

Extratropical storms and ENSO teleconnection

**Presented by
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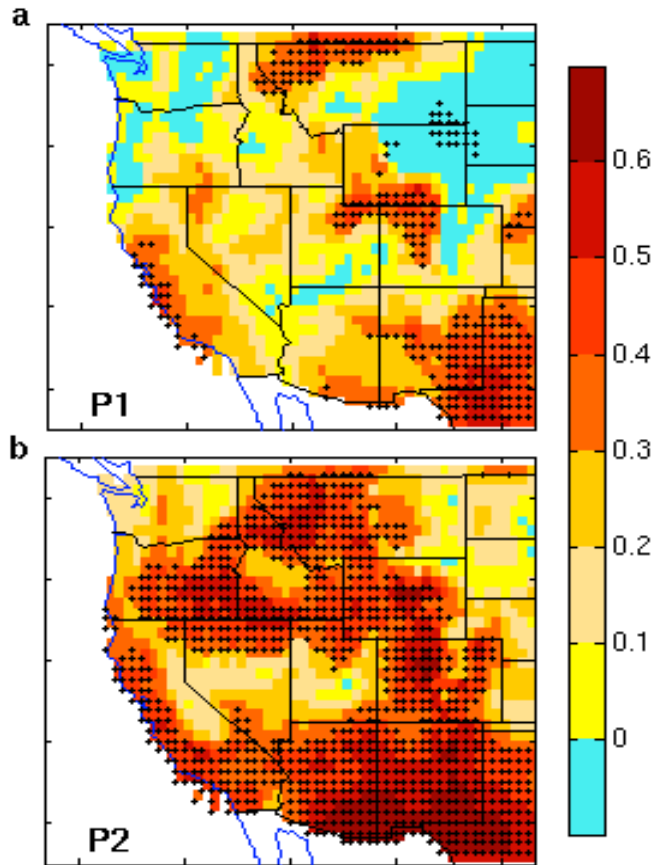


Extratropical seasonal climate prediction

- Understand the extratropical seasonal climate prediction sources at different lead time
 - Roles of ocean initial state (ENSO teleconnection)
 - Roles of atmospheric initial state (troposphere/stratosphere interaction)
- Understand the seasonal precipitation predictability of the western United States during 2015/16 El Niño

Understanding the predictability source of the first season prediction: Roles of atmosphere/land initialization

Winter precip. skill

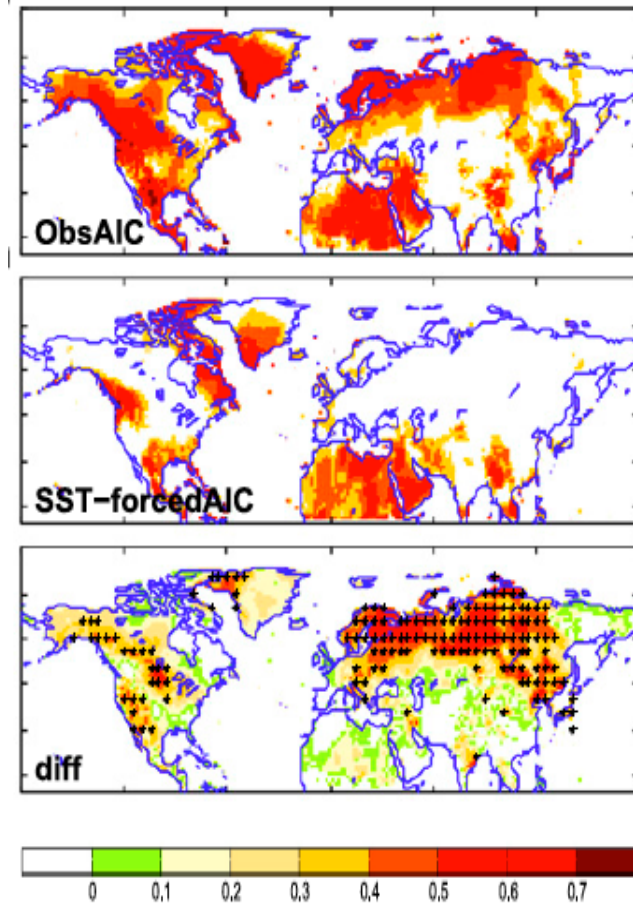


Fcst
Ocean

Fcst
Ocean/
tm/Lanc

Yang et al. (2017, submitted)

