

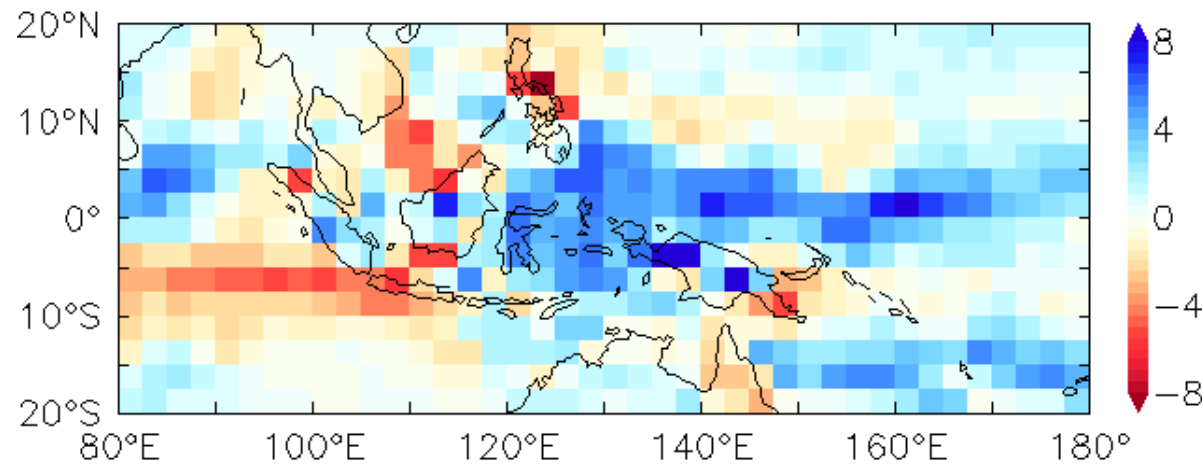
# **Global Climate Model Discussion**

**Eric Maloney**  
**Colorado State University**

Objectives, models, model output to be collected, and preferred model simulations.

# Global Climate Models often Have Significant Mean State Biases Over MC

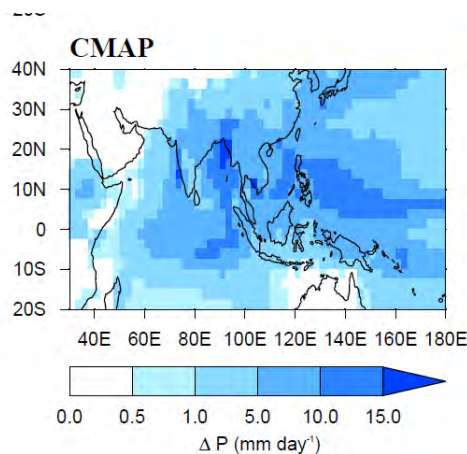
ACCESS1.3 model (Boreal winter?)



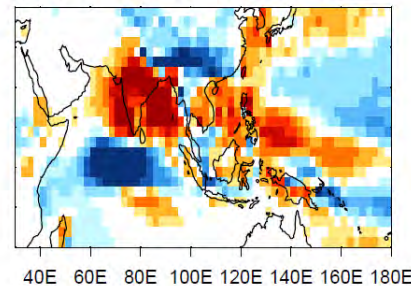
Nguyen and  
Franklin (2015)

Unified Model (JJAS)

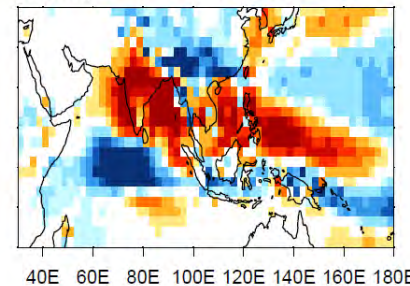
Bush et al. (2015)



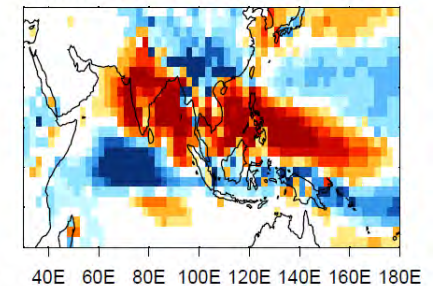
N96 - CMAP  
RMSE = 2.80 Pattern corr. = 0.76



