Some Practical Challenges in Real-time Seasonal Predictions

Arun Kumar

Climate Prediction Center, NCEP

e-mail: arun.kumar@noaa.gov

What is Unique about SI Predictions?

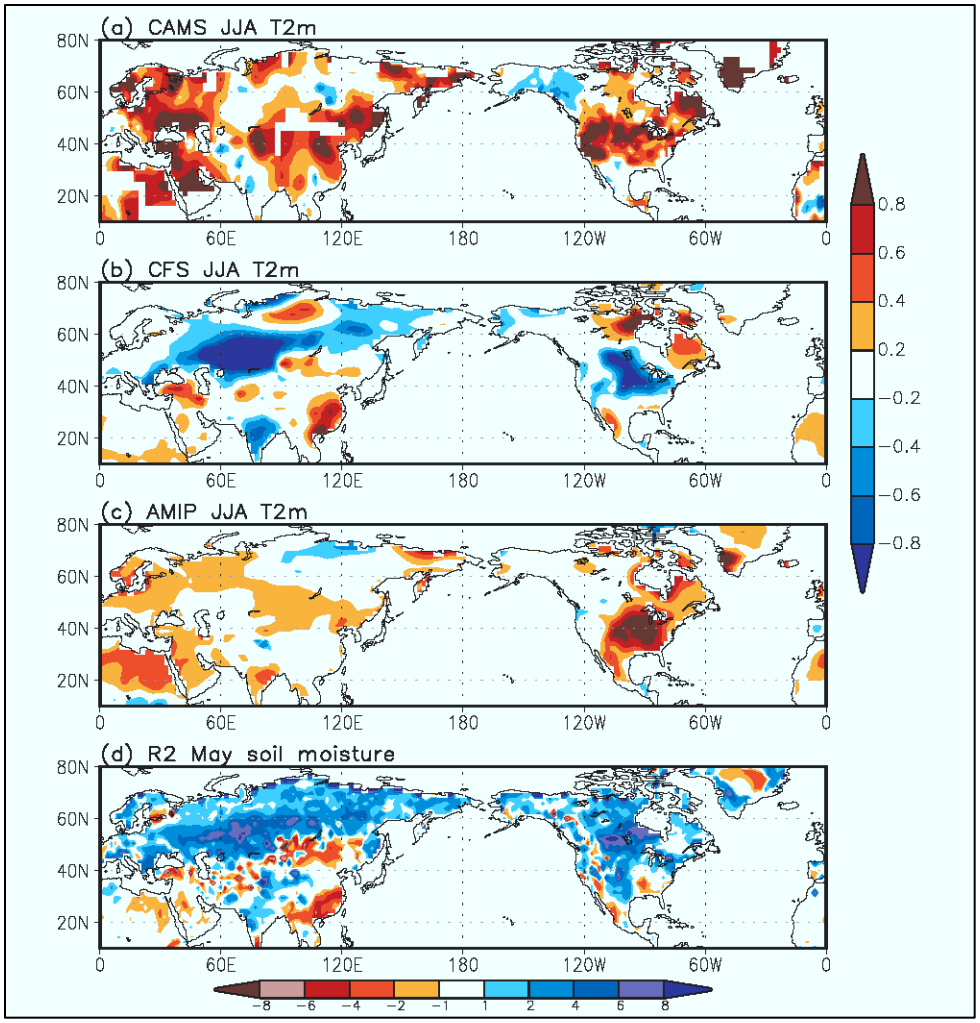
- **For monthly/seasonal prediction biases could be as large as the signal one seeks to predict, and hence, anomalies cannot be computed from the observed climatology**
- **And therefore, one needs to have a set of hindcasts to calibrate real-time predictions**
- **Need for hindcasts creates some difficult practical issues (e.g., consistency of initial conditions; sampling, model evaluations etc.)**

