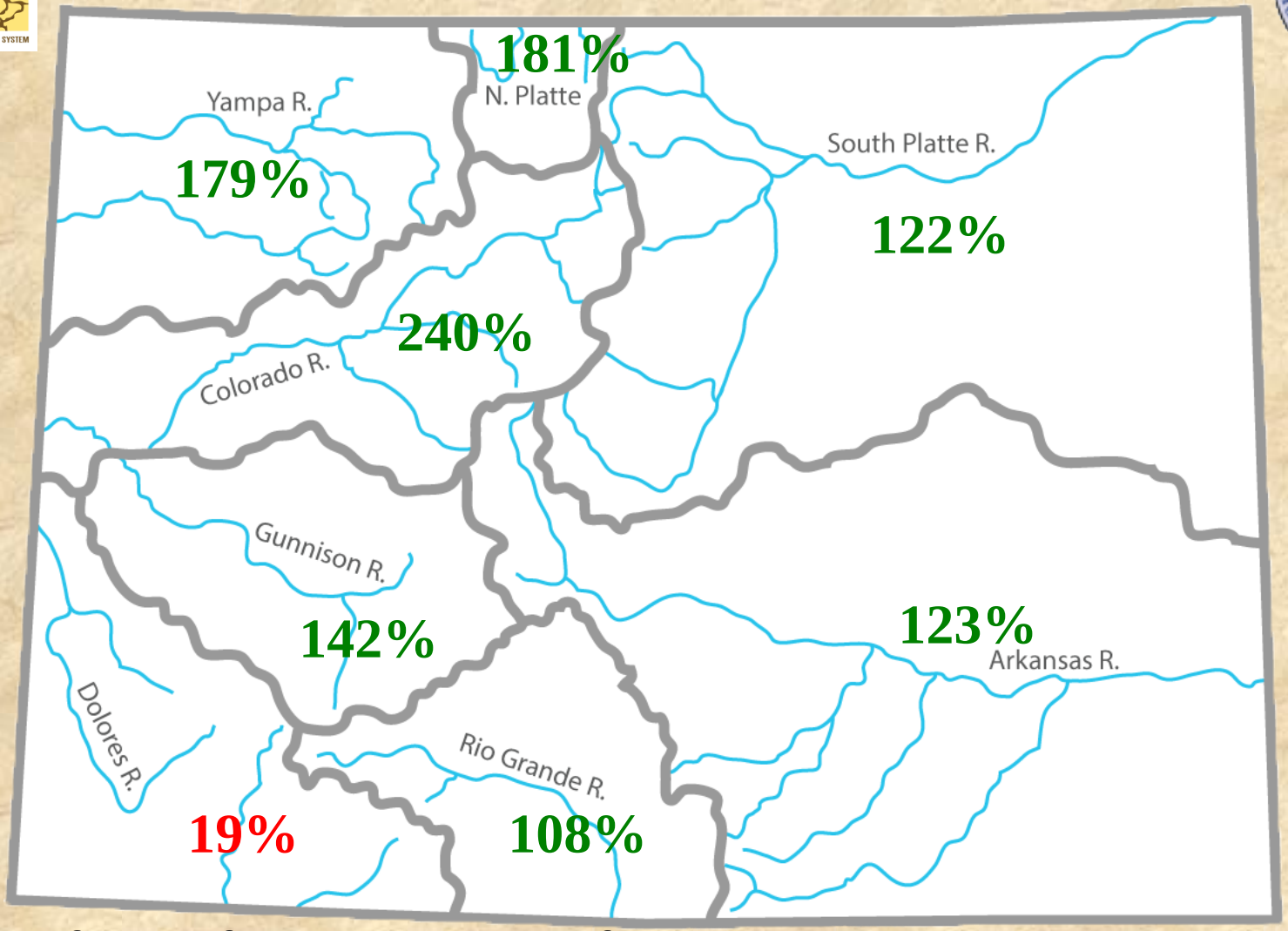




The soil moisture tool anticipates a mostly dry *July-September* for much of CO, which is supported by historical skill.

