

Are some ENSO events more predictable than others?

The Impact of Extratropical Precursors on Long-lead ENSO Predictability

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NPO/Seasonal
Footprinting
Mechanism

Madden-
Julian
Oscillation

Trade Wind
Charging

Western
North Pacific

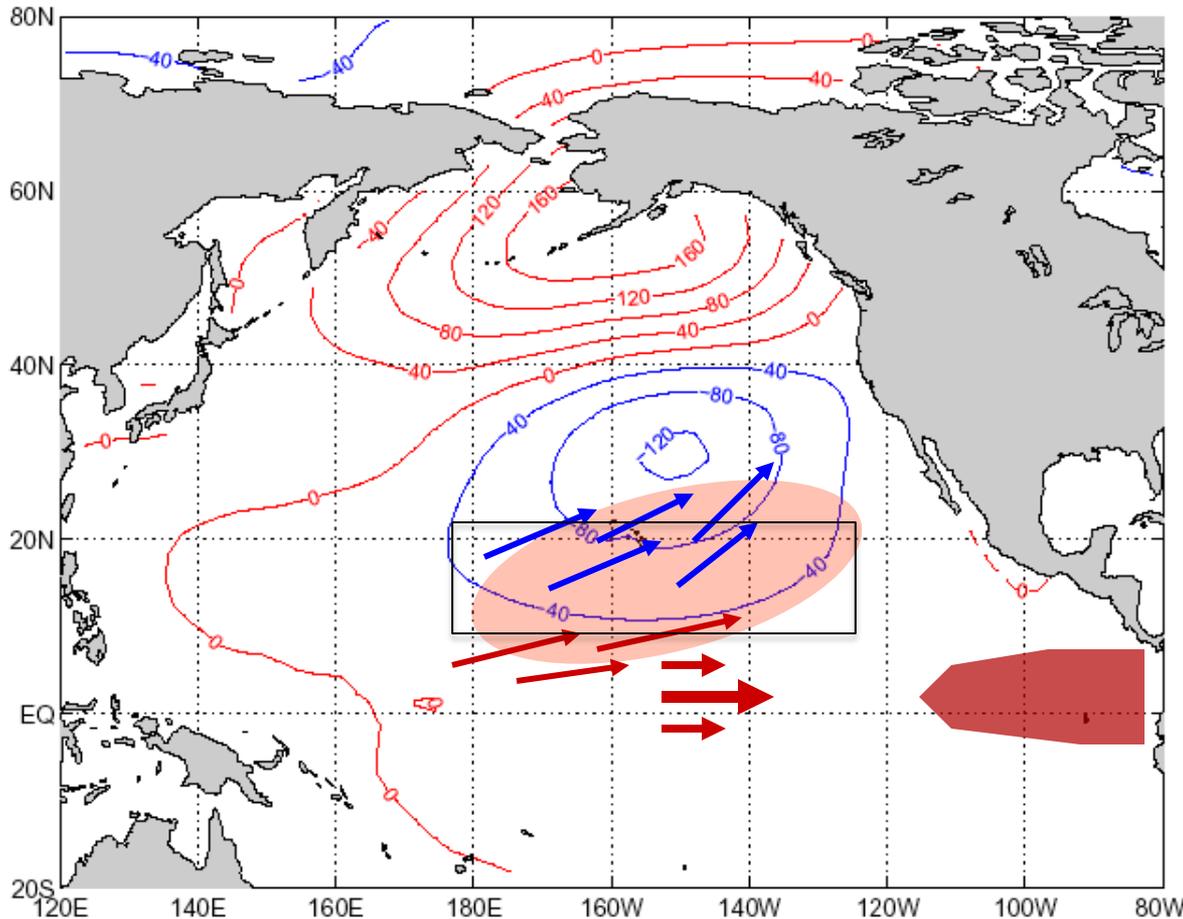
Westerly
Wind Bursts

(North) Pacific
Meridional
Mode

South Pacific
Meridional
Mode

ENSO

What is the Seasonal Foot Printing Mechanism (SFM)?



NPO in NDJ (-1)



Winds & Heat Flux



SST in FMA (0)



Tropical Winds

Feedback (e.g. WES)

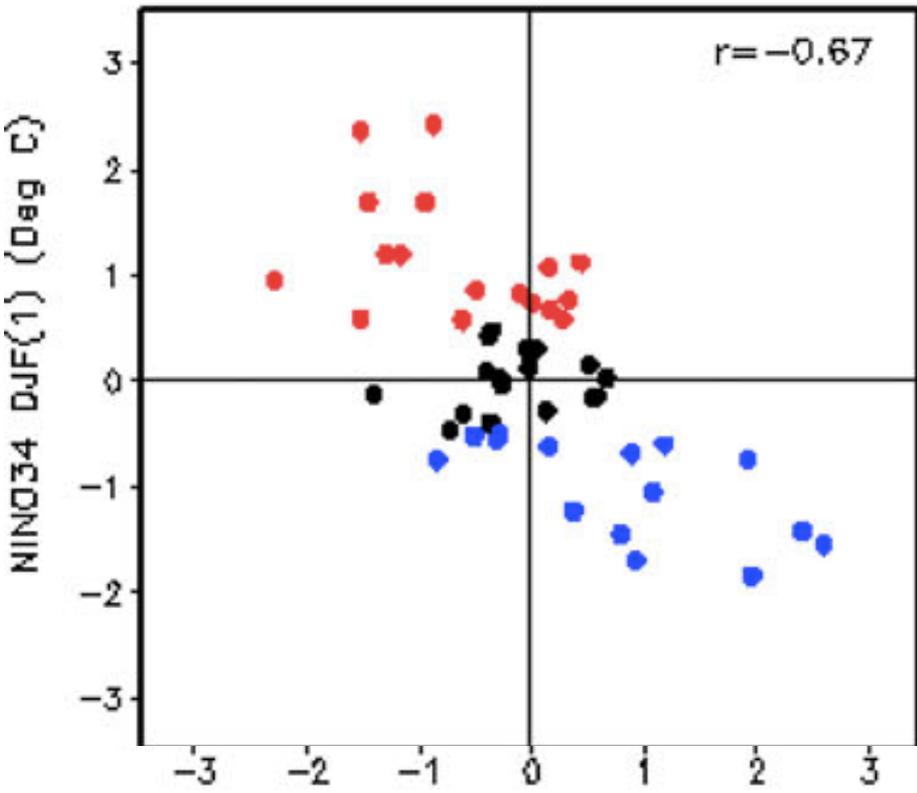
JJAS(0)