N216 - CMAP  
RMSE = 3.39 Pattern corr. = 0.68

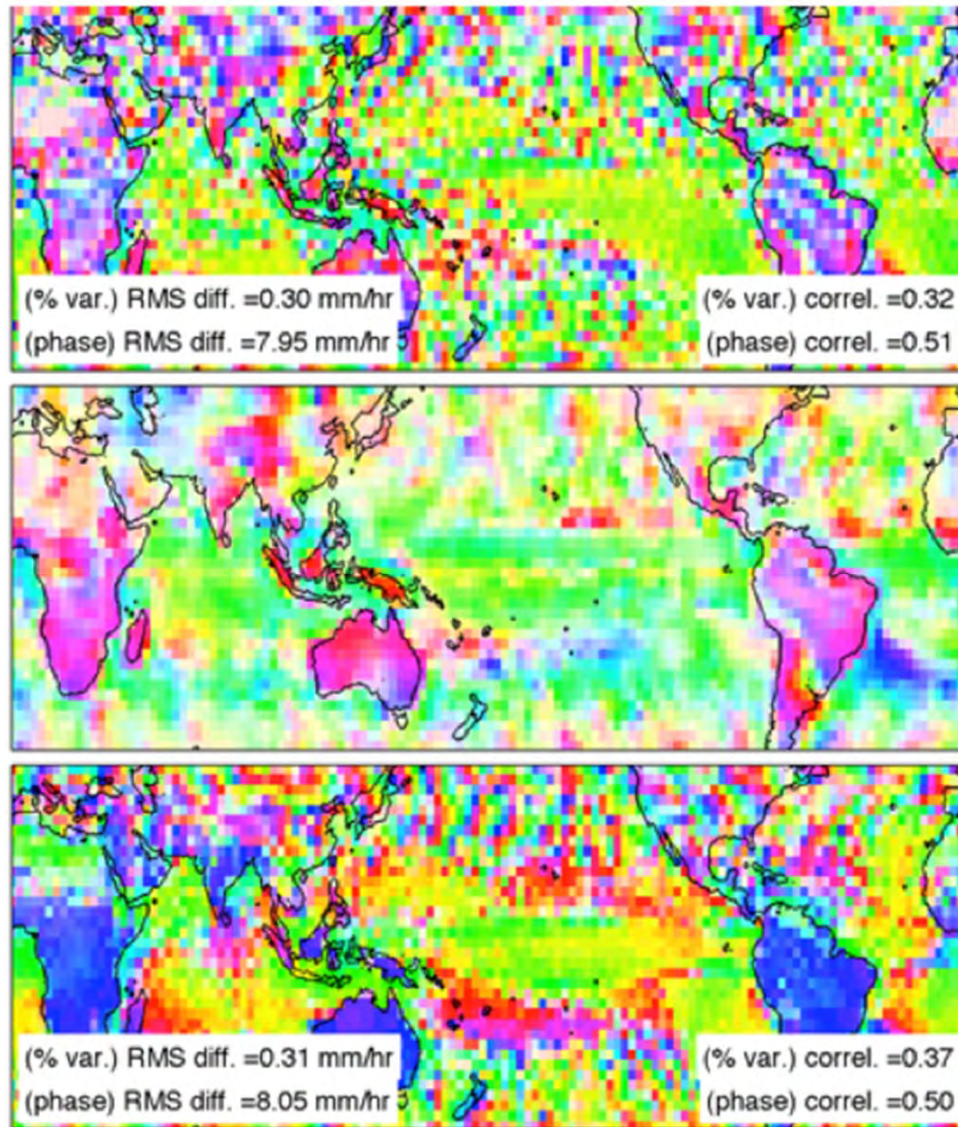


N512 - CMAP  
RMSE = 3.41 Pattern corr. = 0.66



Highlights parameterization issue

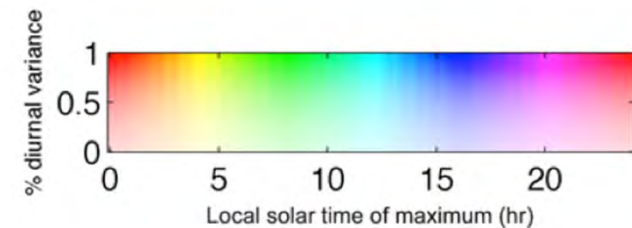
## And Diurnal Cycle Biases.....



SP-CAM

Amplitude of diurnal cycle in precipitation over MC also reduced in SP-CAM relative to CAM3.

