Earth System Research Laboratory
Physical Sciences Division

CIRES
Cooperative Institute for Research in Environmental Sciences

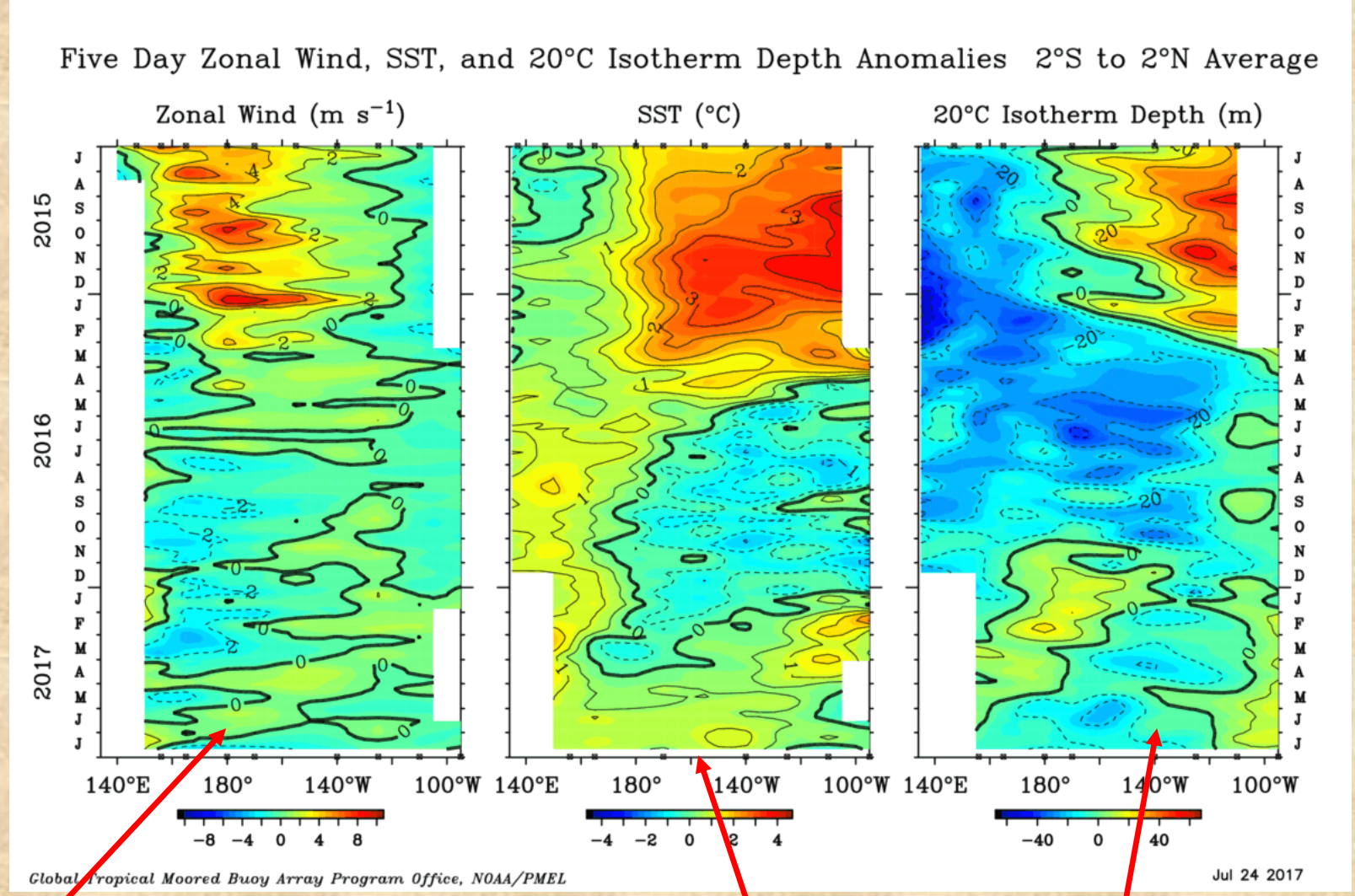
Colorado WATF,
7-25-17, Denver

COLORADO
Colorado Water Conservation Board
Department of Natural Resources

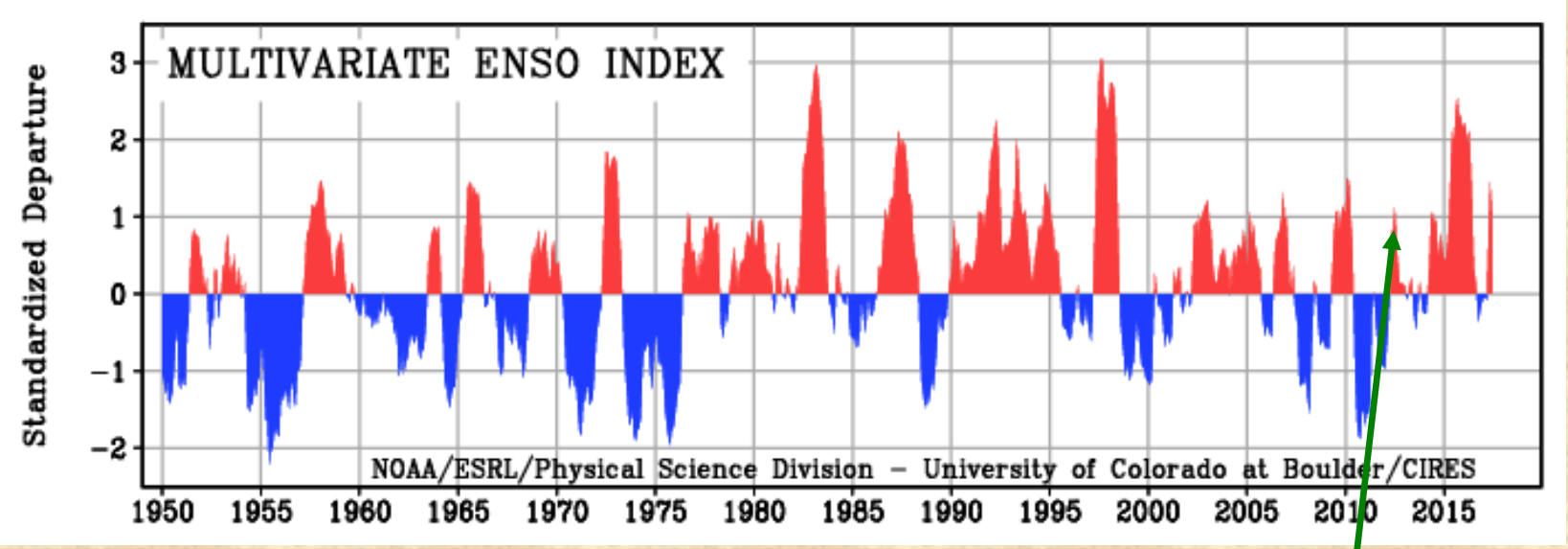
Seasonal Outlook for Colorado

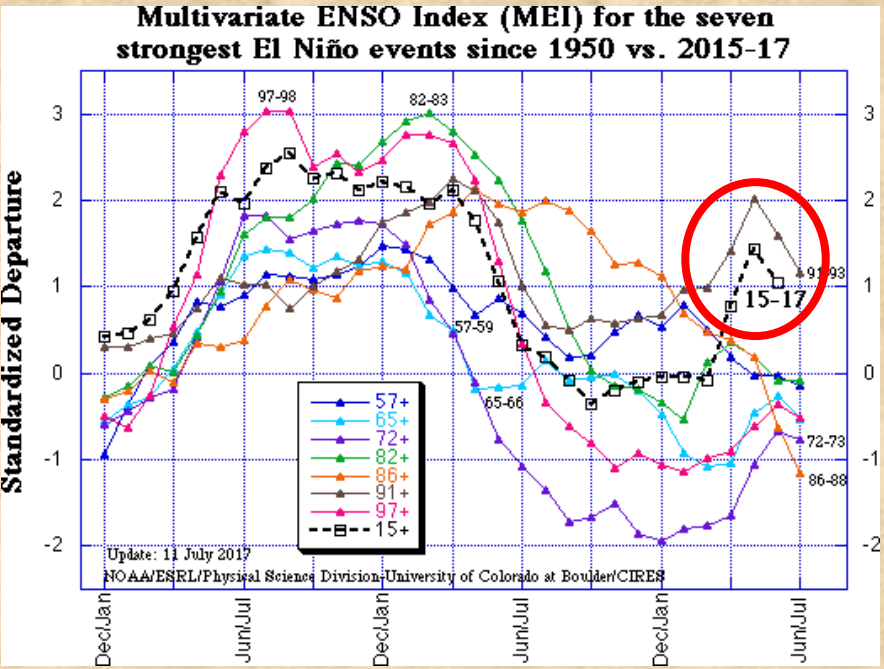
Klaus Wolter
University of Colorado, CIRES & NOAA-ESRL Phyiscal Science Division
klaus.wolter@noaa.gov

- ***Third 'failed' El Niño in six years after 2012 and 2014!***
- ***CPC/CFSv2 forecasts from August thru December***
- ***Experimental forecast guidance & 'analogues'***
- ***Next two weeks***
- ***Executive Summary***



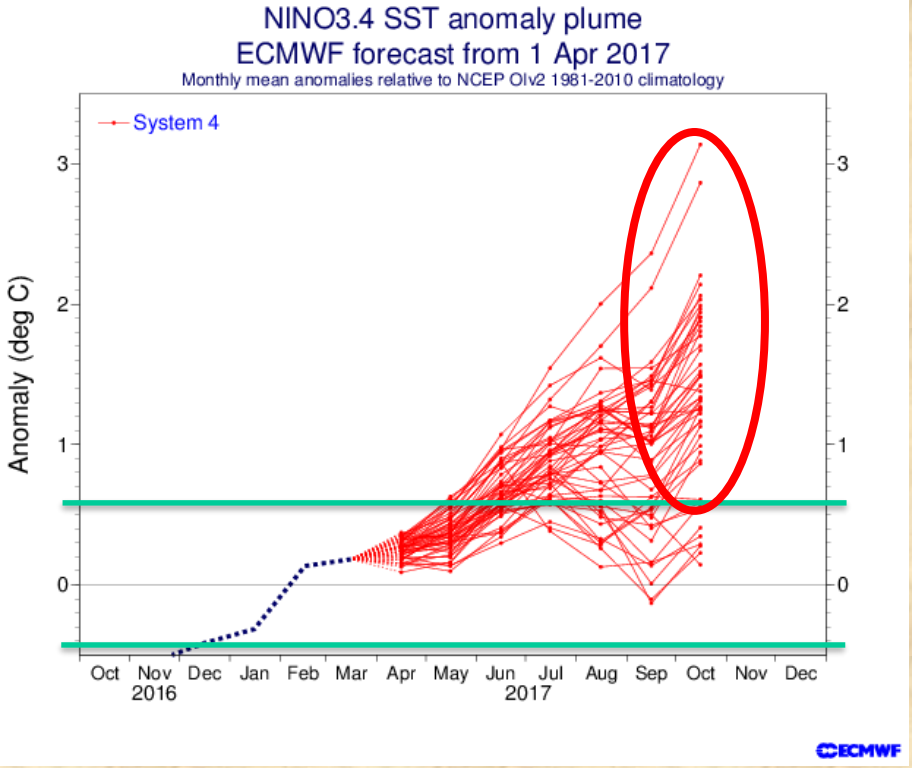
Wind anomalies (left) near the dateline have been remarkably weak lately, warm SST anomalies (middle) have drifted westward and weakened, and negative