Winter T2m skill



Fcst
Ocean/At
m/Land

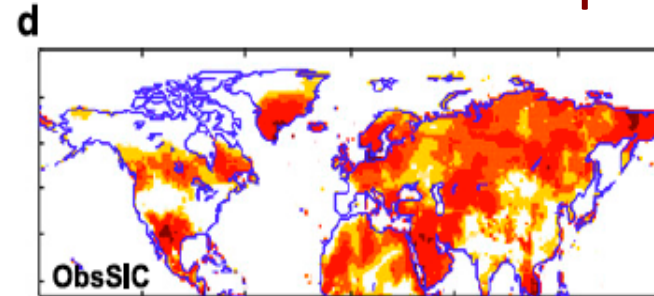
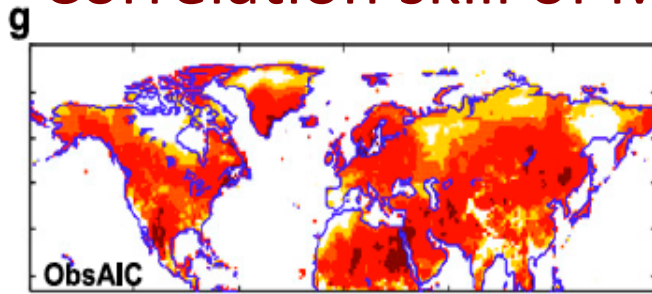
Fcst
Ocean

Jia et al. (2017, J. Clim.)

Understanding the predictability source of the first season prediction: Roles of stratosphere

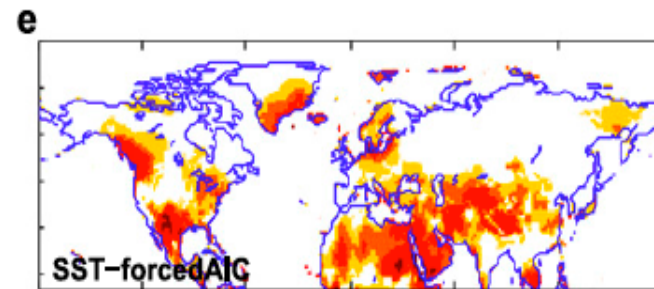
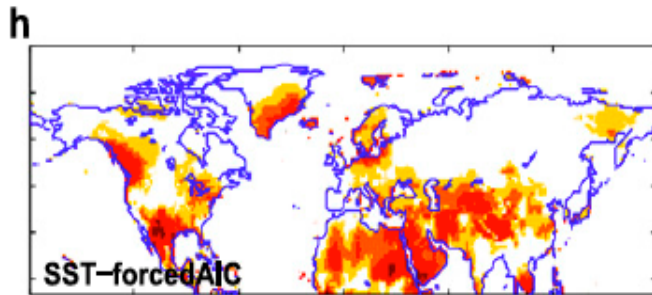
Correlation skill of MAM surface air temp.

Fcst
Ocean/
Atm

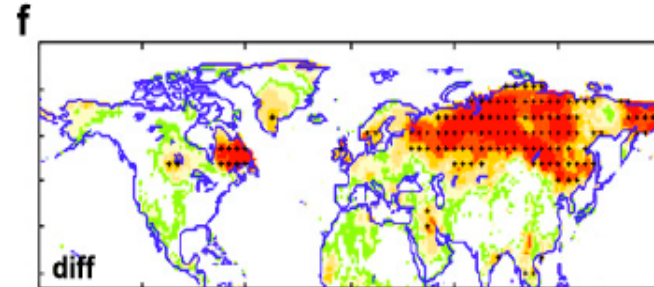
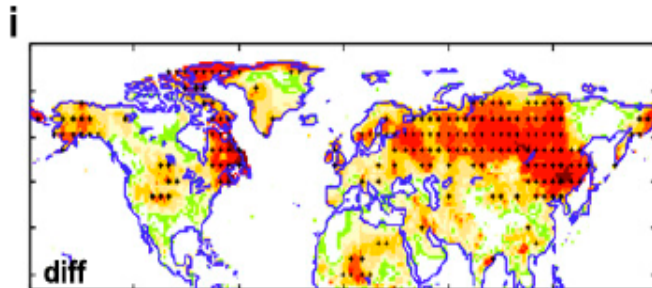


Fcst
Ocean/
Atm(Strato
sphere)

