

A List of Questions

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NCAR/CGD

AGCI workshop, Aspen, Jun 7, 2015

- Predictability vs. prediction skills

Are we getting consistent answers?

- Bias adjustment

Are the “better” hindcast results caused by initialization or bias adjustment?

- Initial shock

Are there return of skills after the initial shock in CCSM4?

- Nonstationary initial errors

How do we get ocean initial conditions for the 60s-70s?

- Forecast verification

What are we trying to predict? Are they predictable?

Predictability vs. prediction skills

Are we getting consistent answers?

Potential Predictability Variance Fractions

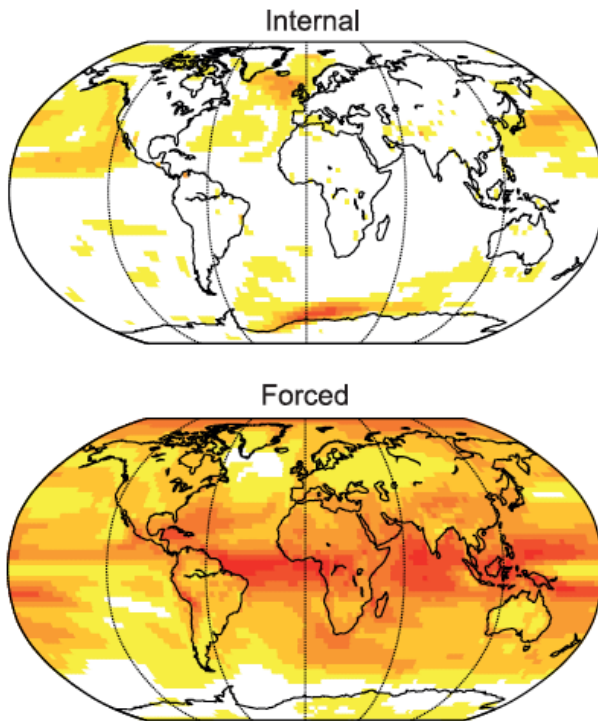
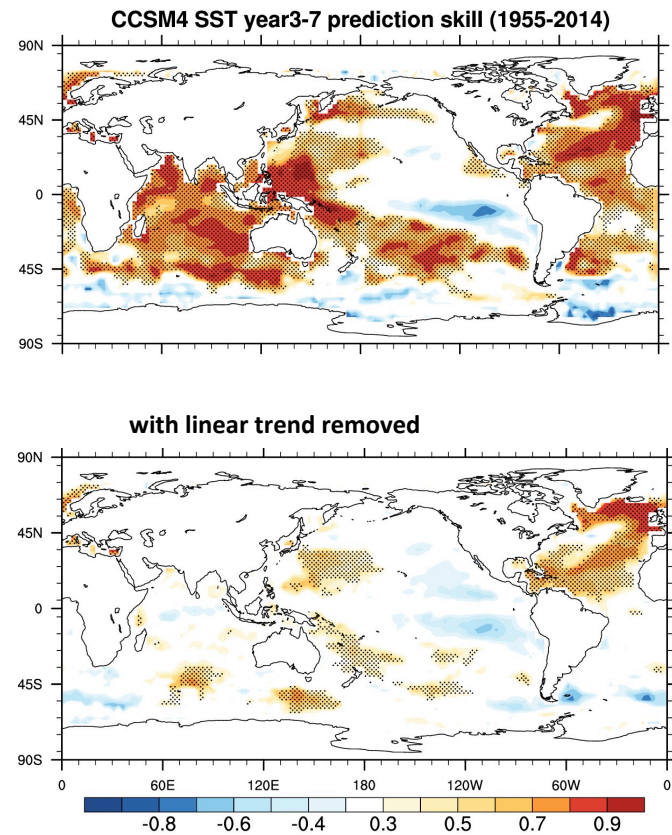


Fig.11.1 from AR5



My struggles

- Perfect model vs. initial shock due to model bias
- More predictable patterns (Branstator and Teng 2014) and initial states?
- The IPO ... **a key but intriguing**

Bias adjustment methods

- For full field initialization CLIVAR2011

Y_{jt} : raw prediction/hindcast j at lead time t , O_{kt} obs corresponding to Y_{jt} , N total number of hindcast

$$\hat{Y}_{jt} = Y_{jt} - \sum_{\substack{k=1 \\ k \neq j}}^N (Y_{kt} - O_{kt}) / (N-1)$$

- For anomaly initialization CLIVAR2011

remove climatological bias over a climatological period

$$\hat{Y}_{jt} = Y_{jt} - \sum_{k=year1}^{year2} (X_k - O_k) / M$$

- Anomaly method Doblas-Reyes et al. 2013

$$\hat{Y}_{jt}' = Y_{jt} - \sum_{k=1}^N Y_{jt} / N$$

- “Kharin” method Kharin et al. 2012

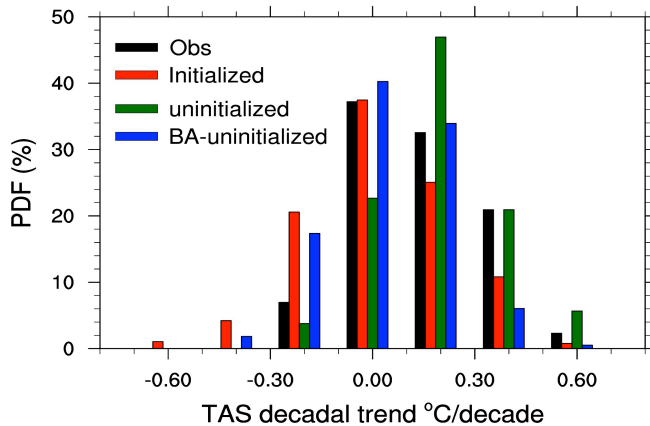
trend correction of global avg tas

- Other methods (least square correction, variance correction, etc.)