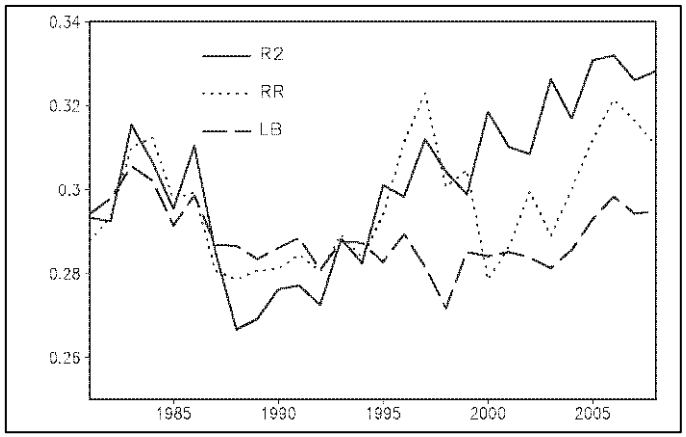
Consistency of Initial Conditions

- **Influence of initial conditions (ICs) (atmosphere, ocean, land) and real-time forecast anomalies**
  - ***If initial conditions for the slowly varying components of the Earth system are important then we require a "consistent" analysis (and reanalysis)***
  - ***Even with the availability of a "consistent" analysis/reanalysis system, things can go wrong because of***

Consistency of Initial Conditions

- ***evolution in the observing system (that provide better initial conditions) can create instances where inconsistencies/differences from the past analysis can lead to…***
- ***…situations when real-time forecast anomalies w.r.t. to hindcasts have spurious "signals"***
- ***and things do go wrong that are hard to identify, and analyze***