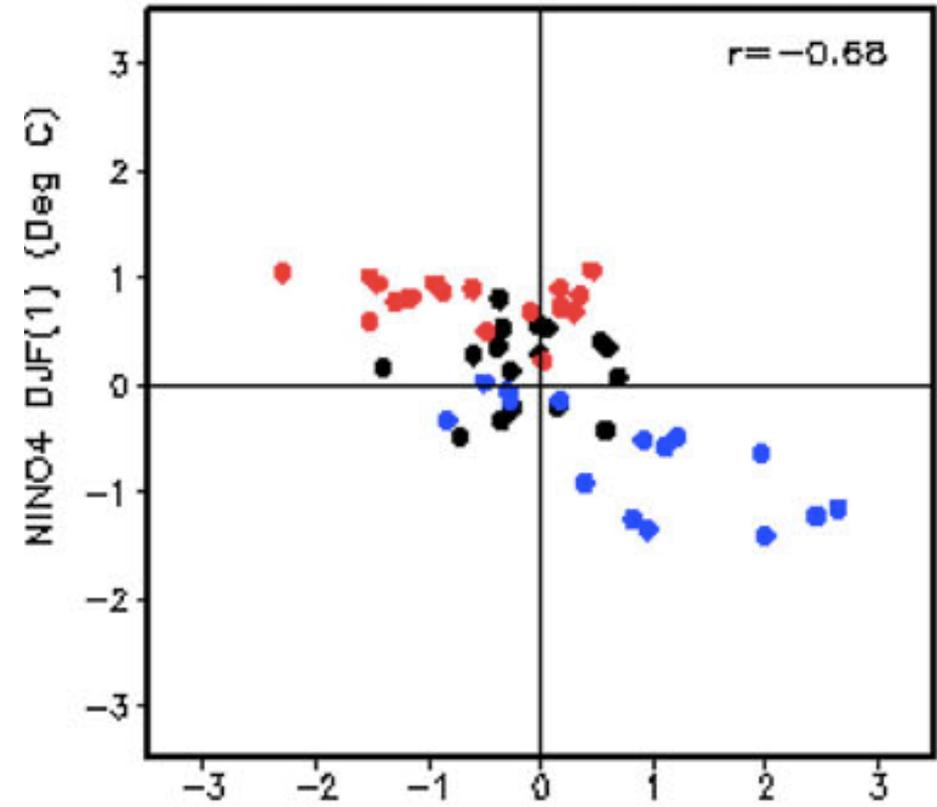
El Nino in NDJ(0)

Vimont et al. 2001, GRL; 2003a&b, J. Climate

Nino3.4

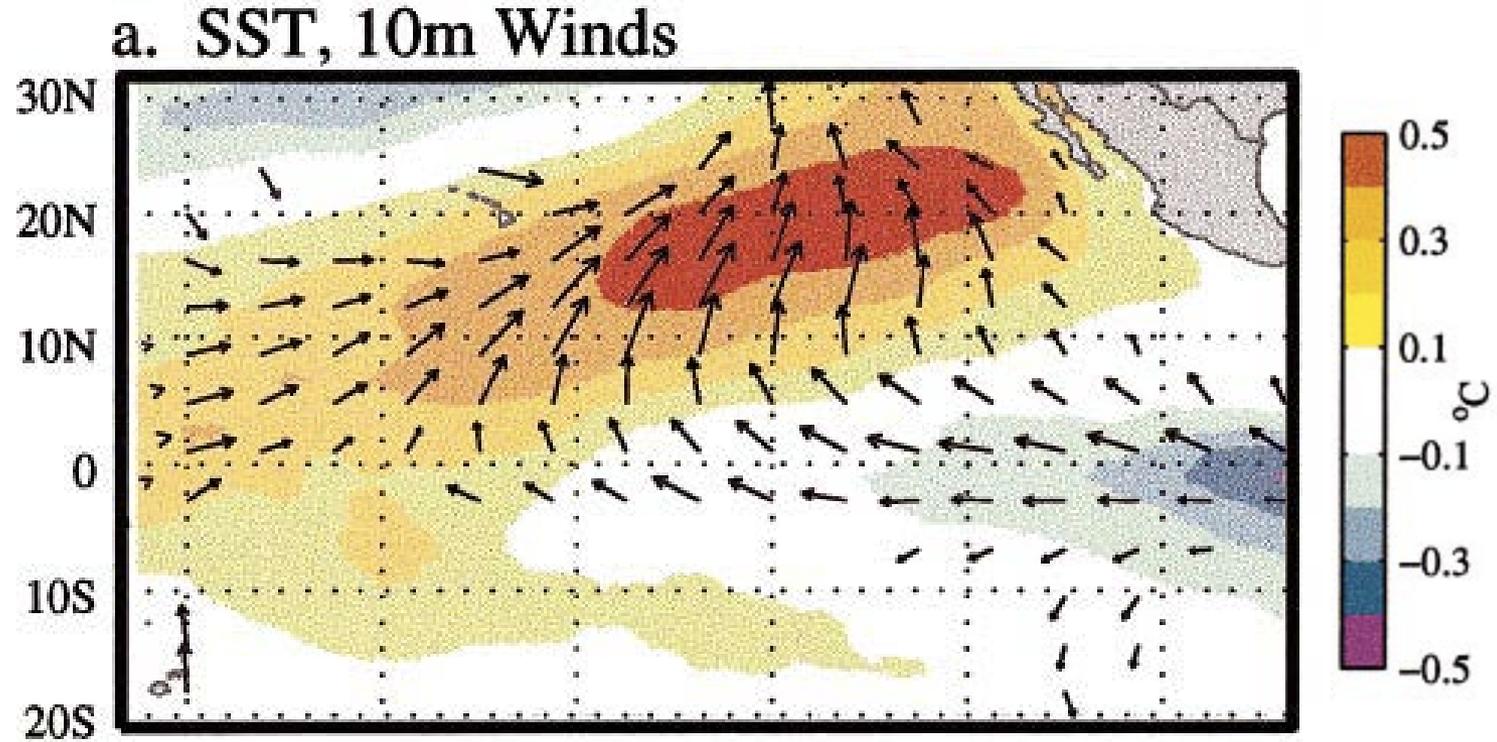


Nino4



Normalized SLPI NDJFM(0)

