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NATIONAL INTEGRATED DROUGHT INFORMATION SYSTEM

Colorado WATF, 4-18-17, Denver

DNR
COLORADO
Colorado Water Conservation Board
Department of Natural Resources

Seasonal Outlook for Colorado

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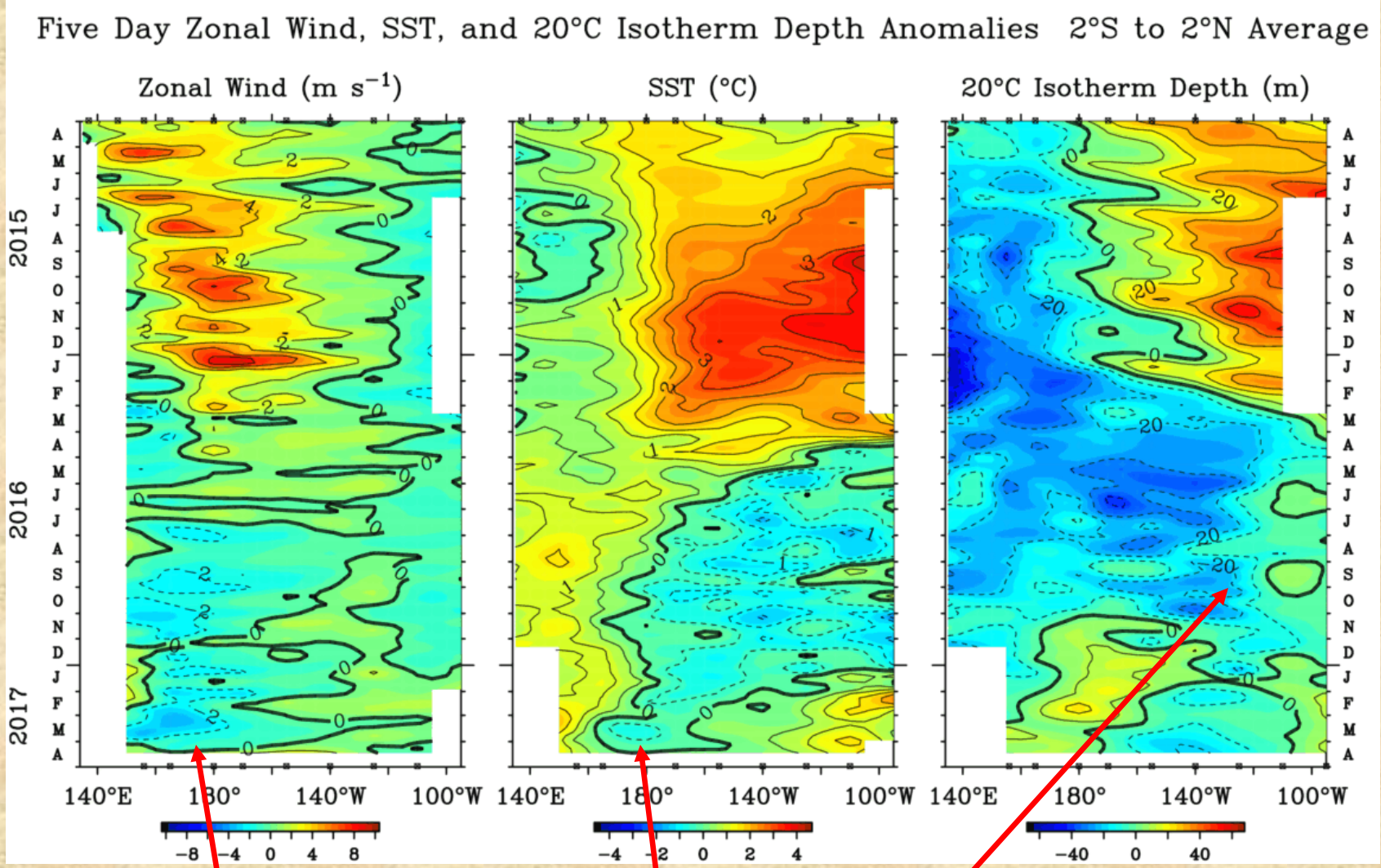
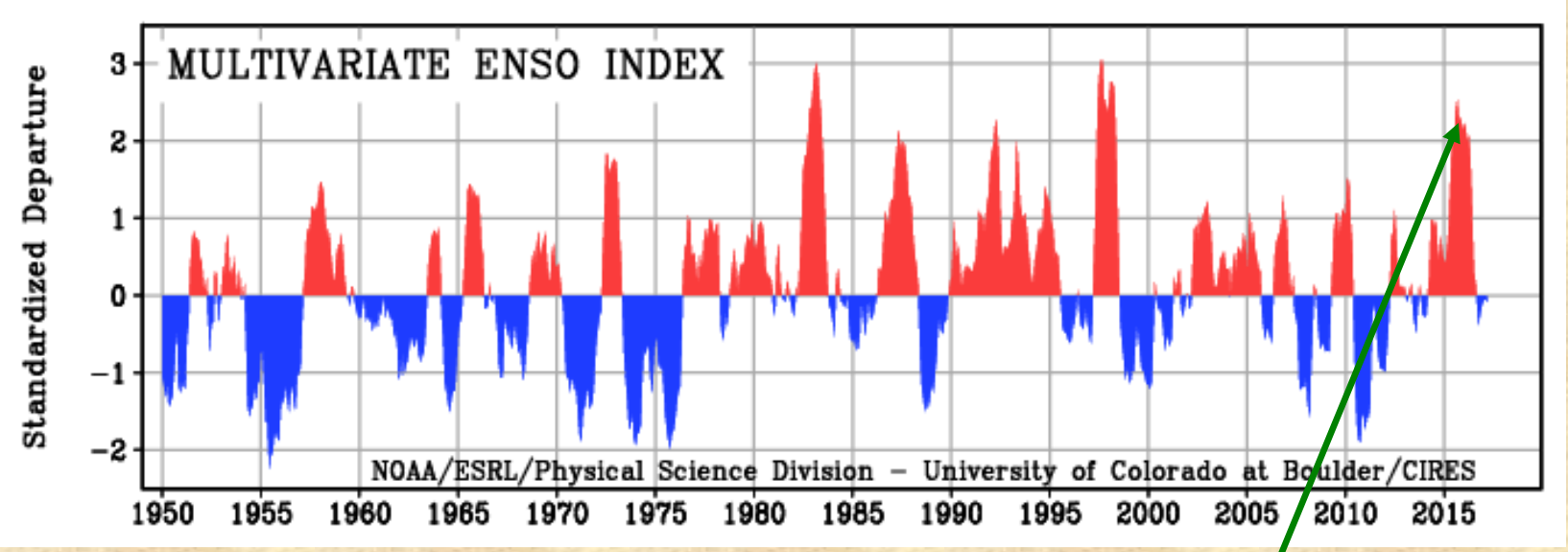
- *ENSO-neutral (coastal El Niño vs lingering dateline La Niña*
- *CPC/CFSv2 forecasts from May-July into July-September*
- *Experimental forecast guidance & 'analogues'*
- *Next two weeks*
- *Executive Summary*

