Components of **S2S2D** Prediction and Projection Systems
NOAA/ GFDL ➔ Predictability Research

- **Observing Systems**
- **Assimilation Systems**
- **Models**
- **Changing radiative forcing**

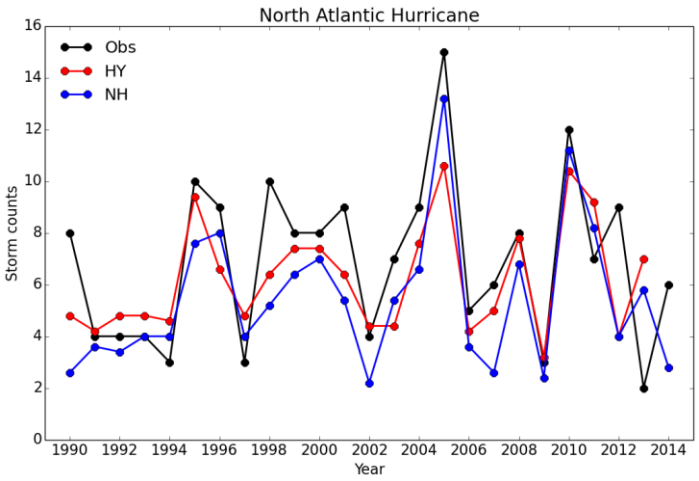
Initial Value Problem
(synoptic to seasonal prediction)

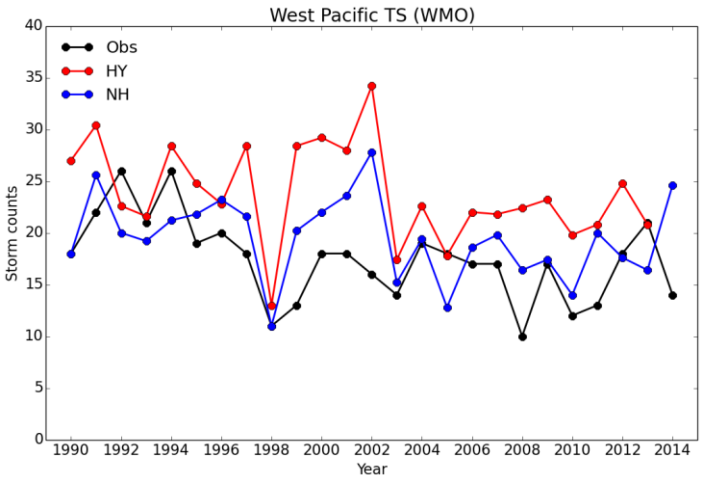
Boundary Value Problem
(multi-decadal to centennial projection)

Synoptic
-Subseasonal
-Seasonal
-Interannual
-Decadal
Predictions and Projections

Goal: ***Unified system for predictions and projections. Seasonal -decadal -centennial***
"Seamless" ➔ ➔ "NRC Report: Advancing Climate Modeling" (2012)

Seasonal Prediction of TCs with GFDL HiRAM





Correlation	HY	NH
1990-2010	**0.88**	**0.86**
2000-2010	**0.94**	**0.96**
1990-2014	**0.72**	**0.76**

Correlation	HY	NH
1990-2010	0.34	0.48
1990-2014	0.33	0.42

- The Non-Hydrostatic (NH) HiRAM successfully reproduces skillful TC seasonal forecasts achieved by the well-tuned HydroStatic (HY) HiRAM in Atlantic basin (Chen & Lin 2011)
- The NH HiRAM significantly improves the storm-count bias in WP basin.

Courtesy: S. J. Lin

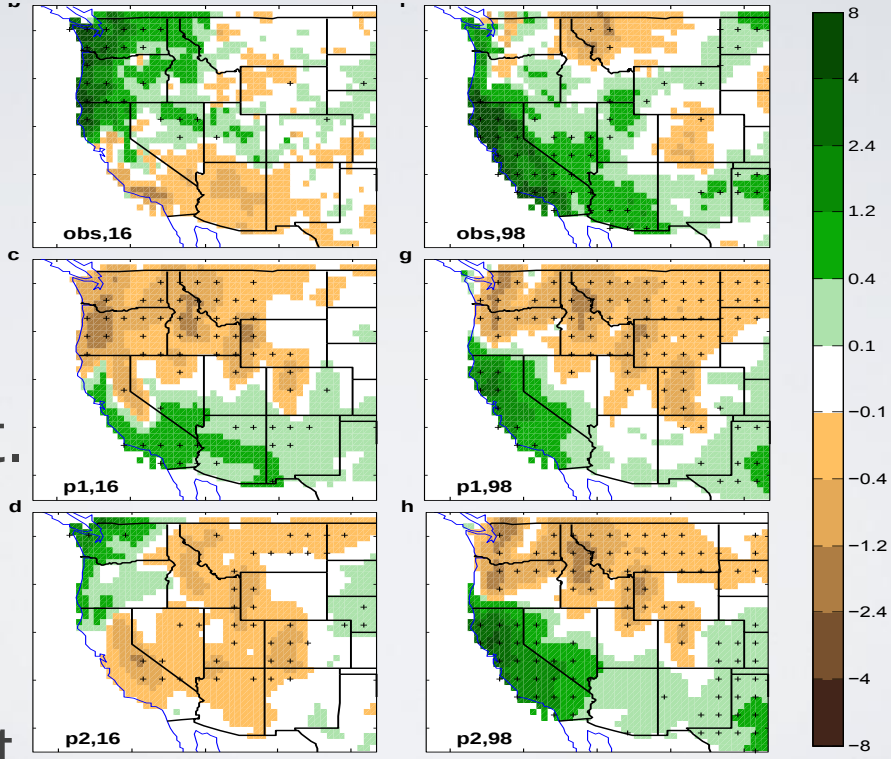
Understanding the causes and predictability of winter 2015-16 precipitation over Western U.S.

