

ENSO Observations, Theory, Predictions

A WGSIP Perspective

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Outline

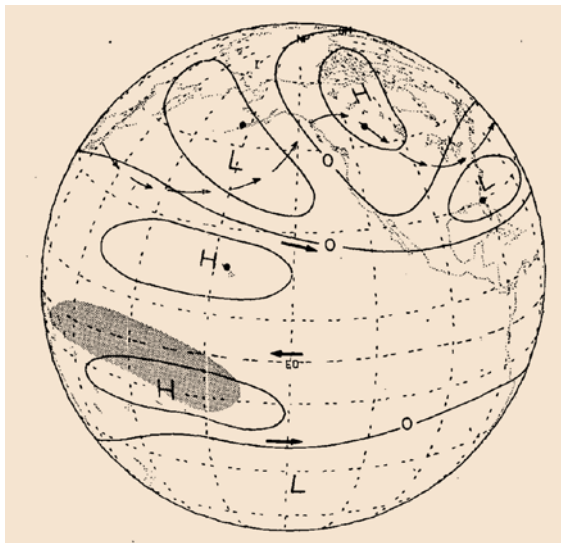
- **An overview of WGSIP**
- **Connecting SI predictions and ENSO in climate model simulations**
- **Shared issues of scientific interest**
- **Possible synergies**

A WGSIP Overview

- **WGSIP: One of the WCRP – CLIVAR crosscutting (global) panels: Working Group on Seasonal and Interannual Prediction**
- **Terms of Reference (ToR)**
 - *develop a programme of numerical experimentation for seasonal-to-interannual variability and predictability, paying special attention to assessing and improving predictions*
 - *develop appropriate data assimilation, model initialization and forecasting procedures for seasonal-to-interannual predictions...*

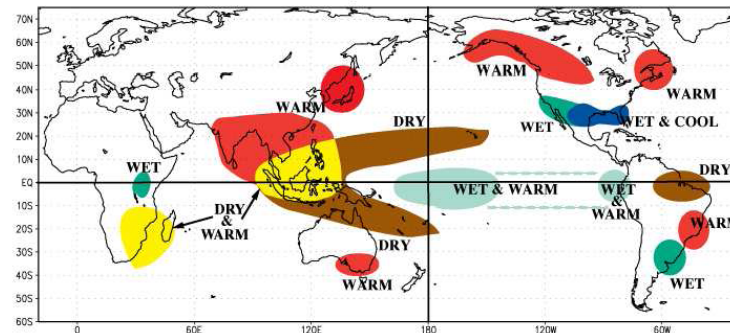
A WGSIP Overview

- One of the major sources of skill for SI prediction of the atmospheric and terrestrial variables is the sea surface temperature (SST) anomalies, particularly SST variability related to the ENSO



Horel & Wallace, [1981](#), *MWR*

El Niño Relationships: December-February



Ropelewski & Halpert, [1987](#), *MWR*

Connecting SI Predictions and ENSO in Climate Model Simulation

- **Source of SI prediction skill, i.e., the ENSO, provides a link between various communities**
 - *Operational SI predictions*
 - *Ocean observing system*
 - *ENSO theories, mechanisms, assessment of predictability, characteristics in a changing climate, ...*

Connecting SI Predictions and ENSO in Climate Model Simulation

A UNIFIED MODELING
APPROACH TO CLIMATE
SYSTEM PREDICTION

BY JAMES HURRELL, GERALD A. MEEHL, DAVID BADER, THOMAS L. DELWORTH,
BEN KIRTMAN, AND BRUCE WIELICKI

- **Efforts towards seamless predictions**
- **Credibility of climate projections depends on our ability to predict current climate variability**
- **SI predictions provide an excellent test bed for testing climate models and understanding model biases**

TOWARD SEAMLESS PREDICTION
Calibration of Climate Change Projections Using Seasonal
Forecasts