TRMM



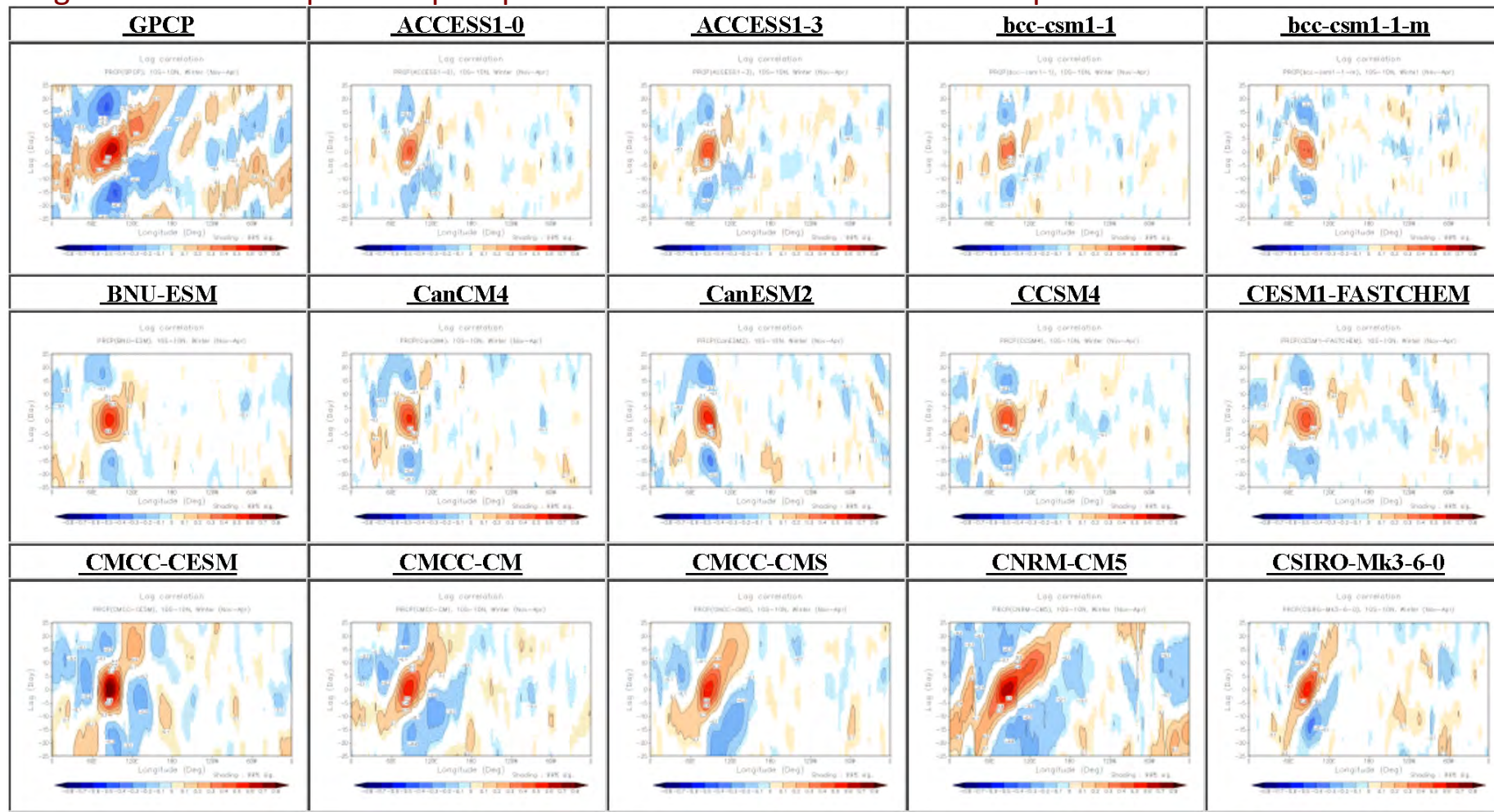
CAM3

Pritchard and Somerville (2009)



