

CMMAP Graduate Student Colloquium, July 2009

Ft. Collins, CO

# Towards understanding the diurnal cycle of precipitation in the prototype CMMAP multi-scale climate model

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# Introduction

- Things about me
  - Neighbour from the north.
  - I like to do lots of things
    - Playing funk & nerdcore music
    - growing food
    - surfing
    - staring at climate model simulation movies.
- My research
  - I want to understand why CMMAP's new climate model simulates better daily rainfall
  - I think computer models are very useful.

# Two climate models

vs.

## Observations

### GCM

Global Climate Model  
clouds etc. “parameterized”

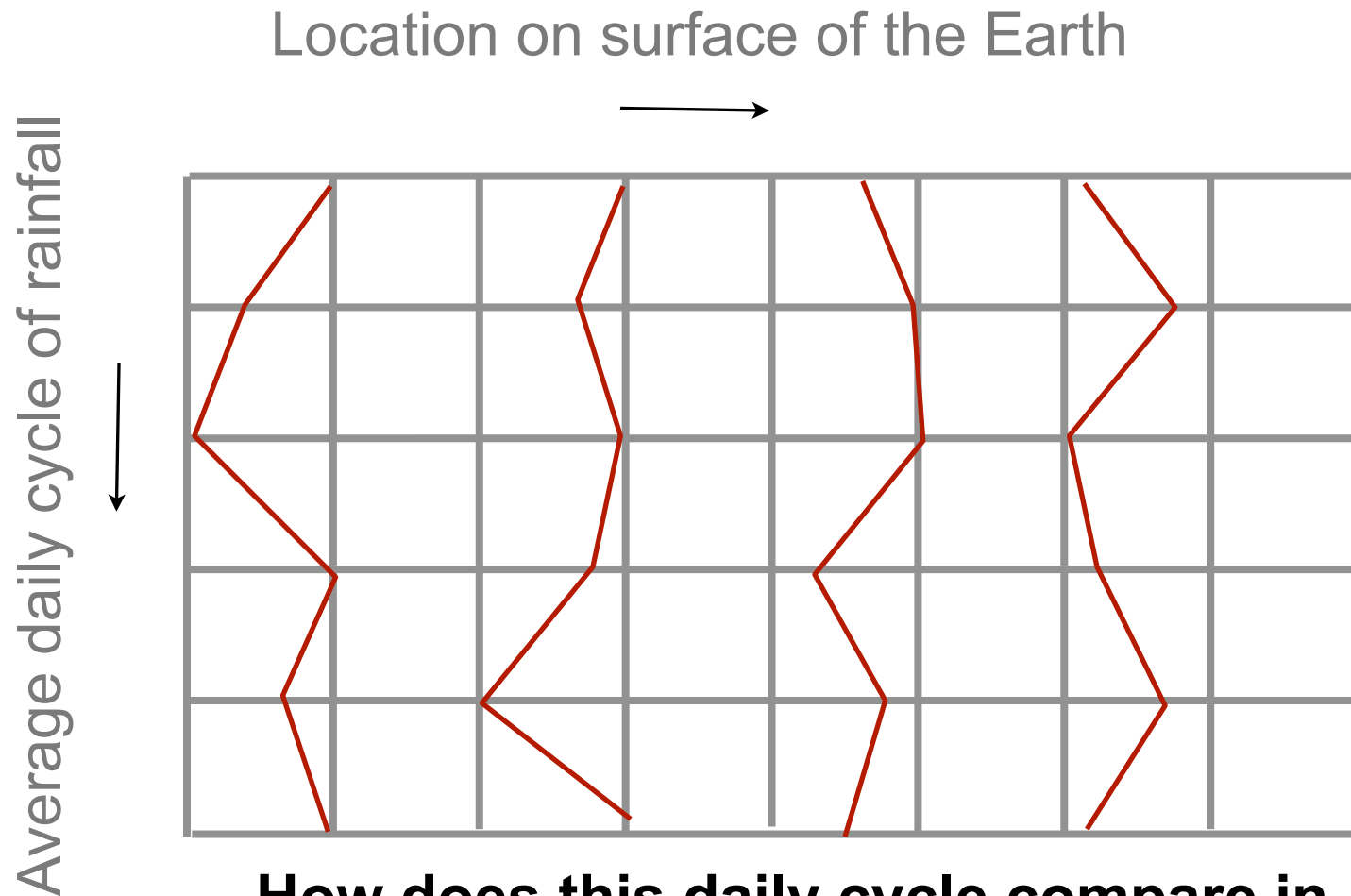
### MMF

Multiscale Modeling Framework  
clouds etc. “super-parameterized”

