

A predictability comparison of 2018/19 and 2019/20 Winter CPC outlooks and model forecasts

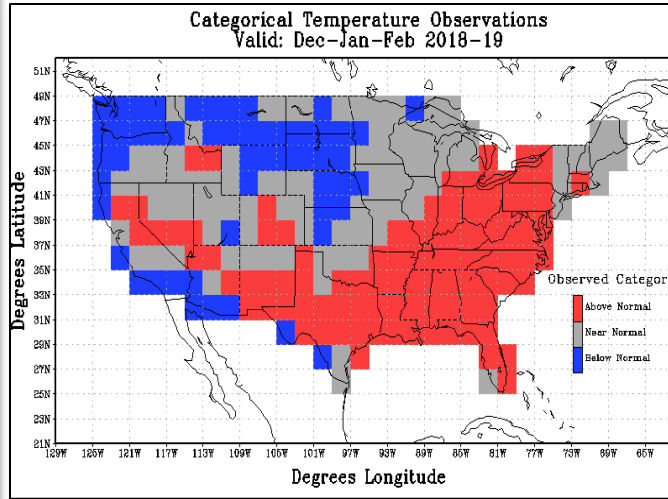
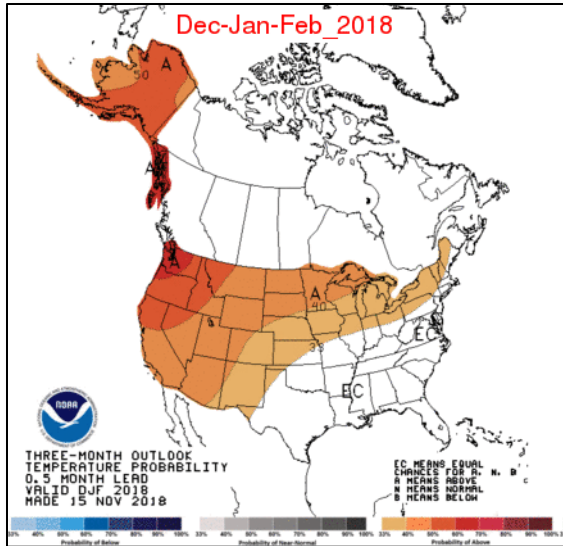
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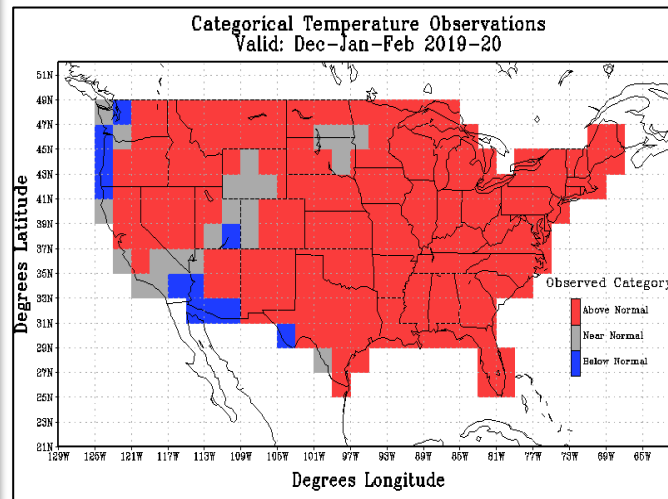
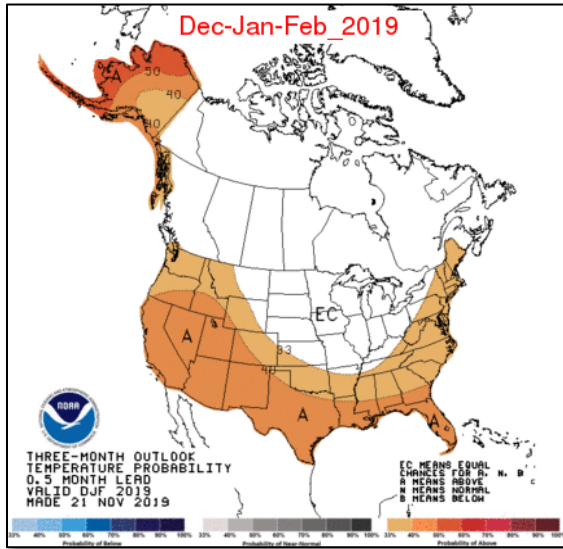
Contrasting performance of CPC's seasonal outlook for DJF 2018/19 and 2019/20