Fcst
Ocean



Diff



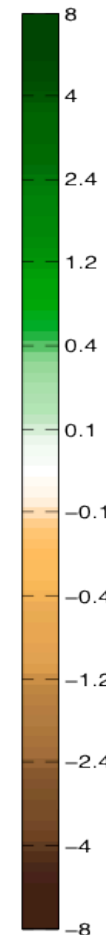
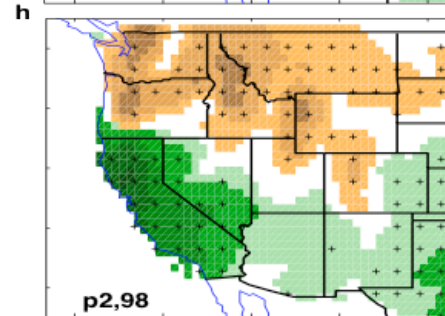
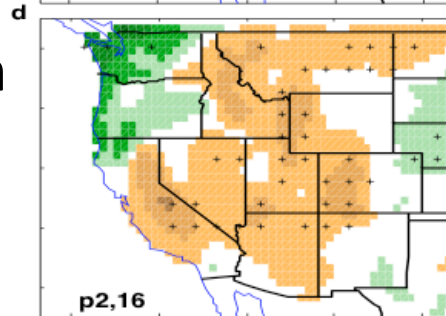
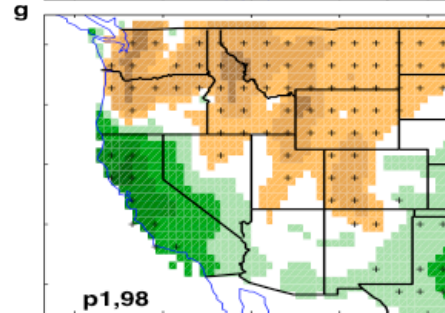
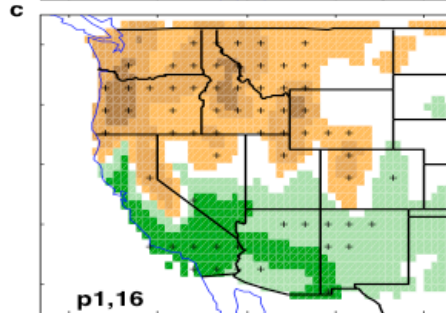
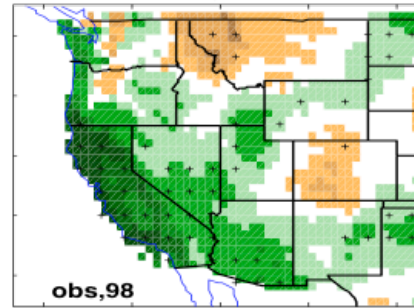
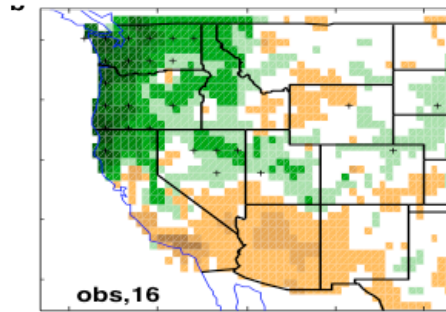
Jia et al. (2017, J. Clim.)

Understanding the predictability of winter 2015-16 precipitation over Western U.S.

Observed

DJF 2015-16

DJF 1997-98



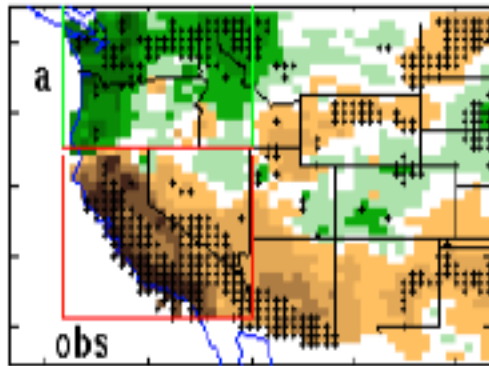
For 1997-8:
Pacific
Forcing
dominant

For 2015-6:
Ocean &
atmosphere
conditions
both
important

Yang et al. (2017, submitted)