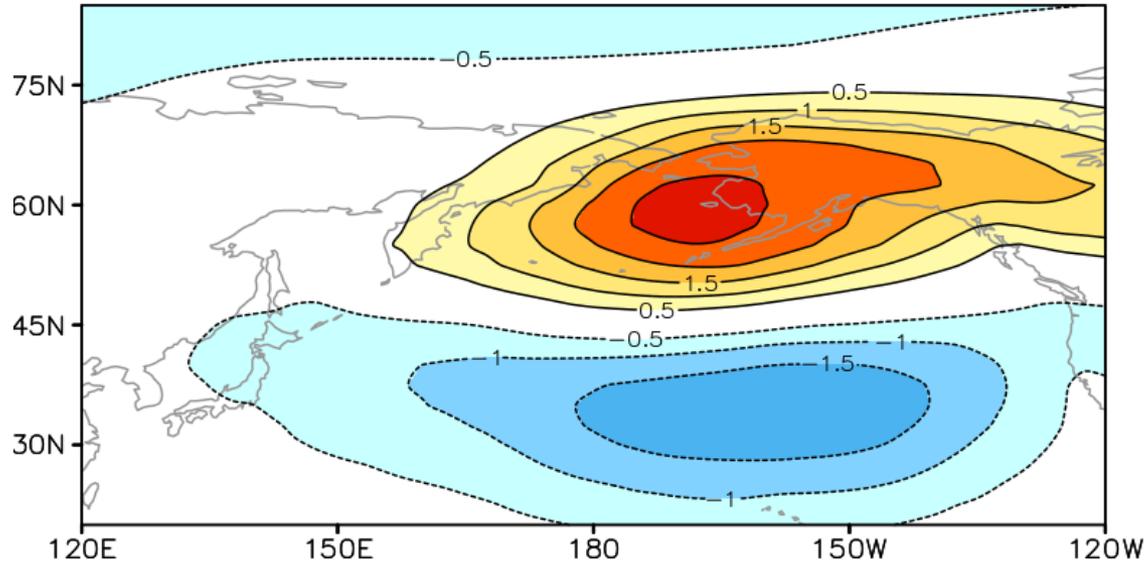
The (North) Pacific Meridional Mode



**How are the NPO/SFM, PMM, &
ENSO Related?**

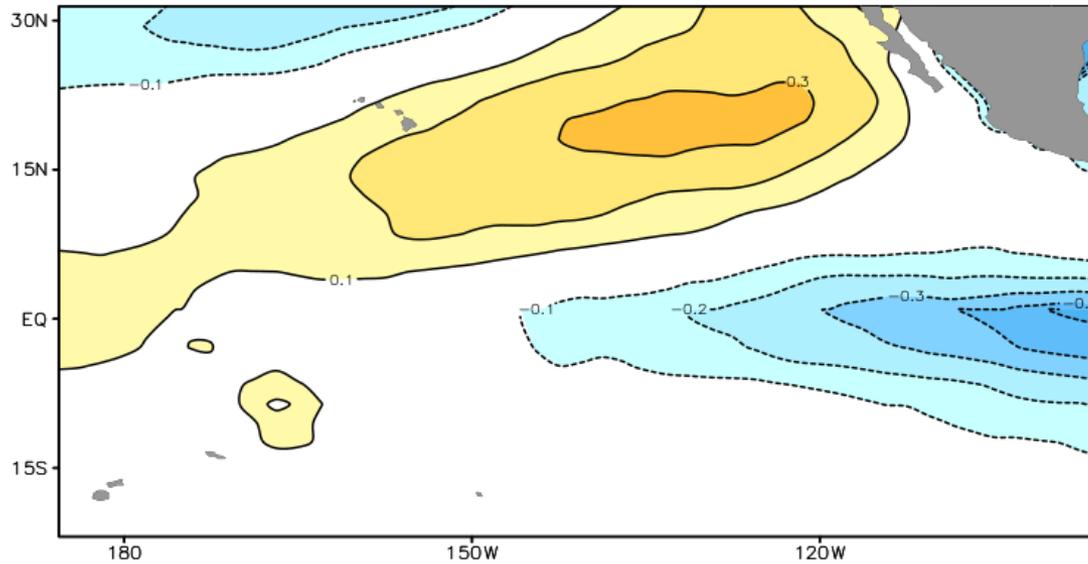
NPO/SFM 2nd EOF DJFM SLP (15%)

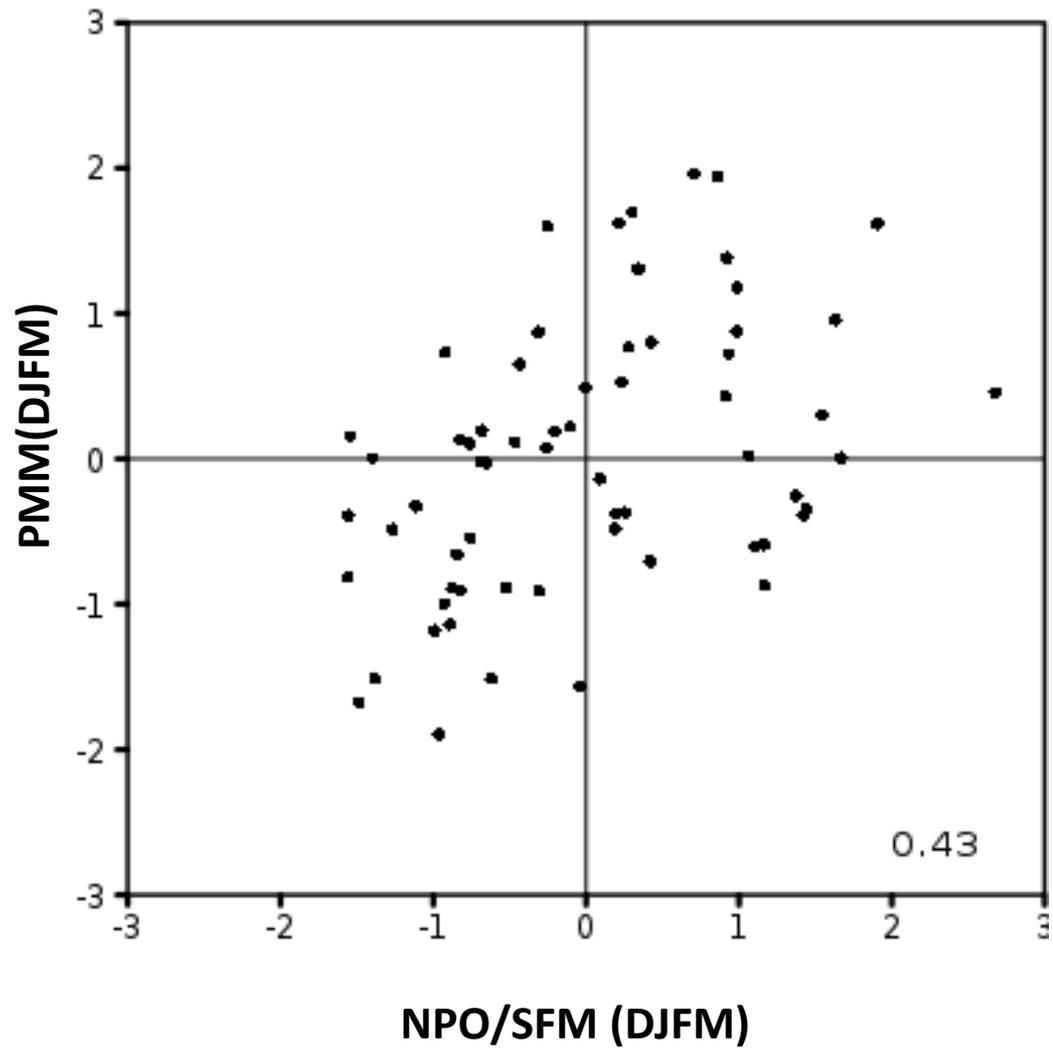
hPa



PMM 2nd EOF SST (11%)