upper ocean heat content anomalies peaked a year ago and hover near-normal since then (right). All in all, ENSO-neutral is the official designation, despite some recent differences of opinion based on the MEI (next slide). *http://www.pmel.noaa.gov/tao/jsdisplay/index.html*





The **MEI** monitors ENSO based on all observed fields over the tropical Pacific (pressure, wind, temperatures, cloudiness). **Compared to just three months ago, we had ourselves a brief El Niño "event" in 2017, not unlike 2012**.

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

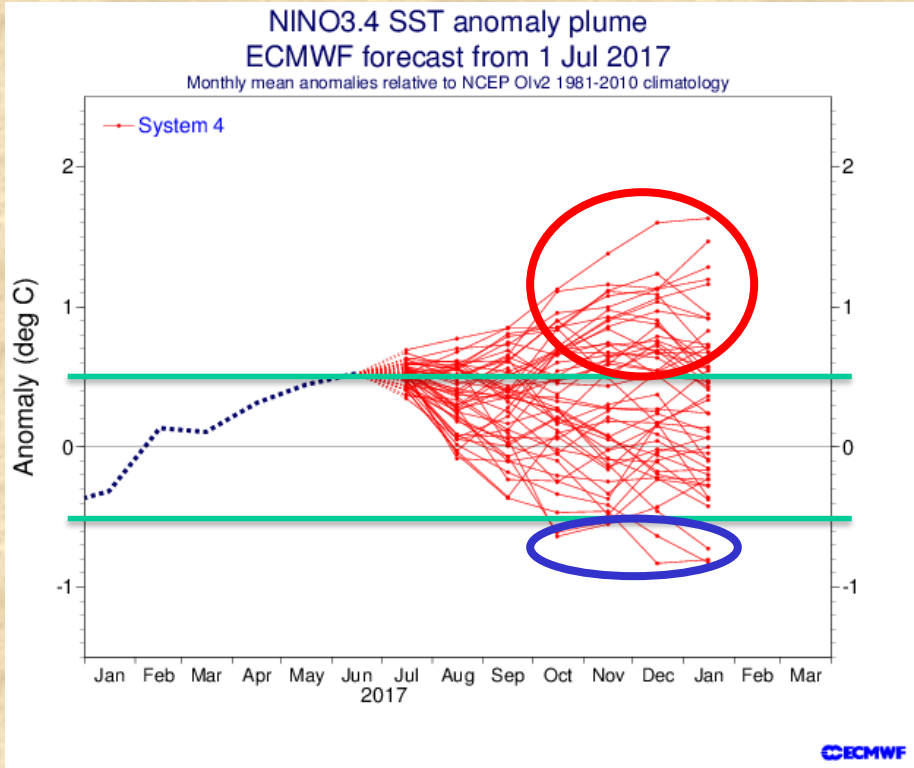


The ECMWF April 2017 forecast (left) showed a large range of possible outcomes, all the way from near-neutral to a few members reaching "Super-Niño" status by October. By then, a large majority of the 50 ensemble members rose above +1.0C, with even the lowest outcome members staying above 0C.

