

# Global analyses of CAPT simulations on recent developed parameterizations

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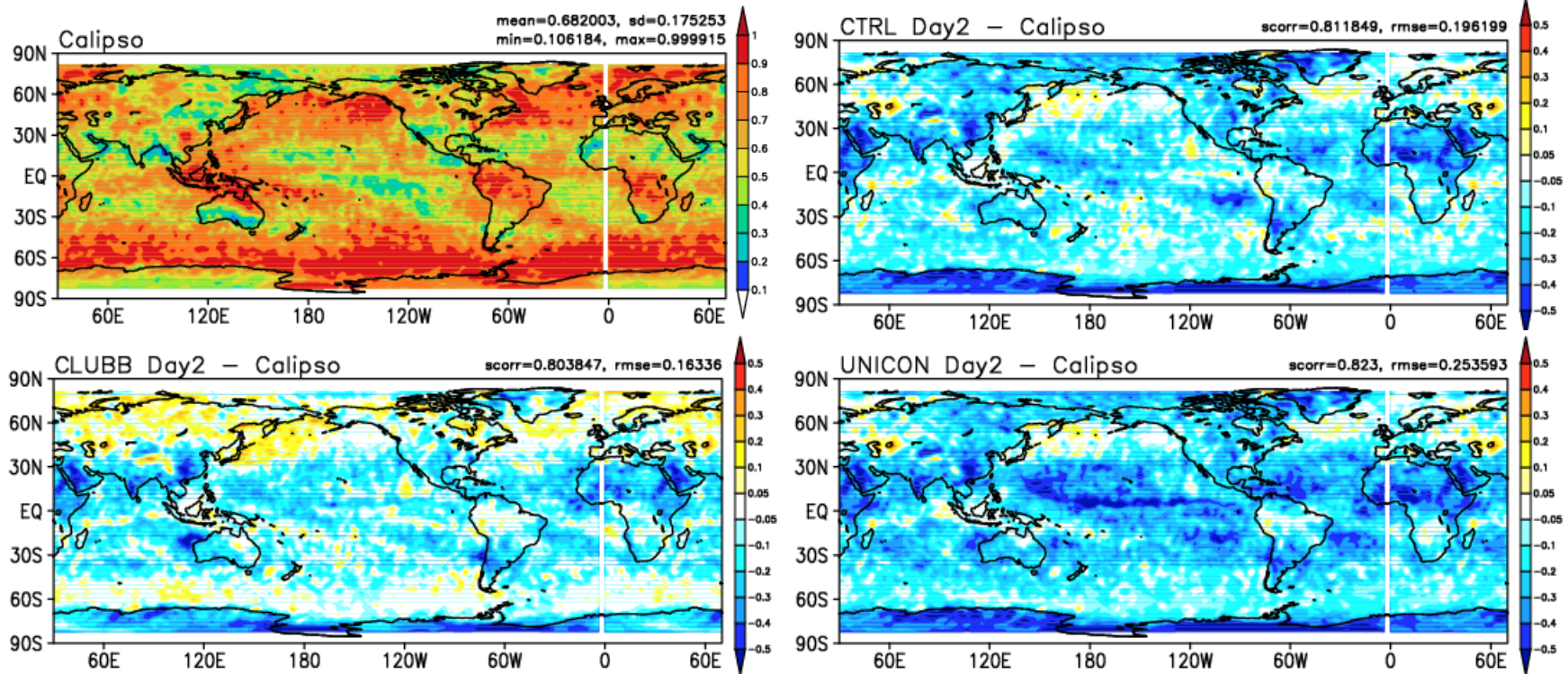
# Motivation:

- US DOE Cloud-Associated Parameterizations Testbed (CAPT): Running climate model in the weather forecast mode to evaluate new parameterizations.
- Provide assessment of CAPT simulations for the CAM5.5 candidate schemes:
  - CAM5.3 with CLUBB/MG2
  - CAM5.3 with UNICON

