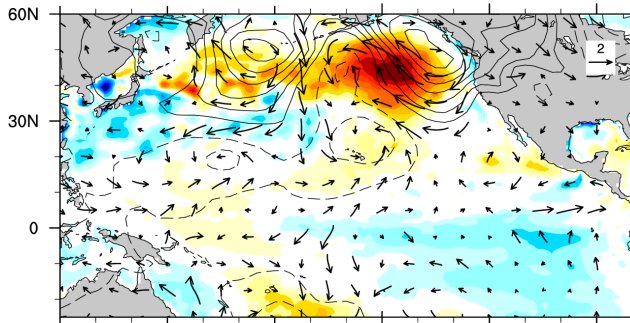


How Important are Large-Scale Climate Influences for the Predictability of Northeast Pacific Marine Heatwaves?

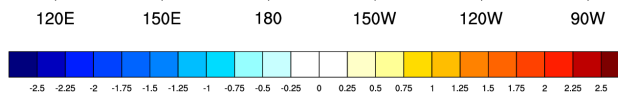
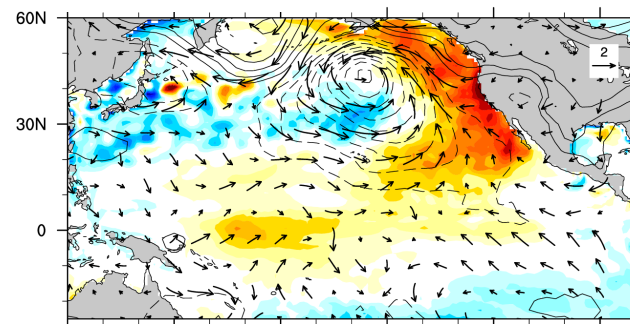
Antonietta Capotondi, Matt Newman *University of Colorado and NOAA PSL*

Tongtong Xu, Emanuele Di Lorenzo *Georgia Institute of Technology*

DJF 2013/14



DJF 2014/15



Use a Linear Inverse Model (LIM) to explore the predictability of this MHW:

$$dx = Lx dt + Sr (dt)^{1/2}$$

x = state vector (SST, SSH)

L = matrix encapsulating predictable dynamics

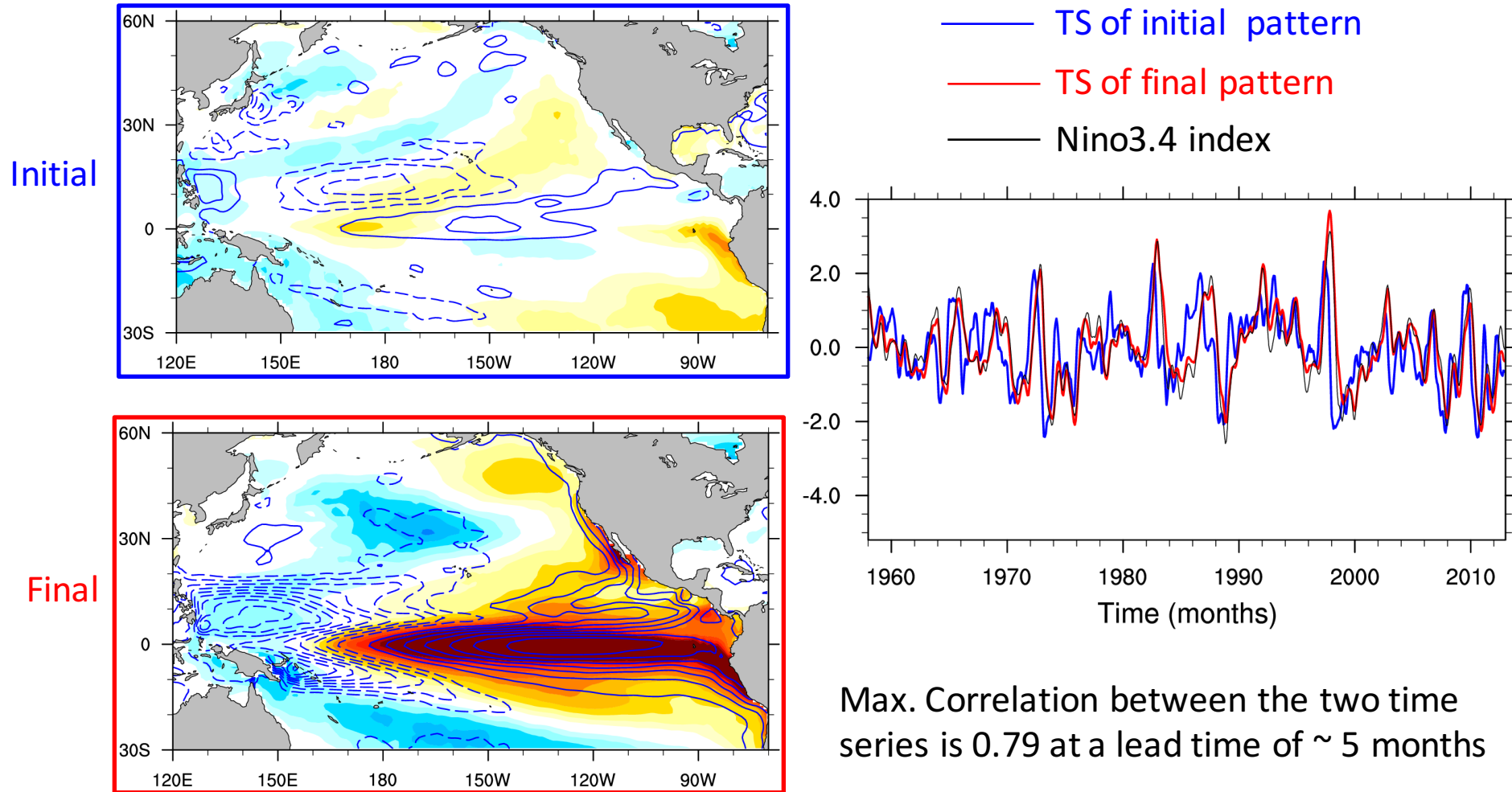
S = stochastic forcing amplitude covariance matrix