°C





Observed Seasonal Lagged Regressions (SST & SLP)

NPO

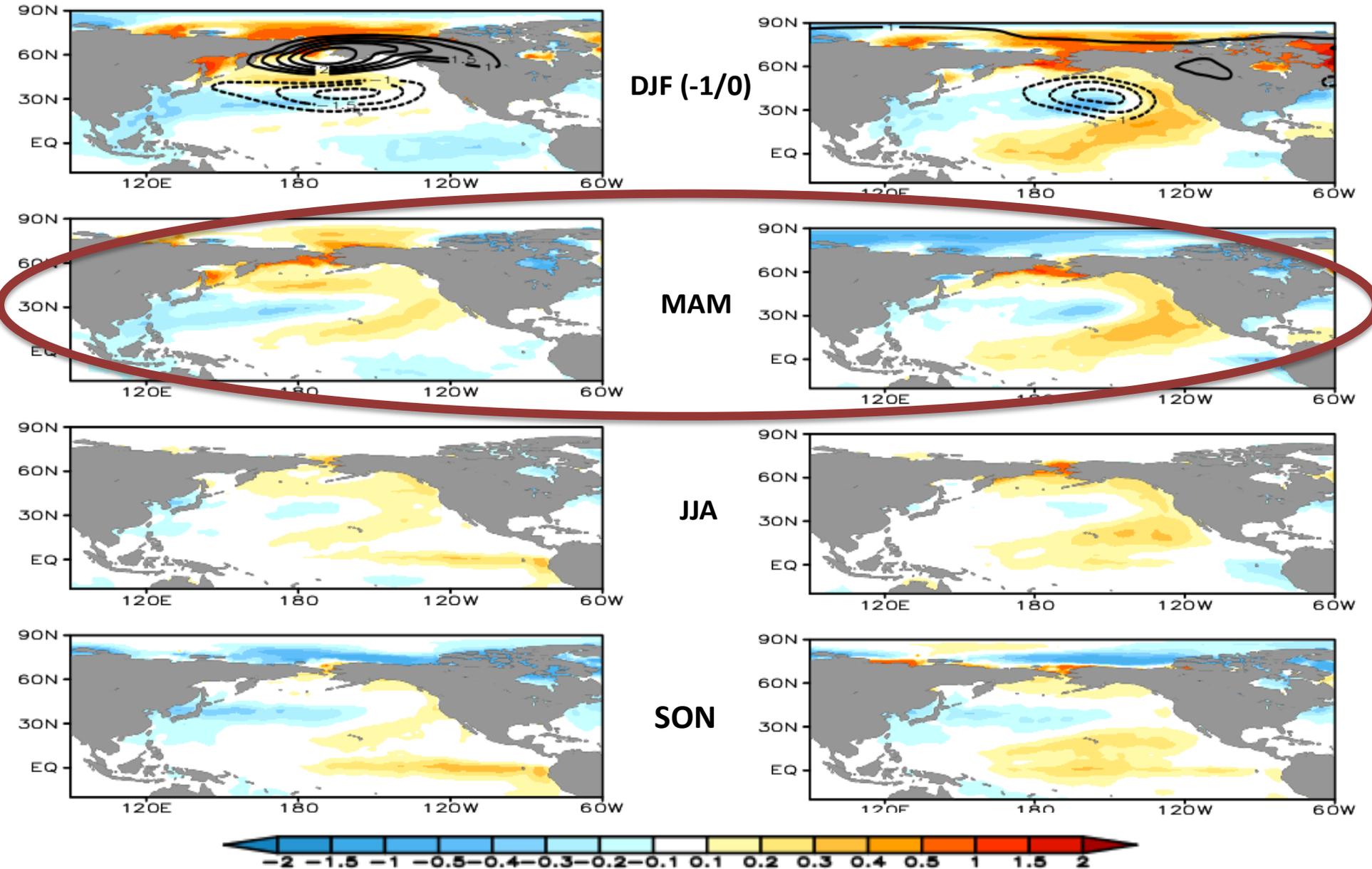
PMM

DJF (-1/0)