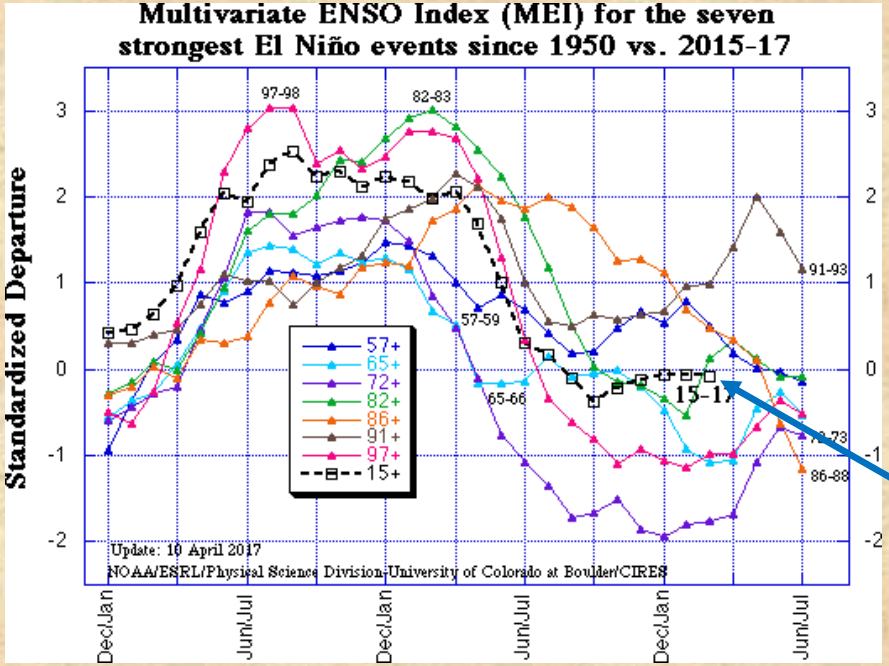


Easterly (negative) wind anomalies (left) near the dateline (the last remnant of the 2016-17 "La Niña") have weakened, ditto for SST anomalies (middle), and negative upper ocean heat content anomalies came and went by the end of 2016 (right). All in all, ENSO-neutral is the correct label, despite recent warmth in far eastern Pacific (and flooding in Peru).

http://www.pmel.noaa.gov/tao/jsdisplay/index.html

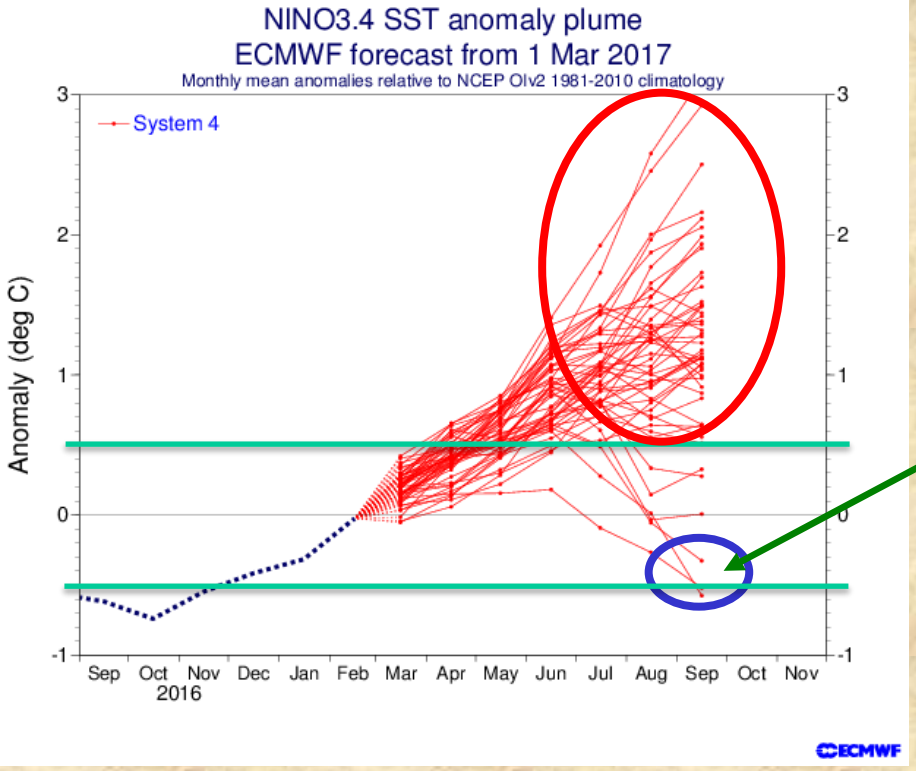
See also: *https://www.climate.gov/news-features/blogs/enso/april-2017-enso-update-conflicting-signals-tropical-pacific-ocean*





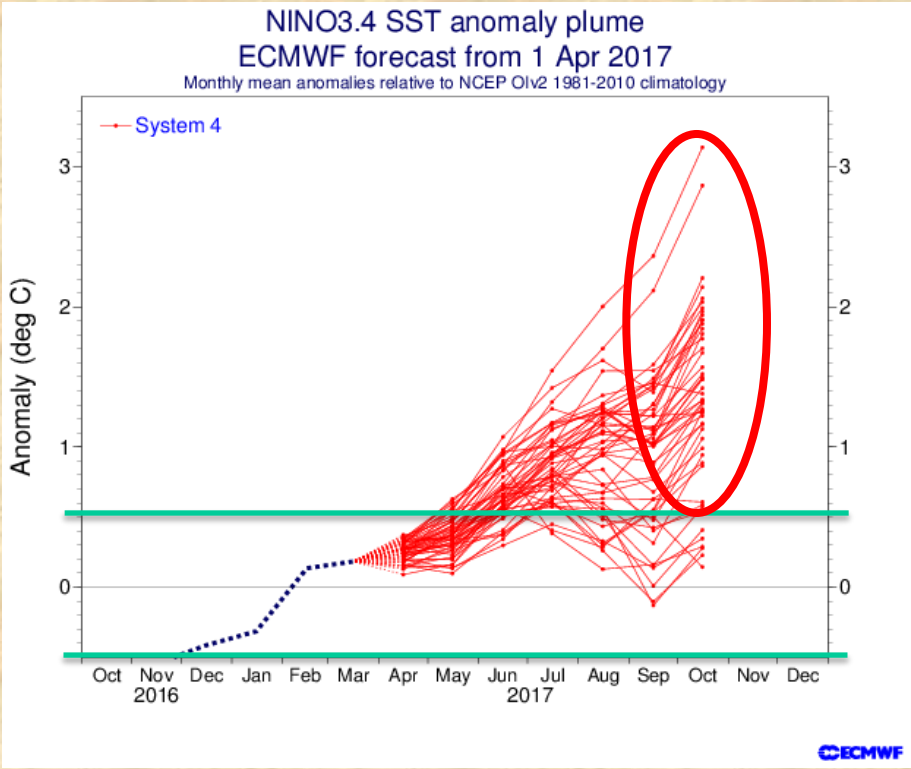
The **MEI** monitors ENSO based on all observed fields over the tropical Pacific (pressure, wind, temperatures, cloudiness). **The latest El Niño peaked in Aug/Sep 2015 at +2.53, the largest MEI value since 1998**. Since June-July 2016, I would classify it as ENSO-neutral, with the last FOUR values stagnating near 0 (***unusual but not unprecedented – it was twice that long near 0 from Sep/Oct '12 to Apr/May '13!)*.**

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



The ECMWF March 2017 forecast (left) showed a huge range of possible outcomes, reminiscent of the short-lived "El Niño" of 2012. By September, the average rises above +1.0C, along with a few dissident members that advertise an early demise of the event.