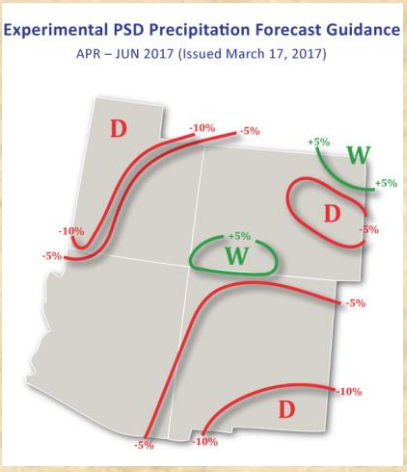
http://www.ecmwf.int/products/forecasts/d/charts/seasonal/forecast/

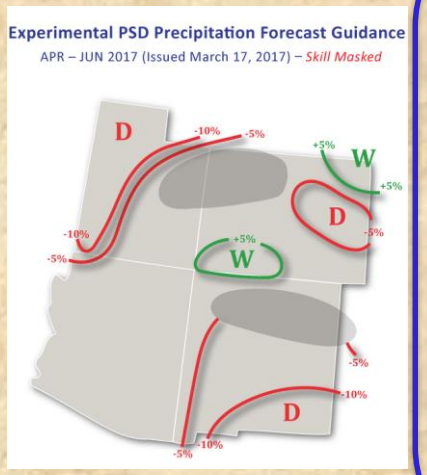
The July 2017 ECMWF forecast (right) has backtracked every month since then. Now, quite a few more ensemble members still linger above +0.5C than even drop below -0.5C by October, but the <u>majority of ensemble members are back to near-normal.</u>

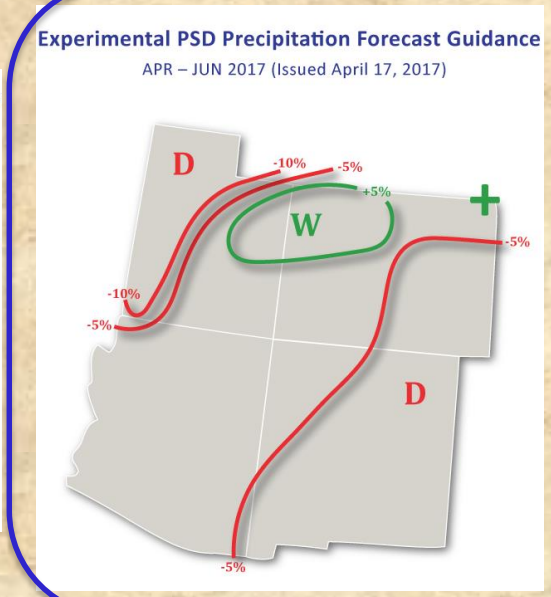
Remember 2012 and 2014? This appears to have been the 3rd El Niño forecast "dud" in six years!

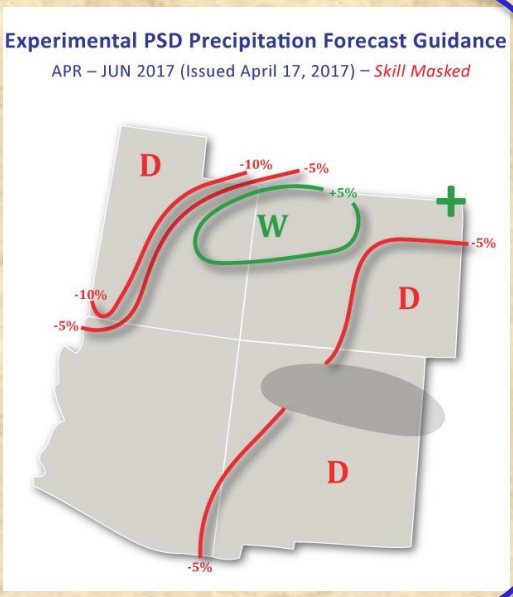


Postmortem April-June 2017



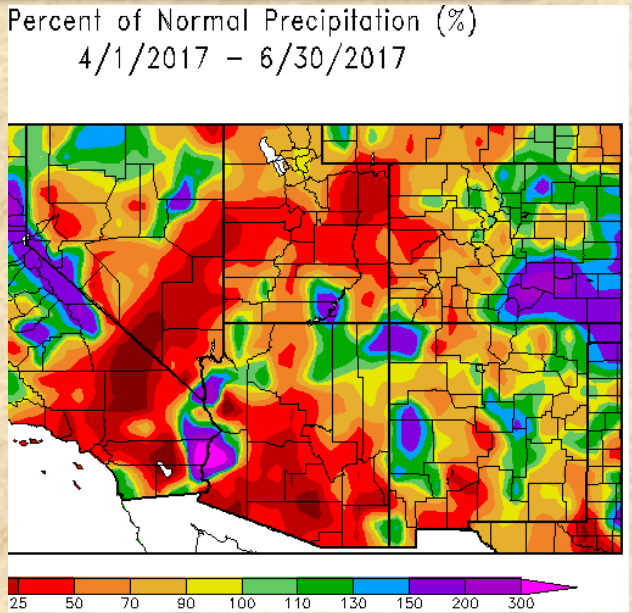




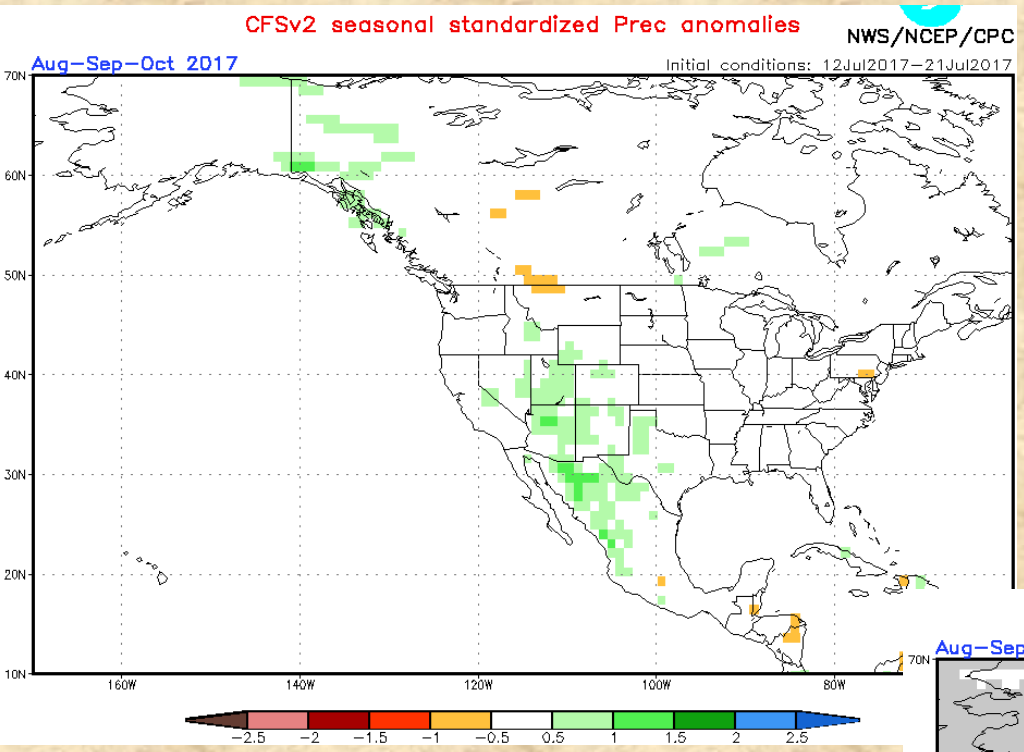


My late spring precipitation forecast was mixed for our state, most encouraging across northern Colorado, but dry over southeastern plains. ***None of the forecast tilts exceed +/-10% in our state.***

Verification (right) looks wetter than expected in SE CO, drier than expected in NW CO, and closer to the forecast in NE CO.