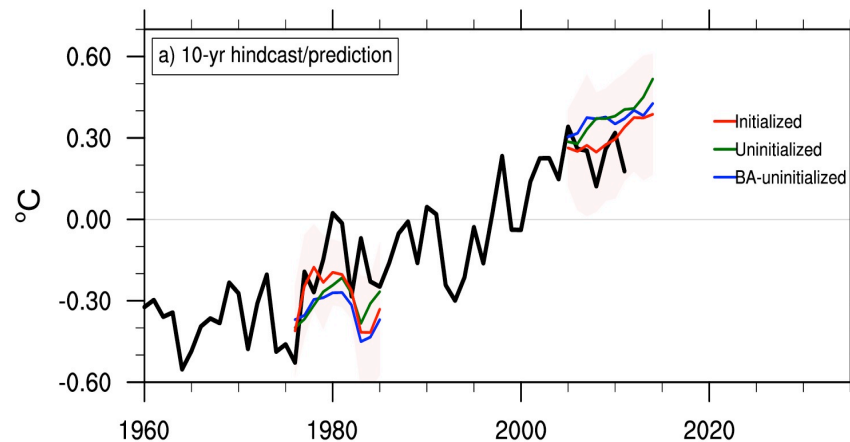
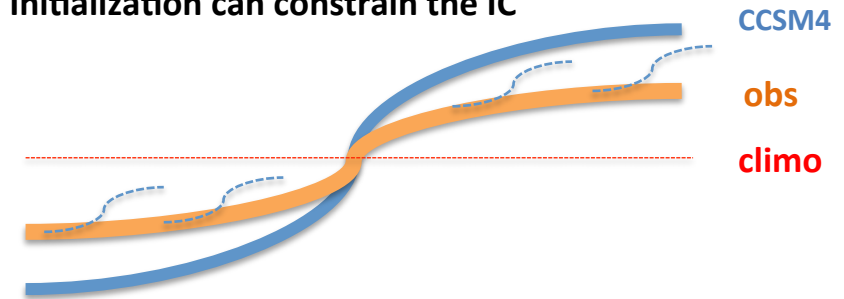
Bias Adjustment

Are the “better” hindcast results caused by initialization or bias adjustment?

BA reduces the overestimated decadal trend

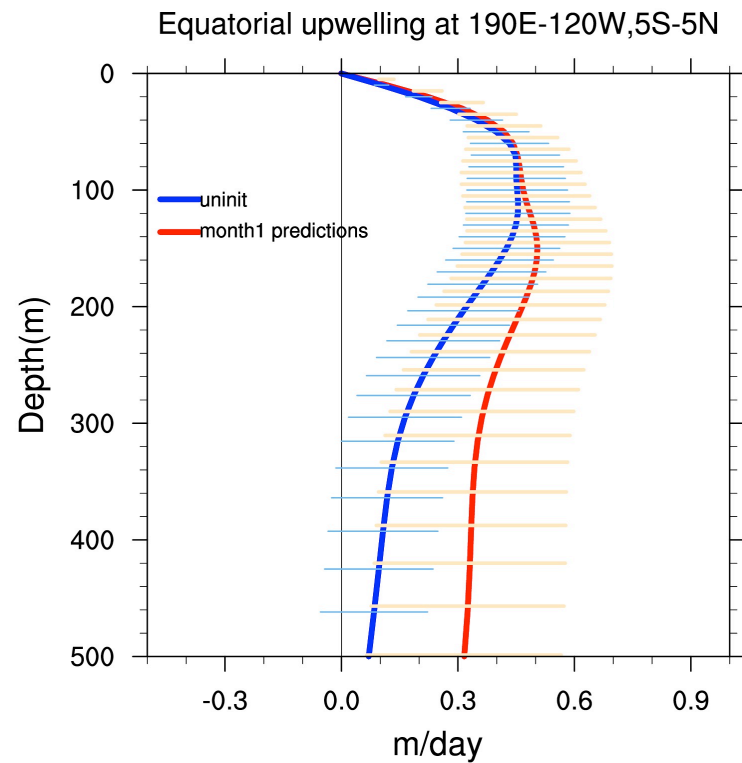
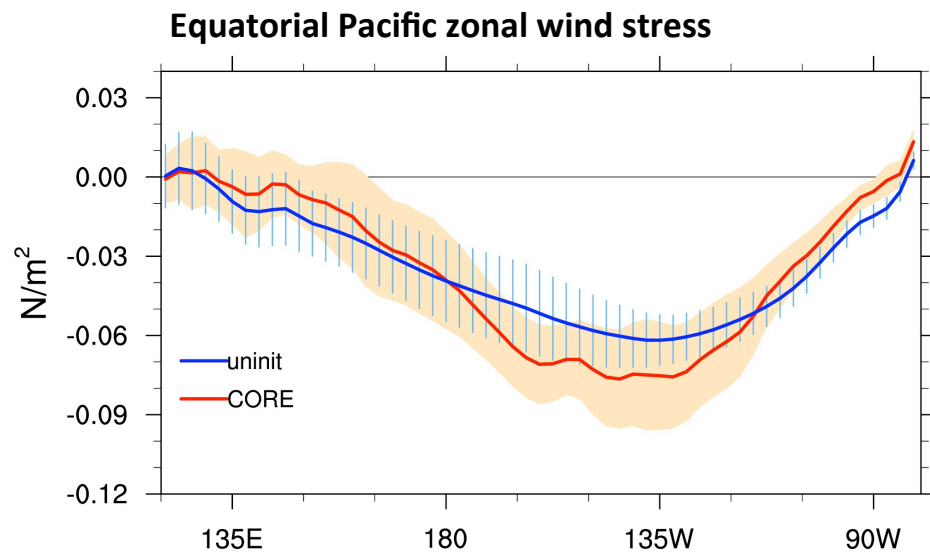


Initialization can constrain the IC



But can we predict the evolution?