### OBS

A best estimate of rainfall from many  
space-based radiation sensors and radars

# The composite seasonal “mean day”



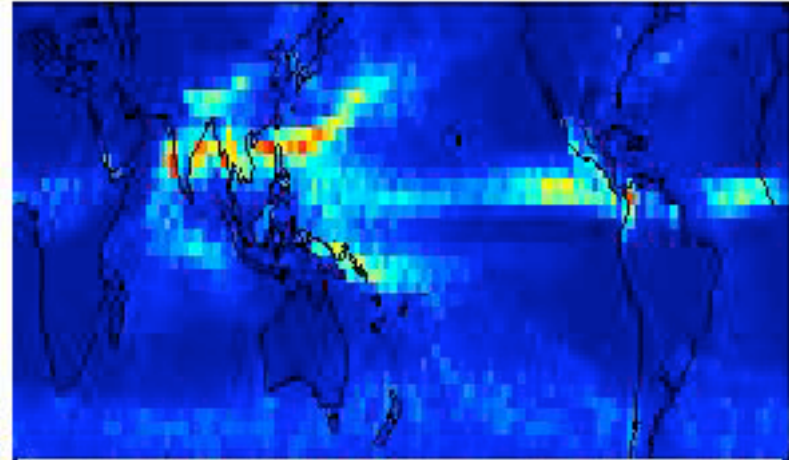
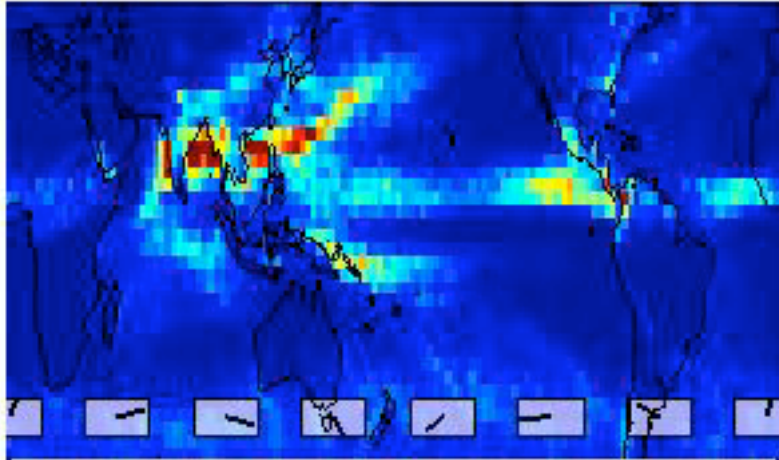
# JJA precipitation

Cool colors (less rain) warm colors (more rain)