# Model experiments

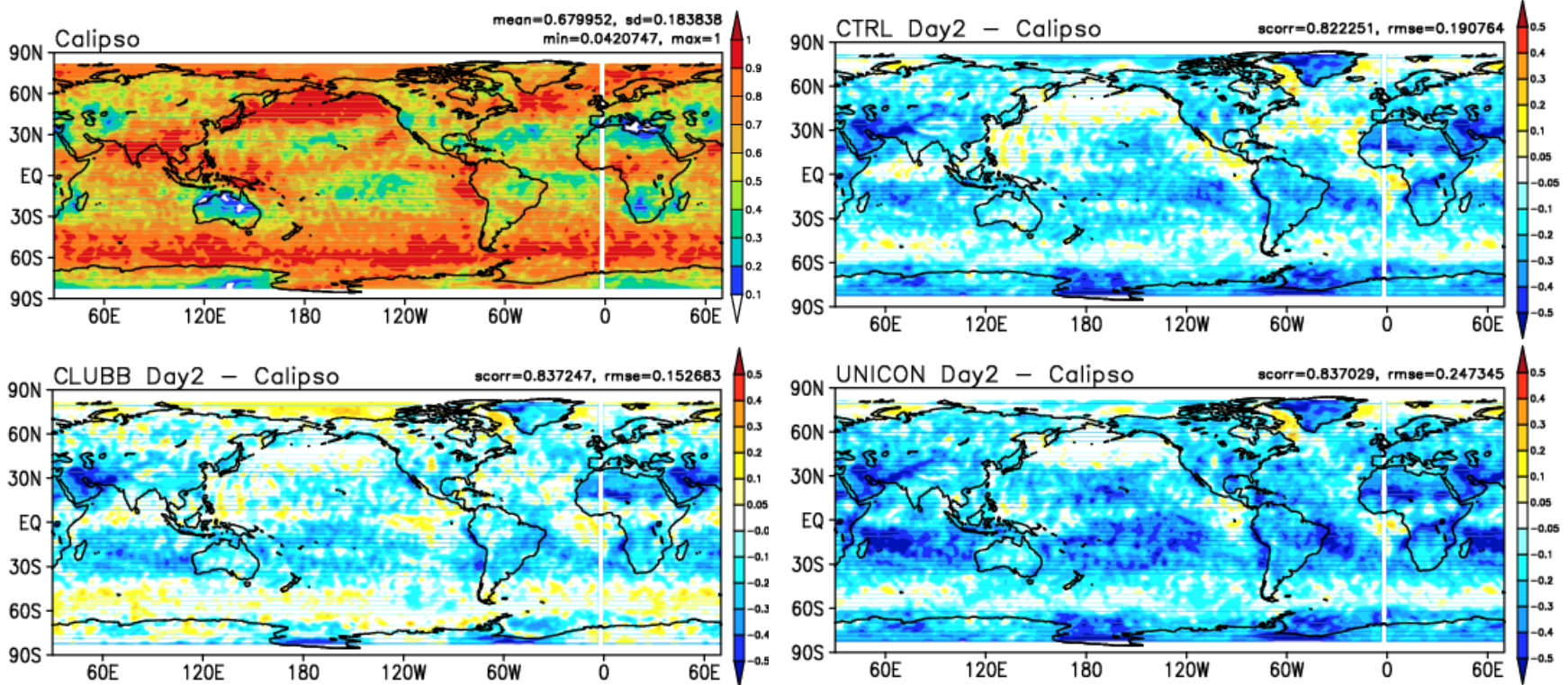
- CAM5.3 FV (0.9x1.25L30)
- Three sets of 5-day hindcasts for 2009
  - CAM5.3 Control; CAM5.3 CLUBB/MG2; CAM5.3 UNICON
  - CAM initial conditions from YOTC analysis
  - CLM initial conditions from an offline CLM simulation forced with precipitation and radiation from observation and reanalysis.

# Total Cloud Fraction (Day 2, Jan 2009)



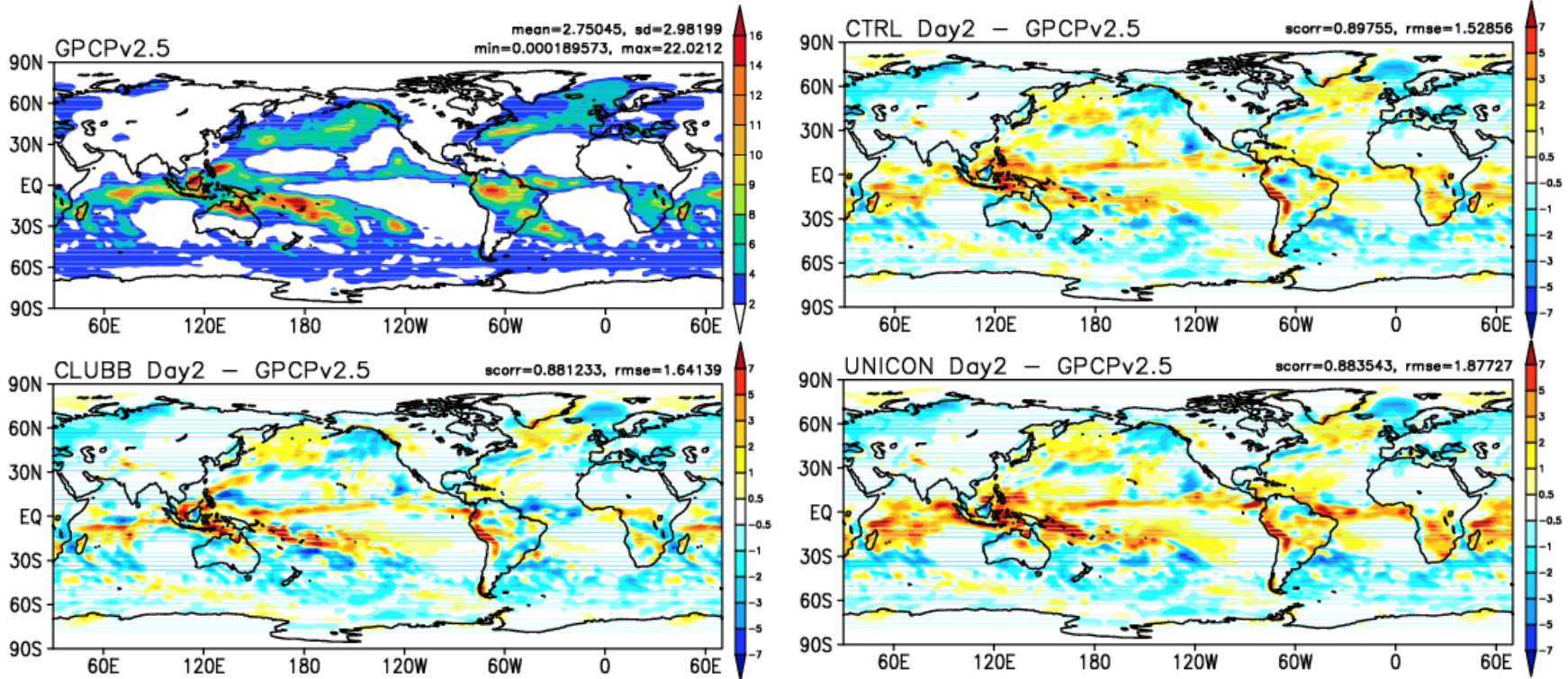
- CLUBB/MG2 produce better total cloud fraction (CALIPSO simulator).
- UNICON shows little improvement or slight worse total cloud fraction in some regions.