DJF 15-16 DJF 97-98

Observed

FLOR Fcst. with Ocean. Init.

FLOR Fcst. with Ocean., Atm. & Land Init.

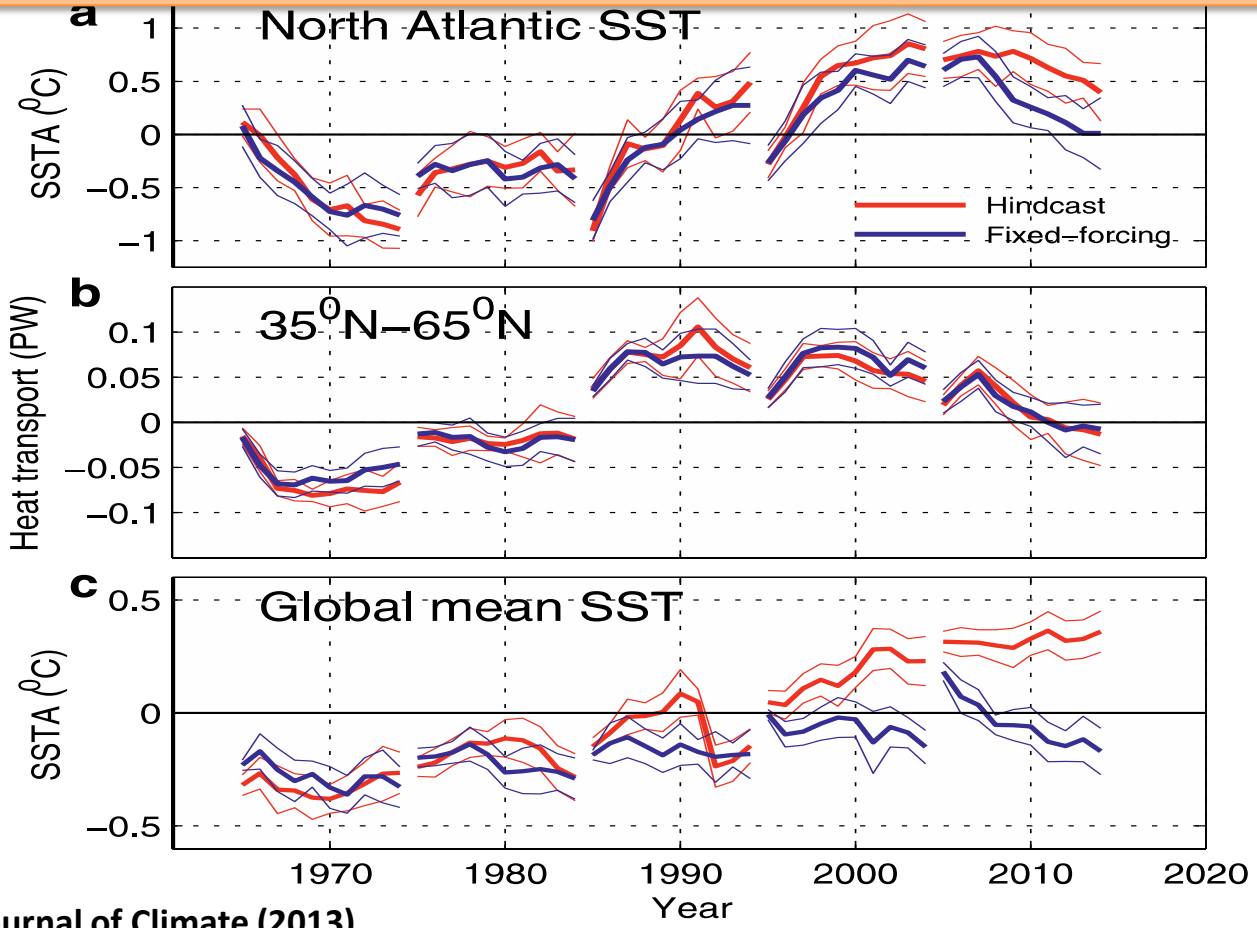


For 1997-8: Pacific Forcing dominant

For 2015-6: Land & atmosphere conditions dominant

Yang et al. (2016)

Skill for decdal prediction of Atlantic SST comes from initial conditions in ocean – not from radiative forcing changes



Yang et al., Journal of Climate (2013)