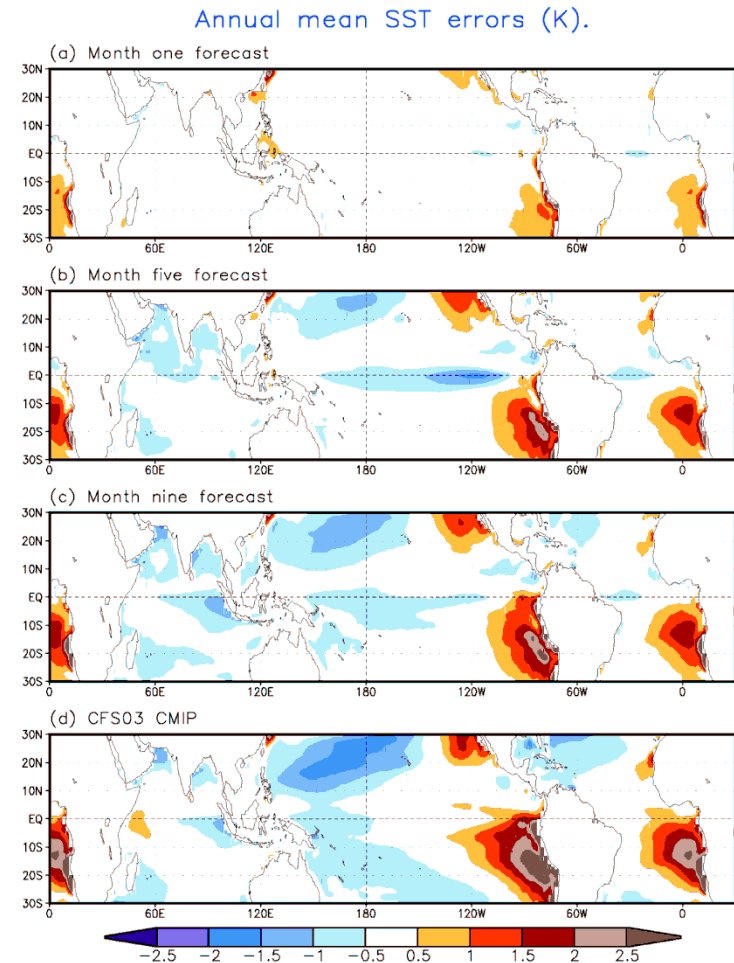
BY T. N. PALMER, F. J. DOBLAS-REYES, A. WEISHEIMER, AND M. J. RODWELL

Shared Issues of Scientific Interest

- **Model biases influence both SI predictions and simulation of ENSO variability in climate models**
- **Low-frequency variability of ENSO is of important relevance for SI (and decadal predictions), and also for understanding modulation of ENSO variability in climate models**
- **Influence of high-frequency atmospheric variability is an important influence on the SI prediction skill of ENSO, and also on understanding the characteristics of ENSO in climate models**