Soil Moisture Analysis

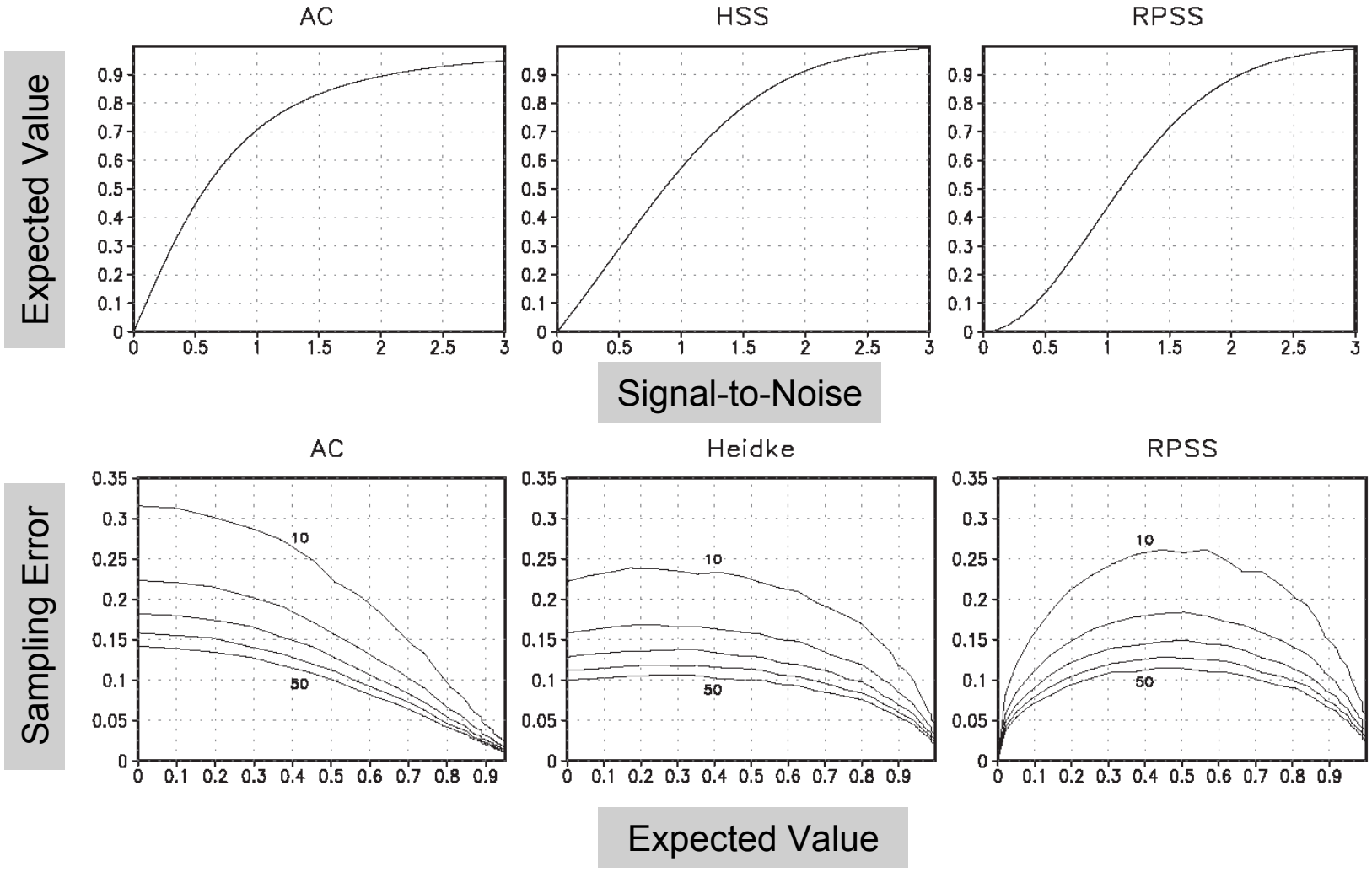
2005-2008 JJA T2m Anomaly

Wang et al., 2010: An Assessment of the CFS Real-Time Seasonal Forecasts. *Weather and Forecasting*

Length of Hindcasts

- **Sampling issues regarding assessment of skill for the SI prediction system, i.e., estimates of skill done over a small period may not be stable**
- **Multi-model ensemble (MME) predictions**
  - ***Skill weighted averages require long hindcasts for the a priori estimation of skill***
  - ***On the other hand, equal weights may not require long hindcasts***
  - ***Which one is better is still an open issue***