CPC Sfc. Temp. Outlook

Observed Category



DJF 18/19
HSS = -20

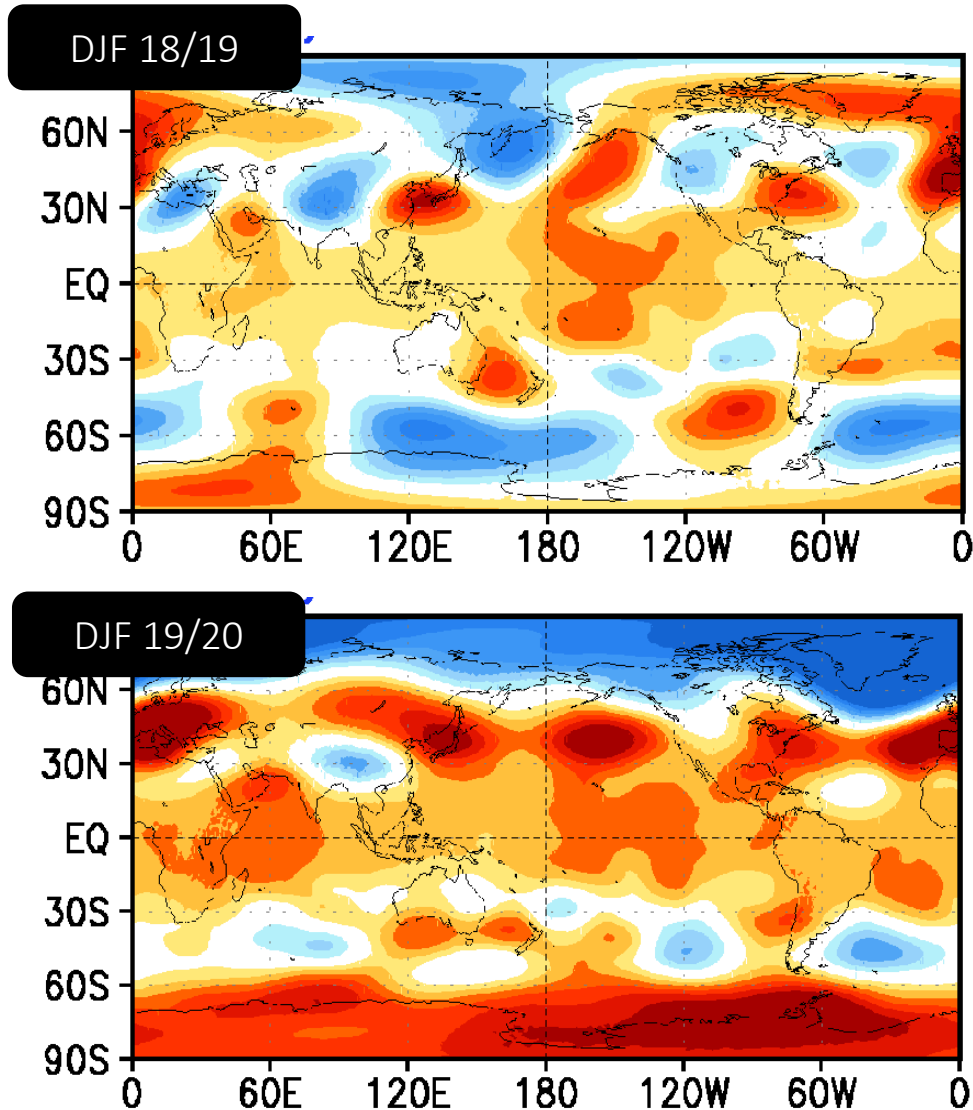


DJF 19/20
HSS = 72

Prognostic discussion

- DJF 2018/19
 - SST ANOMALY FORECAST MAINTAINS ITS RECENT PREDICTIONS OVER THE PAST SEVERAL MONTHS WITH A PEAK [in El Niño) DURING NDJ 2018-2019 OF JUST UNDER +1.0 DEGREE C...
 - THIS SET OF OUTLOOKS UTILIZED TYPICAL IMPACTS ASSOCIATED WITH EL NINO EVENTS...
 - DYNAMICAL MODEL GUIDANCE FROM THE NMME...IN AGREEMENT WITH THE AFOREMENTIONED STATISTICAL FORECAST TOOLS [*SST response*]
- DJF 2019/20
 - ...OUTLOOK FOR NINO3.4 ALL FAVOR CONTINUED ENSO-NEUTRAL CONDITIONS...