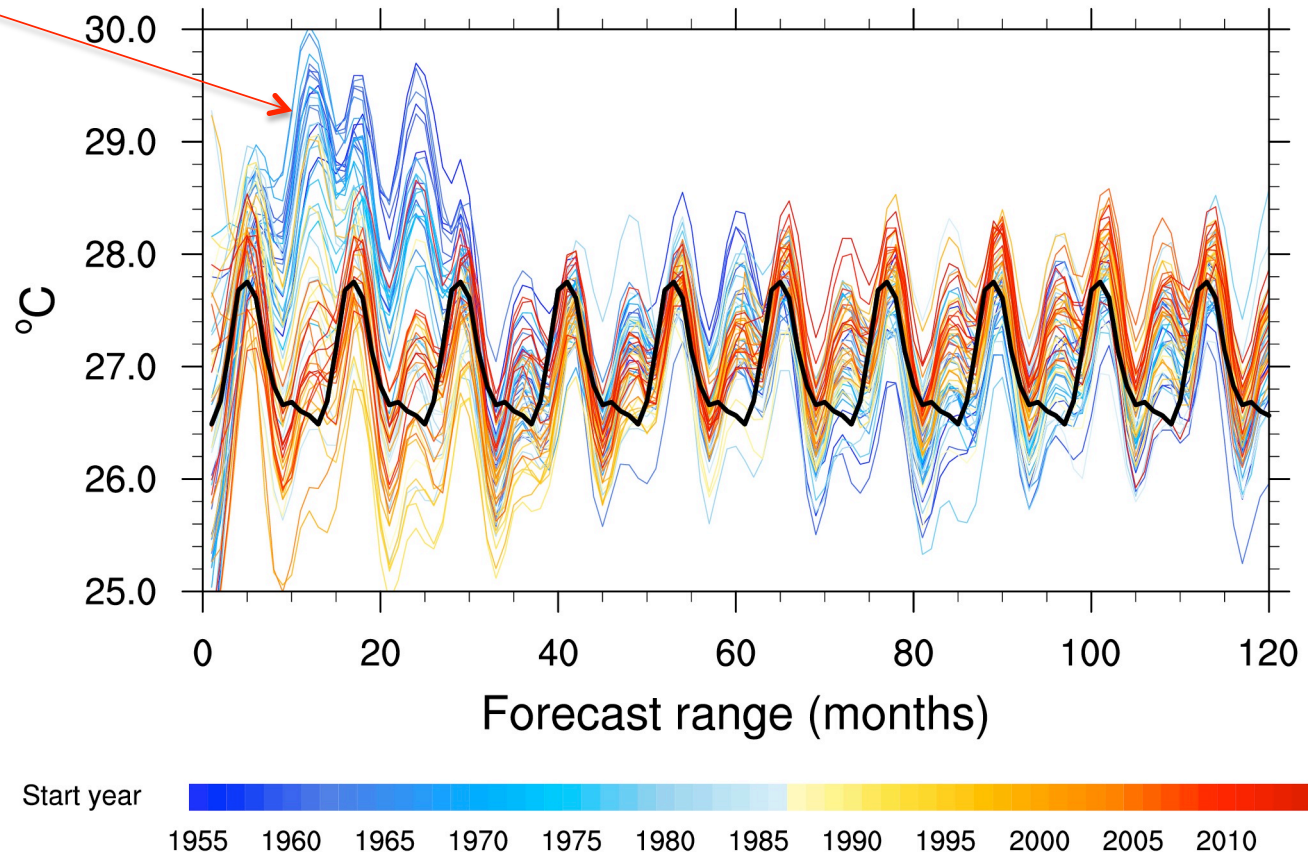
Initial shock in CCSM4 was expected



Initial shock in CCSM4

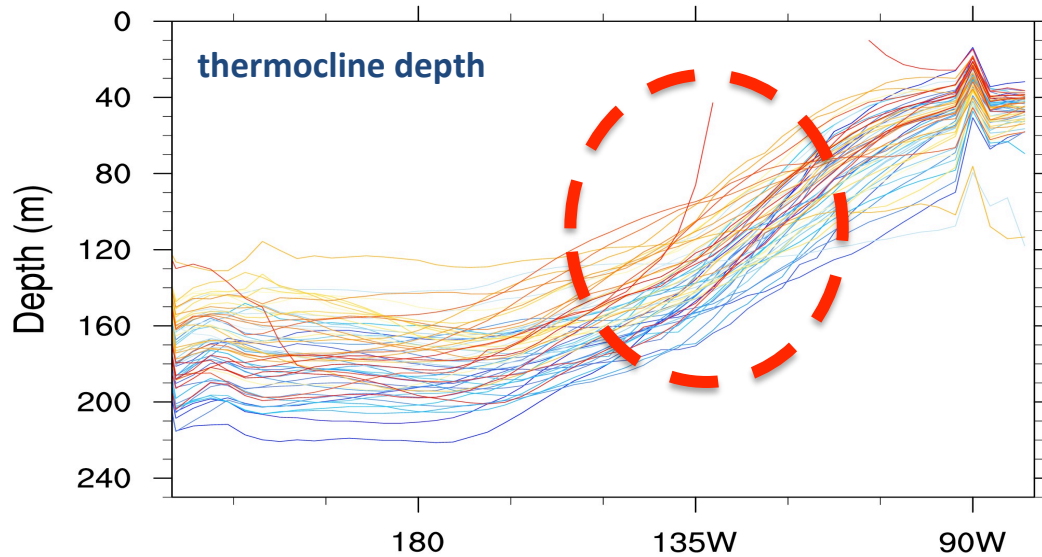
unexpected

CCSM4 Nino34 SST

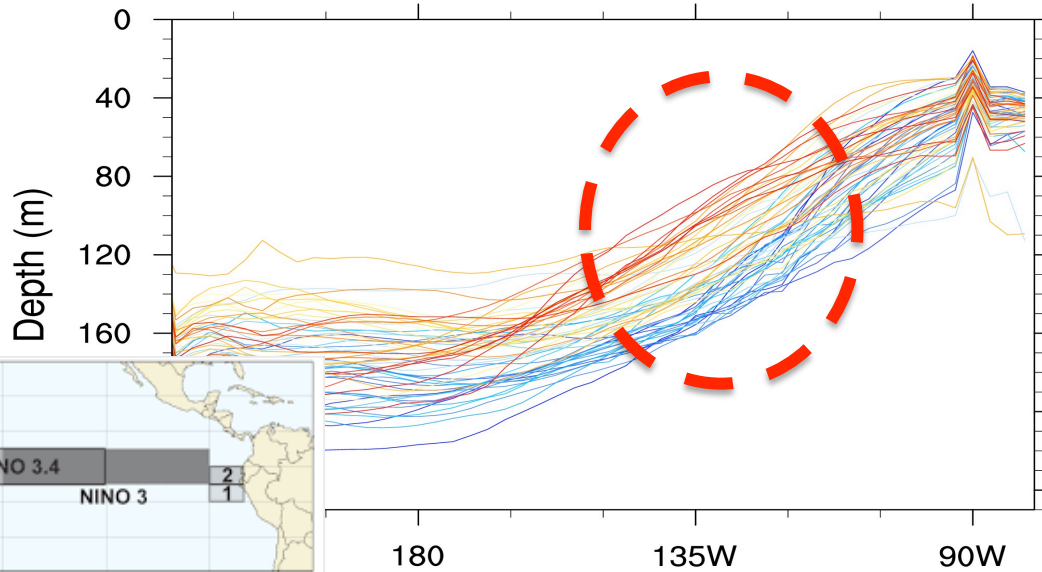


Initial shock in CCSM4 ...a coupling error