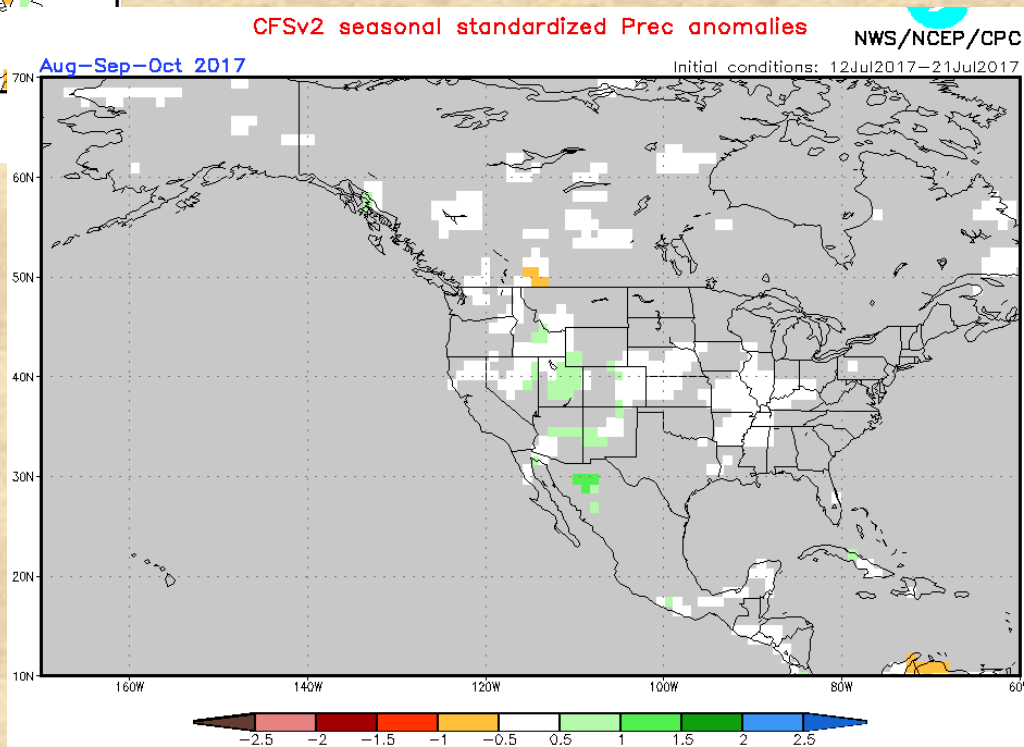


CFSv2 forecasts for August-October 2017



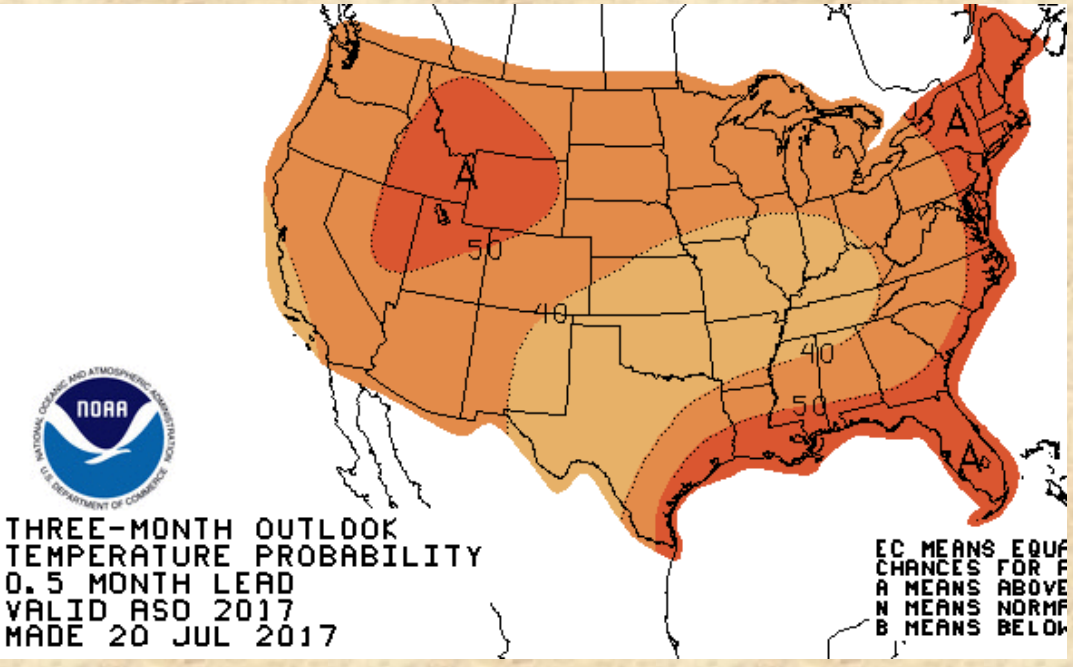
http://www.cpc.ncep.noaa.gov/products/predictions/90day/tools/briefing/

NO TILT IN ODDS FOR OCT-DEC 2017 (not shown here)



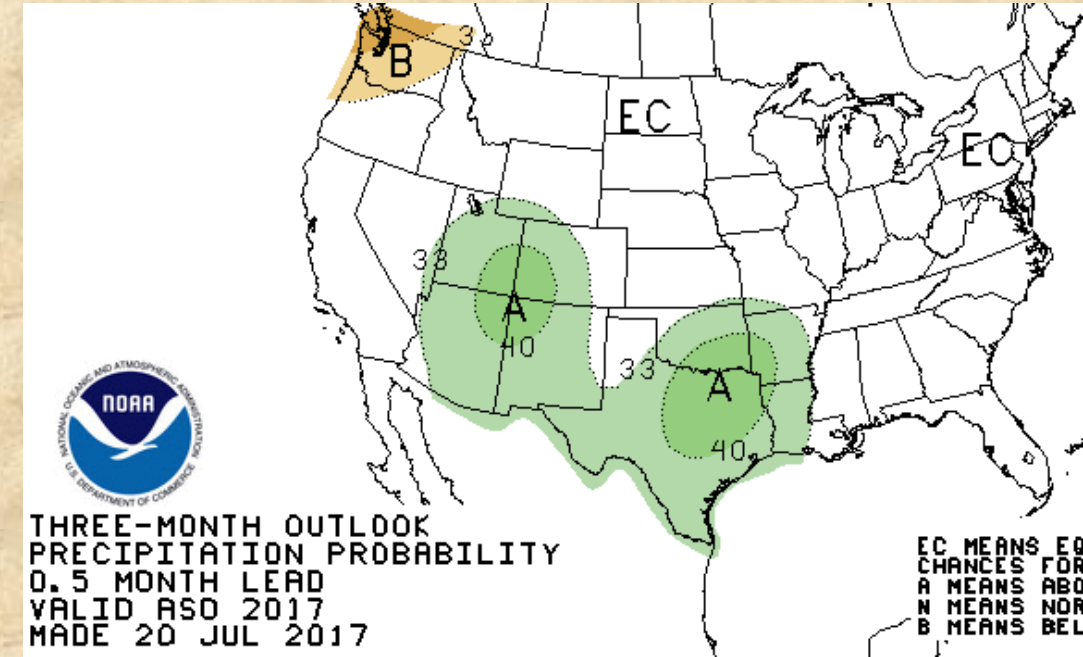
ASO 2017 (top) shows decent chances for a wet outcome in the CFSv2, if mostly to our west. This is anchored by a wet August forecast (*not shown*). A small fraction of this even survives the skill mask right on the northern Front Range (right).