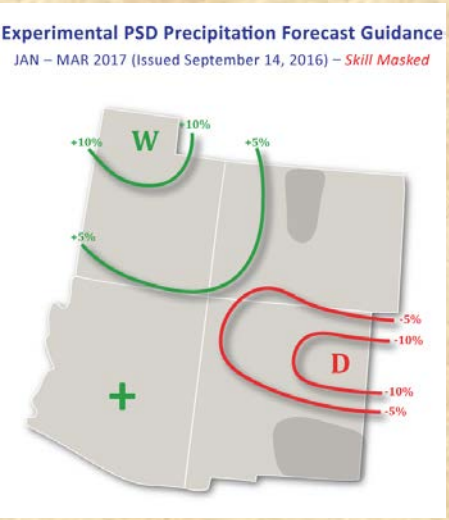
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/seasonal_range_forecast/

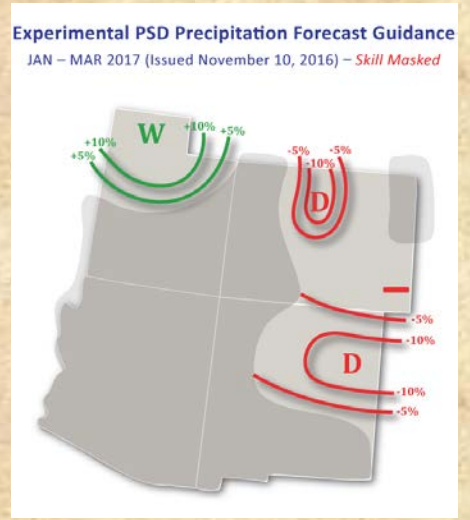


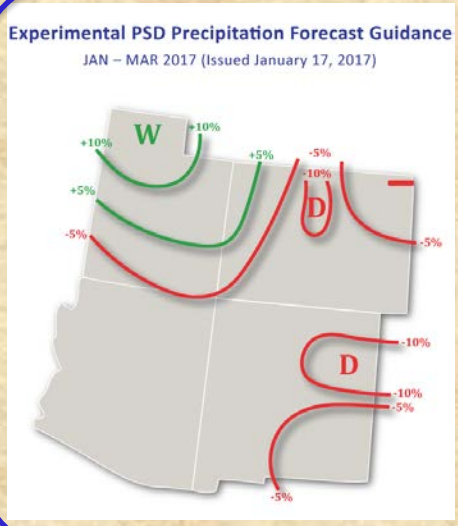
The updated ECMWF forecast (right) favors El Niño by the summer, although seasonal averages are about 0.2C lower than a month ago. By October, a large majority of ensemble members rises above +1.0C, with even the lowest outcome members staying above 0C.

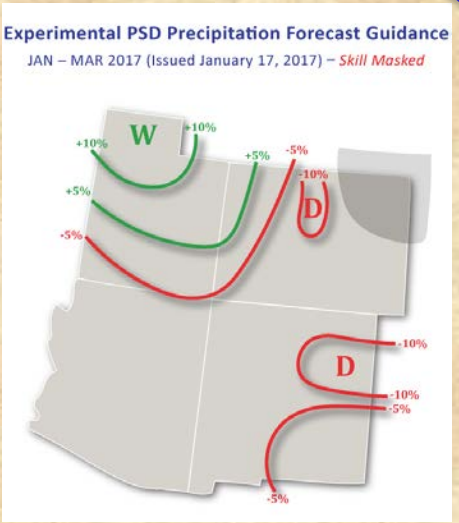
In IRI plume (not public yet), 90% of the dynamical models reach the 0.5C threshold by July-September compared to 4 out of 6 statistical models.

Postmortem Jan-Mar 2017



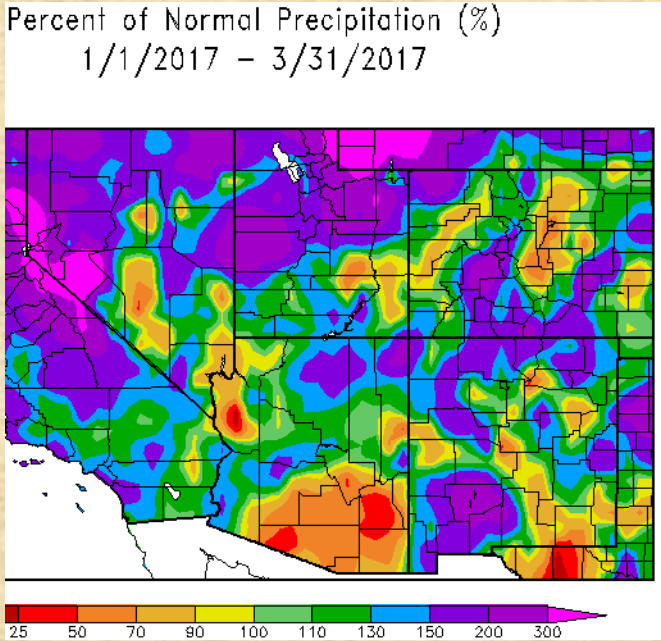




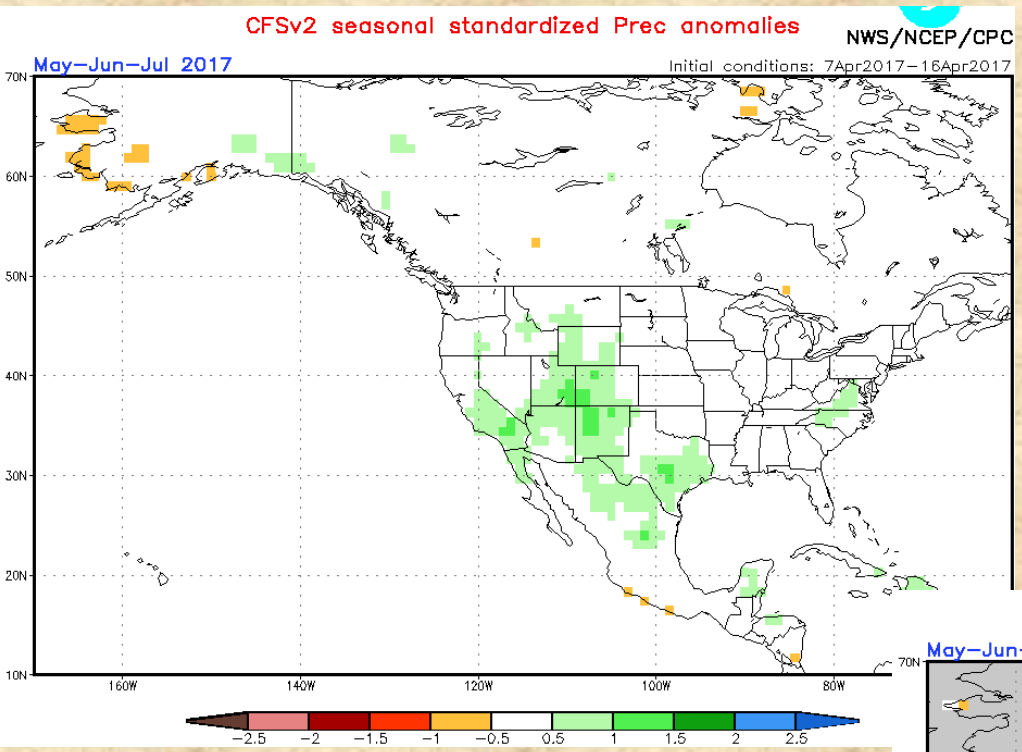


My late winter forecasts were dry for most of Colorado since November, with lingering wetness towards Utah. Outcome was indeed dry for many lower elevation sites in Colorado, especially along the Front Range, while northern Utah did very well this winter.

"Hail-Mary Pass" wetness in late March helped in SE Colorado in particular.