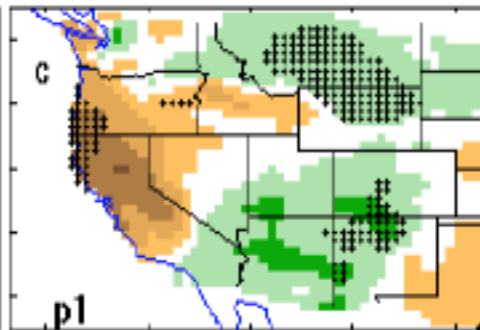
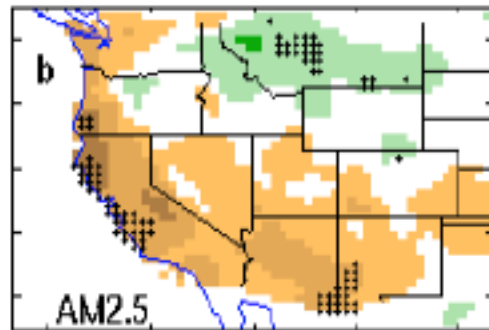
The cause of the flipped precipitation pattern over the western U.S. between 1997/98 and 2015/16 El Niño events

Obs

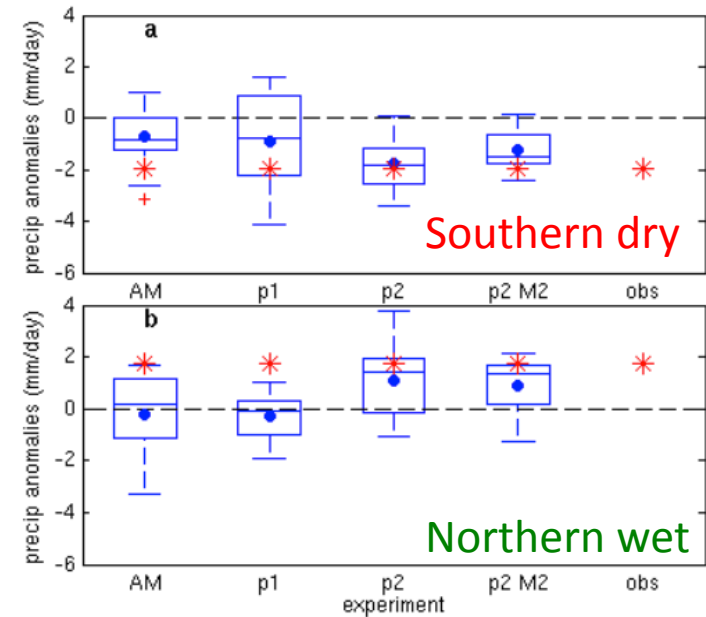
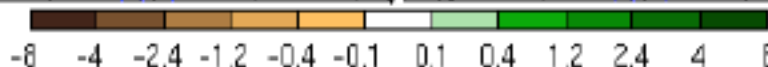
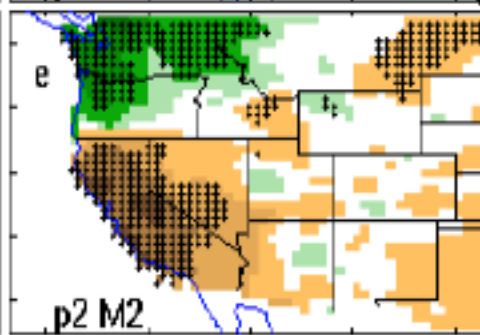
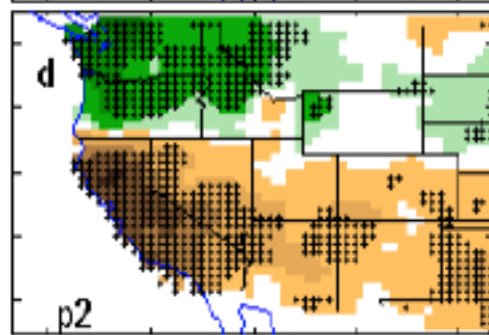


Winter precipitation difference:
2015/16 minus
1997/98

FLOR
Fcst
Ocean
Obs.



FLOR
Fcst
Ocean
&Atm
Obs.