# Total Cloud Fraction (Day 2, July 2009)



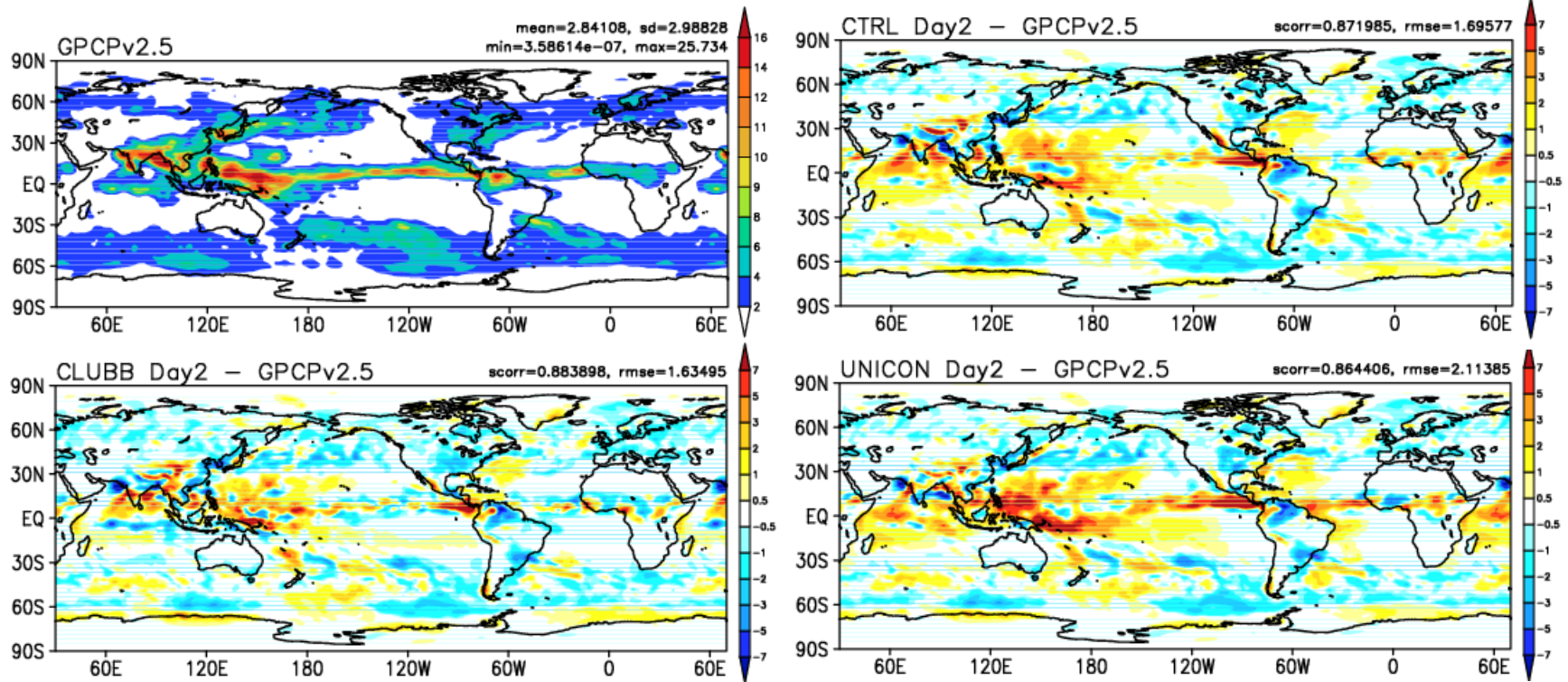
- Similar to January performance.
- All these features are consistent with AMIP results from other satellite simulators.

# Precipitation (Day 2, Jan 2009)



- Both experiments produce higher than observed precipitation in most tropical oceans but less precipitation over most continents.
- UNICON produce more precipitation in the tropics.

# Precipitation (Day 2, July 2009)



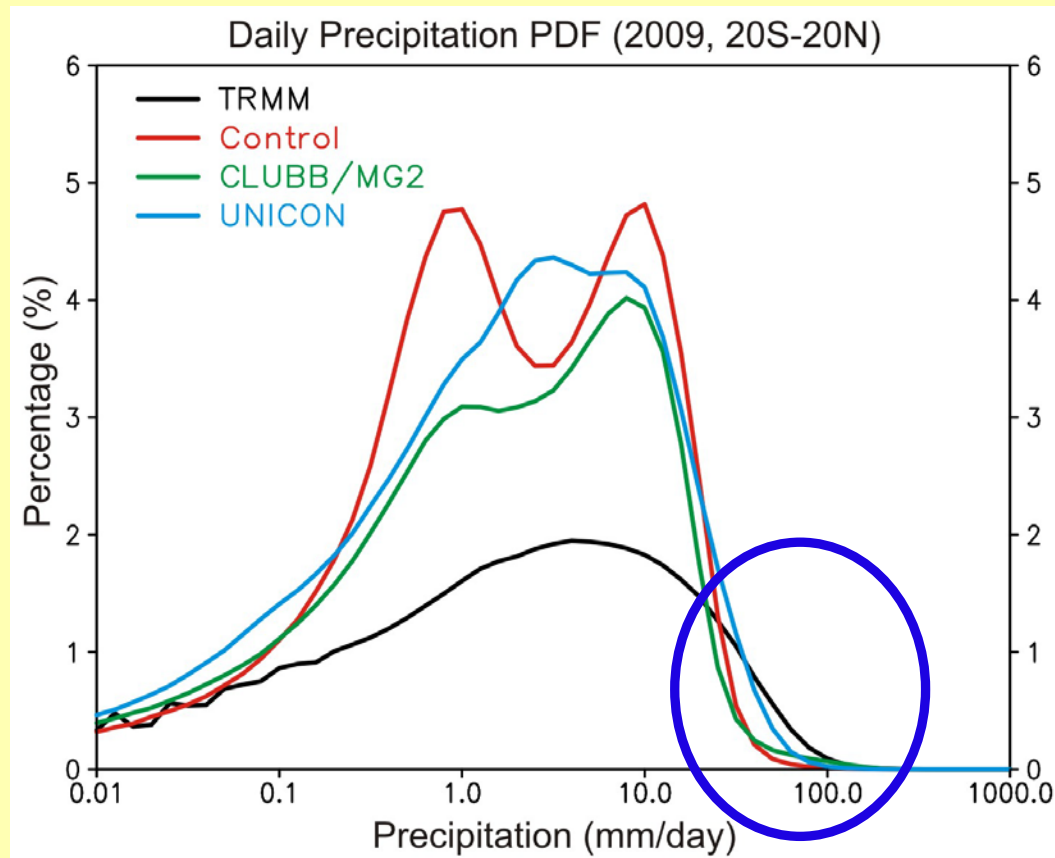
- Both schemes produce higher than observed precipitation in most tropical oceans but less precipitation over most continents.
- All these features are consistent with AMIP simulations.