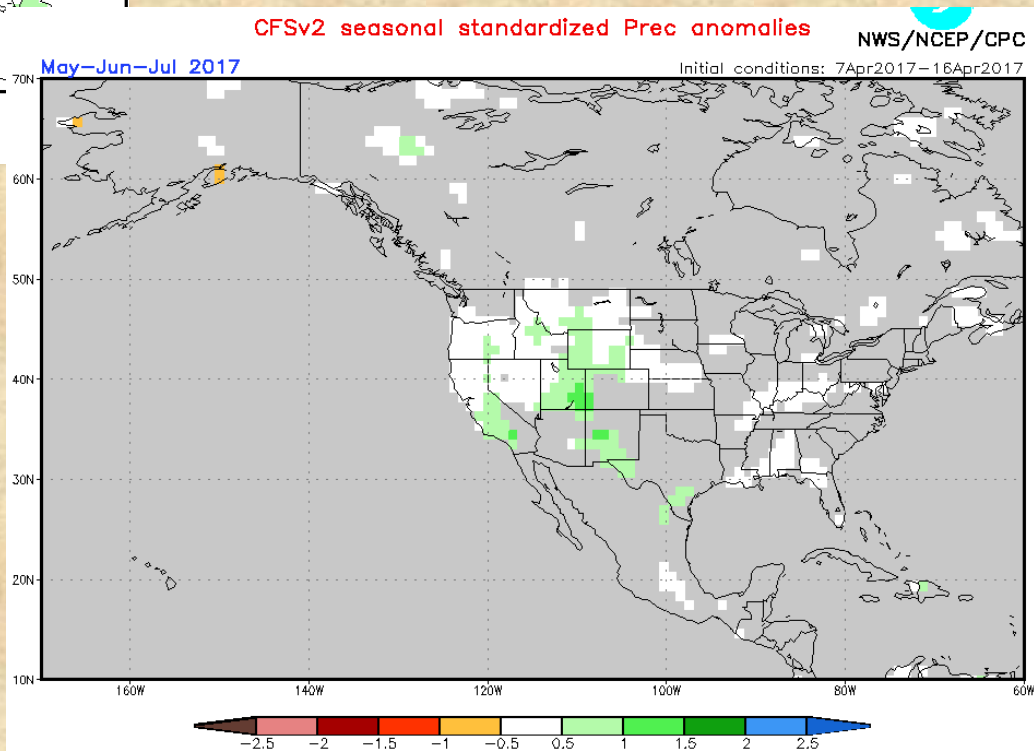


CFSv2 forecasts for May-July 2017

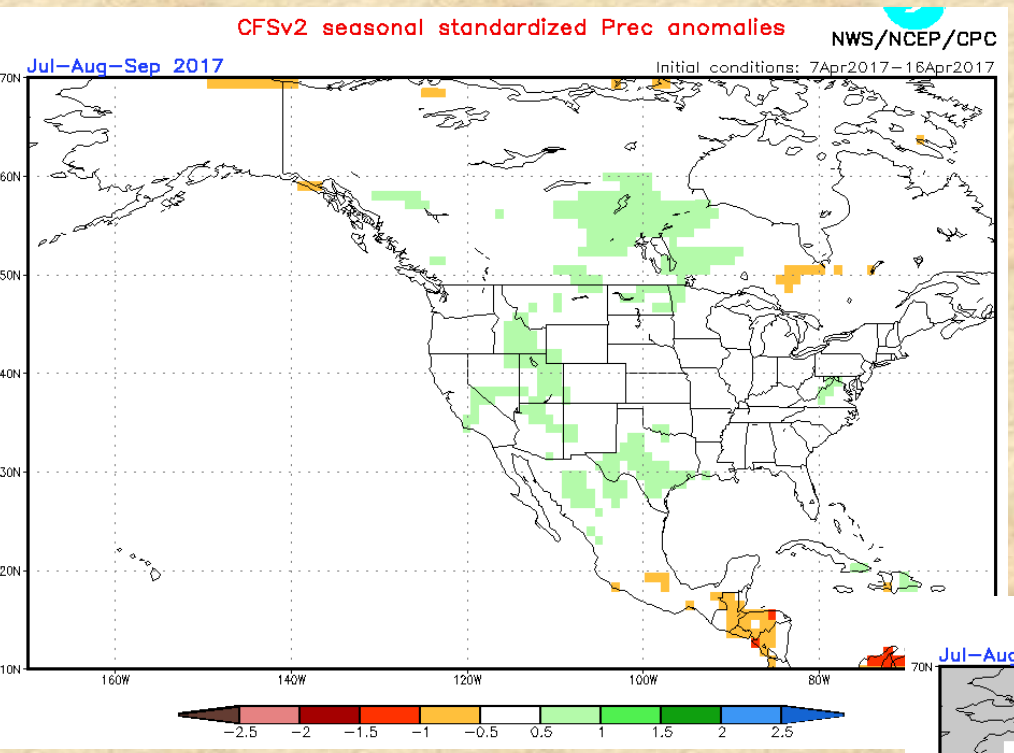


http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/

Early summer (top) shows decent chances for a wet outcome in the CFSv2. This is anchored by a wet June forecast (*not shown*). Unfortunately, this is only partially supported by skill towards UT (right).



CFSv2 forecasts for July-September 2017



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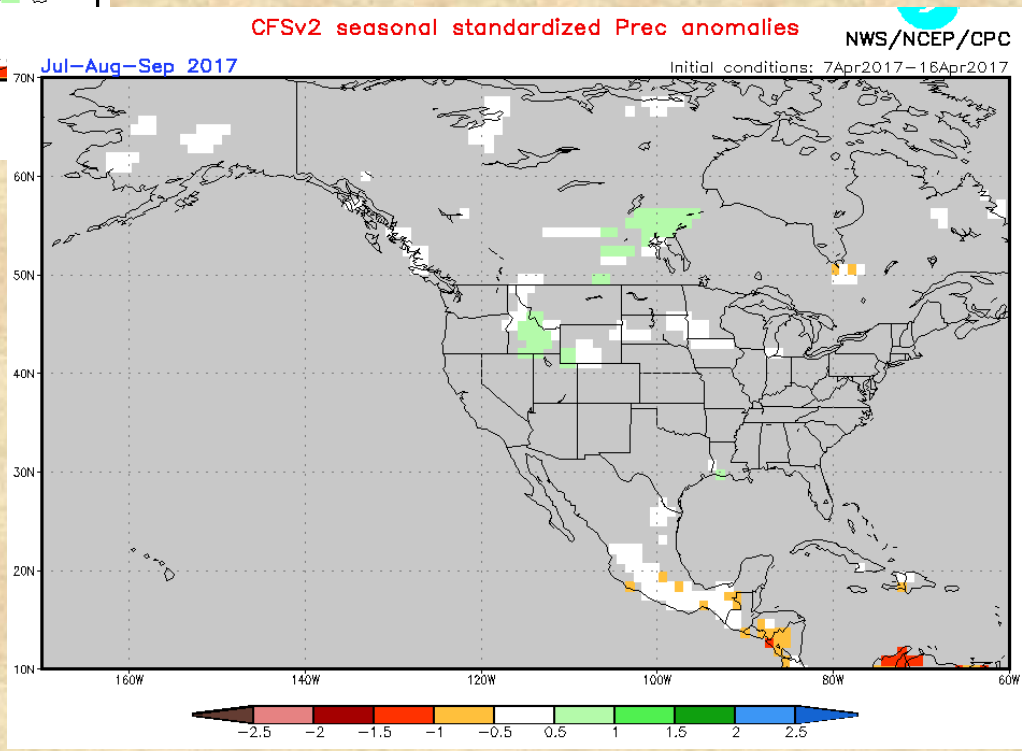
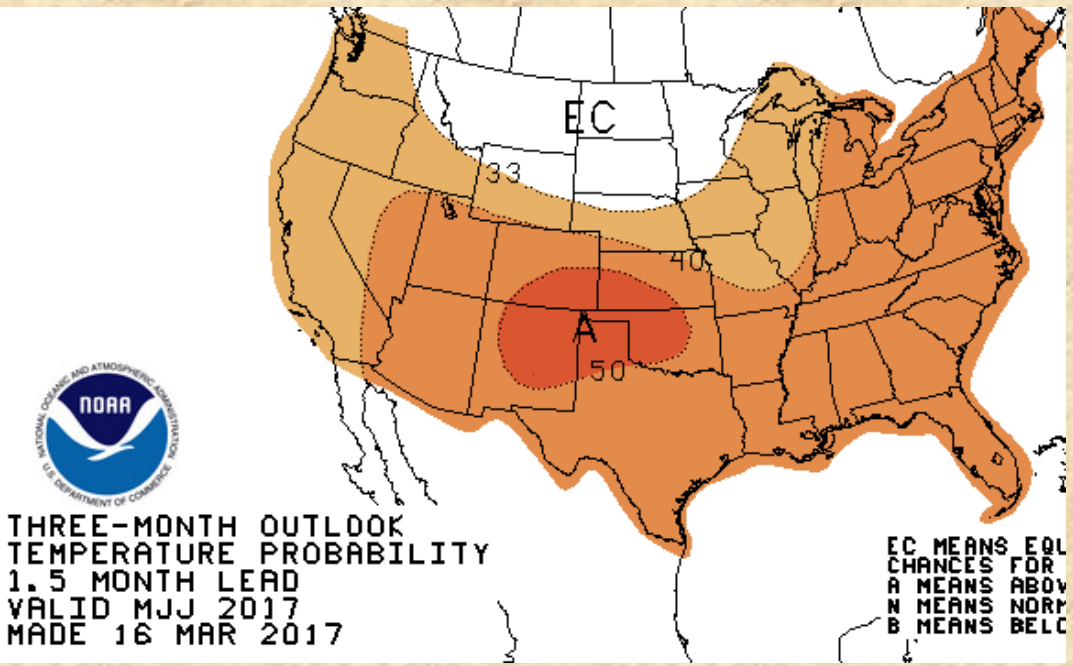