CORE-IA month1

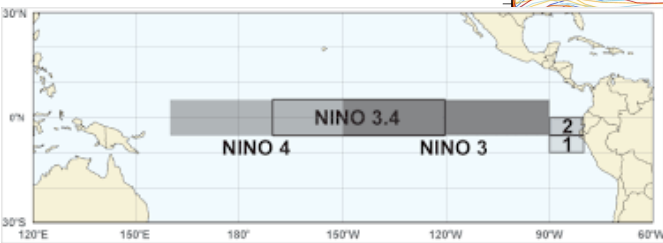


CCSM4 month1

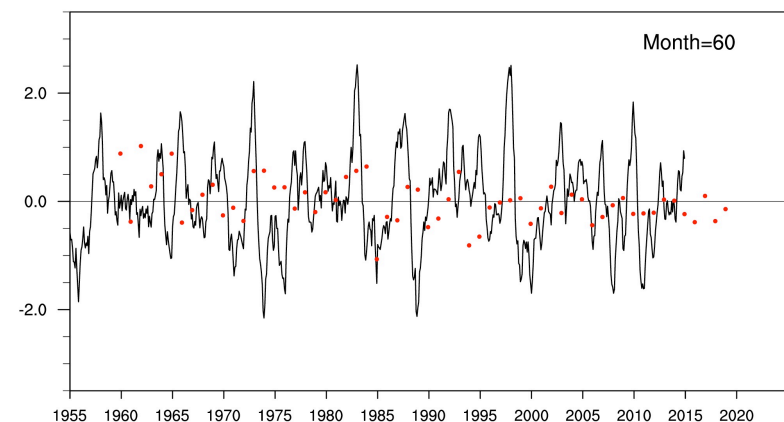
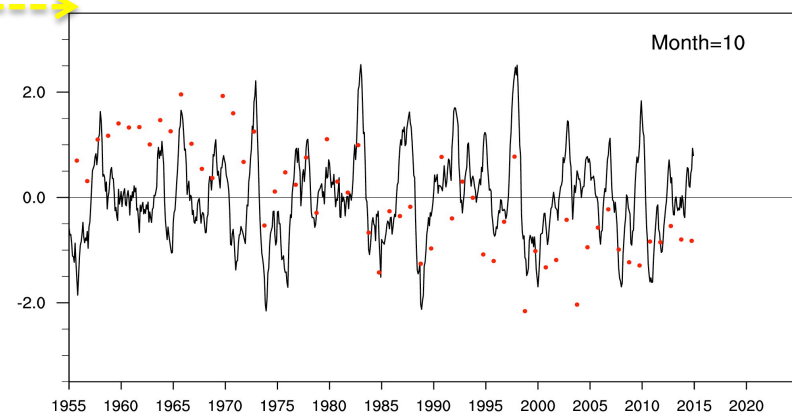
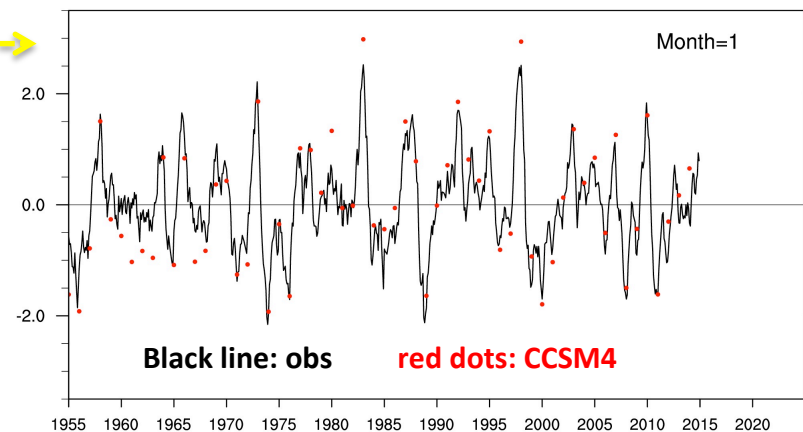
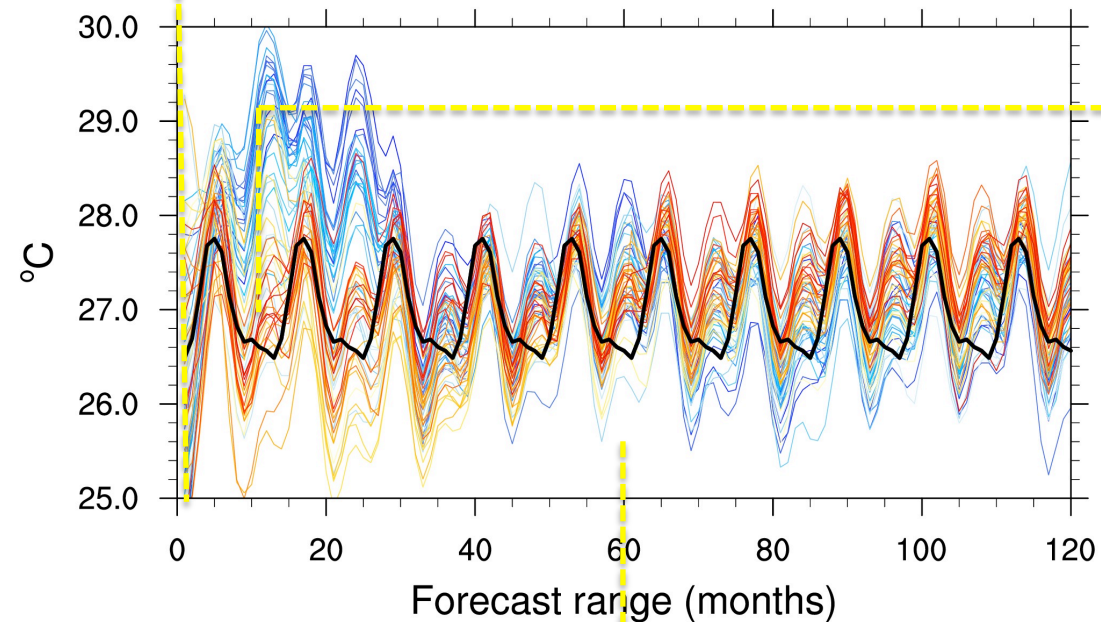