Northern wet anomalies:

ocean state difference

Southern dry anomalies:

atmosphere/land state

difference

Yang et al. (2017, submitted)

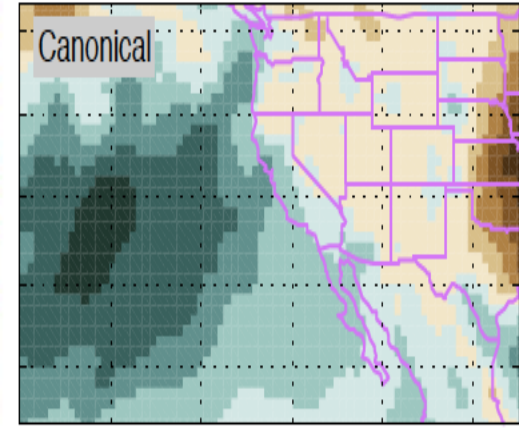
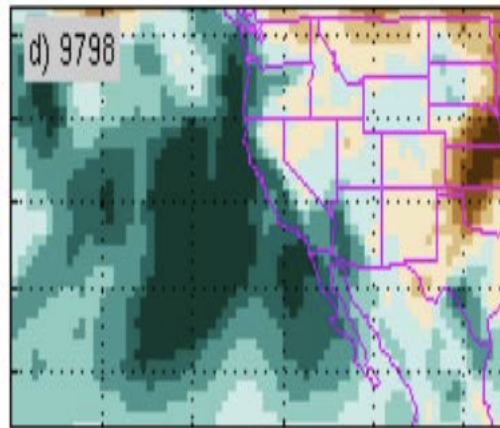
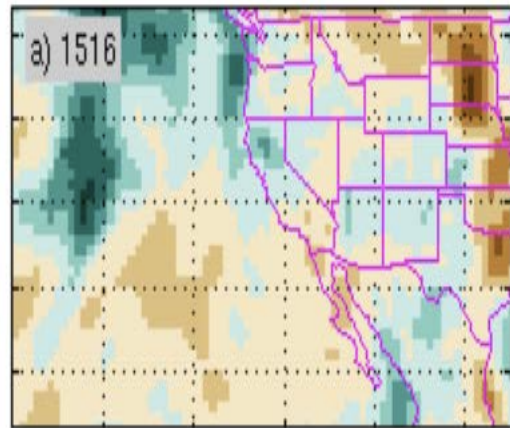
ENSO-teleconnected extratropical storm variations over the western U.S.: Canonical VS diversity

DJF 2015-16

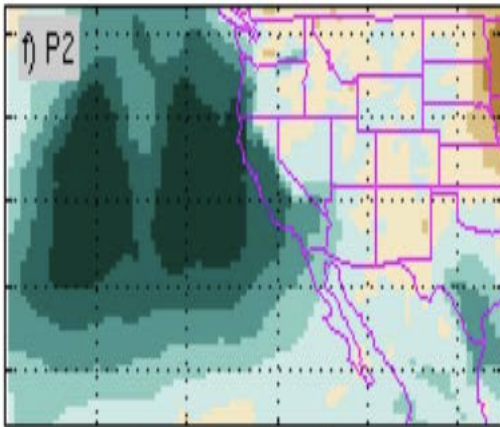
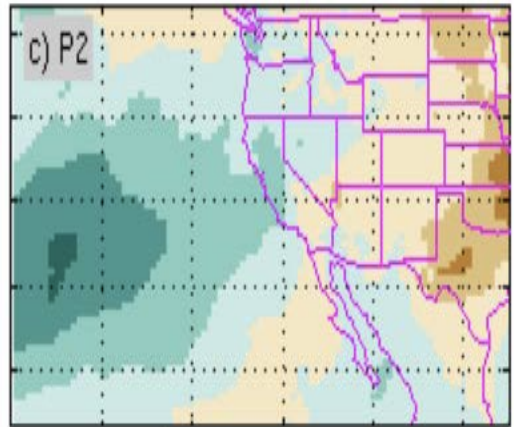
DJF 1997-98

Canonical Pattern

Obs



FLOR
Fcst
Ocean
&Atm
Obs.



Canonical: More storms in the WUS

1997/98: More storms in the WUS

2015/16: More (less) storms in the southern (northern) WUS



Yang et al. (2015, JC; 2017, submitted)

Summary

- Atmospheric/land initialization using observations could substantially improve the extratropical seasonal climate prediction.
- Stratosphere initial state plays important roles in predicting the extratropical surface climate.
- Atmospheric/land initialization could improve the regional climate (e.g., precipitation, storms) prediction even during the large El Niño events (2015/16).