[spcam] PRECT 0 Z

[spcam] PRECT 0 LT

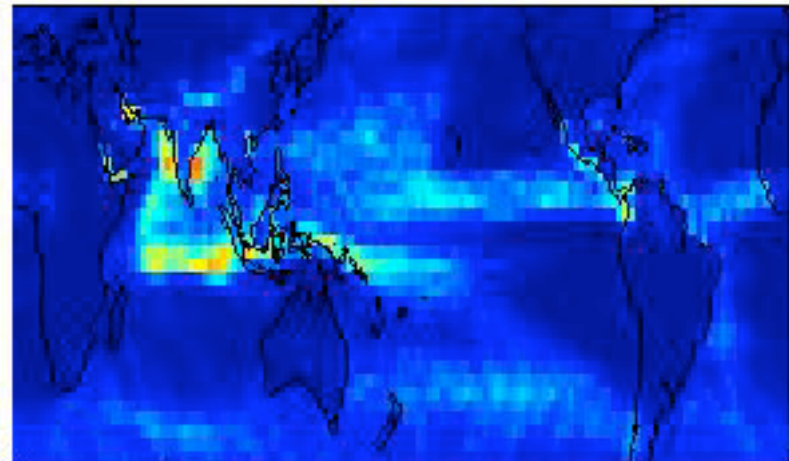
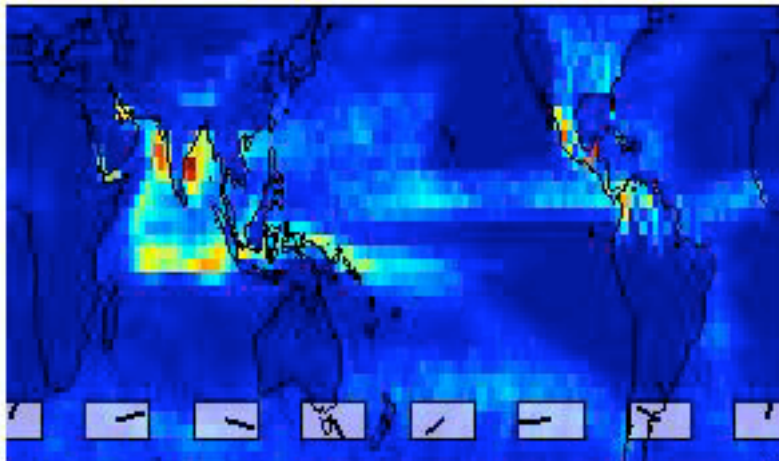
MMF



[cam] PRECT 0 Z

[cam] PRECT 0 LT

GCM



Universal time

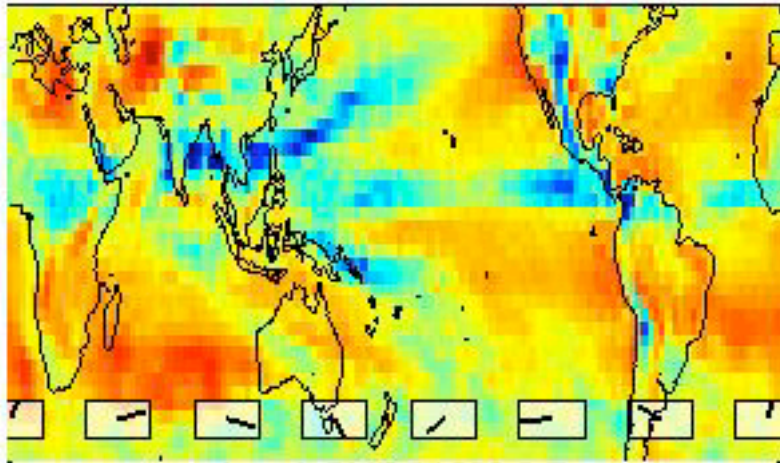
Local time <sup>5</sup>

# JJA vertical velocity

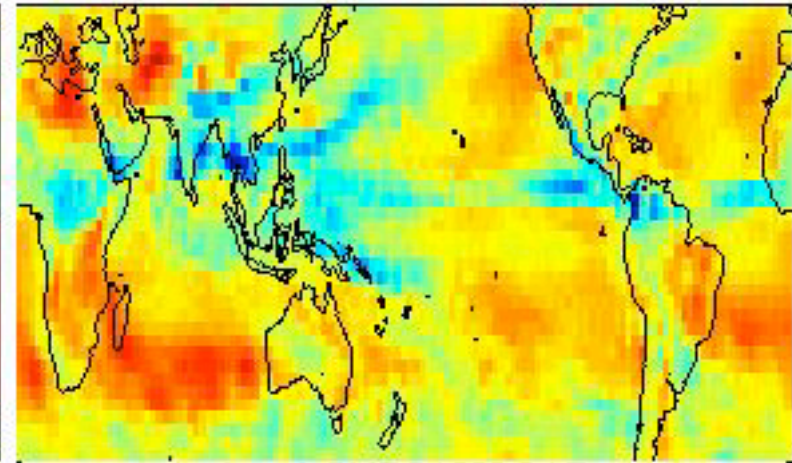
Cool colors (upward) warm colors (downward)