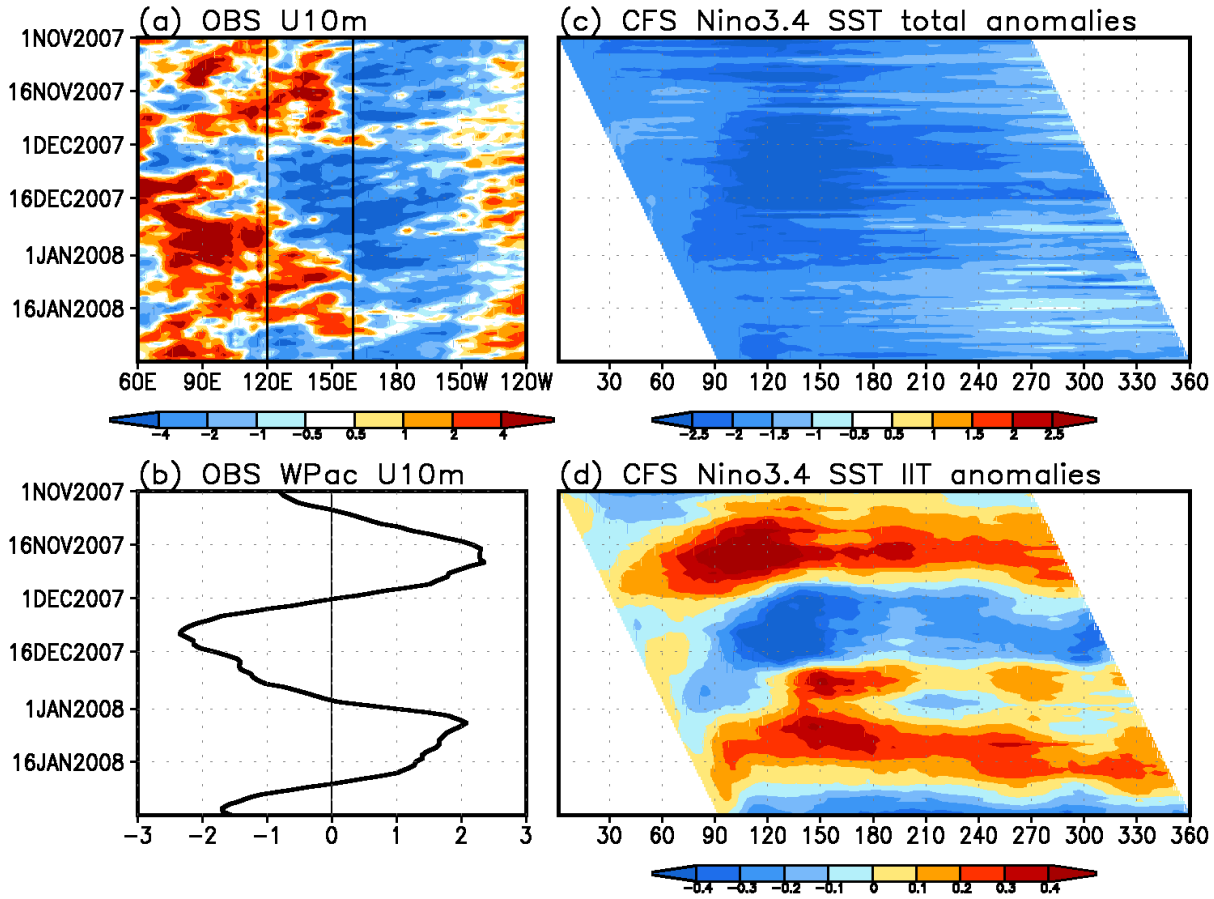
Length of Hindcasts



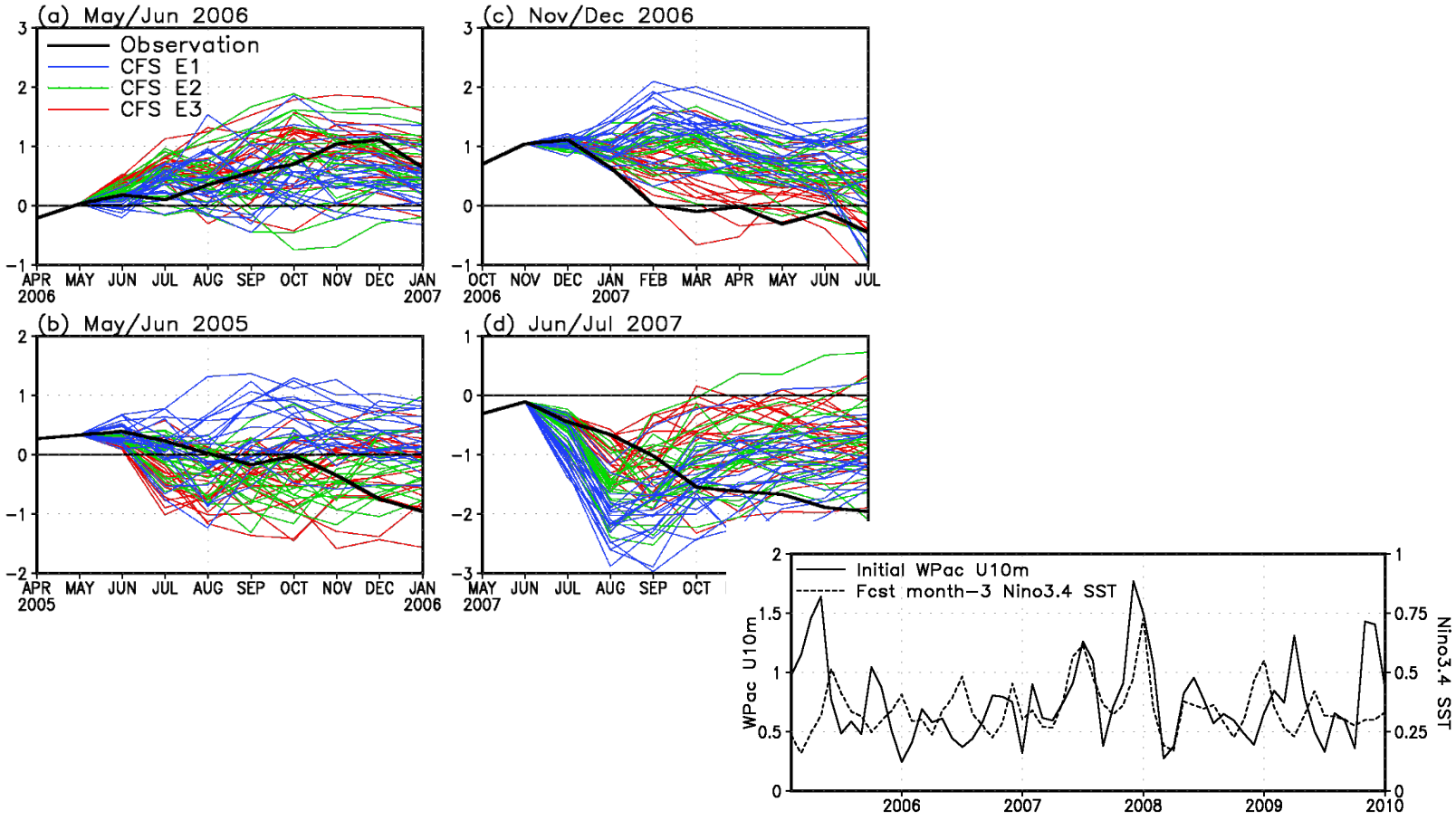
Configuration of SI Prediction Systems

- **Burst mode – An ensemble of SI forecasts (~ 50 members) made on a particular day (ECMWF, UKMET, Meteo-France,…)**
- **Continuous mode – An ensemble of SI forecasts (~ 1-4 members) made every day (NCEP, BoM,..)**
- **Issues**
  - ***Does the method has an influence the spread of forecasts?***
  - ***Lagged ensembles and dependence of skill on lead-time vs. number of total initial conditions***

Configuration of SI Prediction Systems



Configuration of SI Prediction Systems

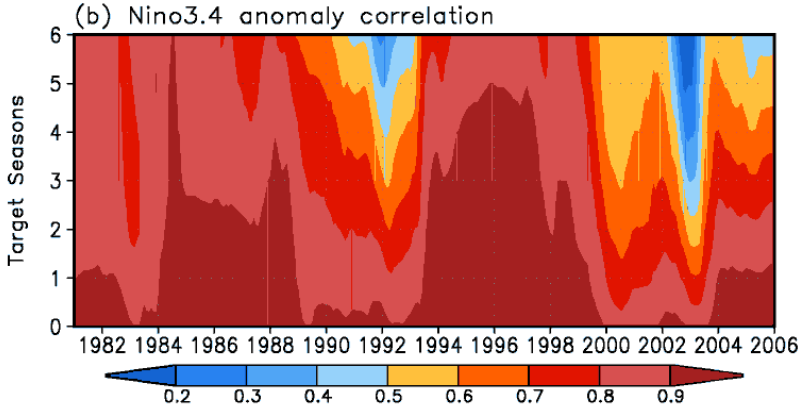


Assessing Improvements in Models

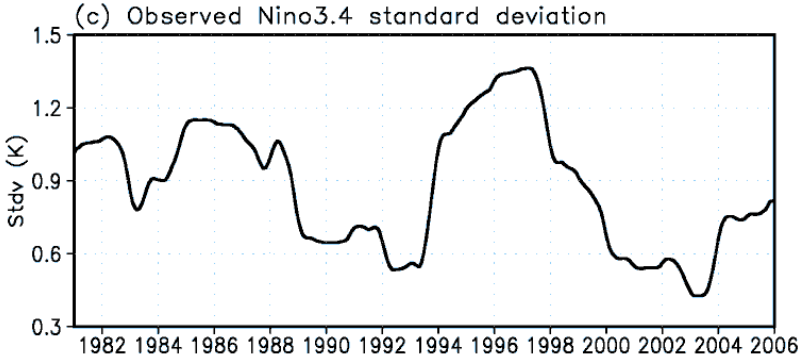
- **Which metrics?**
  - ***Reduction in bias, improvements in modes of variability and teleconnections, improvements in skill?***
  - ***Which variables? Location? Seasons?***
  - ***Downstream application models?***
- **There is sampling variability in all the assessments ; At times predictability is high, other times it is low**
- **Some measures get better, some get worse**

Assessing Improvements in Models

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



Skill for Nino34 SST



Nino34 Variability

Wang et al., 2010

Conclusions

- **For SI predictions hindcasts are required (at least for now)**
- **There are unique practical issues associated with the requirement of hindcasts**
- **As of yet, most of these issues are not settled, and more research, and experience with the prediction systems, is required**