r = random noise vector from $N(0,1)$

LIM is trained on observations, it does not have biases and initialization shocks as dynamical models

LIM can capture the large-scale ENSO dynamics

Initial and Final LIM optimal structures show ENSO evolution from the precursor phase to the mature phase



Max. Correlation between the two time series is 0.79 at a lead time of ~ 5 months

6-Month Lead Predictions (SST)

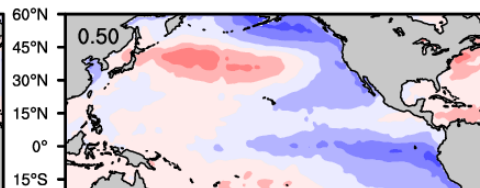
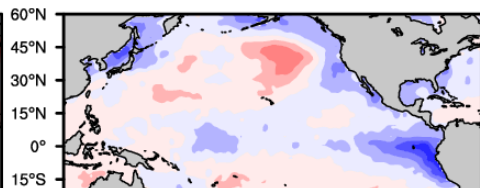
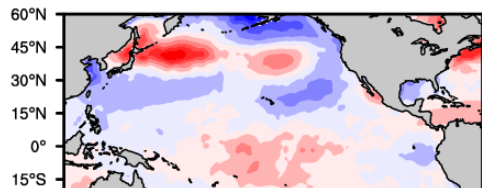
Initial

Observed

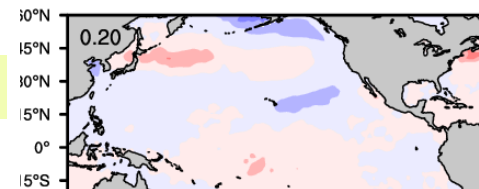
Predicted

Damped persistence

SON2012 →
MAM2013

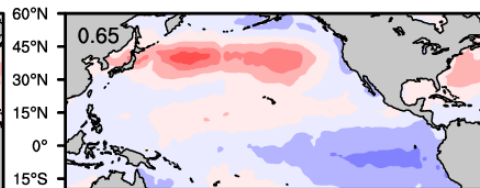
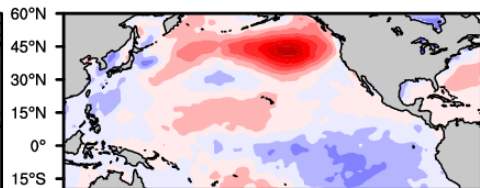
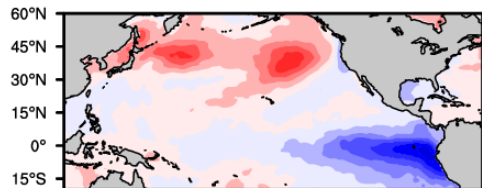