Climate Prediction Center Forecasts (ASO)

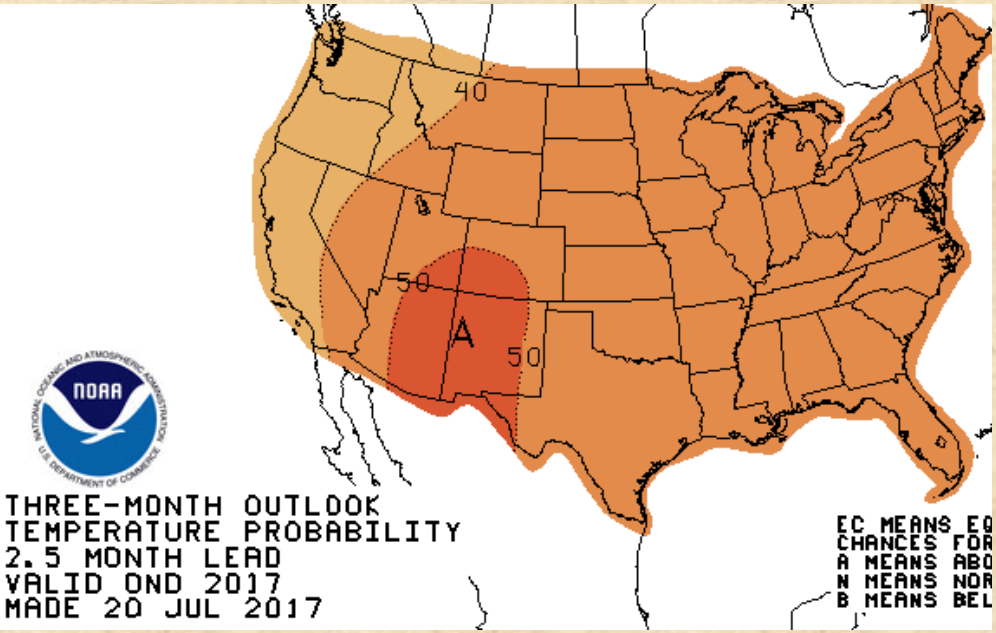


http://www.cpc.ncep.noaa.gov/products/predictions/

The latest CPC late summer temperature forecast (top left) is warm for CO, especially towards NW, while the precipitation forecast is putting western half of CO under wet odds (right) – *consistent with a wet AUGUST forecast (not shown).*

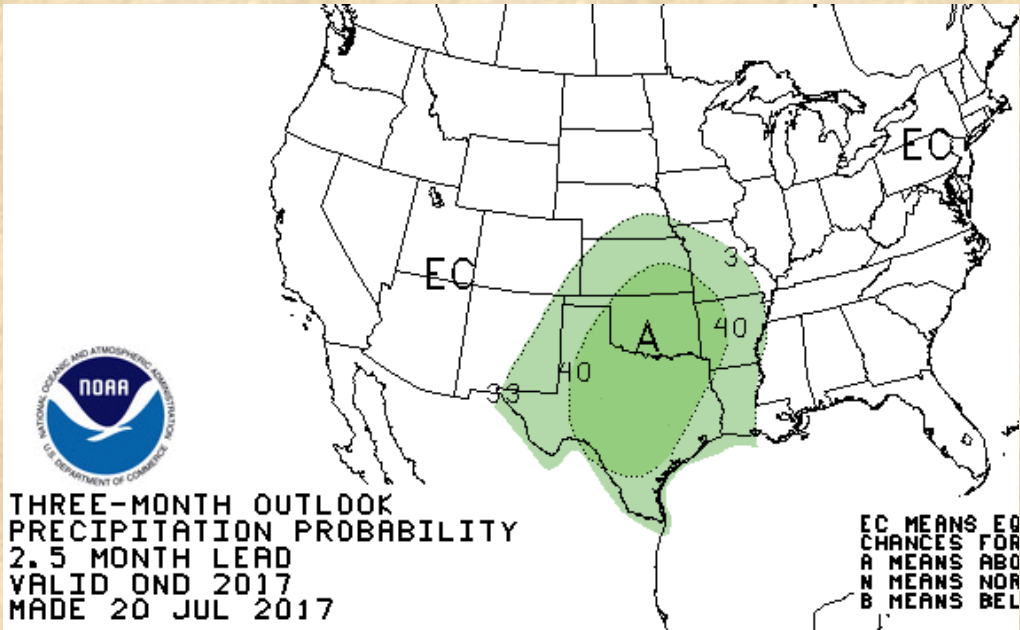


Climate Prediction Center Forecasts (OND)