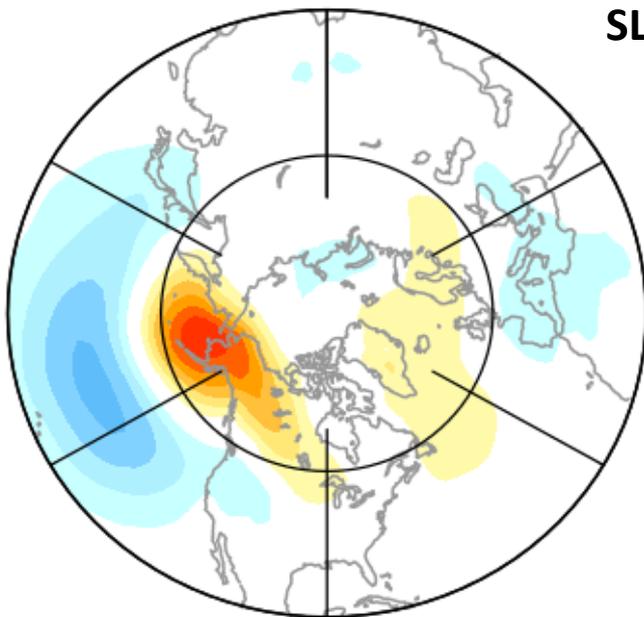
MAM

JJA

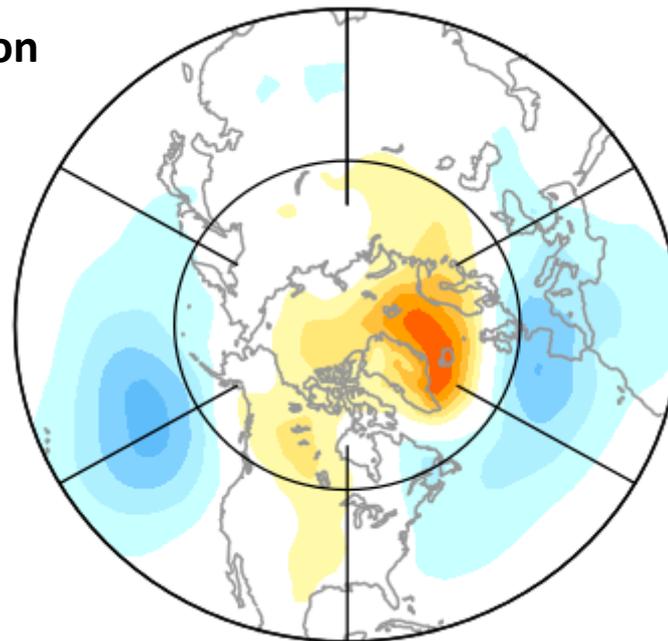
SON



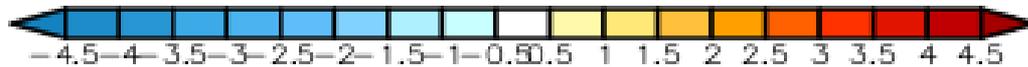
NPO/SFM



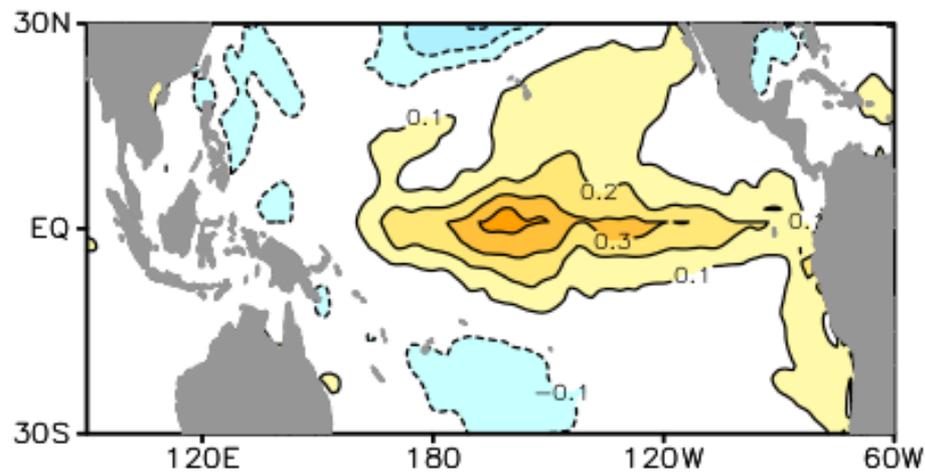
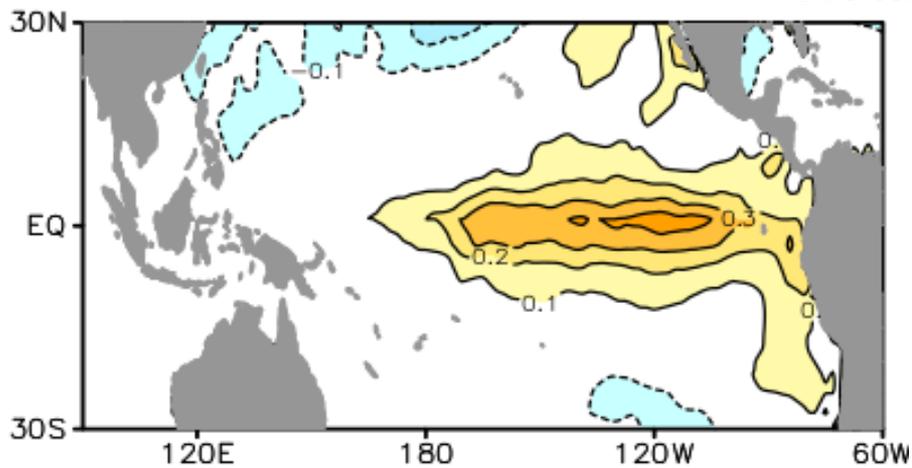
**SLP Regression
DJF(0)**



PMM

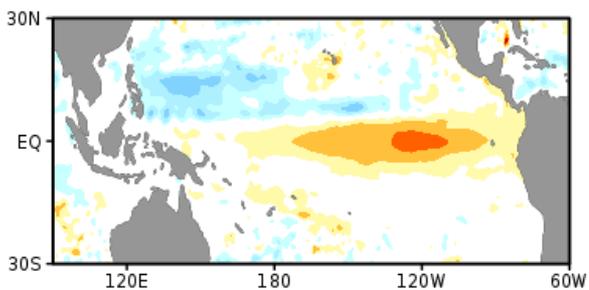
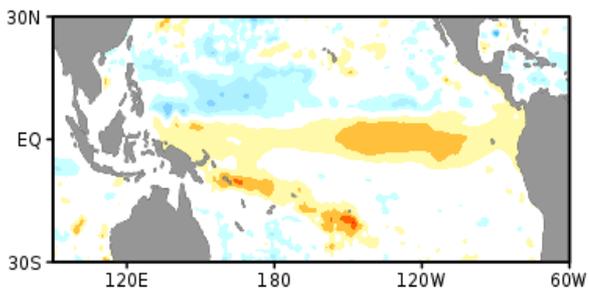
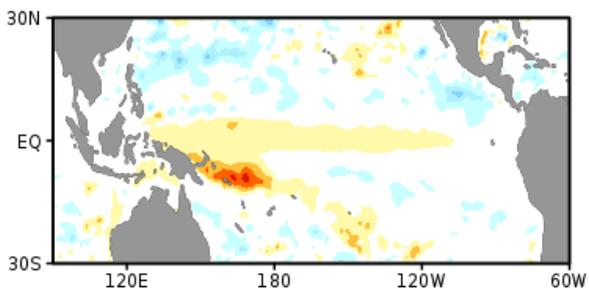
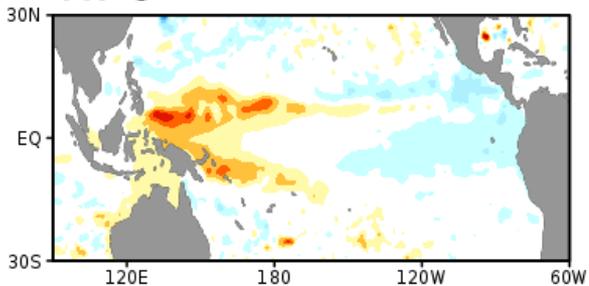