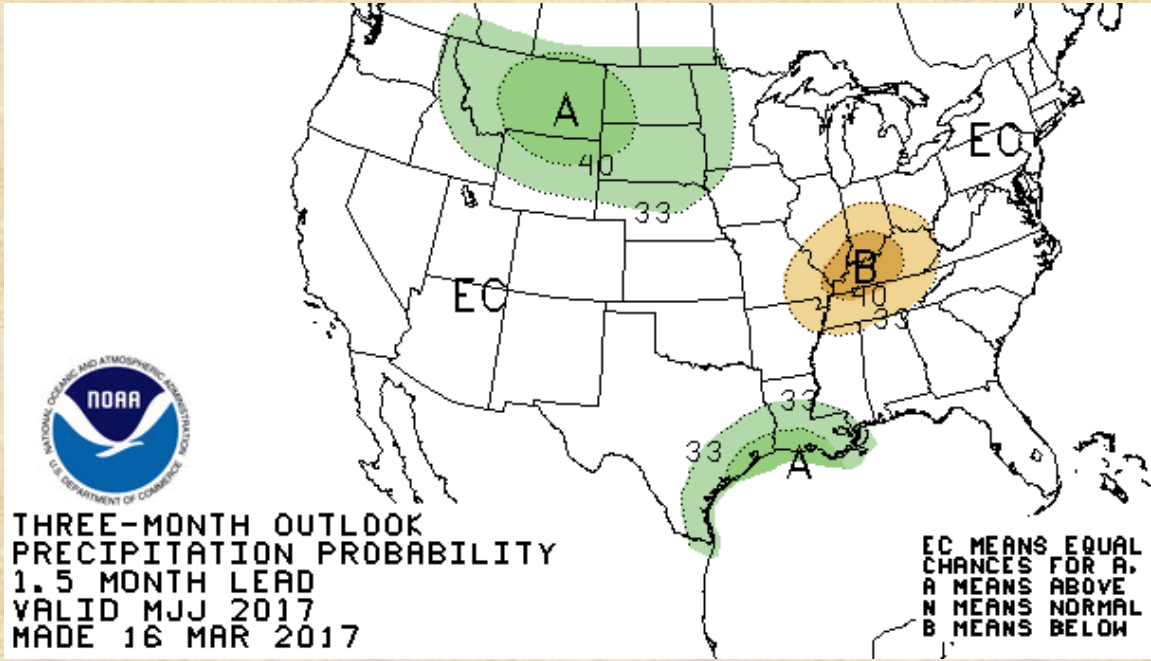
Late summer (top) shows less good chances for a wet outcome than a month ago. In addition, this is also skill-masked (right). ***Note that the CFSv2 shown here (average of last 10 days) also produces a sizable El Niño this summer.***

Climate Prediction Center Forecasts (MJJ)

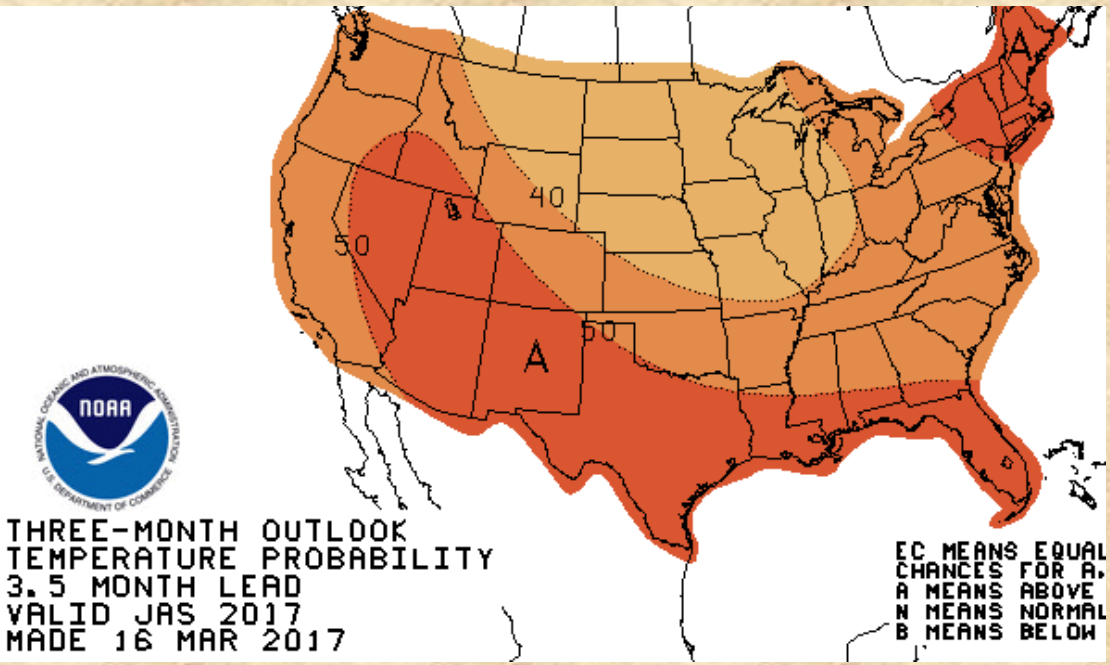


The CPC early summer temperature forecast (top left) is warm for CO, especially in the Arkansas Valley, while the precipitation forecast keeps the best odds for moisture to the north (right) – *could be worse, could be better…*