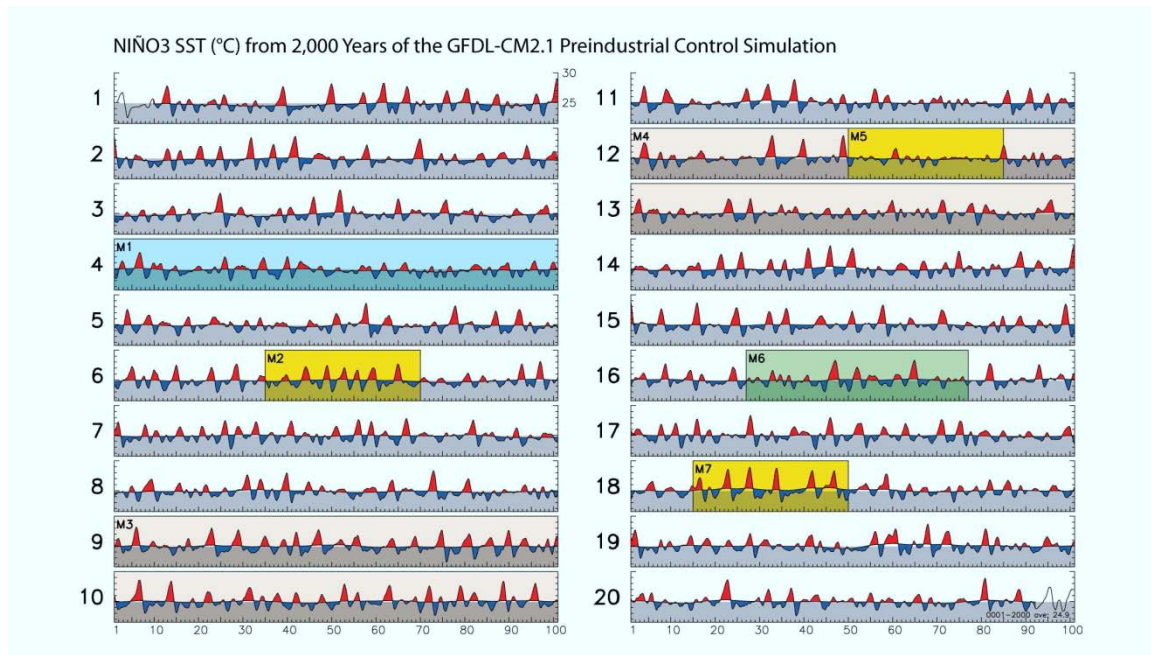
Shared Issues of Scientific Interest

- **Model biases set in very early, therefore SI predictions are a good pathway to understand model biases in climate simulations**



Shared Issues of Scientific Interest

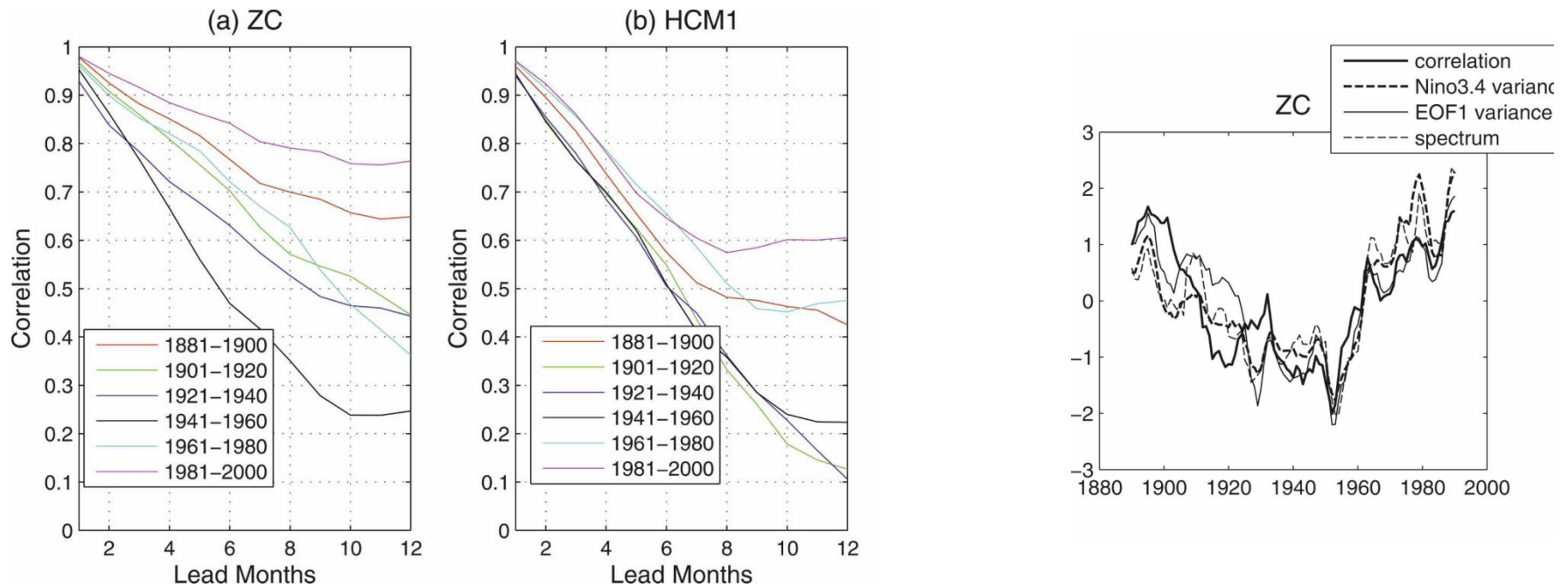
- LF frequency ENSO variability in climate model simulations