 - THE DJF 2019-2020 TEMPERATURE OUTLOOK IS INFORMED BY THE OBJECTIVE CONSOLIDATION, BUT HEAVILY ADJUSTED TO ACCOUNT FOR THE LATEST CFSv2 RUNS, THE INTERNATIONAL MODEL SUITE...
- Thus, for both years, CPC outlooks relied on MME guidance.

Observed anomalies – 200 hPa Height

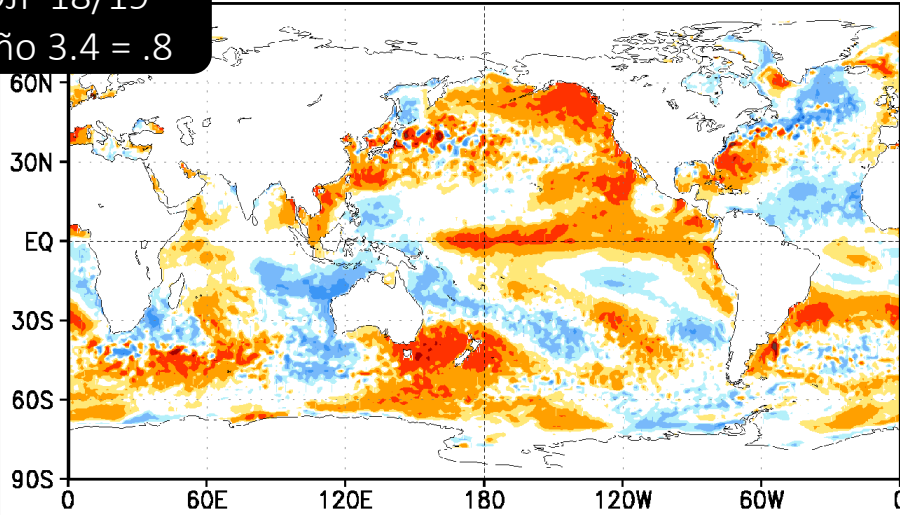


- 2019/20 had zonal flow in higher latitudes and projected on the positive phase of AO.

Observed anomalies - SST

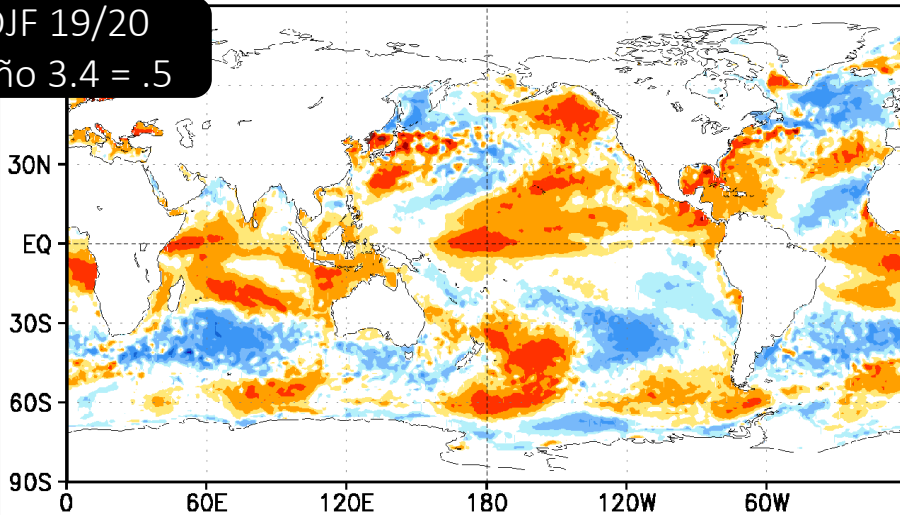
DJF 18/19

Niño 3.4 = .8



DJF 19/20

Niño 3.4 = .5



- Warm SST anomalies in the central Pacific for both winters.
- Warmer Indian Ocean in 2019/20.