MMF

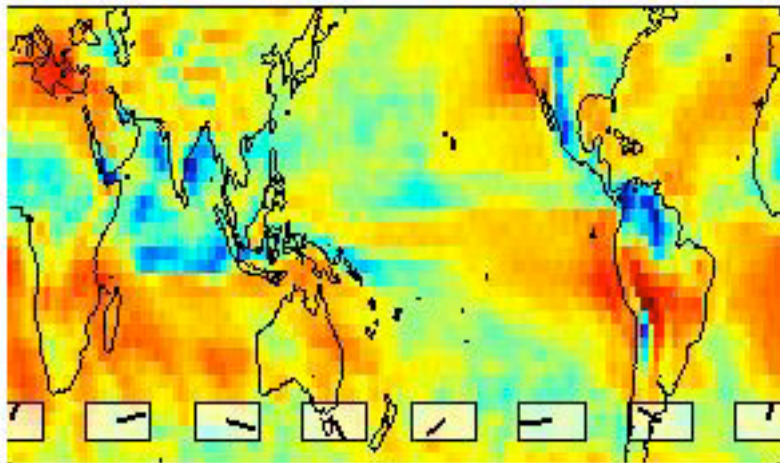
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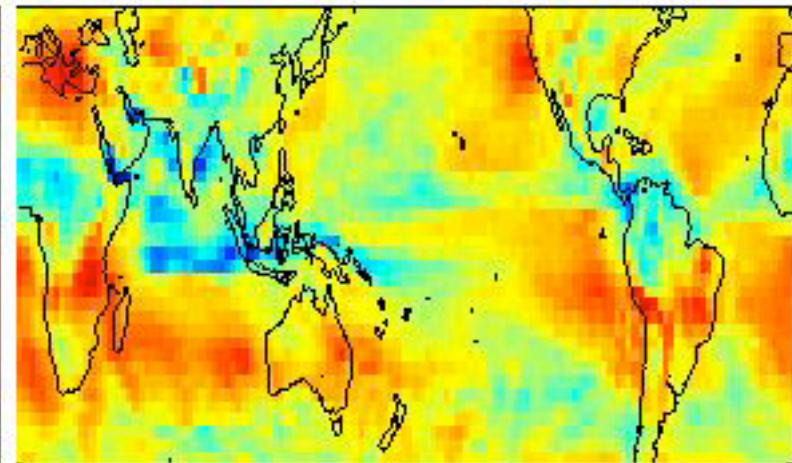
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[cam] OMEGA500 0 Z