Start year

1955 1960 1965 1970 1975 1980 1985 1990 1995 2000 2005 2010

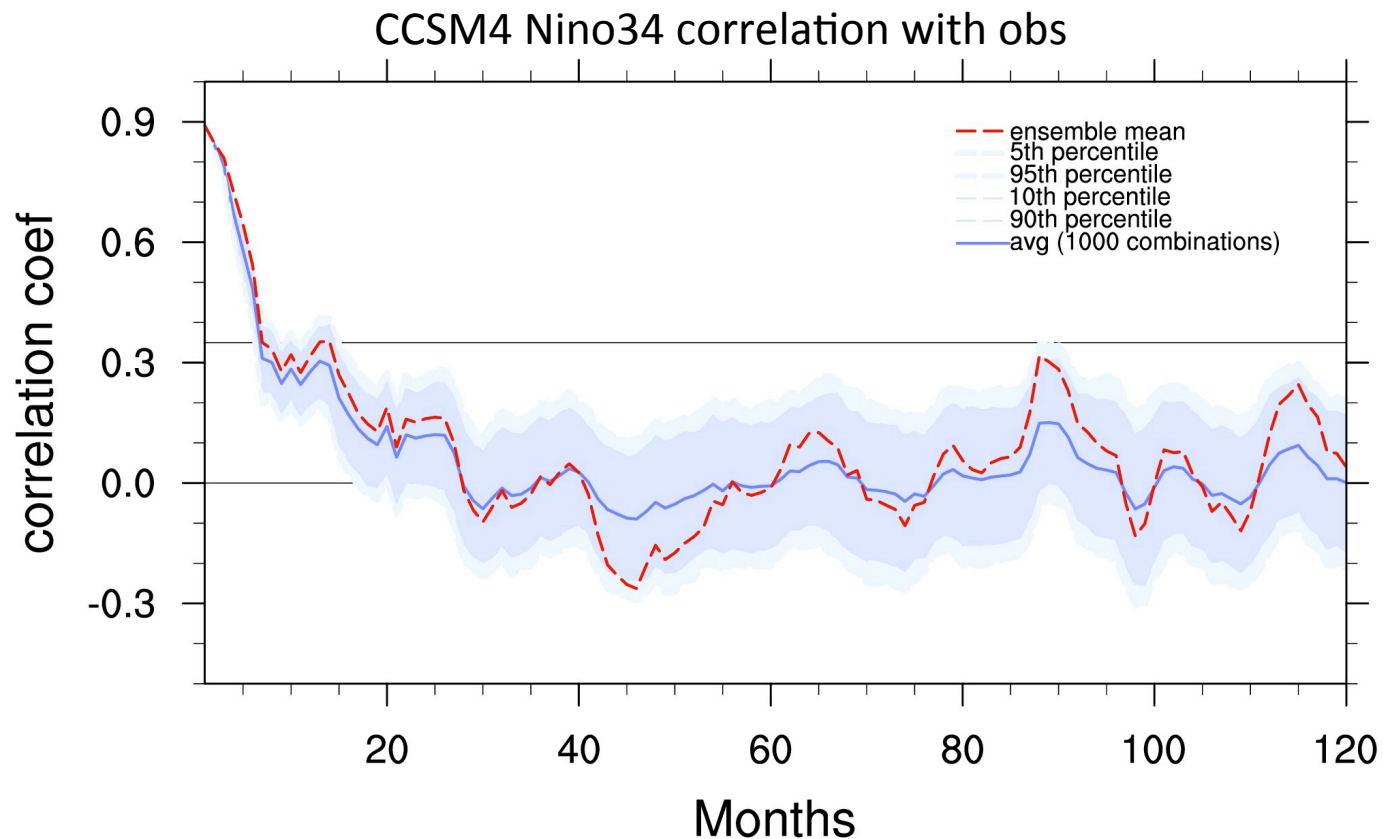


CCSM4 Nino34 SST



Initial shock in CCSM4

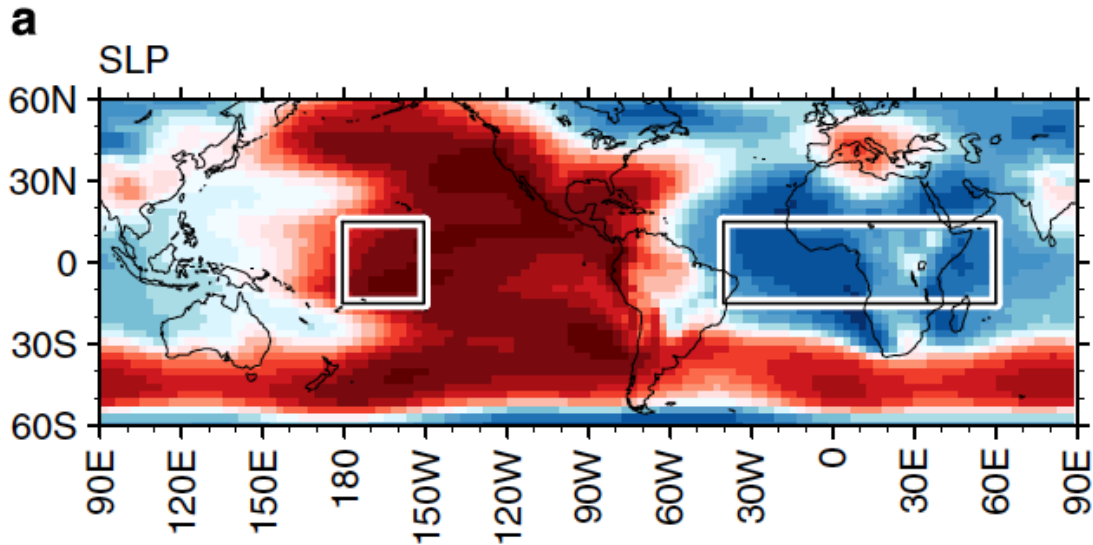
Are there return of skills after the initial shock in CCSM4?