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

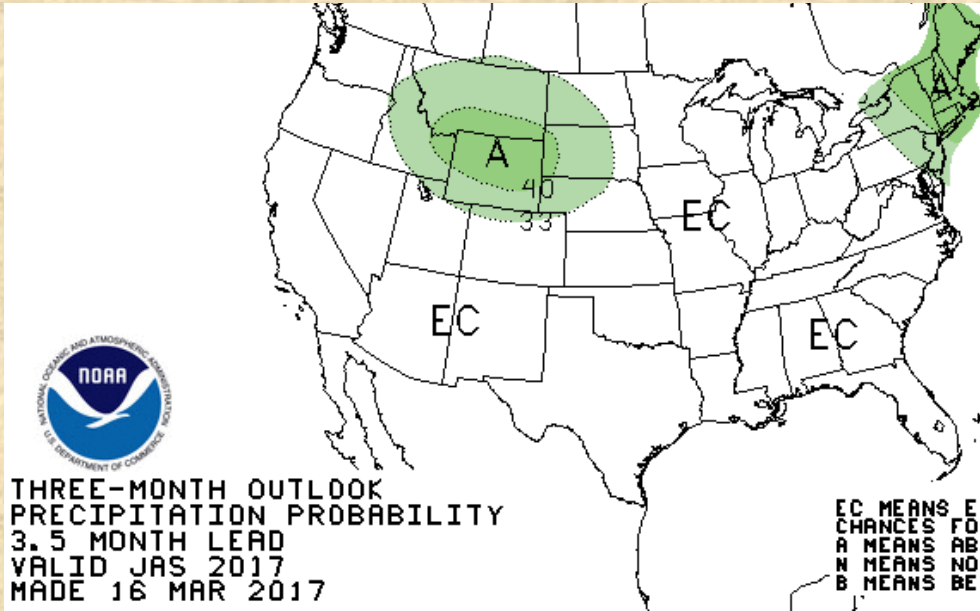


Climate Prediction Center Forecasts (JAS)

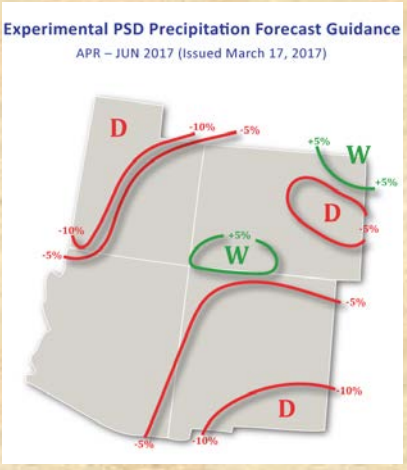


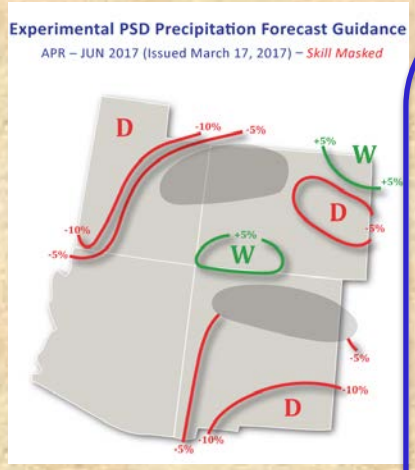
The CPC late summer temperature forecast (top left) is warm for all of the US, near the Four Corners, while the precipitation forecast keeps the best odds for moisture close to the north (right) – *while not officially acknowledged, this is consistent with El Niño conditions.*

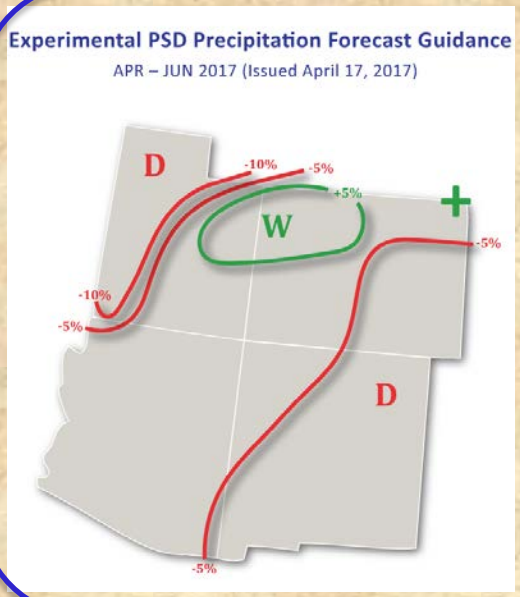
http://www.cpc.ncep.noaa.gov/products/predictions/