[cam] OMEGA500 0 LT



GCM

Universal time

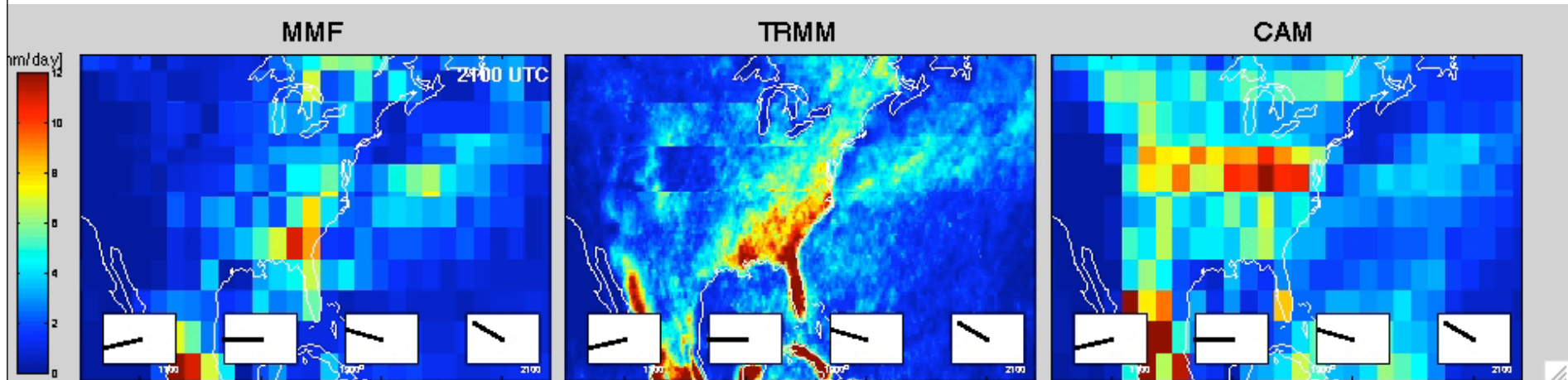
Local time <sup>6</sup>

# North American JJA Diurnal Precipitation

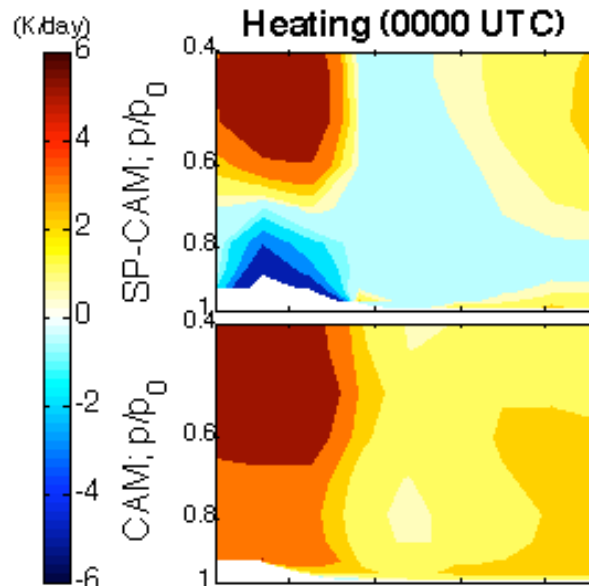
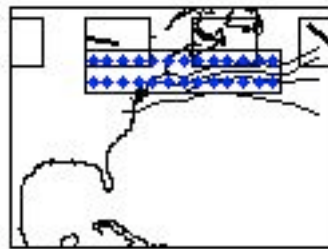
MMF

OBS

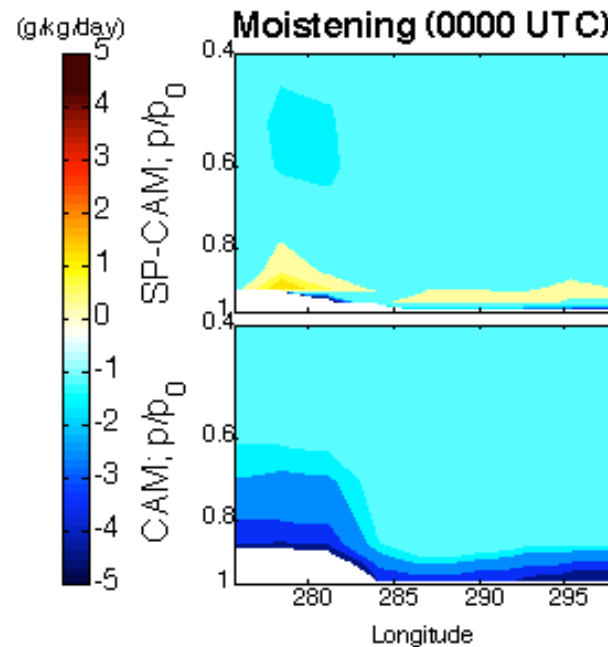
GCM



# Different representations of convective heating and moistening



MMF



GCM

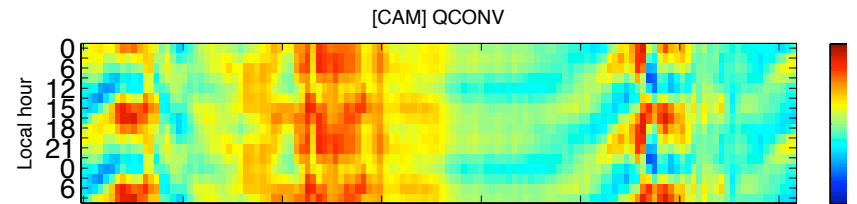
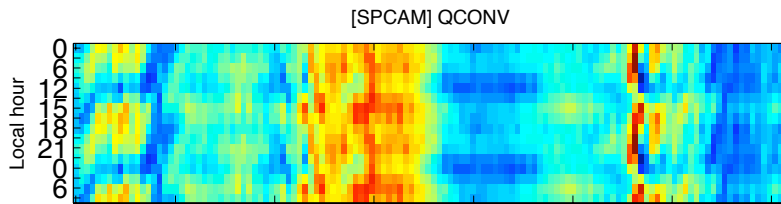