# And Problems in Simulating Subseasonal Variability

Lag correlation of equatorial precipitation onto Indian Ocean reference point



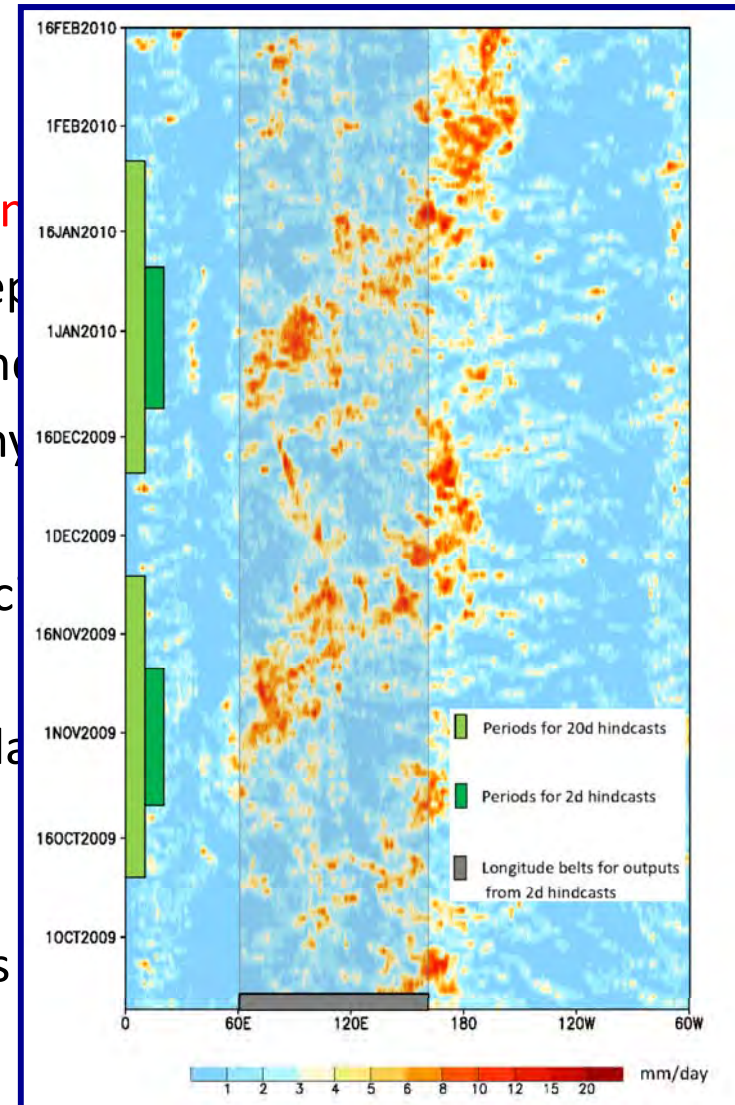
CMIP5 Analysis Website: [http://climate.snu.ac.kr/mjo\\_diagnostics/index.htm](http://climate.snu.ac.kr/mjo_diagnostics/index.htm)

Courtesy of Min-Seop Ahn

# Global Model Resources

## Existing:

- **MJOTF-GASS diabatic heating YOTC hindcasts and forecasts**
  - 2 day hindcasts with timestep by timestep
  - 20 day hindcasts with 3 hour physical timestep
  - 20-year simulations with some 6 hour physical timestep
- **S2S operational forecast database**
  - Limited physical output. Only 6 hour precipitation
- **ISVHE datasets**
  - Hindcast dataset targeting the MJO and related phenomena
  - limited output to study physical processes
- **CMIP5 database**
  - Basic intercomparison of mean state bias