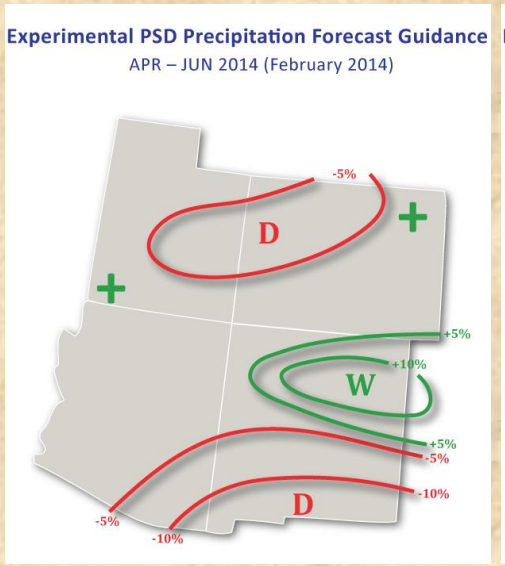
Source: ***http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/***

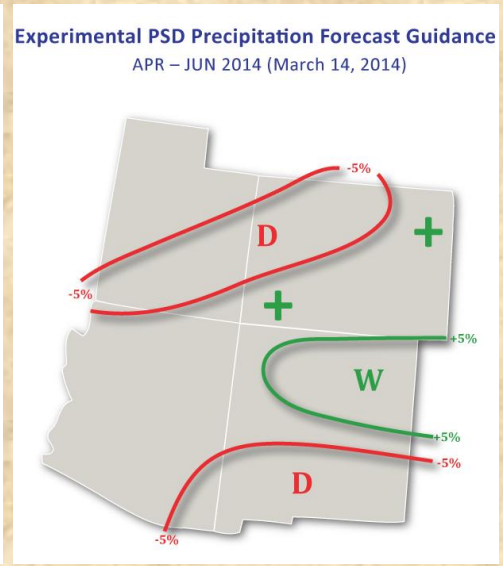
SWE forecast for 1 June 2014 (50%ile)