# Water storage and convergence

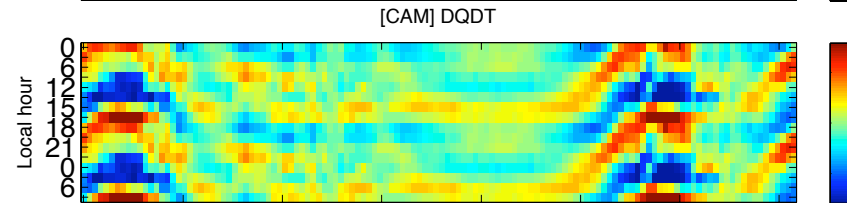
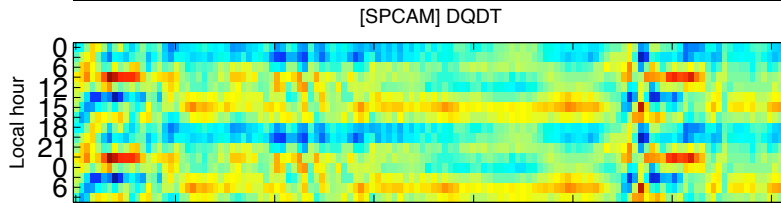
MMF

GCM

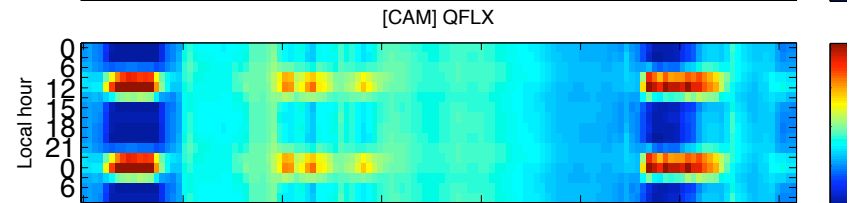
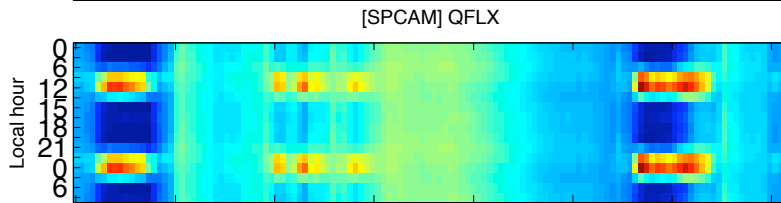
Convergence



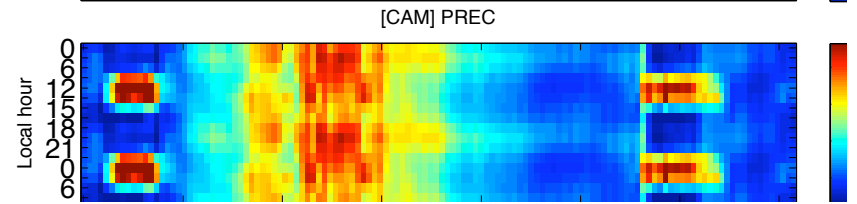
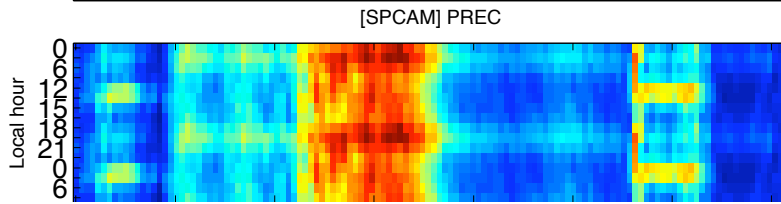
Storage



Evaporation



Precipitation



# Summary

Shallow convective entrainment humidification over land is but one part of the improved diurnal rainfall cycle in the MMF. There is much, much more going on.