SST Regression DJF(1)

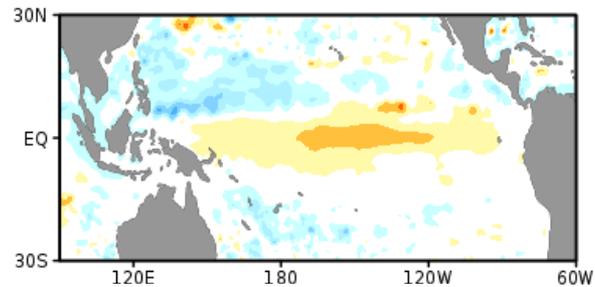
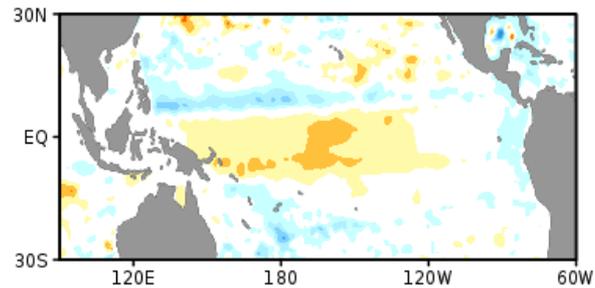
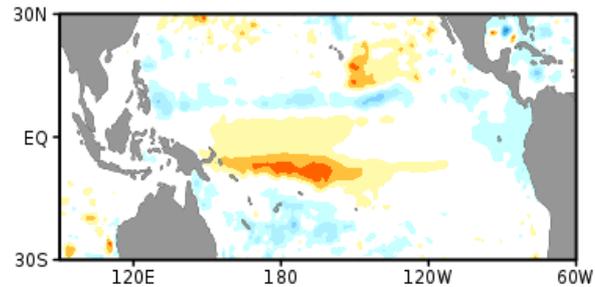
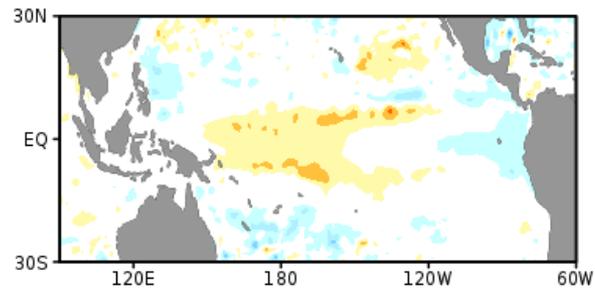


Observed Seasonal Lagged Regressions (SSH)

NPO



PMM

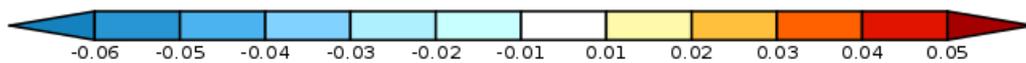


DJF (-1/0)

MAM

JJA

SON



El Nino Event SST Composites (°C)

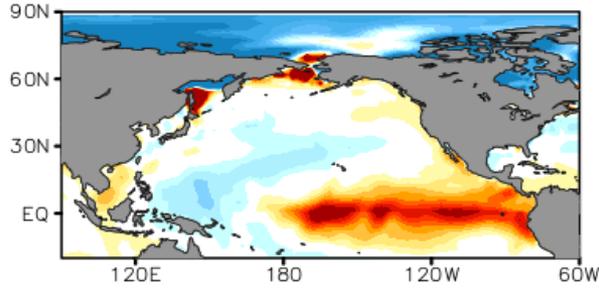
El Nino Years

57/58

65/66

72/73

NPO/SFM(3)

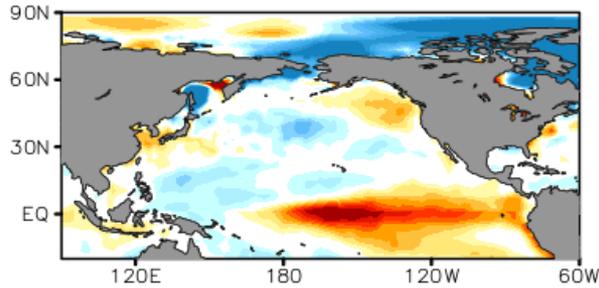


86/87

91/92

94/95

PMM(3)

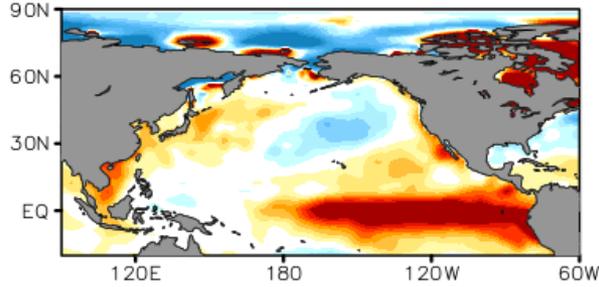


82/83

02/03

09/10

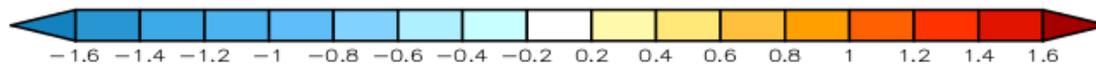
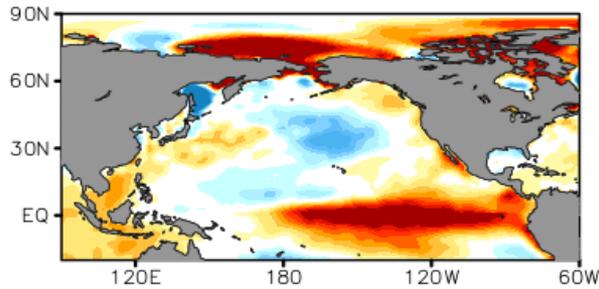
Both(3)



68/69

97/98

Neither(2)

