Analysis of the MJO in the Super-CAM

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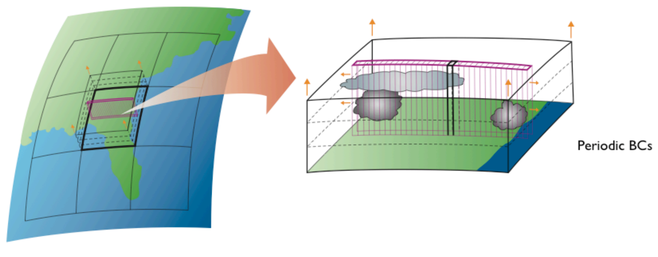
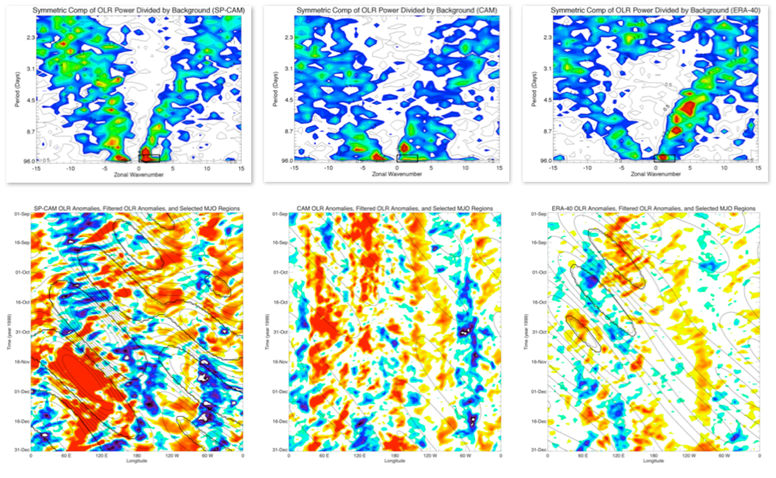
Super-Parameterization

(a.k.a. the Multiscale Modeling Framework, or MMF)



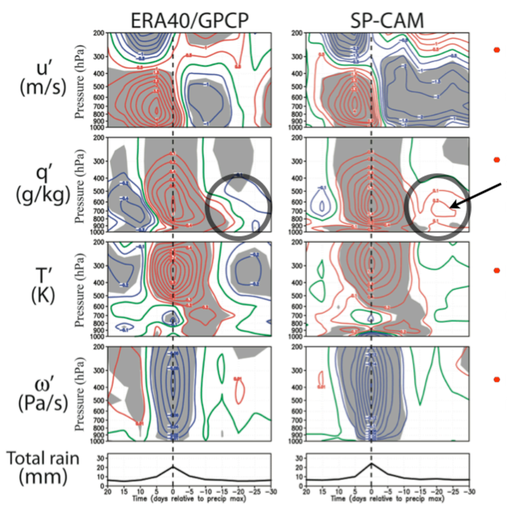
Idea proposed by W. Grabowski

OLR: WKs and Hovmüllers



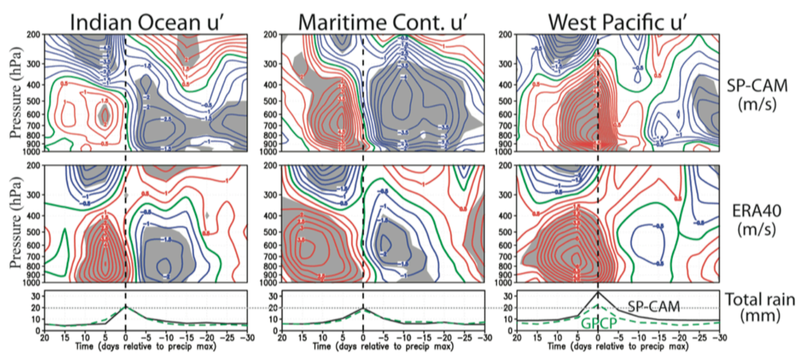
SP-CAM **CAM** **ERA-40**

State variables



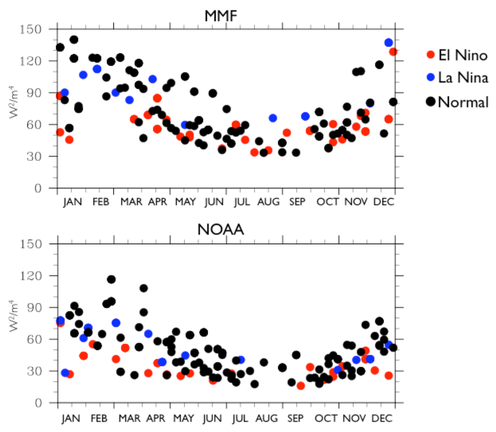
- **Baroclinic structure well-simulated, easterly anomalies too extensive**
- **SP-CAM too moist (relative to its climatology) prior to most intense rainfall**
- **Leading and trailing cool upper trop. too weak in SP-CAM, warm anoms similar**
- **More tilted structure of w′ in model, weaker subsidence**