0.50

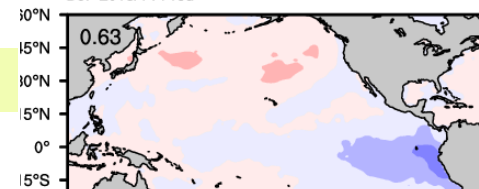


0.20

JJA2013 →
DJF2013/14

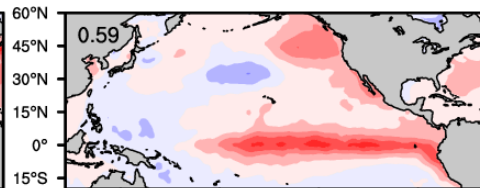
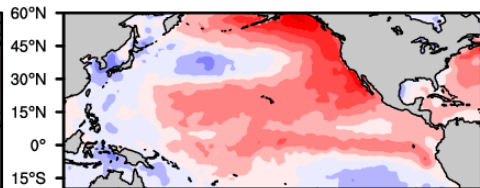
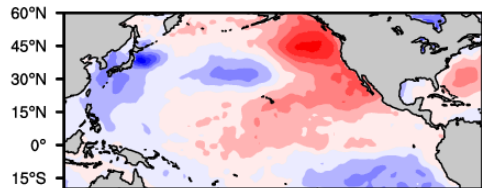


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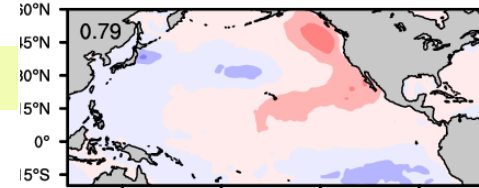


0.63

MAM2014 →
SON2014

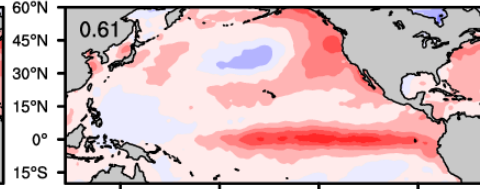
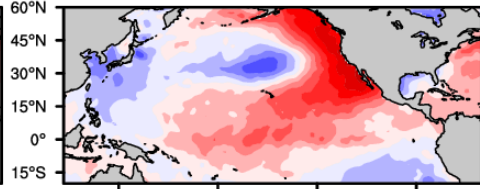
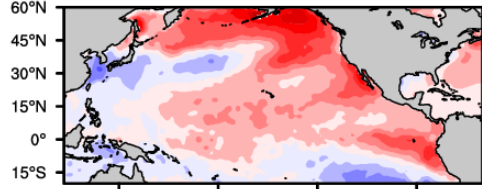


0.59

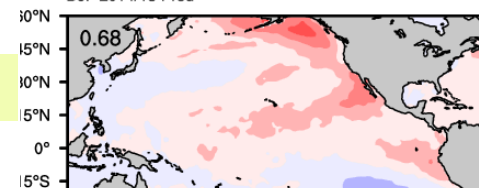


0.79

JJA2014 →
DJF2014/15

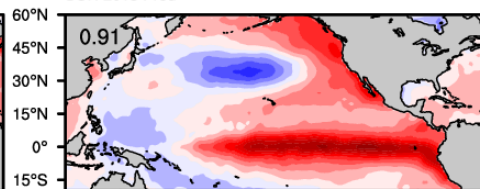
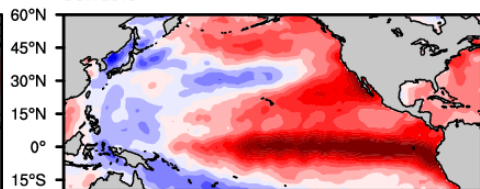
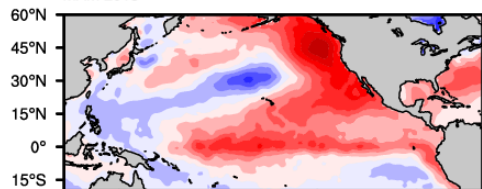


0.61

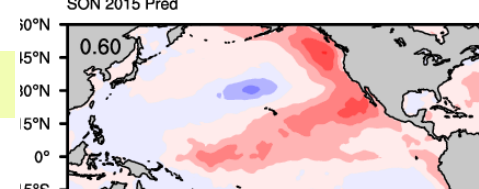


0.68

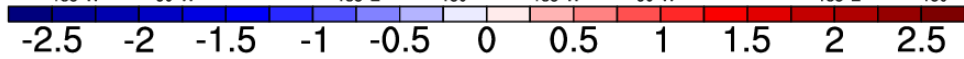
MAM2015 →
SON2015



0.91



0.60



Conclusions

Results suggest that large-scale ENSO dynamics does influence the predictability of Northeast Pacific Marine Heatwaves, including amplitude and evolution.

The amplitude of the northeast Pacific SST anomalies appears to be underestimated, and may be controlled by local atmospheric forcing.

Current work is diagnosing the role of ocean dynamics, as encapsulated by sea surface height in influencing this predictability.