# Tropical Precipitation Analysis





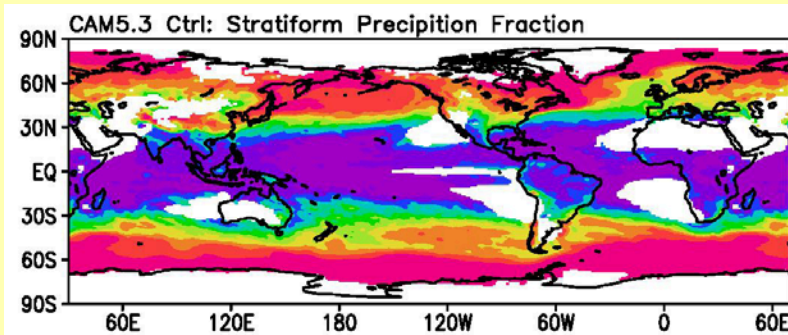
# Precipitation PDF (2009, Day 2, 20S-20N)



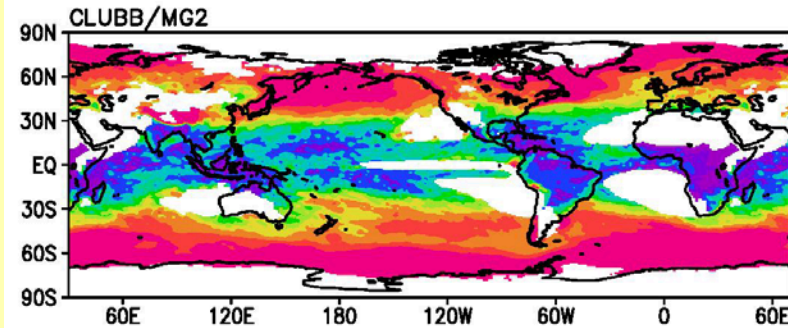
- Both schemes produce too frequent light to intermediate intensity of precipitation but produce less frequent strong and extreme events.
- UNICON is slightly better for the intense precipitation frequency.