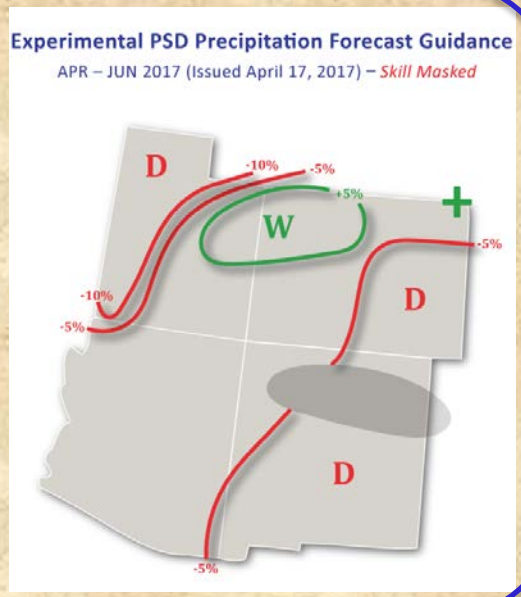


Forecasts for April-June 2016







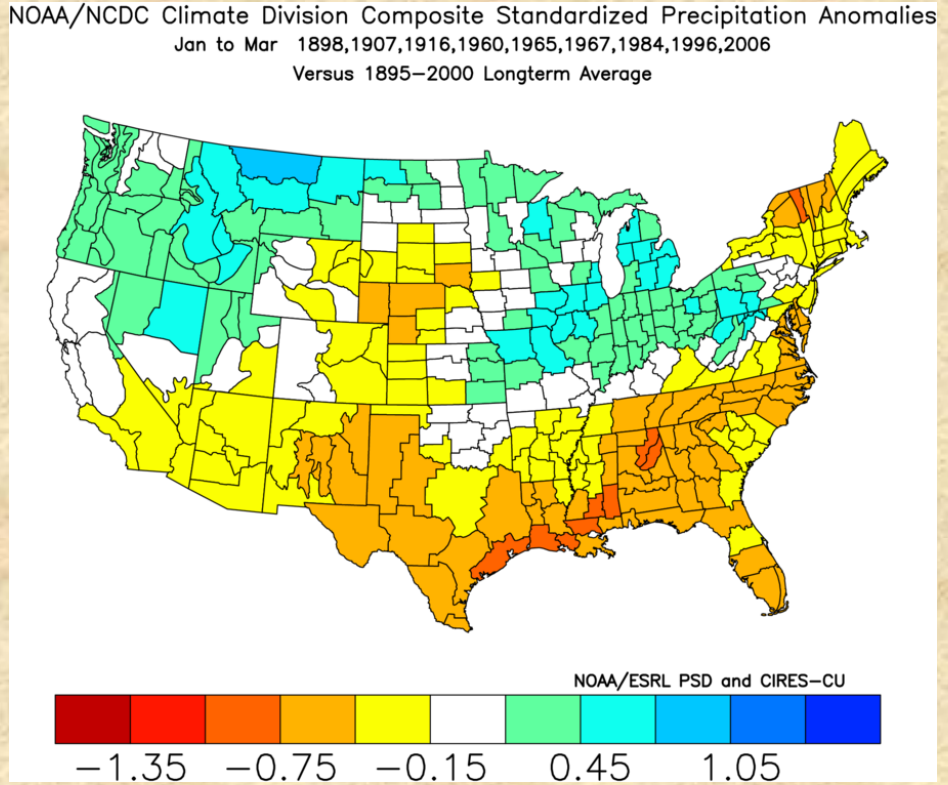


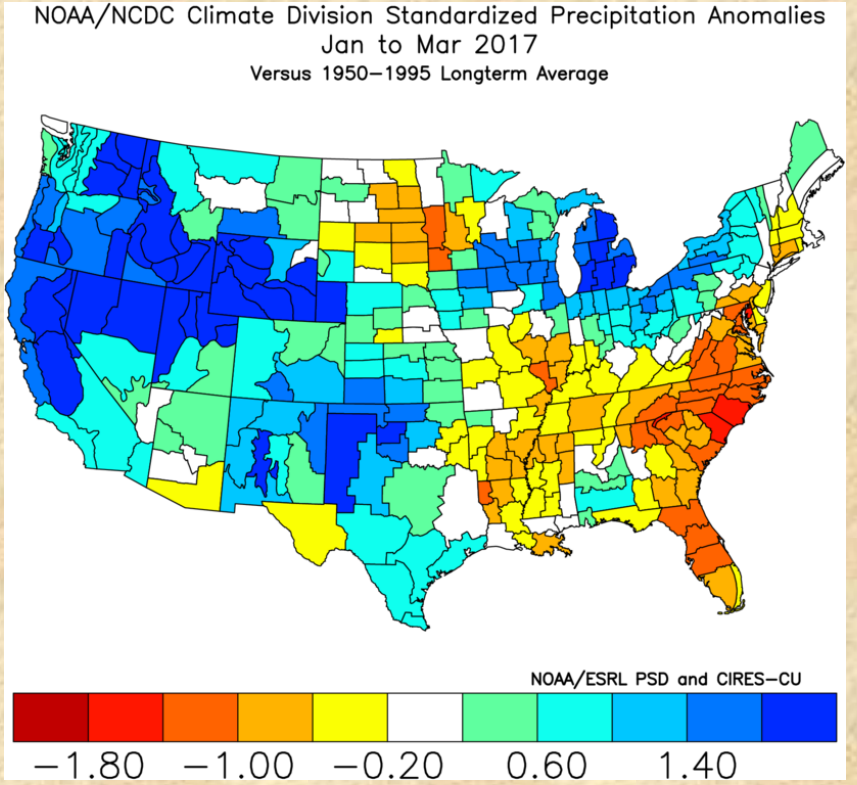
My late spring precipitation forecast remains mixed for our state, most encouraging over northern Colorado, especially west of here, but dry over southeastern plains. ***None of our forecast tilts exceed +/-10%.***

A first look at monsoon season will be included in Upper Colorado briefing next Tuesday (data feed has gotten sluggish over last few months, sorry!).


What about those analogues?
Photo@Sal DeVincenzo, Nov'15

January-March Climate Analogue Guidance (@late Oct'16)



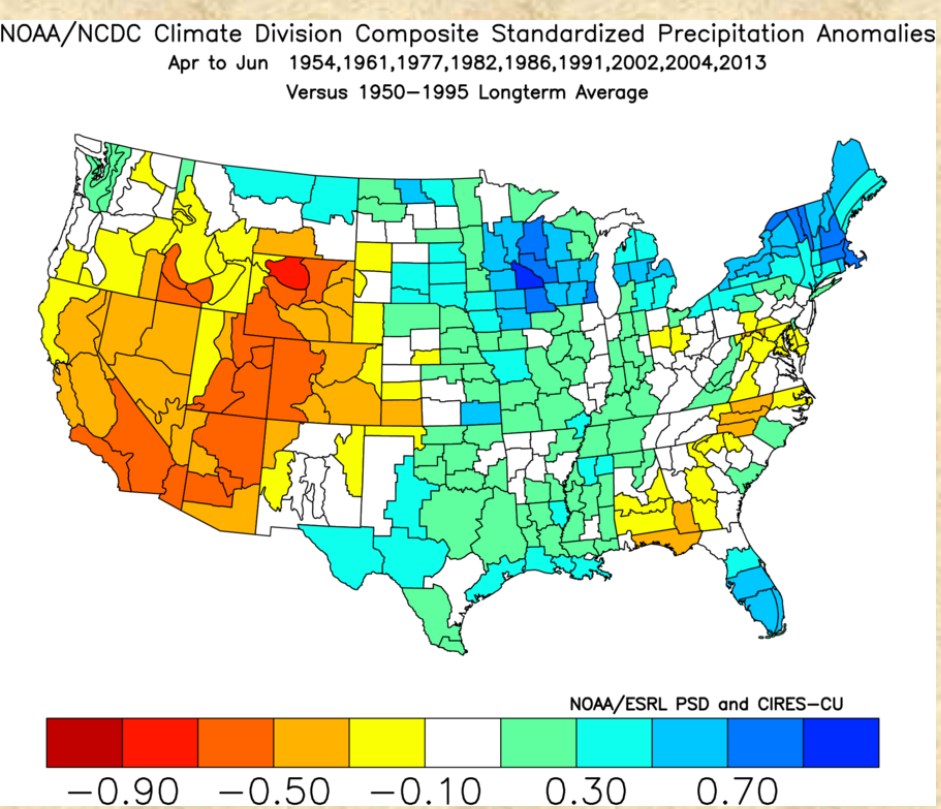


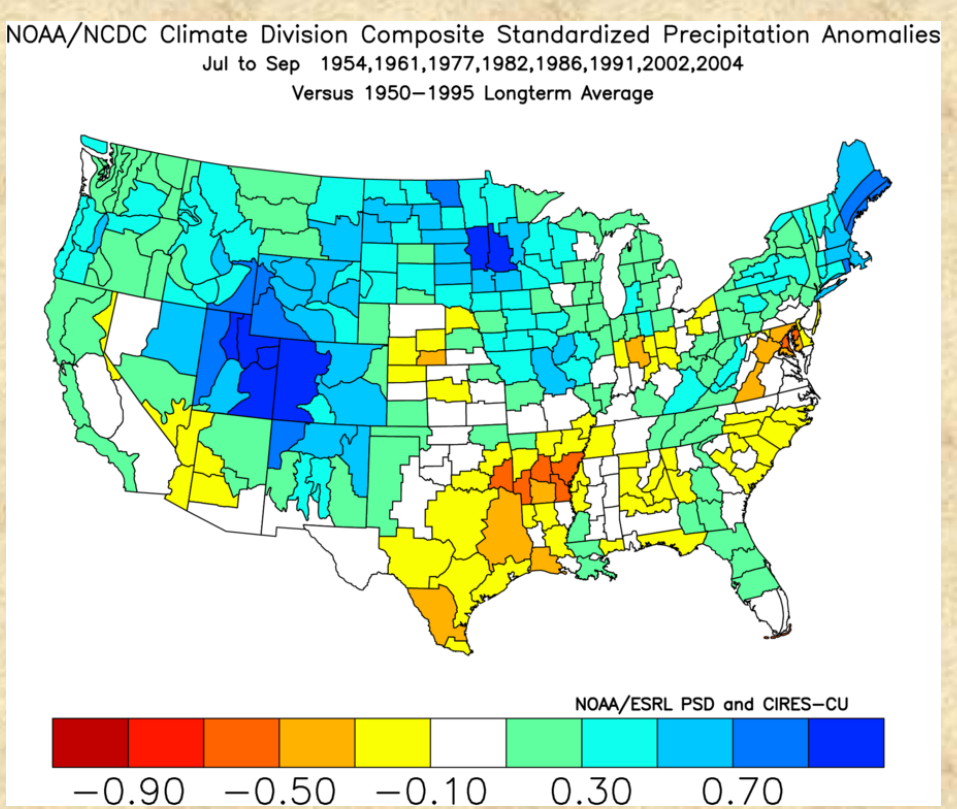
Analogue (left) was based on <u>rapid declines in the MEI and PDO from positive values without hitting major negative values in the following winter</u> during last century(+) for temperatures (left) and precipitation (right). With a sample size of nine, the 2nd color shade (beyond +/-0.45 standard deviations) is considered 'significant'.