Wittenberg, 2009

Shared Issues of Scientific Interest

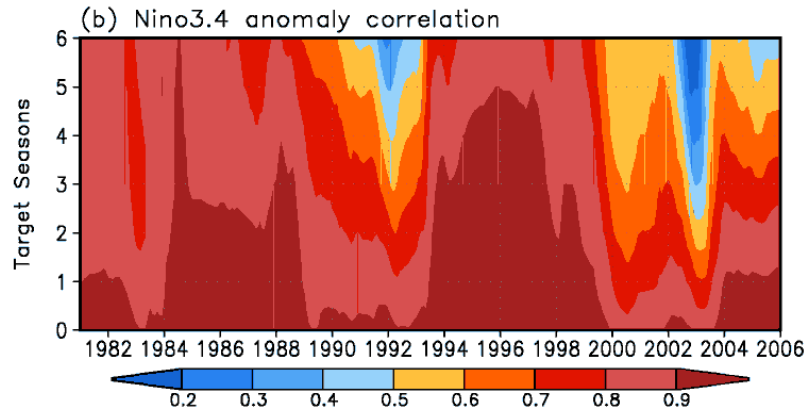
- LF ENSO variability and SI prediction skill



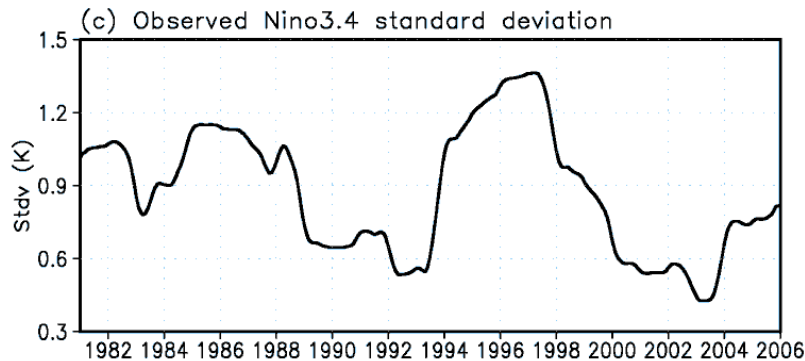
Tang et al., 2008