Relevant questions

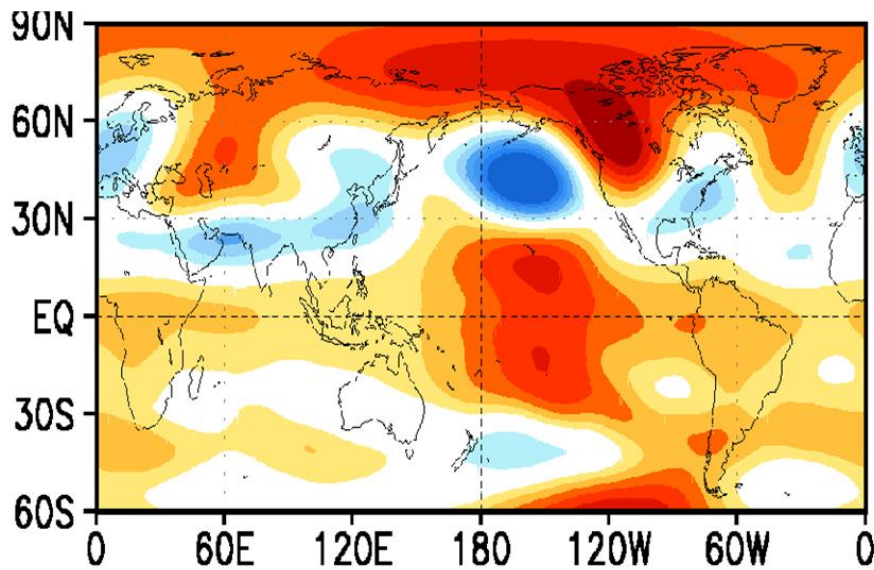
- What guidance led to different CPC outlooks?
- What was the role of ocean anomalies (e.g., warmer Indian Ocean in DJF 2019/20) in different ocean basins in shaping the observed seasonal mean anomalies?
- What were various initialized multi-model ensemble forecasts?
- How much the influence of atmospheric initial conditions mattered in DJF mean seasonal forecasts?

Analysis approach

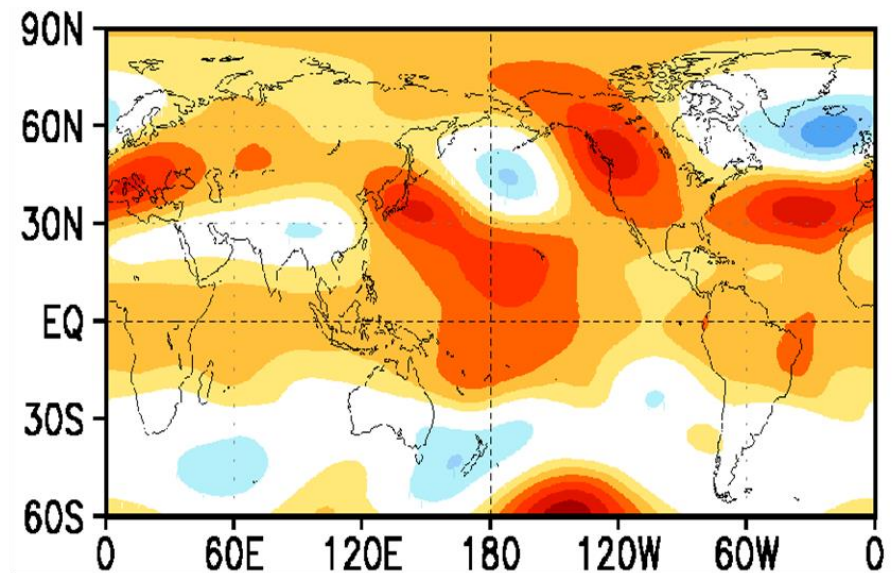
- Using atmospheric model simulations, assess response to observed SSTs in different ocean basins → AMIP simulations.
 - Influence of SSTs.
- Use multi-model ensemble data, analyze initialized predictions.
 - Influence of SSTs + initial conditions.