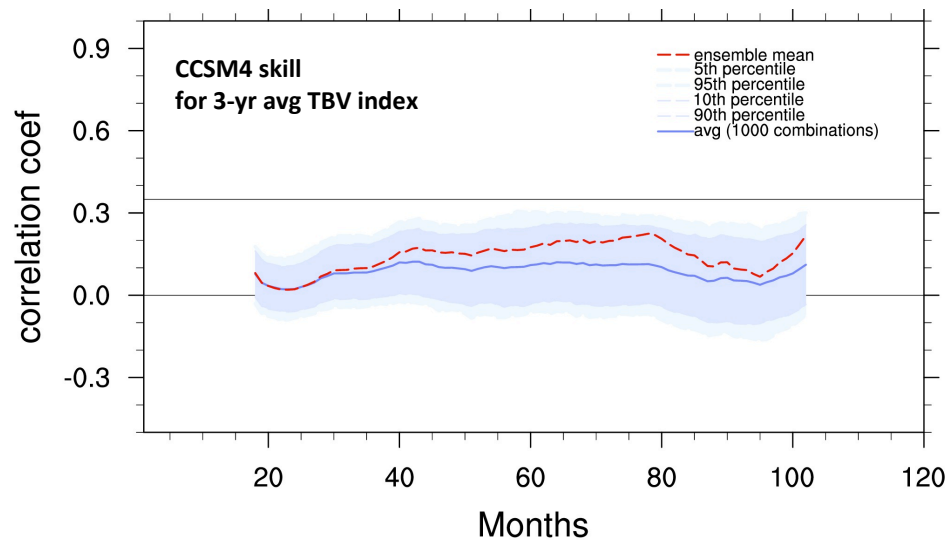
10^{60}
combinations

Initial shock in CCSM4

The “more predictable” trans-basin mode?

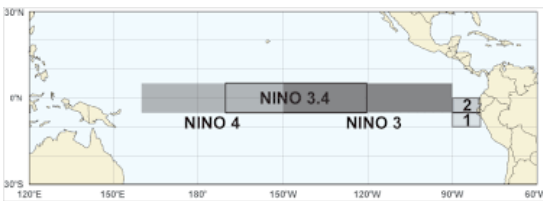
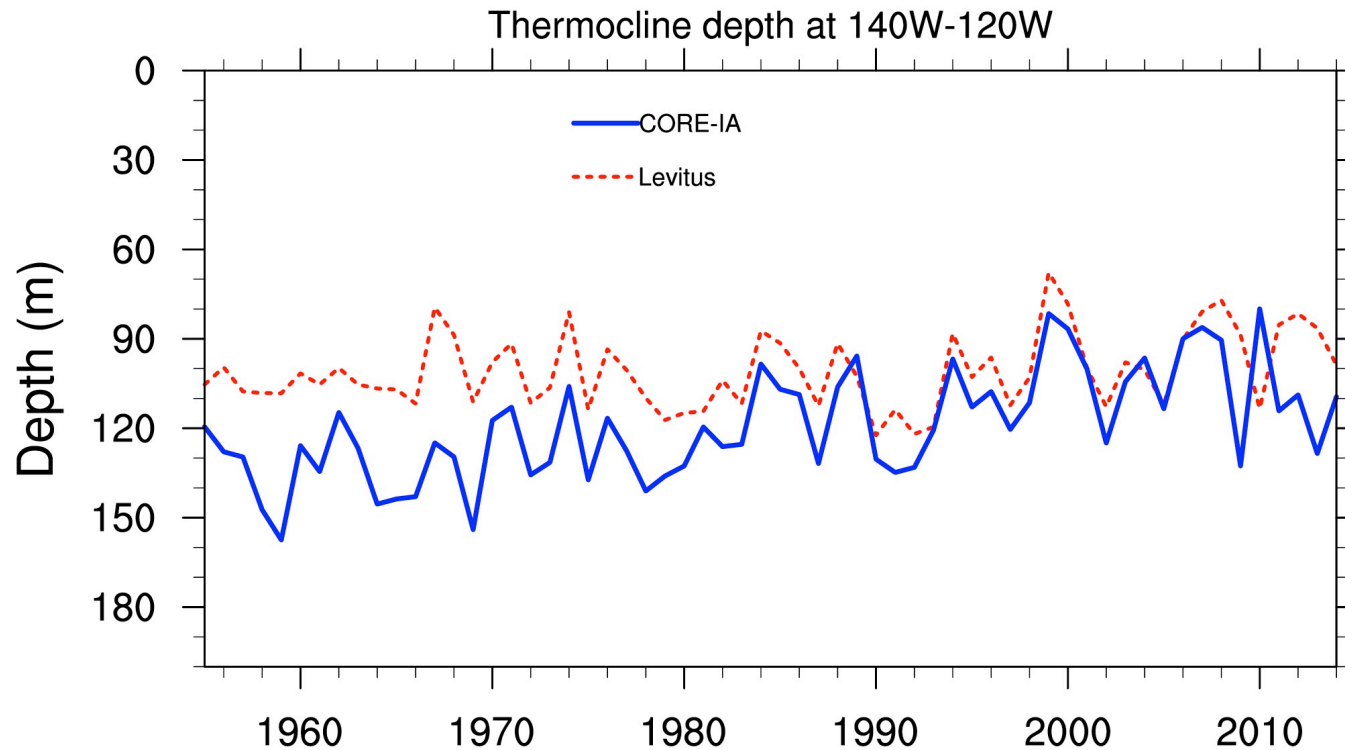