Shared Issues of Scientific Interest

- **LF ENSO variability and SI prediction skill**



Skill for Nino34 SST

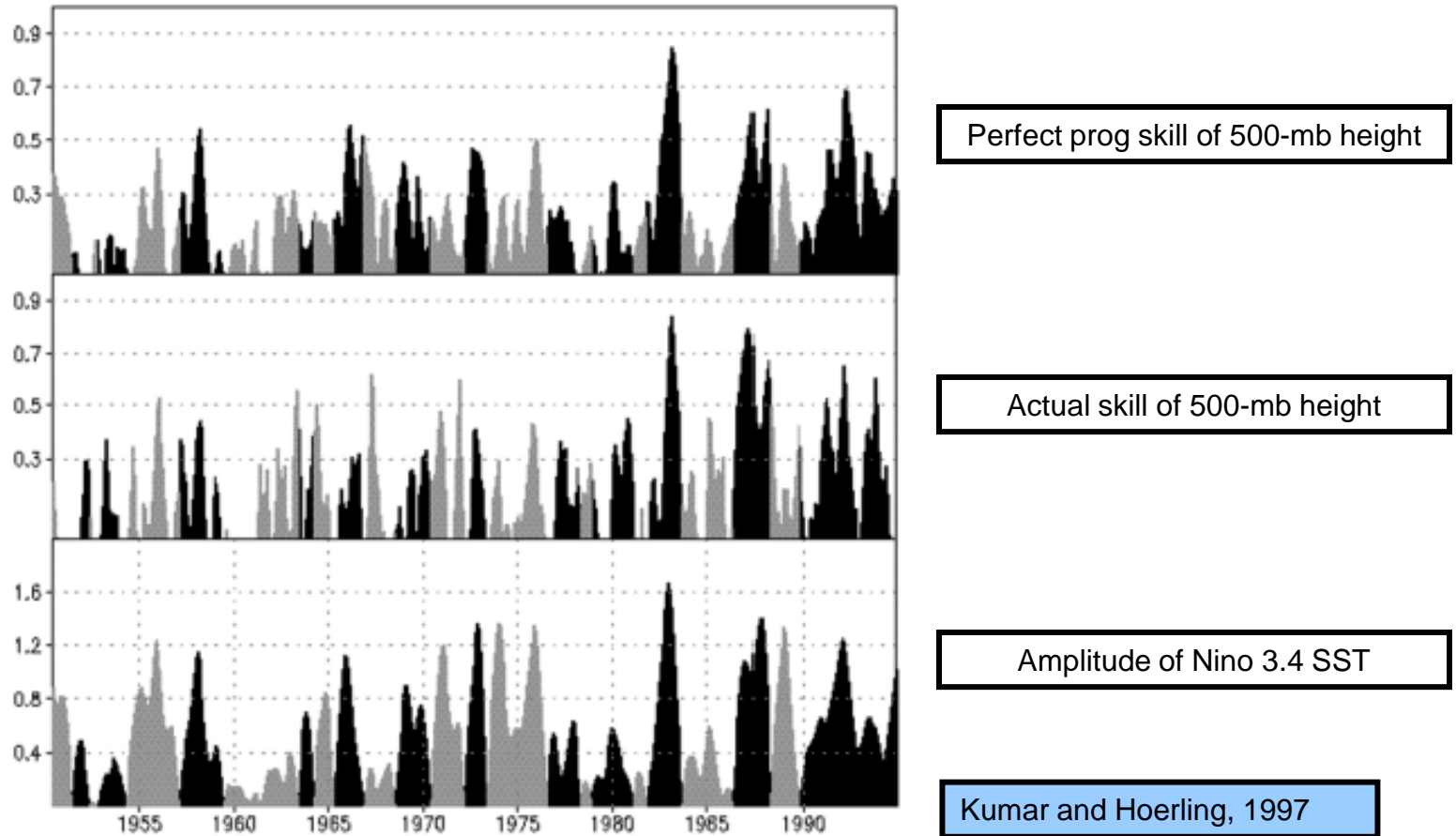


Nino34 Variability

Wang et al., 2010

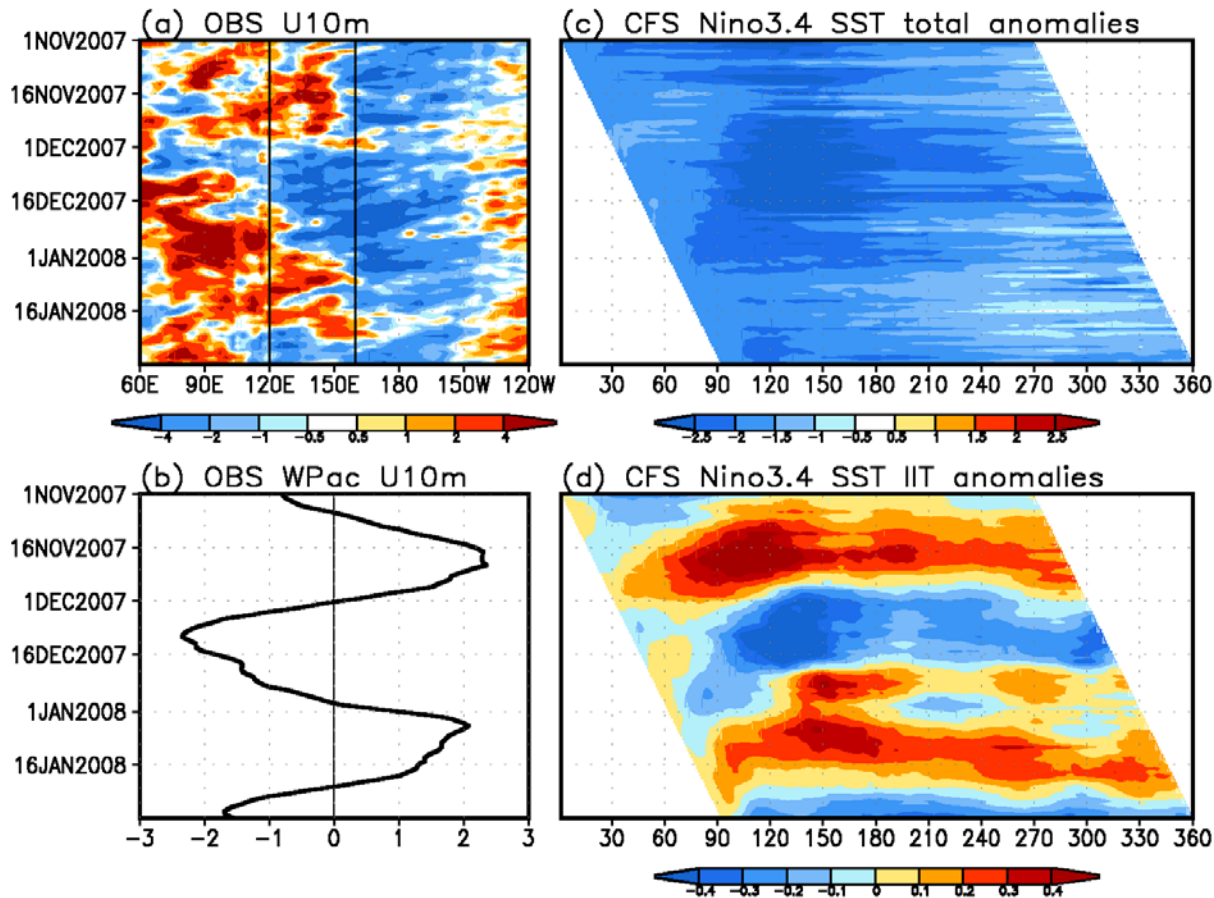