# Stratiform Precipitation Fraction (Day2, ANN)

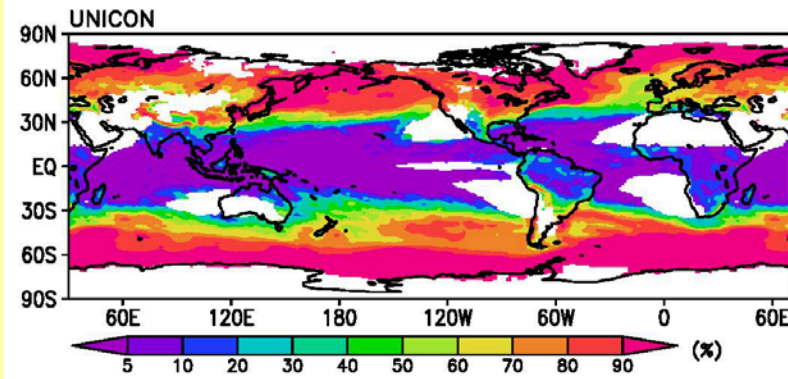
Control



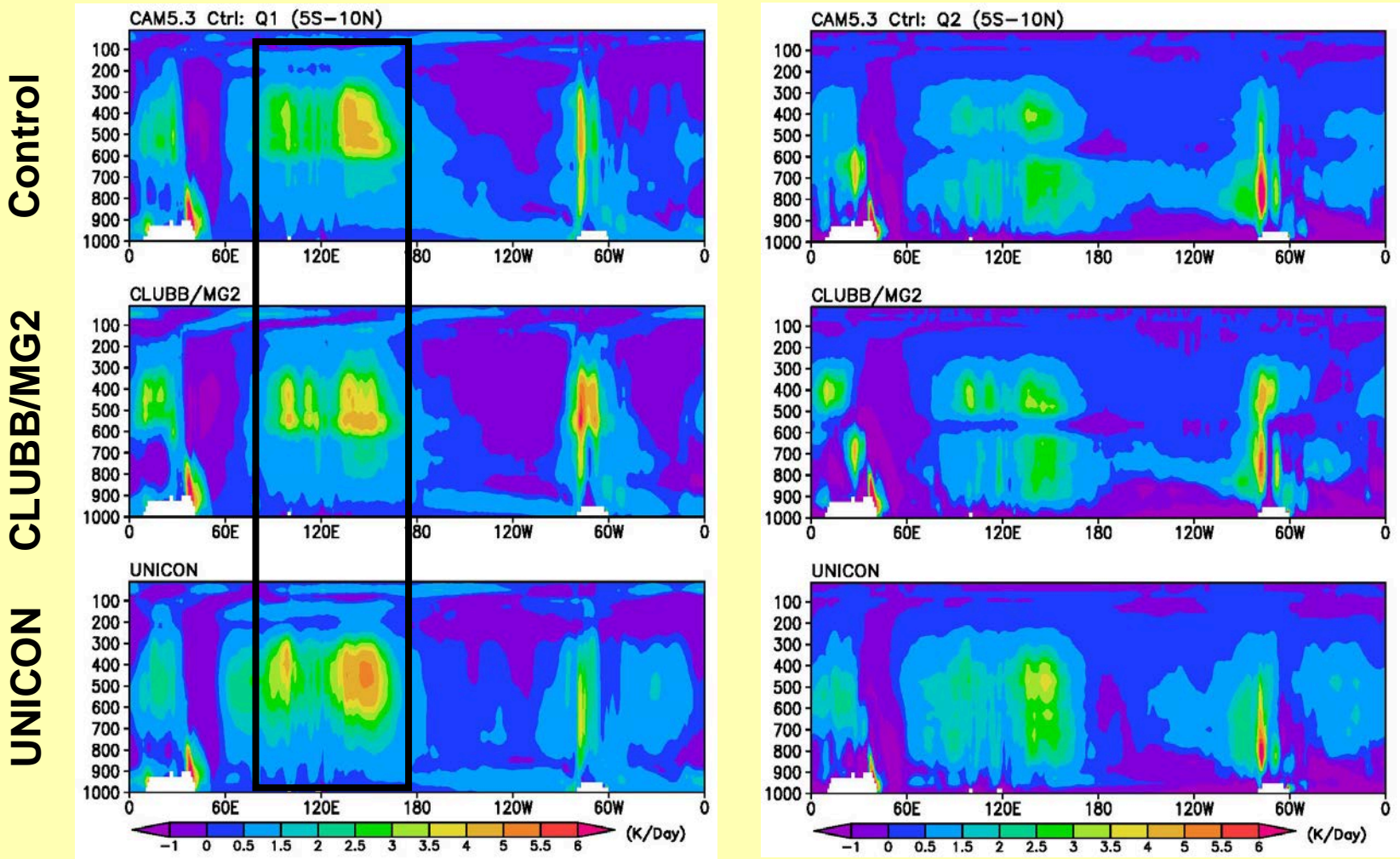
CLUBB/MG2



UNICON