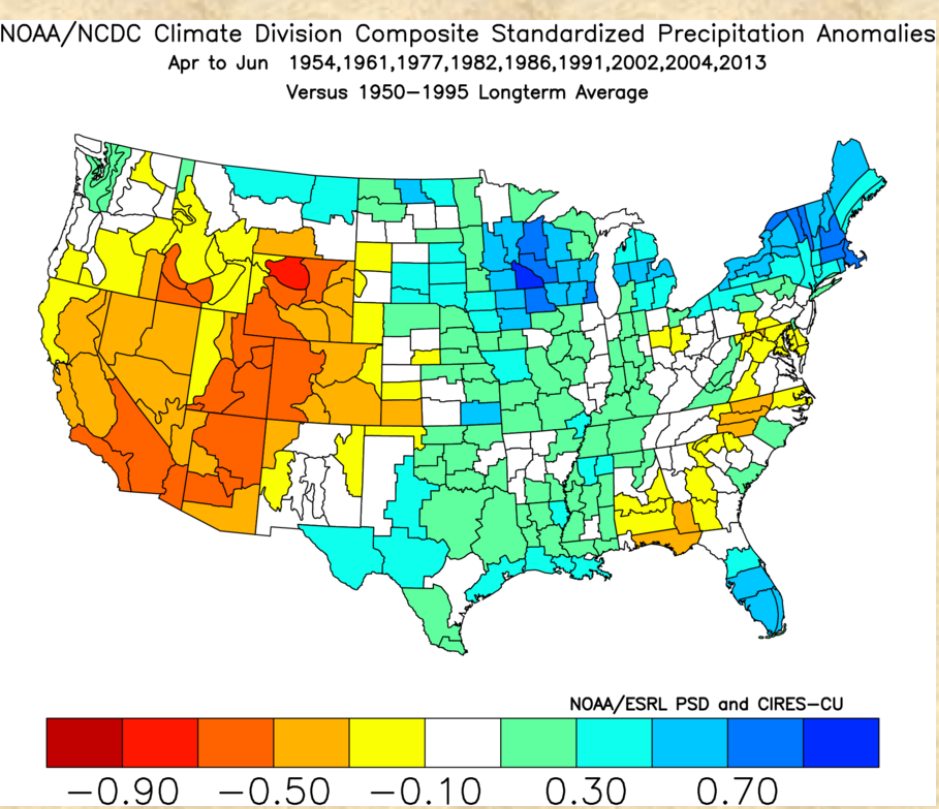


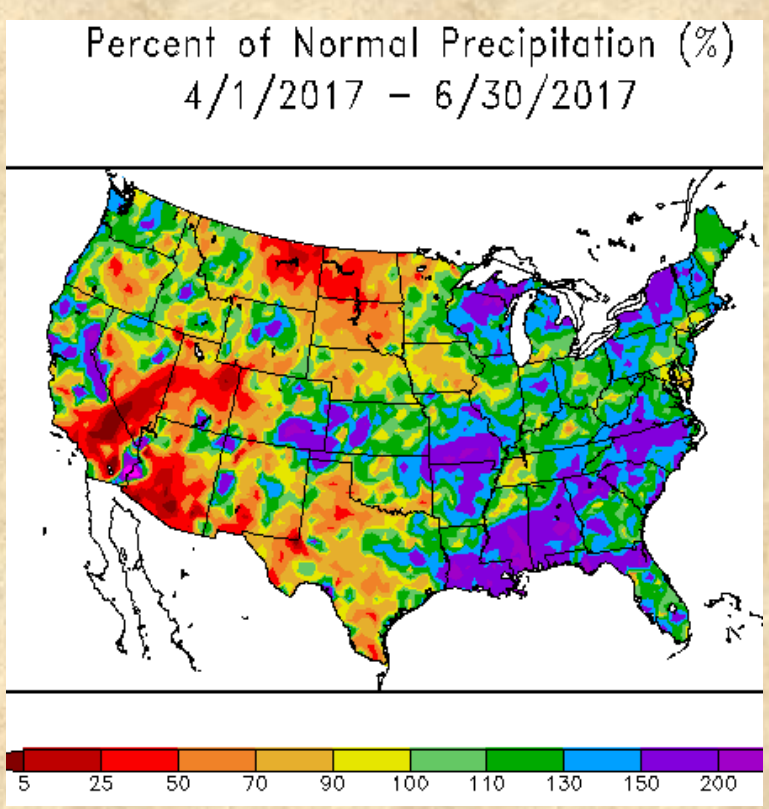
http://www.cpc.ncep.noaa.gov/products/predictions/

The latest CPC late fall temperature forecast (top left) is warm for CO, especially towards Four Corners, while the precipitation forecast is mostly 'EC' for our state (right). Given the lack of ENSO-forcing, both forecasts are mostly based on long-term trends.



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





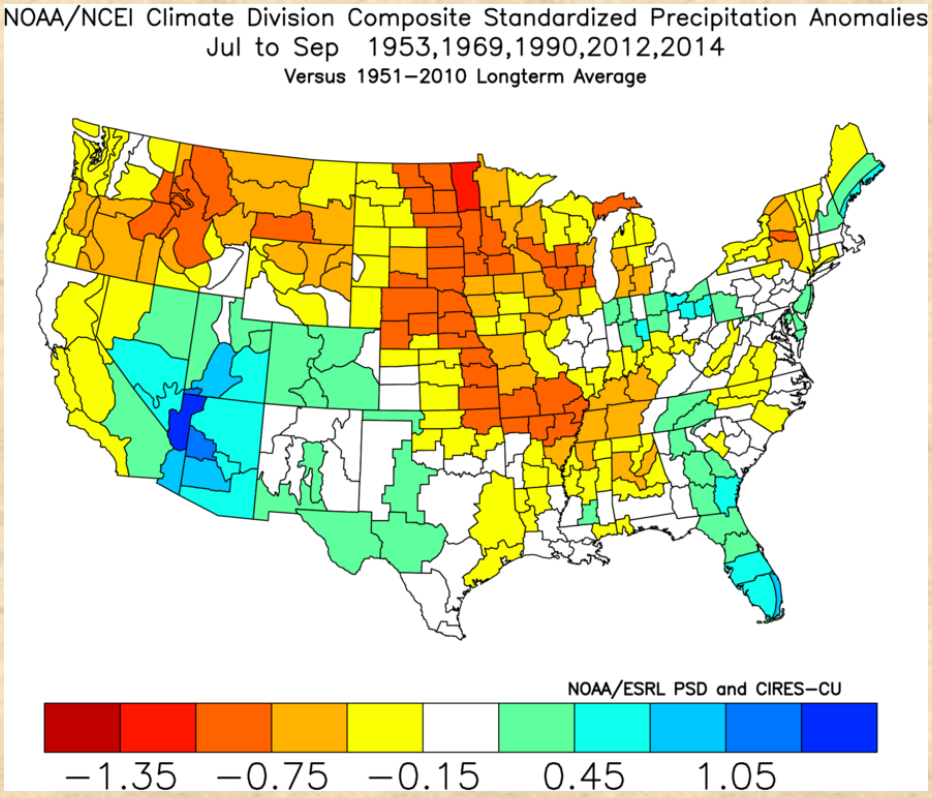
Six of these nine analogues morphed into El Niño before the end of the year ('77, '82, 86, '91, '02, '04), so this was consistent with model forecasts back then.

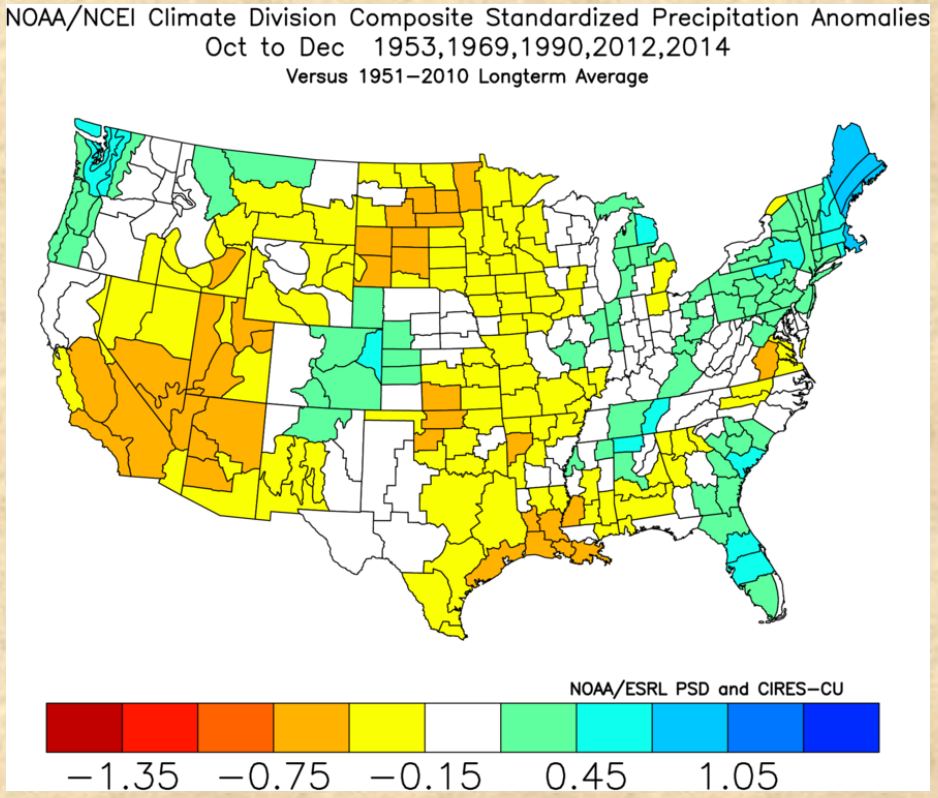
April-June (left) looked dry, especially over western CO (2002 perhaps the worst-case scenario)