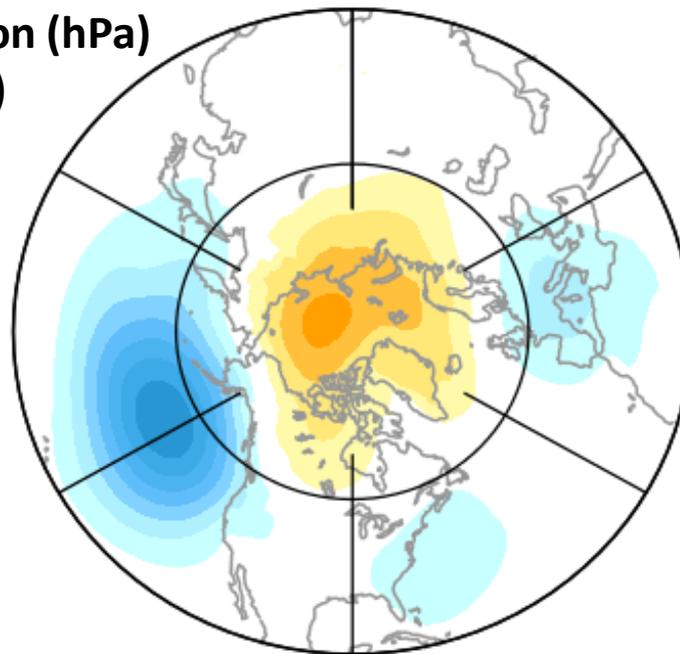
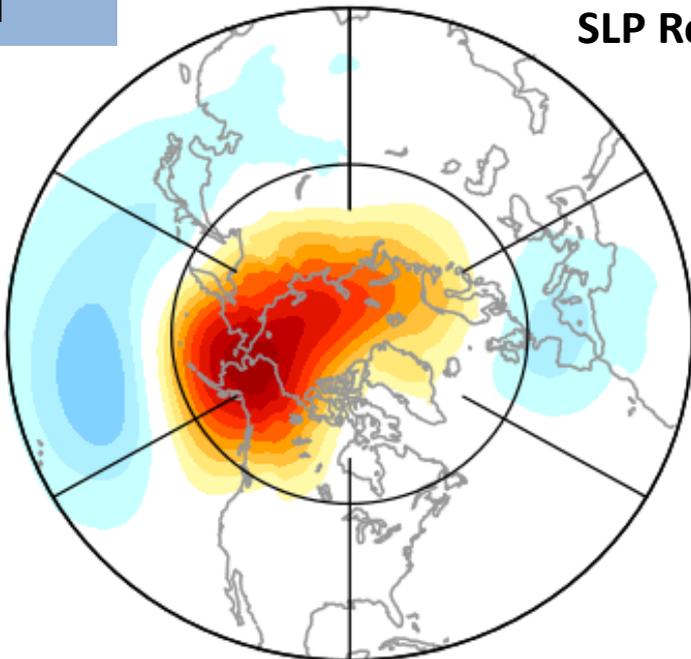


CCSM4 PI
Control

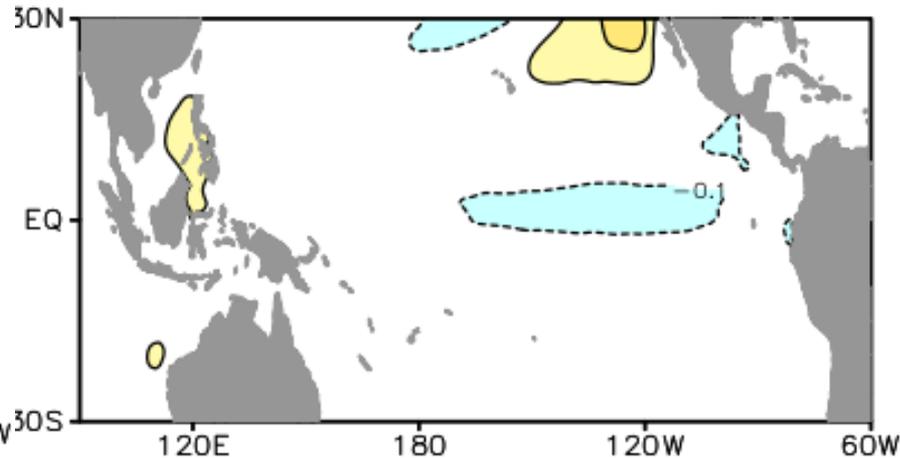
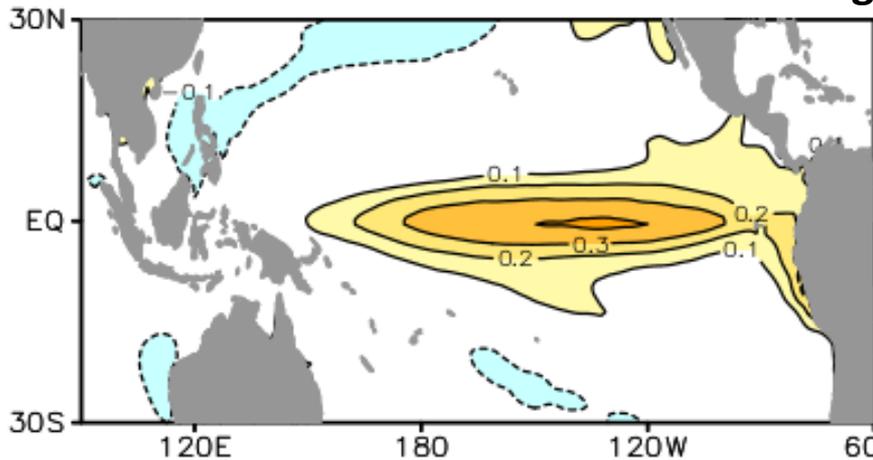
NPO/SFM (24%)

PMM (11%)