Shared Issues of Scientific Interest

- LF ENSO variability and SI prediction skill



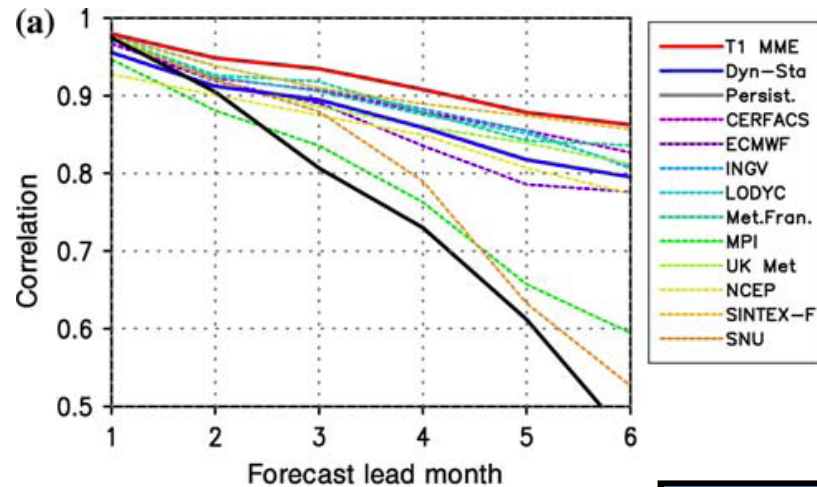
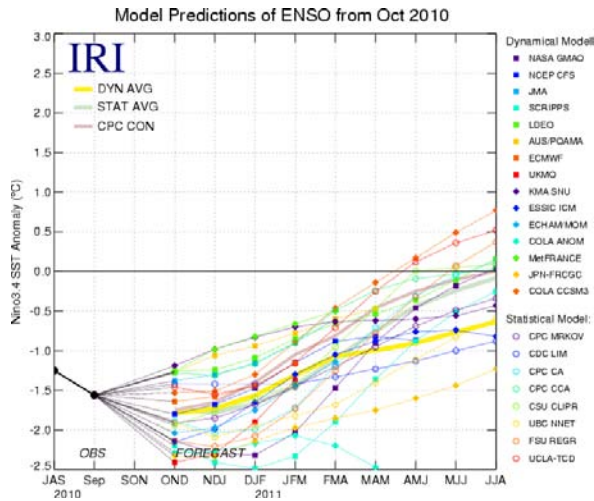
Shared Issues of Scientific Interest