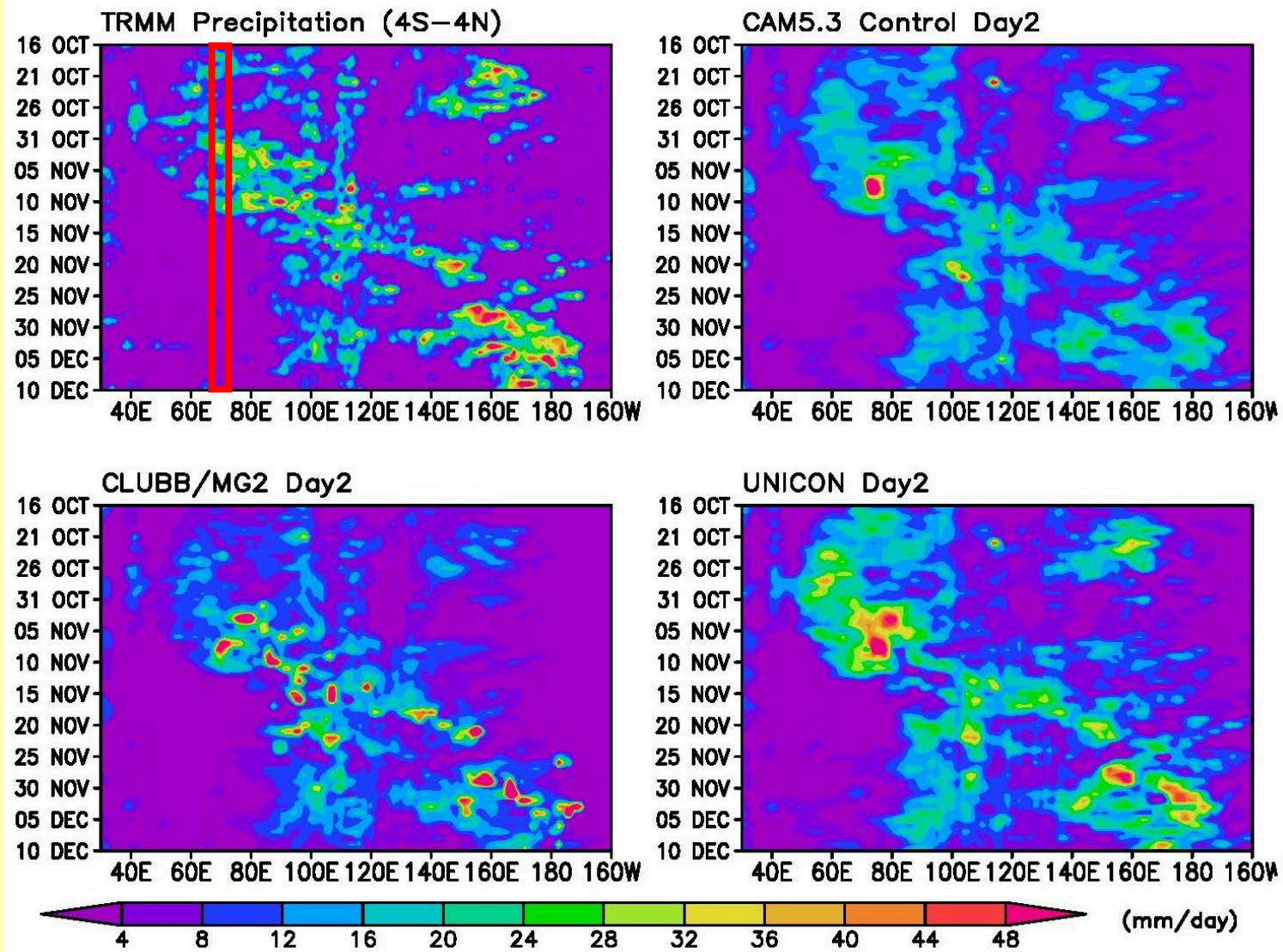


# Diabatic Heating (2009, Day 2, 5S-10N)

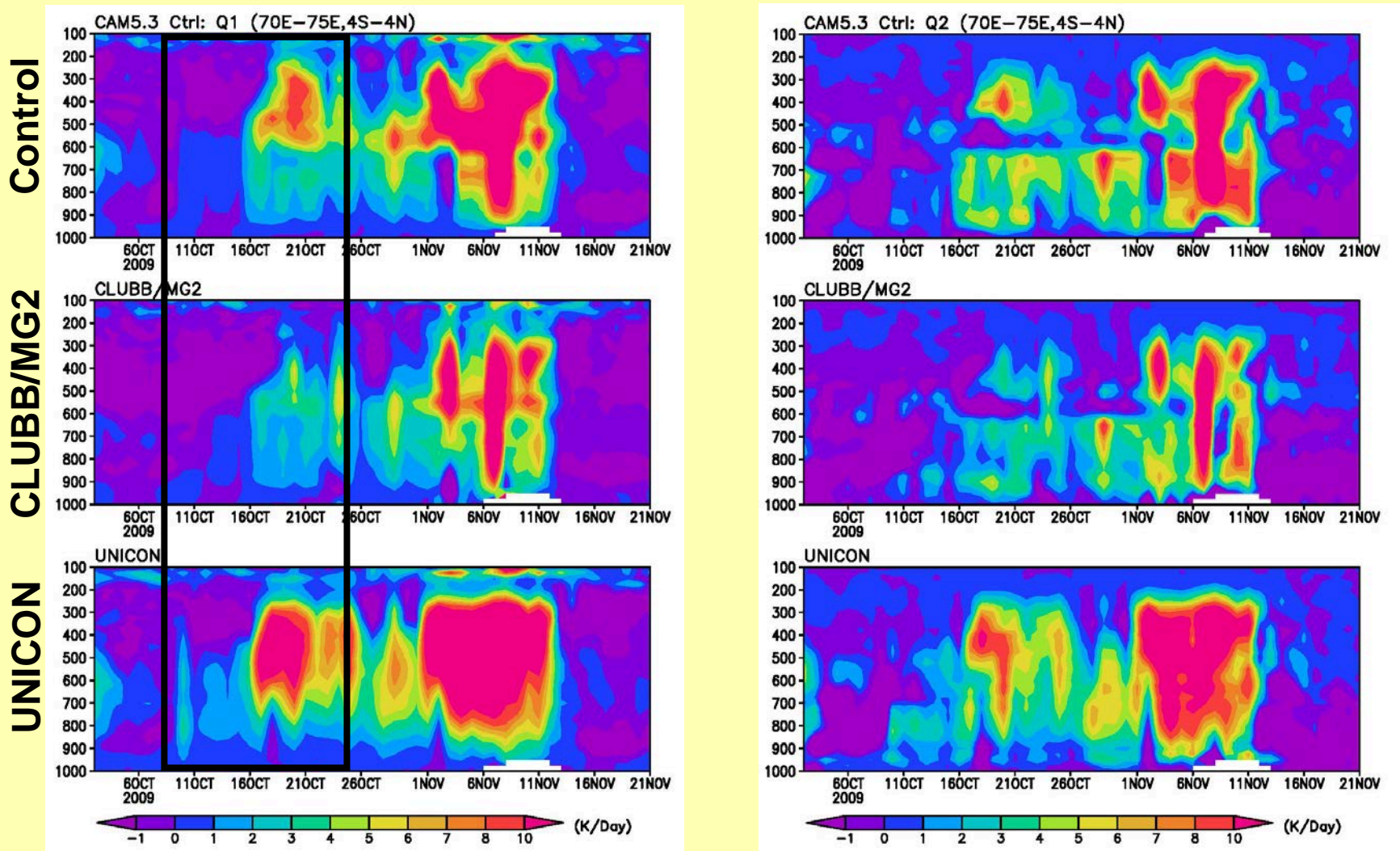


- Higher diabatic heating center in UNICON (top heavy)