200-mb hPa height response in AMIP simulations

DJF 18/19



DJF 19/20

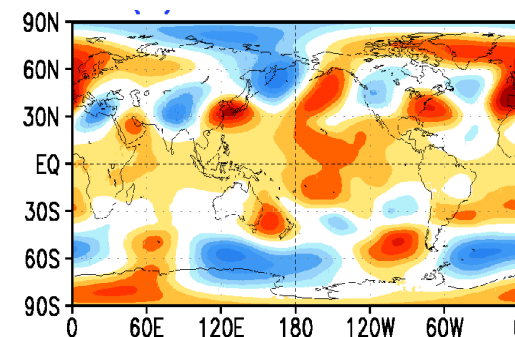
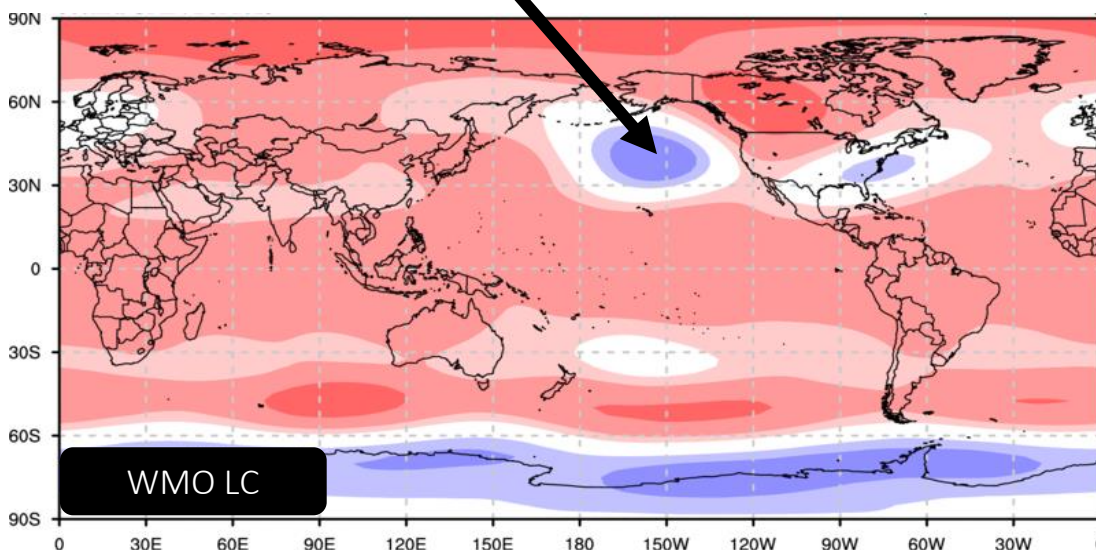
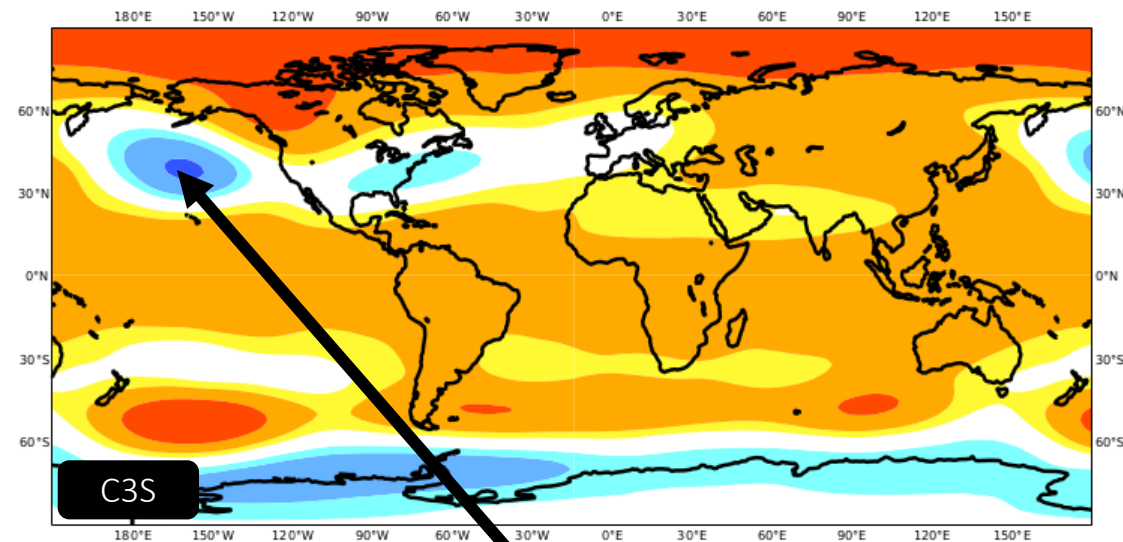