Chikamoto et al. 2015
TBV index:
SLP Pacific minus Atlantic

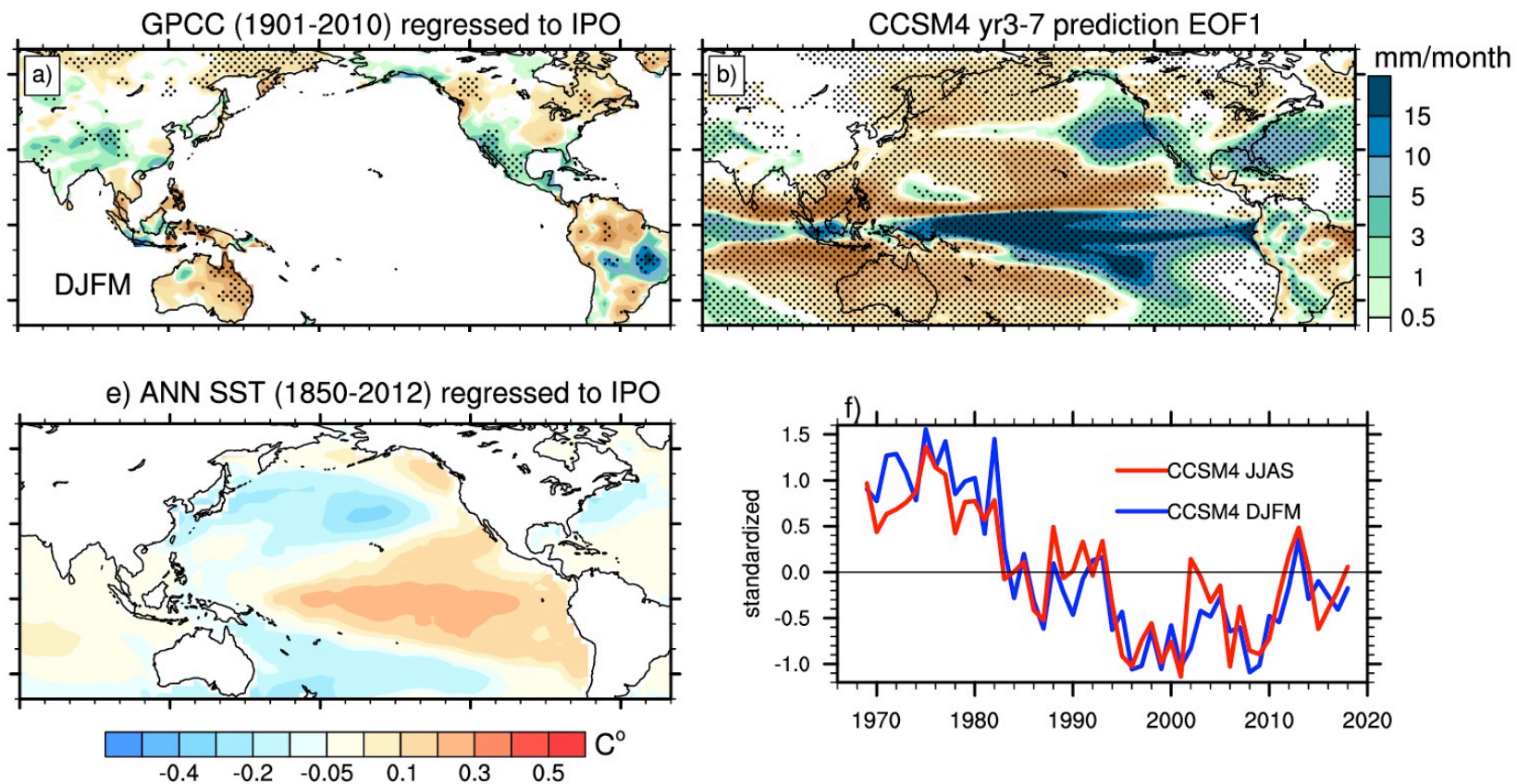


Nonstationary initial error

How do we get ocean initial conditions for the 60s-70s?
How good are the initial conditions from the CORE-IA?



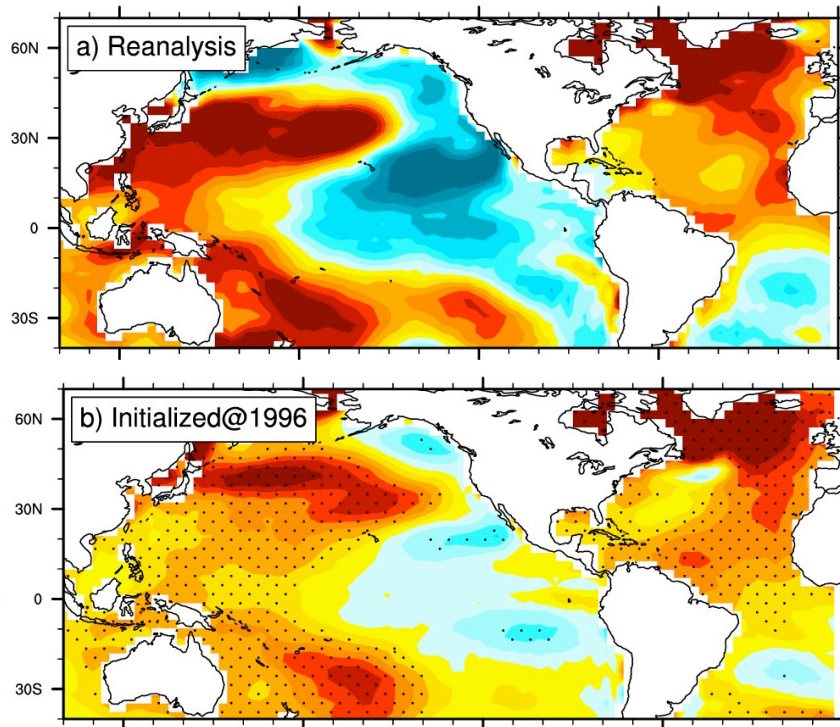
Signal or nonstationary initial error?