Western US got wetter than expected!

http://www.esrl.noaa.gov/psd/data/usclimdivs/

March set of analogues based on neutral MEI and little change in previous three months (@March'17)





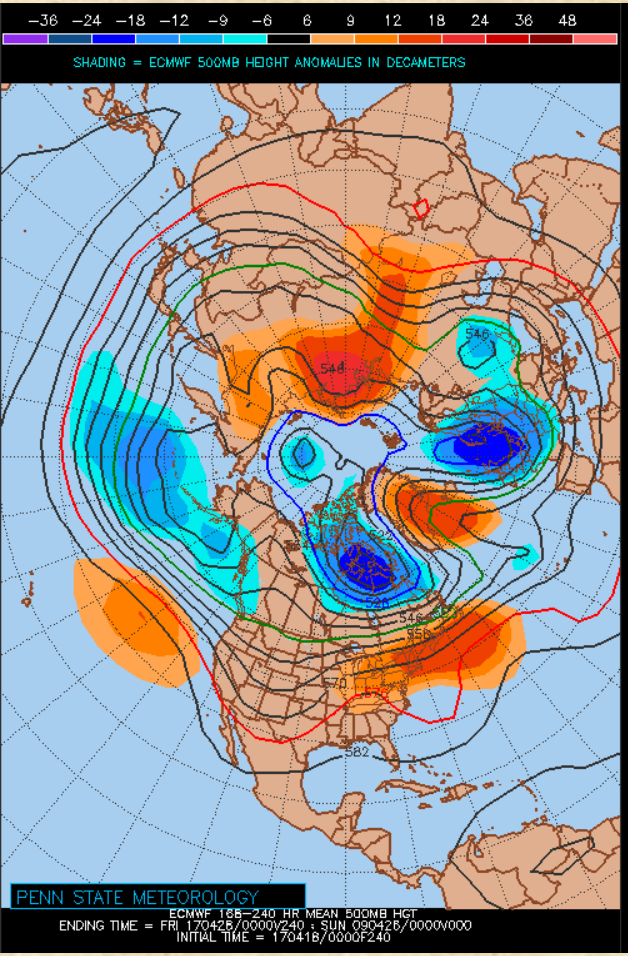
Six of these nine analogues morphed into El Niño before the end of the year ('77, '82, 86, '91, '02, '04), so this is consistent with model forecasts.

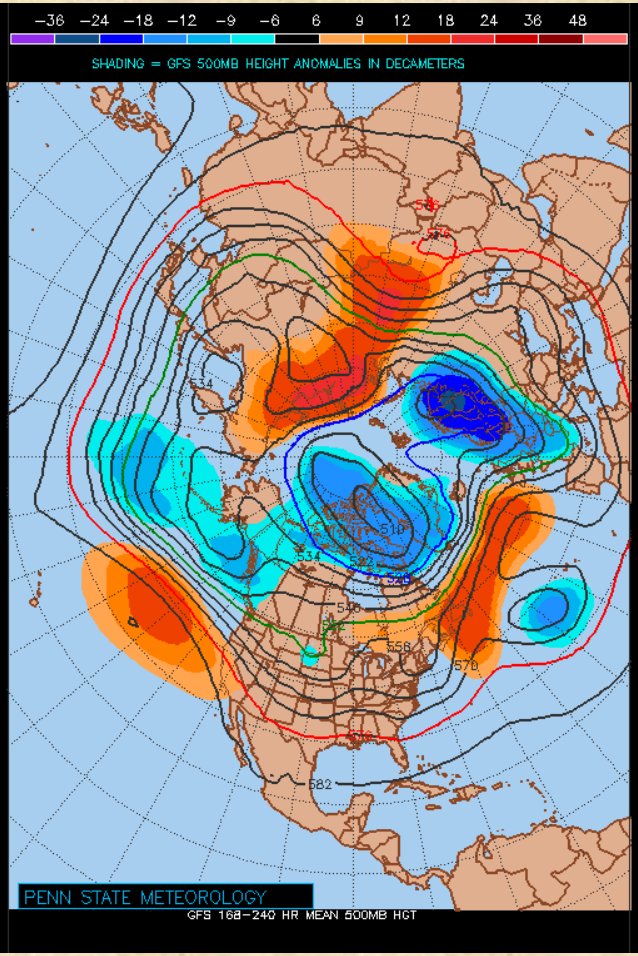
April-June (left) looks dry, especially over western CO (2002 perhaps the worst-case scenario) where it departs from forecast guidance in contrast to:

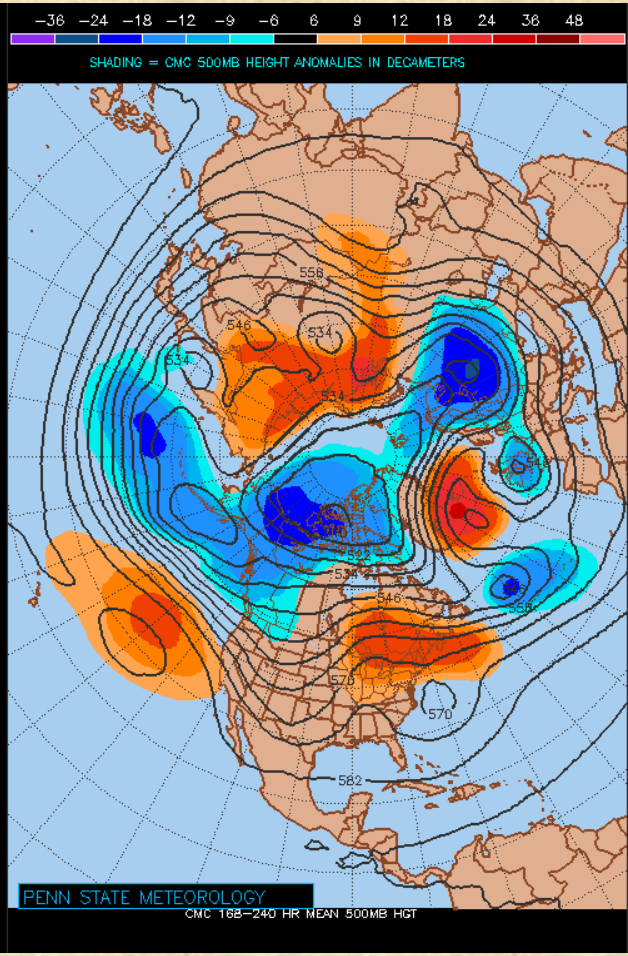
July-September (right) looks wet, especially over western CO, even with 2013 taken out!

http://www.esrl.noaa.gov/psd/data/usclimdivs/

What can we expect next week (7-10 days out)?







ECMWF (left), GFS (middle,) and CMC (right) show near-normal heights over our state, with lower pressure to the north. This *should* be an active weather pattern for the northern mountains, but also windy and mostly dry east of there!

Executive Summary (18 April 2017)

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- **A weak La Niña snuck in last fall, behaved as if it were much bigger, and is now gone. Precipitation impacts in CO have been consistent (late start to snow season, wet in mid-winter), and even lingering dryness this spring matches expectations.**
- **Experimental forecast guidance for late winter correctly anticipated an east-west gradient from wet in the west to dry over eastern Colorado, but the mountains did better than expected, especially in the South. *Going forward, the April-June forecast looks dry for the eastern plains, with mixed messages west of the Divide (analogue dry / experimental forecast wet).***
- **Forecasts from CPC are 'EC' for the next five months (update on April 20). CFSv2 is optimistic for early summer in particular, but not as wet looking later on as last month, and not supported by prior skill.**
- **The next two weeks look more active than last 10 days, but not as wet as a month ago. Nevertheless, we should see a cool-down and occasional moisture, especially in northern half of state, as is typical for this time of year.**
- **BOTTOMLINE: Given continued warmer than average temperatures, we will need more than average moisture to keep our burgeoning vegetation from drying out. My main concern is about non-irrigated farmlands (Arkansas Valley!) and foothill fire danger for the near future. *El Niño is still in the cards later this year, but does not look imminent (it could improve chances for moisture by fall).***