- For DJF 2018/19, the height response is like the canonical El Niño response BUT has NO resemblance to observed anomalies.
- Resemblance to El Niño is less so for 2019/20 but elements of El Niño response are there BUT it also has NO resemblance to observed anomalies.
- Thus, using El Niño response for either winter would not be a good prediction for upper-level heights.

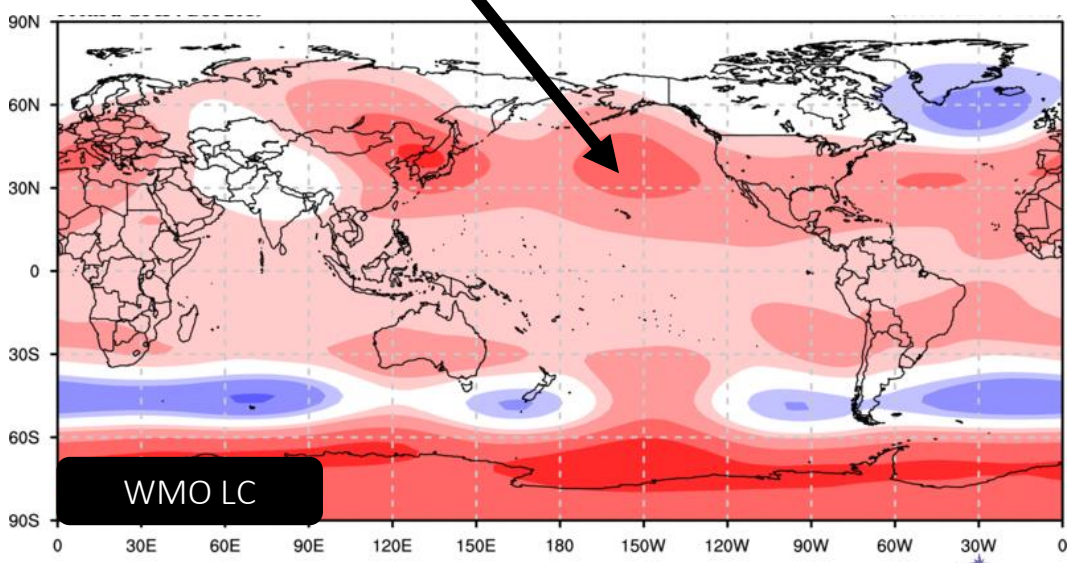
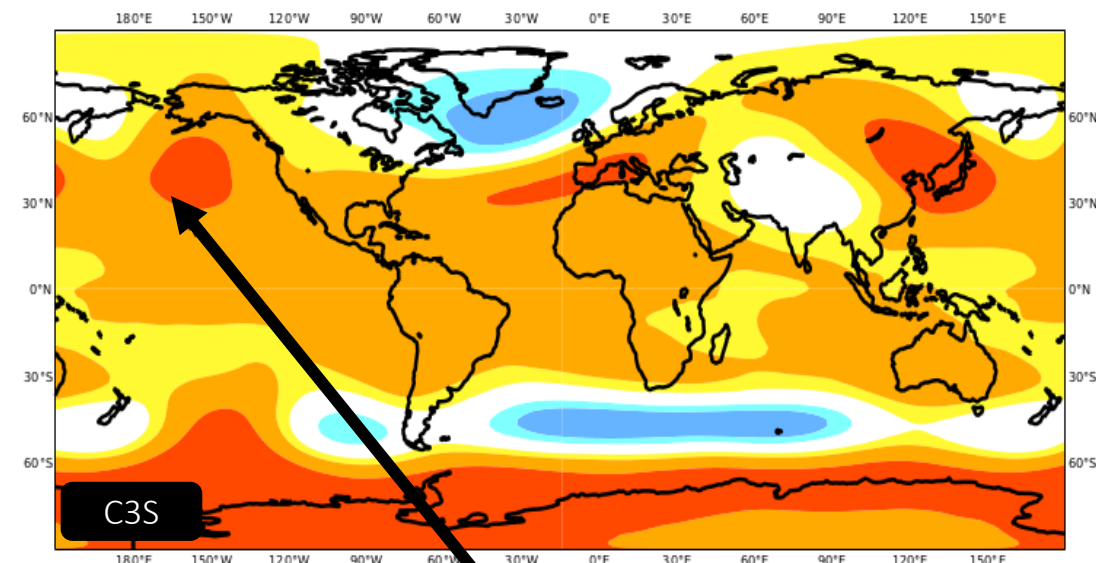
Multi-model ensemble (MME) initialized predictions