Outcome was mixed: dry as expected over much of SW USA, but surprisingly wet over SE CO

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

July set of analogues based on similar MEI rankings&evolution (@thru June'17)



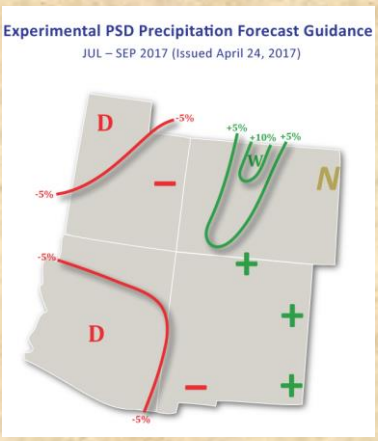


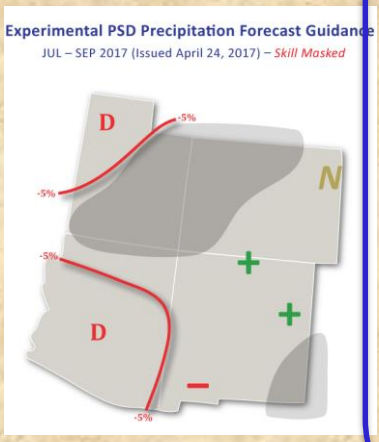
All five of the new analogues showed a peak in the MEI in late spring or early summer, followed by a decline to (warm-)neutral conditions by end of year.

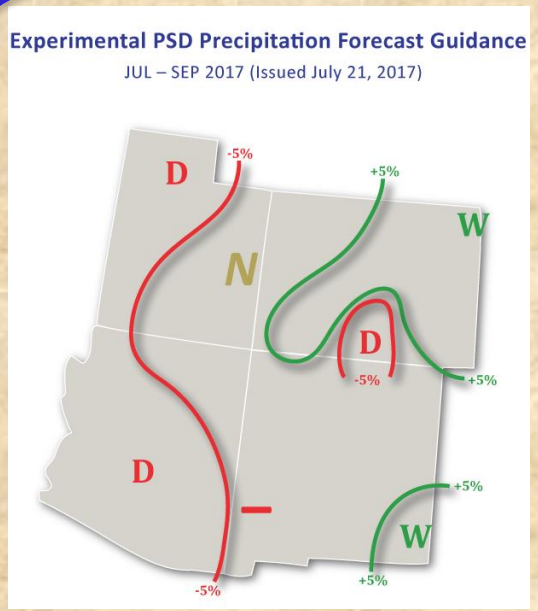
July-September (left) looks modestly encouraging for all of CO, while October-December (right) shifts wetter odds back to eastern CO. None of the composite anomalies are "strong" over CO.

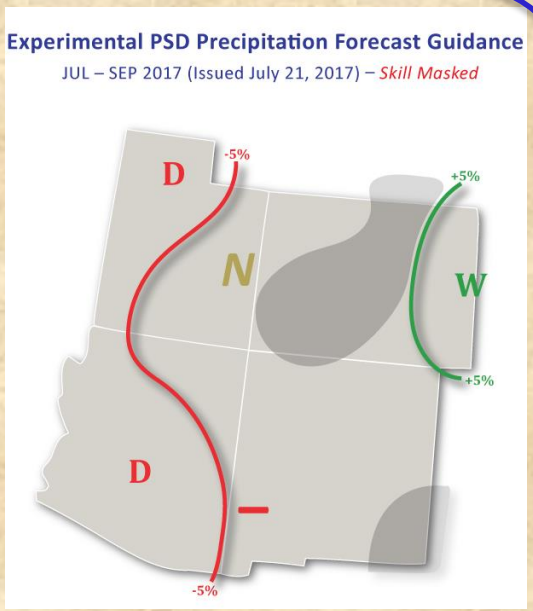
http://www.esrl.noaa.gov/psd/data/usclimdivs/

Forecasts for July-September 2017





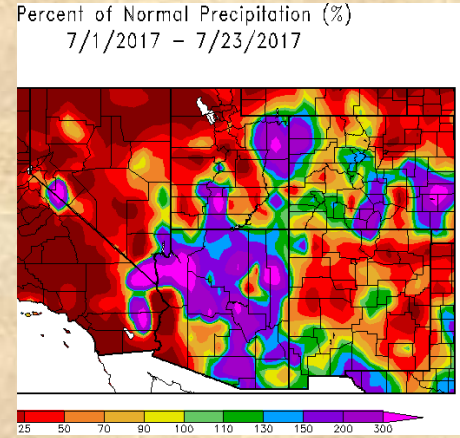




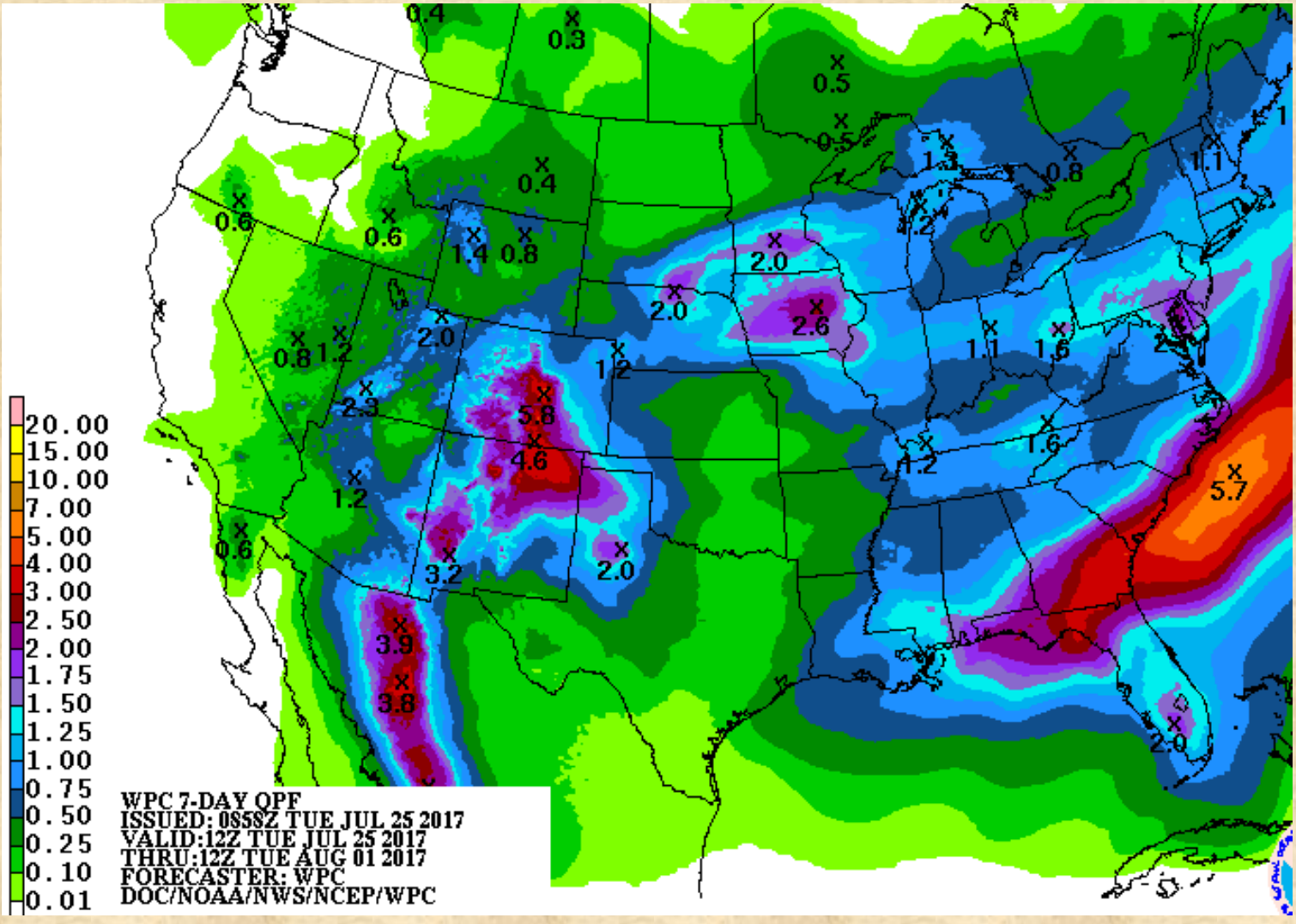
In April, my experimental July-September precipitation forecast (far left) was optimistic over our mountains, with little skill this far ahead (middle left). ***There was a general west-east gradient from more moisture east of the Divide to least in AZ and UT.***