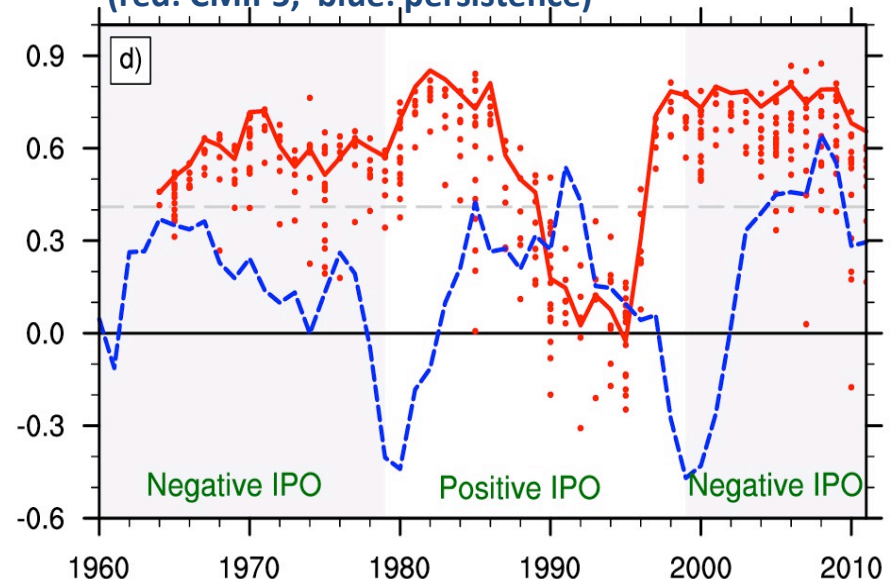
Forecast verification

What are we trying to predict? Are they predictable?

TAS 1998-2002 minus 1981-1995

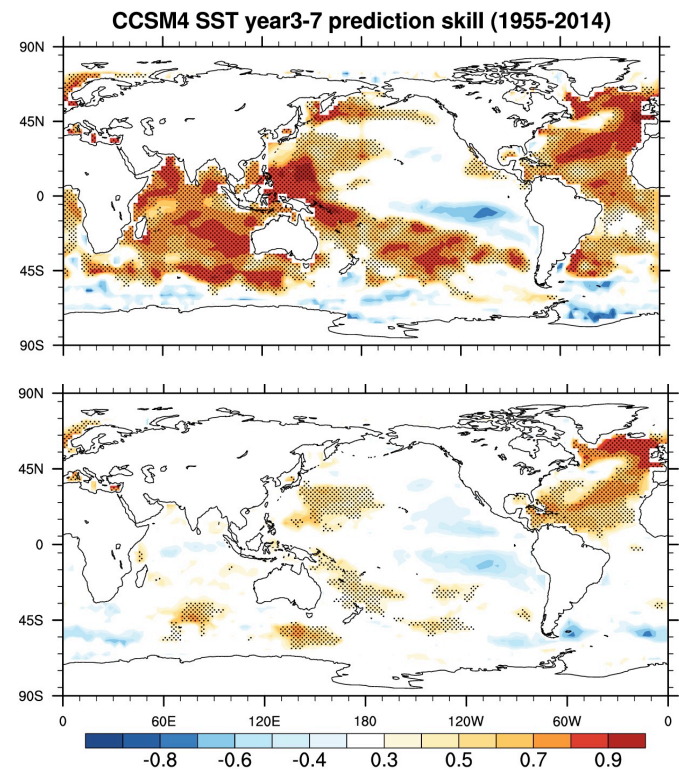
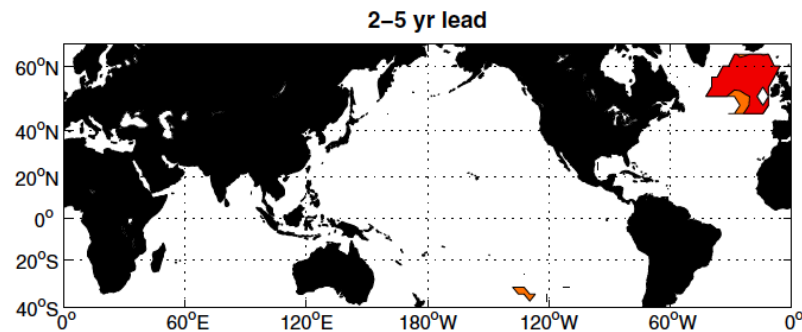
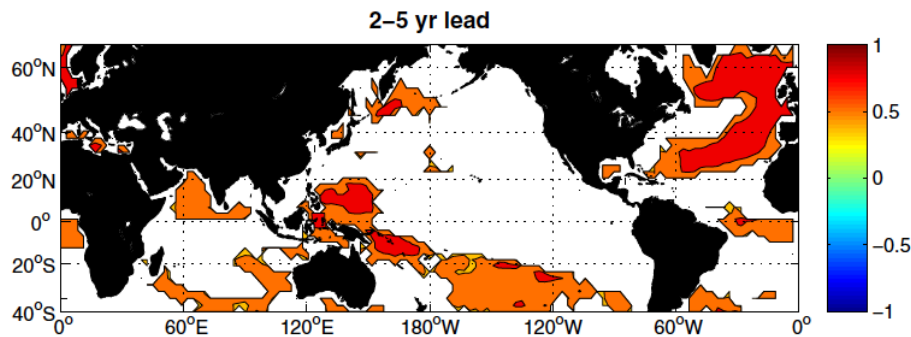


**Pattern correlations
(red: CMIP5, blue: persistence)**



Forecast verification

What are we trying to predict? Are they predictable?



Karspeck, A, S Yeager, G. Danabasoglu, H.Teng: An evaluation of experimental decadal predictions using CCSM4, Clim Dyn, 2015, 44: 907-923.

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How do we get ocean initial conditions for the 60s-70s?=> multi model comparison of ocn ICs

- Forecast verification

What are we trying to predict? Are they predictable?=> multi model perfect model predictability comparison