Z500 DJF 2018/19

- Predicted anomalies are consistent across two MME systems.
- Project on the negative AO phase.
- Initialized predictions are like response in AMIP simulations.

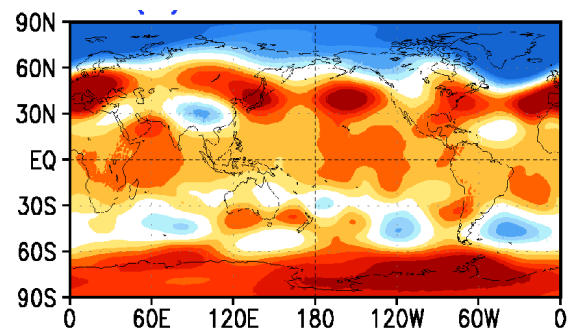


Multi-model ensemble (MME) initialized predictions



Z500 DJF 2019/20

- Predicted anomalies are consistent across two MME systems.
- Initialized predictions are different from response in AMIP simulations.
- Forecast has elements of observed anomalies.



Summary

Analysis	2018/19	2019/20
AMIP ensemble mean	El Nino response	Somewhat like El Nino response.
Initialized MME predictions	<p>El Nino response.</p> <p>Small influence from initial conditions.</p>	<p>Not like El Nino response but has similarity with observed anomalies.</p> <p>Initial condition information or influence of SSTs in another ocean basin, e.g., Indian Ocean?</p>
CPC outlooks	El Nino factored in the outlook...also the MME outlook	El Nino did not factor in the outlook...informed by MME.
Observations	<p>Not like El Nino response.</p> <p>Likely due to atmospheric noise/internal variability.</p>	Not like El Nino response BUT like MME forecasts
CPC outlook performance	Worse	Better

Summary

- Conclusions
 - 2018/19 AMIP simulations and initialized predictions were consistent with El Niño response. Observed anomalies, however, deviated from it, **possibly due to the influence of atmospheric noise**.
 - 2019/20 initialized predictions deviated from El Niño response, however, did match observed anomalies. **Possibly an influence of initial condition information**.
 - For both winters, CPC outlooks relied on MME forecasts. 2019/20 (2018/2019) was better (worse) prediction.
- Follow up questions
 - In 2018/19, could MME have done better? Depends on what is SNR.
 - What was the influence of SST anomalies in some other ocean basin, e.g., warmer Indian Ocean in 2019/20? [Hardiman et al., 2020: Predictability of European winter 2019/20: Indian ocean dipole impacts on the NAO. *Atmospheric Science Letters*]
 - Unusual persistency of initial conditions in 2019/20, particularly related to the positive phase of the AO? How does it compare with other analog winters?

Thanks!

CPC's monthly attribution analysis:

<https://www.cpc.ncep.noaa.gov/products/people/mchen/AttributionAnalysis/>