- Influence of HF atmospheric variability



Possible Synergies

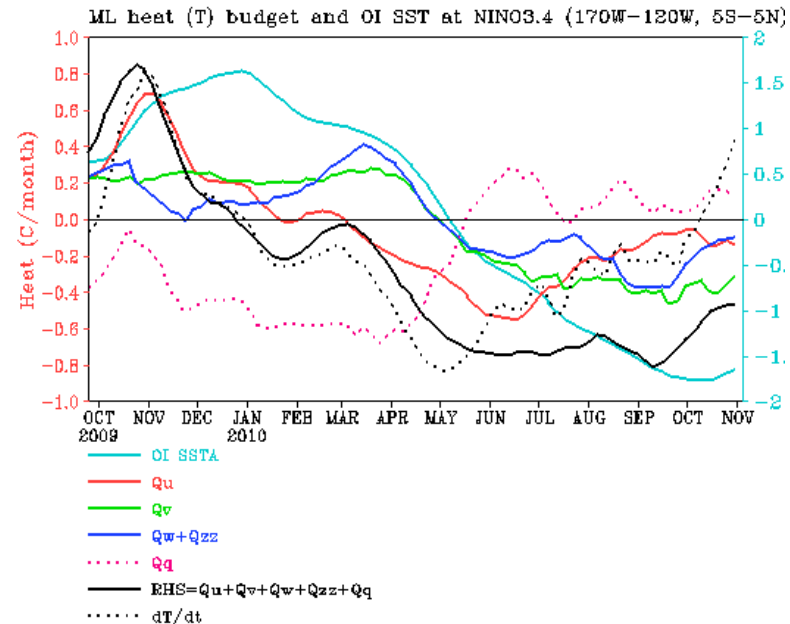
- There is a wealth of data coming from SI ENSO predictions from the operational (e.g., NCEP, ECMWF, UKMET, BoM, JMA, BCC, ...) and research centers



Jin et al., 2008

Possible Synergies

- **Operational SI predictions start from 3-dimensional analysis of ocean state, and**
- **Provide a good opportunity to monitor ENSO budget and feedback terms, and could be used for validation of various ENSO mechanisms in climate models**



http://www.cpc.ncep.noaa.gov/products/GODAS/ocean_briefing.shtml

Possible Synergies

- **WGSIP – Climate-System Historical Forecast Project (CHFP) will have repository of coupled hindcasts from various operational and research centers**



- **WMO - Lead Center for Long-Range Forecast for Multi-Model Ensembles (<http://wmoic.org>)**

Conclusions

- **There are various issues of common interest between the SI ENSO prediction and understanding of the ENSO variability in climate models that could be mined for accelerating the progress in understanding and prediction of ENSO.**
- **SI prediction platform provides a good test-bed for validating ENSO variability in climate models, and understanding interactions between model biases and ENSO characteristics.**
- **SI prediction efforts can be used to validate relative importance of various ENSO mechanisms and to better understand onset of model biases.**

References Cited in the Presentation

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