# MJO YOTC "Case E" (Day 2 Precipitation)



# Diabatic Heating (Day 2, 70-75E, 4S-4N)



# Southern Great Plain Analysis with ARM observations

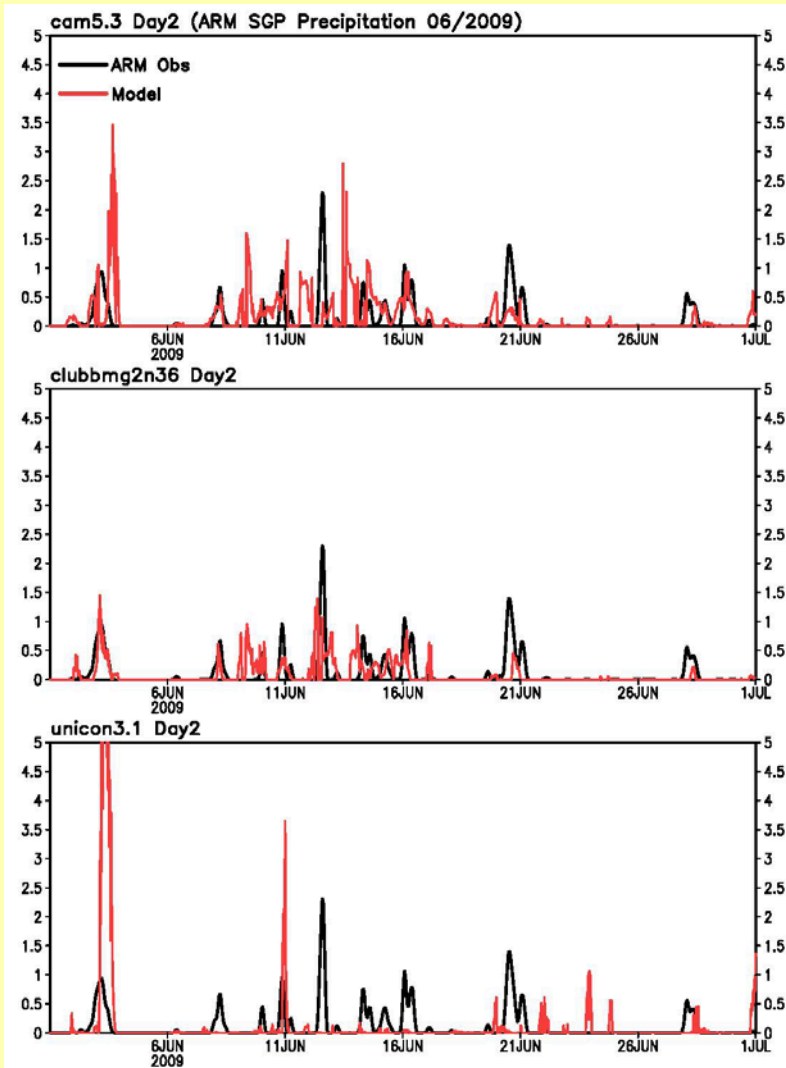


# SGP Precip and Cloud (Day 2, June 2009)

Control

CLUBB/MG2

UNICON

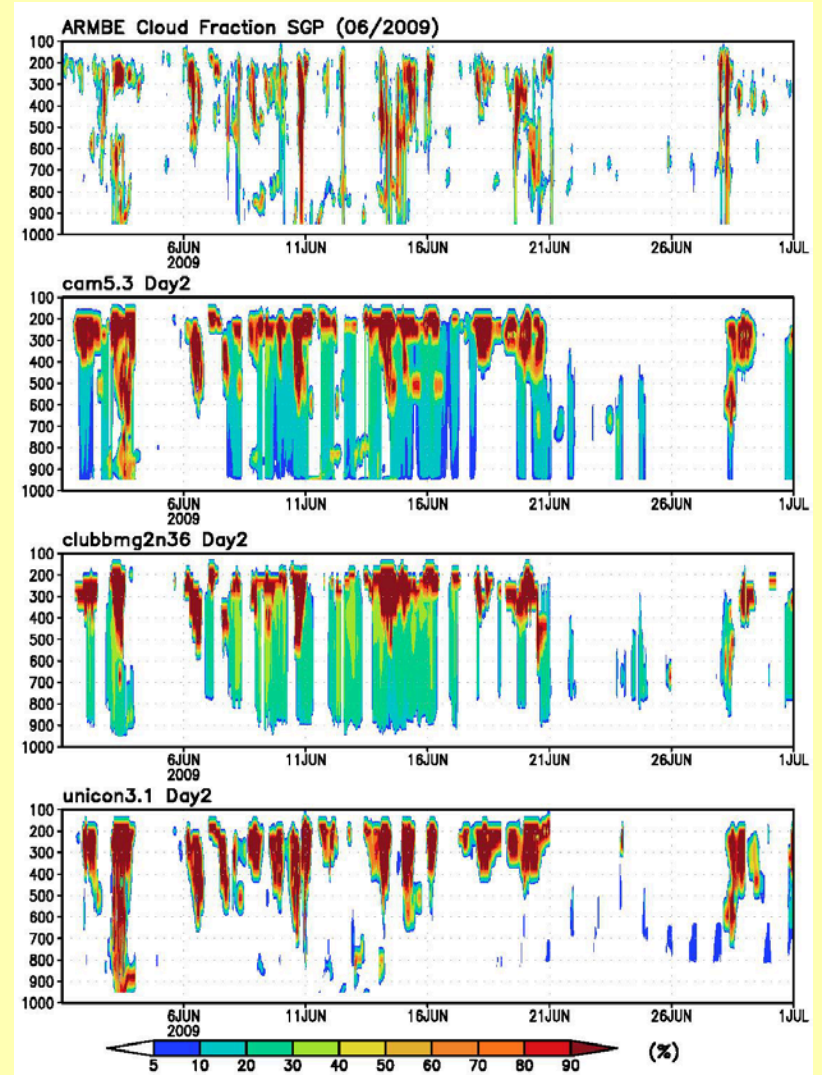


ARM Obs

Control

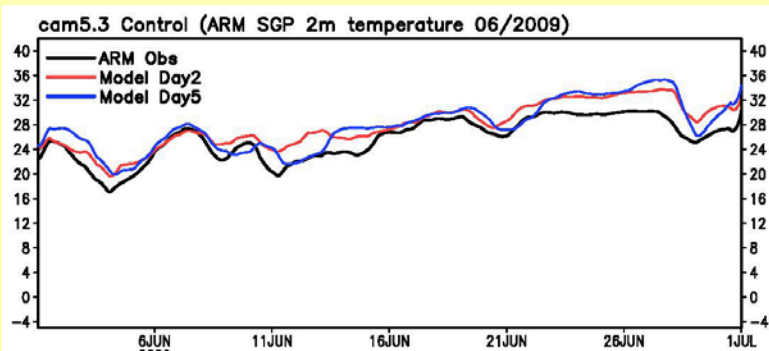
CLUBB/MG2

UNICON

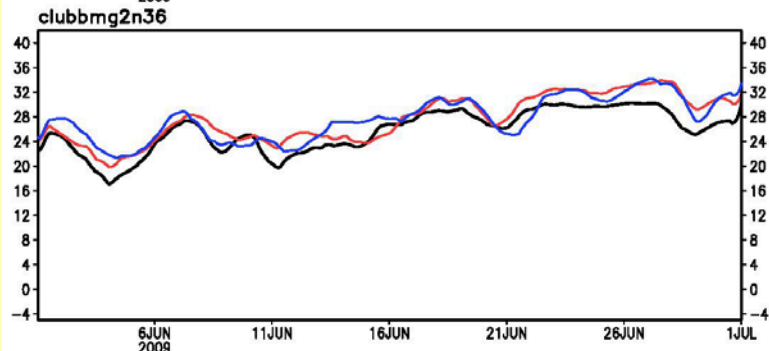


# SGP 2 meter temperature vs Precip

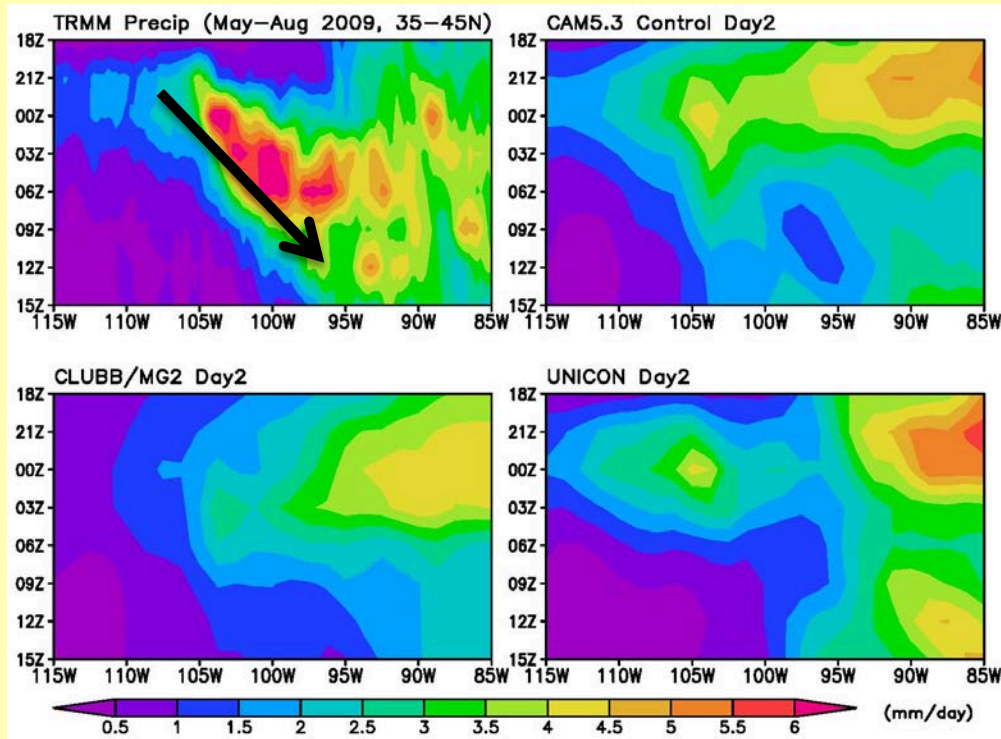
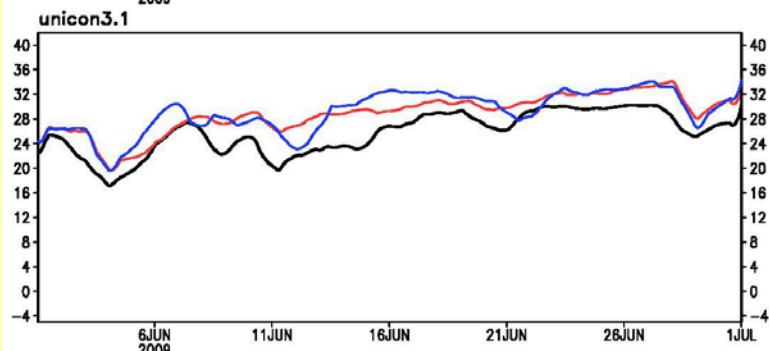
Control



CLUBB/MG2



UNICON



- Both CLUBB/MG2 and UNICON still simulate warmer T2m.
- None of the schemes are able to simulate the propagation systems from the Rockies to the central great plain.



# Summary:

- We performed analysis of three CAPT simulations for CAM5.5 candidate schemes
  - Improvements are found in both CLUBB/MG2 and UNICON for many aspects.
  - CLUBB/MG2 shows better global mean cloud simulation
  - UNICON shows better tropical precipitation variability
  - Both schemes produce too much precipitation in the tropics but less precipitation over midlatitude continents during the summer time (warm surface temperature bias). Both schemes also fail to simulate the propagation precipitation system over the central US.