# Global Model Resources

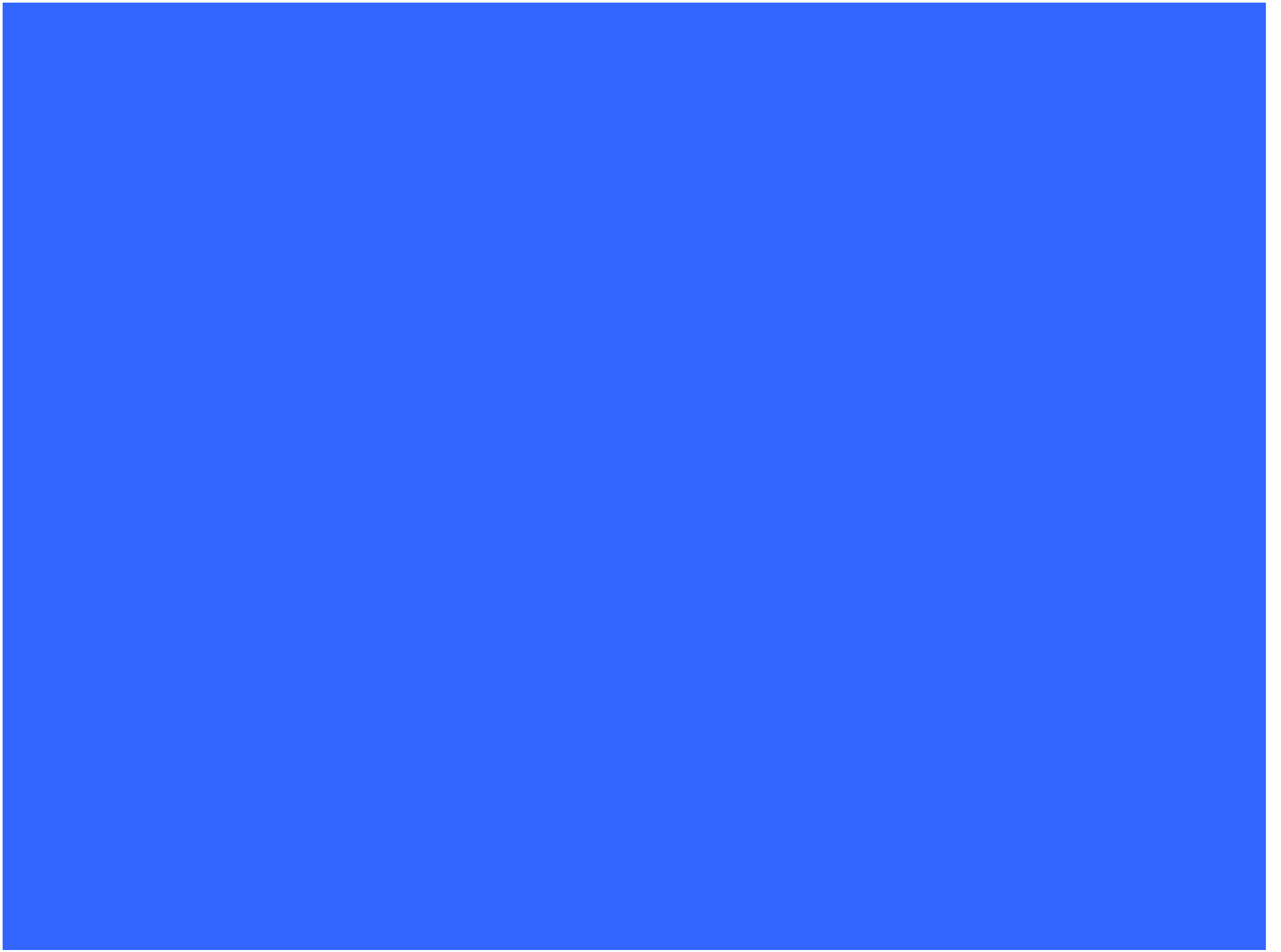
Potential experiments (some in collaboration with S2S-MJOTF effort):

- **ad hoc experiments with specific models**
  - Coupled vs. uncoupled
  - Sensitivity to topography and land-surface type
  - Idealized planets with various island configurations
  - Soil moisture initialization and parameter sensitivity
  - Constraining diurnal cycle

# How to Use YMC to Improve Global Models?

*An overall YMC objective is to “Integrate observations with model development to assist process-oriented model diagnoses, improve model representations of key processes, and optimize current model applications to the region.”*

- Use of validated high resolution models to diagnose and improve global models.
- Key process-oriented diagnostics that will be derived from field observations to directly diagnose global models
- Coordinated model sensitivity experiments to understand aspects of model construction that most strongly affect MC simulations.
- How much detail do we need at this point? Is lip service enough?





# Questions from MJO Task Force- S2S Collaboration

- What is the current skill of operation systems at predicting the passage of precipitating/active phases of the MJO into and across the MC, including aspects such as reliability?
- What processes determine whether individual MJOs propagate through the Maritime Continent?
- How is the simulated propagation of the MJO through the Maritime Continent related to biases in models?
- How does the partitioning of variability from diurnal to seasonal, including equatorial wave characteristics, influence the MJO and MC interaction?
- Does the above partitioning depend on model resolution, and is accordingly affected by the use of explicitly resolved convection versus parameterized convection?
- How does the ocean-atmosphere coupling in the context of the MC influence the MJO and MC interaction?
- How does topography versus land-sea contrast play a role in the MJO and MC interaction?
- How do land-atmosphere interactions (temperature, soil moisture, diurnal cycle) influence the MJO and MC interaction?
- How is forecast skill associated with the MJO over the MC influenced by the above science elements?

- LIDAR to assess diurnal cycle of BL
- Surface flux measurements to assess partitioning of fluxes and diurnal cycle.
- Basic precipitation statistics
- Dynamical and physical tendencies?