Geographical differences

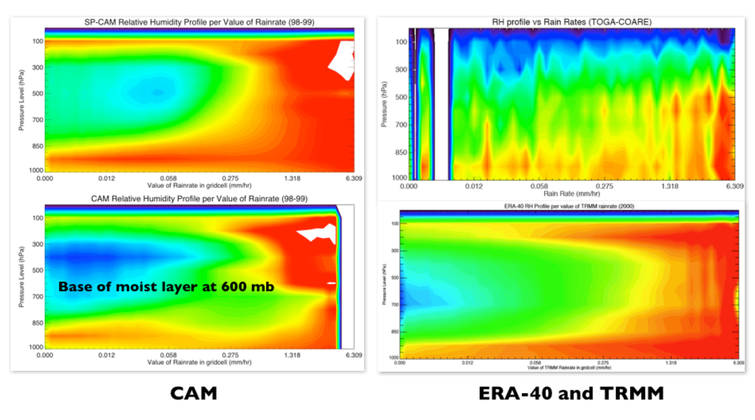


Westerlies shift eastward relative to precip max
Easterlies weaken →

Seasonal Change, 1986-2003

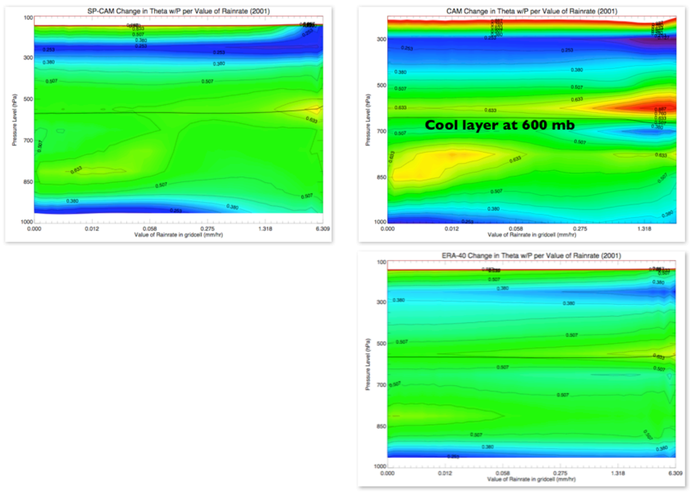


Rainfall-humidity composites

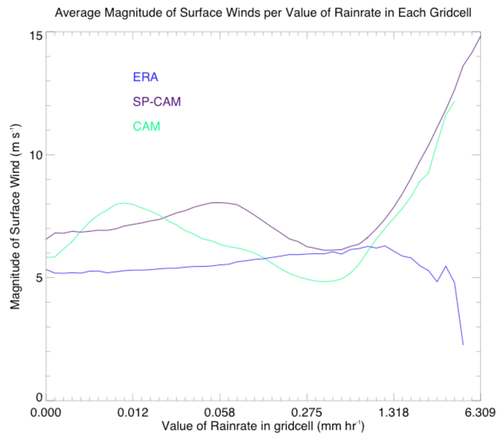


CAM **ERA-40 and TRMM**

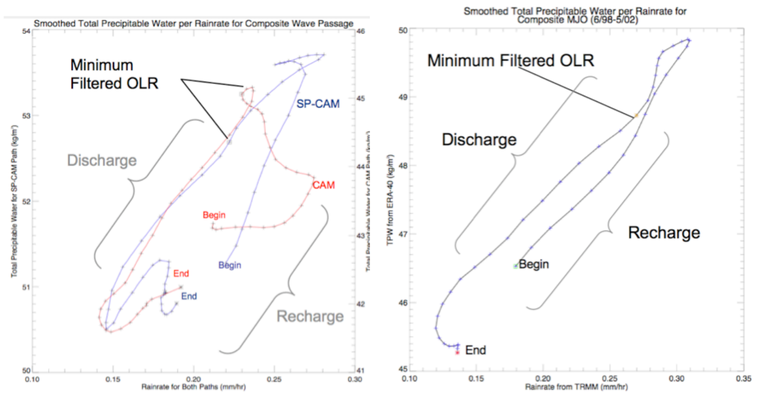
Static stability vs. rain rate



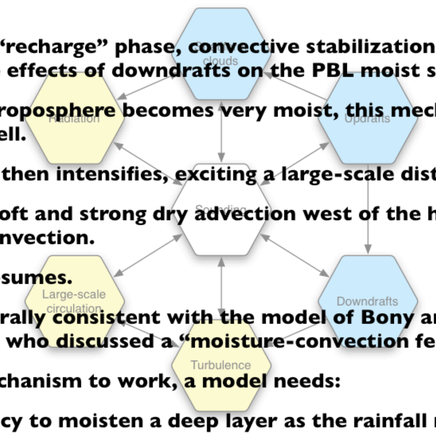
Wind-Evaporation Feedback



Discharge and Recharge



Models **ERA-40 & TRMM**

What I think is going on

- **During the "recharge" phase, convective stabilization occurs mainly through the effects of downdrafts on the PBL moist static energy.**
- **When the troposphere becomes very moist, this mechanism does not work well.**
- **Convection then intensifies, exciting a large-scale disturbance.**
- **Warming aloft and strong dry advection west of the heating shut off the deep convection.**
- **Recharge resumes.**
- **This is generally consistent with the model of Bony and Emanuel (JAS, 2005), who discussed a "moisture-convection feedback."**
- **For this mechanism to work, a model needs:**
  - **A tendency to moisten a deep layer as the rainfall rate increases**
  - **Downdrafts that modify the PBL**