**SLP Regression (hPa)
DJF(0)**

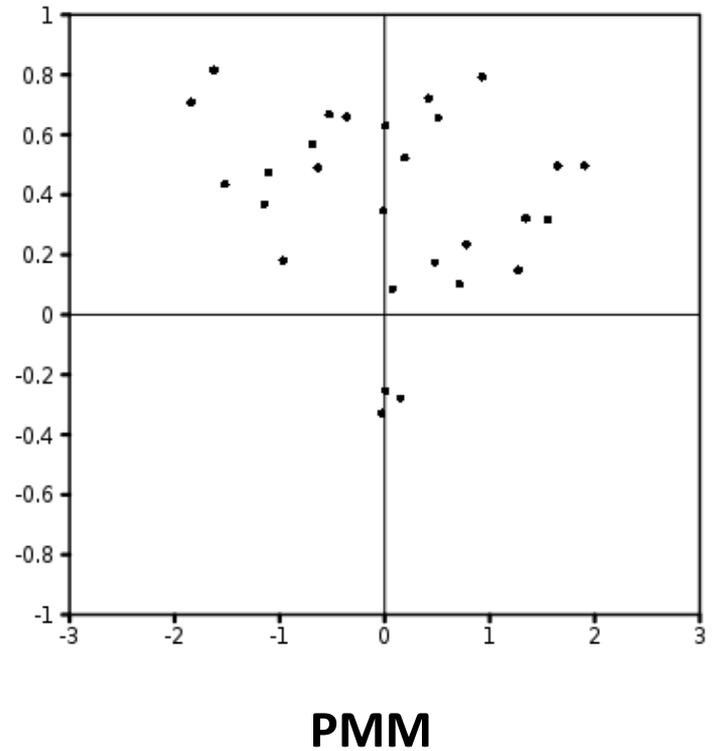
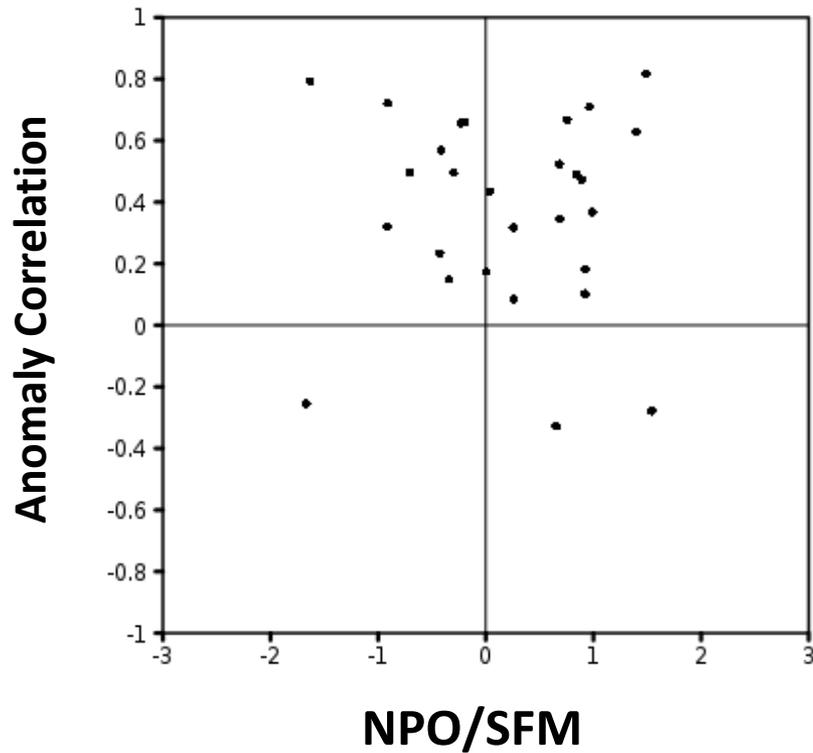


SST Regression (° C) DJF(1)

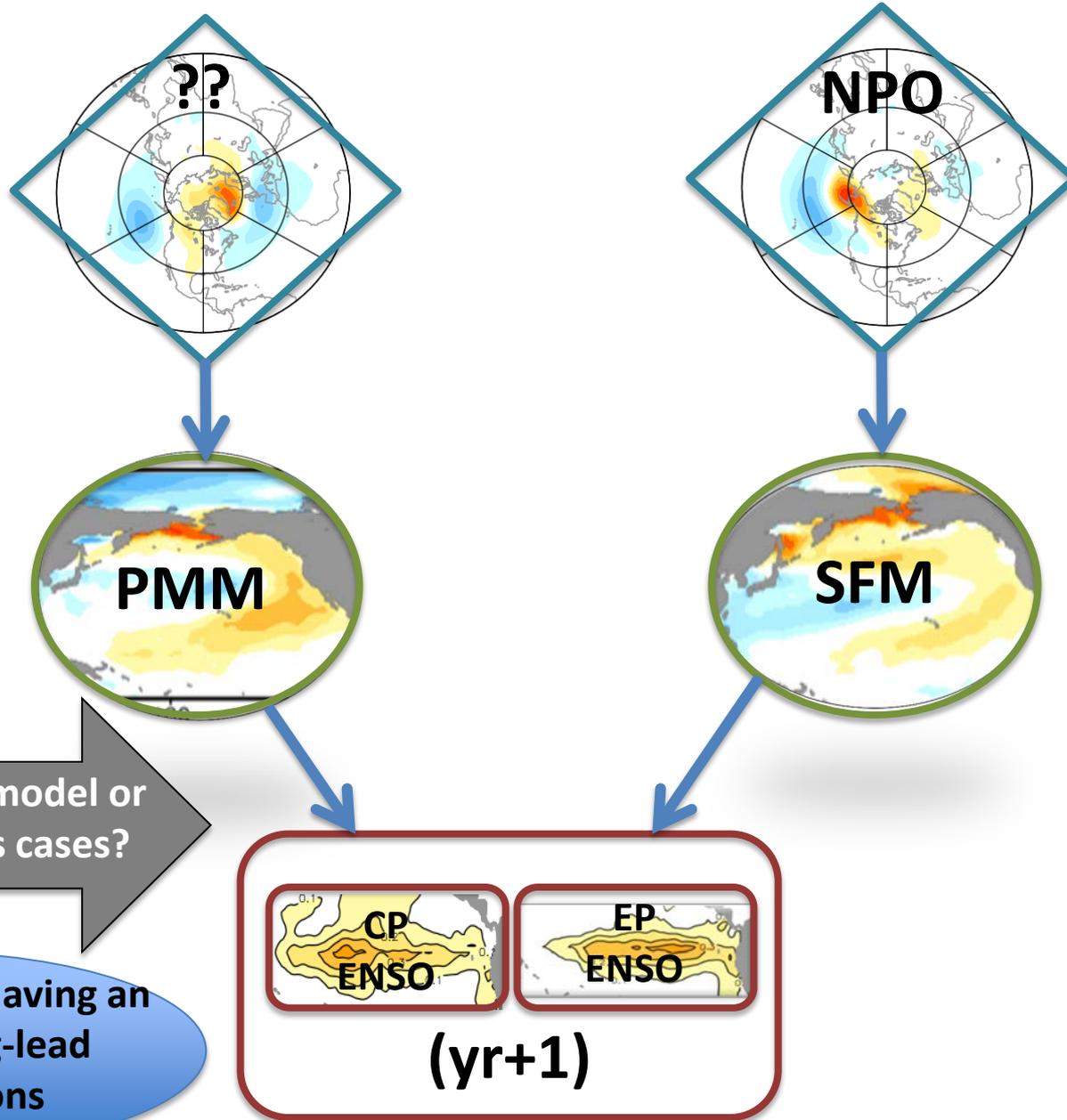


Can models better predict ENSO when precursors are active?

Initialized in Mar
Valid in Nov



How are the NPO, SFM, PMM, & ENSO Related?



Conclusions & Future Work

- The PMM & NPO/SFM are *different mechanisms* forced by *different atmospheric circulations* in both model and observations.
- An explanation why models do not simulate or predict central Pacific ENSO events.
- Are there models that have this relationship and can they simulate/predict CP ENSO?