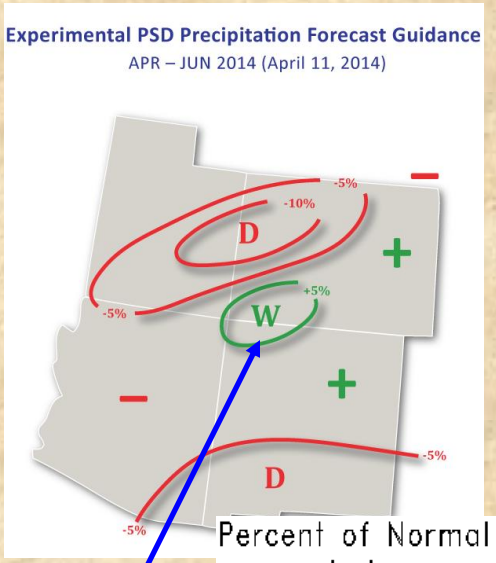


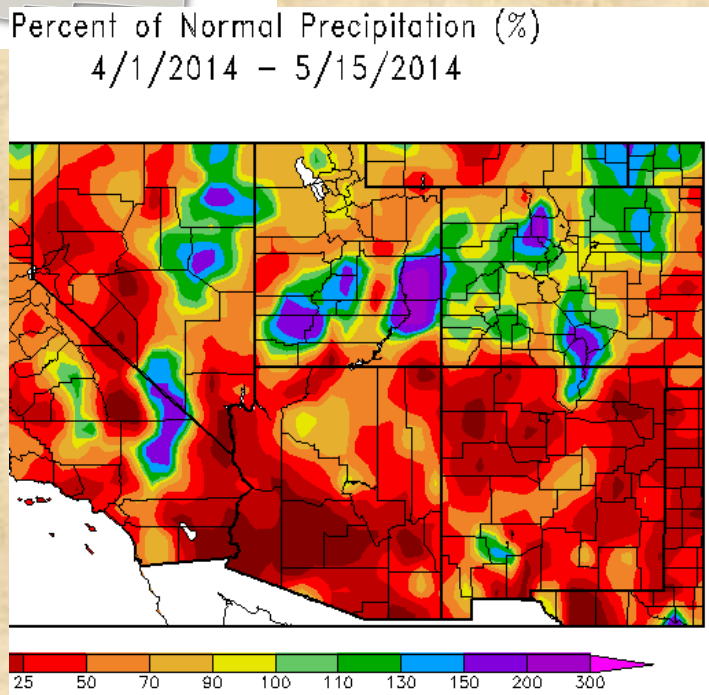
My median forecast for 1 June snowpack from last month was higher than the long-term median for most of the state, even in regions where 1 April snowpack was low (Rio Grande). The forecast was apparently latching onto the developing El Niño situation.