The updated forecast maintains the general west-east gradient (middle right). The skill-masked version (far right) removes a lot of detail, but maintains a decent tilt towards wet conditions over the eastern plains.

The observed anomalies have been wet in SE CO, but not to the north…

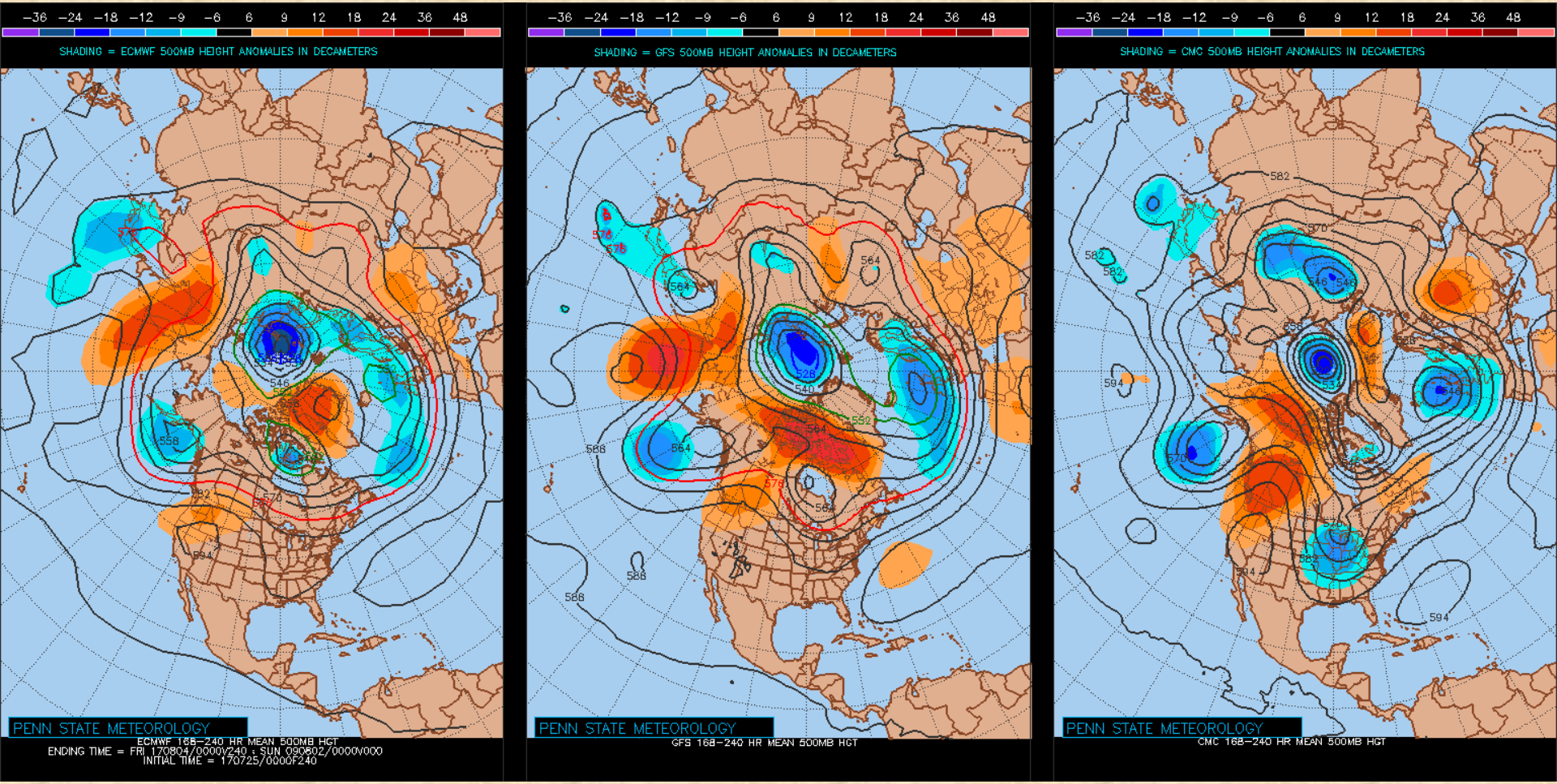


What can we expect in next seven days?



Classic monsoon pattern, anchored by next few days that are particularly wet in GFS (but supported by EC as well) – while there is temptation to compare this to Lucy tempting Charlie Brown with a football, I do think that this one is for real!

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 higher pressure to the north. This is not a bad pattern for us, keeping the hottest temperatures to our north and allowing for monsoonal moisture to undercut the ridge.

Executive Summary (25 July 2017)

klaus.wolter@noaa.gov

- **A weak La Niña snuck in last fall, behaved as if it were much bigger, and was briefly replaced by El Niño-like conditions in late spring. Precipitation impacts in CO have been consistent (late start to snow season, wet in mid-winter higher up, and early spring dryness ~ La Niña; wet May ~ El Niño).**
- **Experimental forecast guidance for late spring had a hard time with lingering La Niña/emerging El Niño conditions. *The analogue forecast based on ENSO-neutral conditions during winter anticipated better that it would be dry to our west.***
- **Forecasts from CPC start with a wet late summer, but retreat to 'equal chances' during late fall. This is largely based on coupled model forecasts, followed by long-term trends & ENSO-neutral conditions.**
- **The next week look more active than the last *seven*, right around the normal peak of our monsoon season. This should also result in cooler weather than observed for much of this summer. Beyond that both the European and American models indicate a wet August.**
- **BOTTOMLINE: While the monsoon has been anemic for the northern Front Range, increased humidity has reduced fire danger, and some lucky folks have even gotten decent amounts of rain in last week. The rest of the year could still benefit from a resurgent El Niño, but that looks less and less likely. Therefore I agree with CPC's assessment of climatological odds for now.**


Thank you!
klaus.wolter@noaa.gov
© Ed Kopesky 2015