Statistical Forecast for April-June 2014





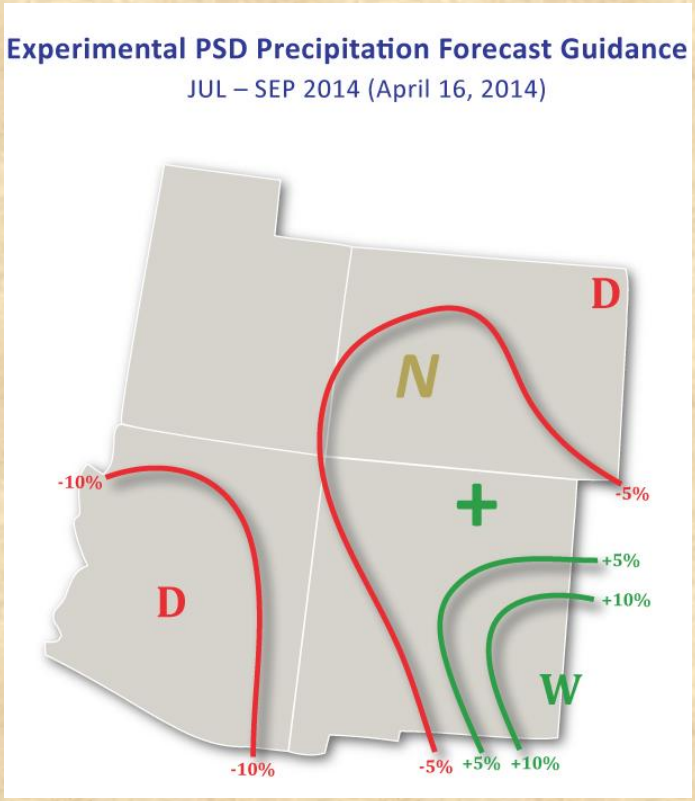


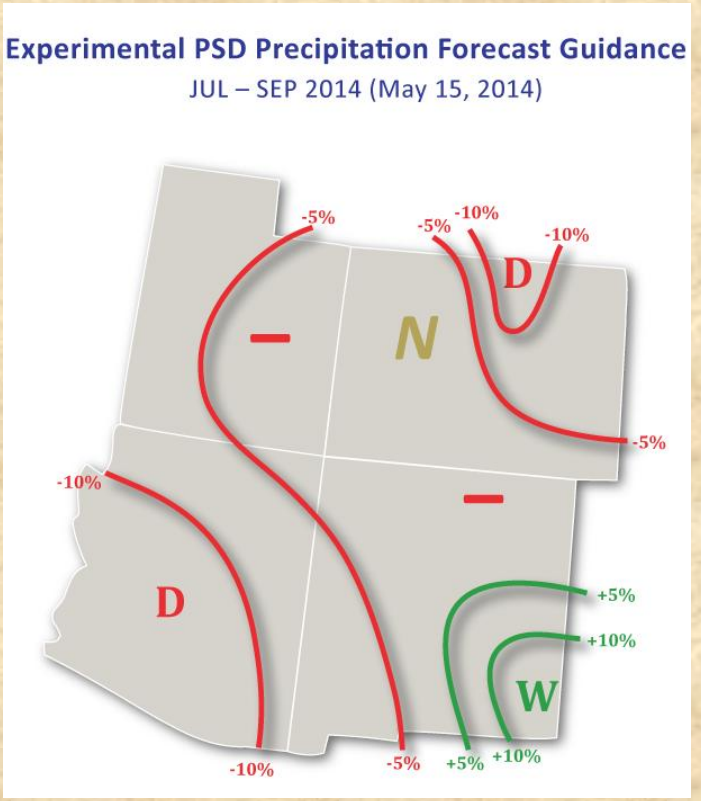


My forecasts for April-June 2014 from Feb' (left), Mar' (middle), and Apr' (top right) showed slightly increased chances for moisture in the southeastern half of CO, and less over much of the Upper Basin, but increasingly better news for the San Juans. ***Operational skill has been best over UT and CO.***

So far, moisture has been spotty, but above-normal precipitation has been falling from SW towards E CO.

Statistical Forecast for July-September 2014





My first seasonal forecast for July-September 2014 (left) was dry for much of the interior southwestern U.S., driest over AZ where El Niño often results in dry conditions during the summer. The updated forecast (right) remains surprisingly dry for much of the interior Southwest, including the eastern plains in particular.

Stay tuned for the update in June!

Notes on flooding risks in 2014

SNOWMELT-RELATED:

- ***High snowpack** continues to increase the snowmelt-related flooding potential in South Platte basin in particular (just where we don't need it). Snowmelt has resumed below 9K after a very late-season storm last weekend, and will get going higher up.*
- ***Increased dust loads** compared to two months ago can be found across the state.*
- *We may get into weather pattern that bears some resemblance to the September storm next week, with less moisture at its disposal, but prolonged precipitation falling as rain into higher elevations – this is the one to watch!*

FLASHFLOOD-RELATED:

- *Some of the most prominent examples of flash-flooding occurred during **El Niño onset years ('65, '76, '97; also: 1896, 1904, 1911)** – basic odds are roughly doubled compared to normal.*
- ***Soil moisture and water table** have remained high in regions hit by September floods. All natural **reservoirs** are also about as full as I have ever seen around here going into spring (have all man-made ones been drained ahead of spring-runoff?). Reservoirs that are still full would have a lot less 'wiggle-room' in dealing with new inflow. A lot of temporary fixes to our infrastructure may end up getting severely tested.*

Executive Summary (16 May 2014)

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- **While El Niño/La Niña can provide decent guidance for climate outlooks around here, this was not very helpful in two years of ENSO-neutral conditions. We are now on track for El Niño to emerge very soon. This should favor lower elevations with moisture during the growing season.** ***The stronger this event gets, the more likely we will see a wetter growing season.***

- **My statistical forecast for late spring (April-June) shows a slight tilt towards wetness covering the eastern plains which is good news for the Arkansas valley in particular. Mountains are less likely to end up wet, with the exception of the San Juans which now appear more favored than before. The monsoon season is forecast to remain dry for eastern CO and near-normal west of the divide.**

- **Given the rains of last September, an above-normal snowpack in the northern mountains, and a transition to El Niño, the stage is set for increased flood risk during the growing season, somewhat independent of seasonal rainfall totals.** ***Individual weather events ('triggers') are still needed to realize the potential of this risk, but we should definitely be on 'high alert' status, especially as we approach our first normal flood risk peak around the end of May/early June, as snowpack will start melting in earnest.***