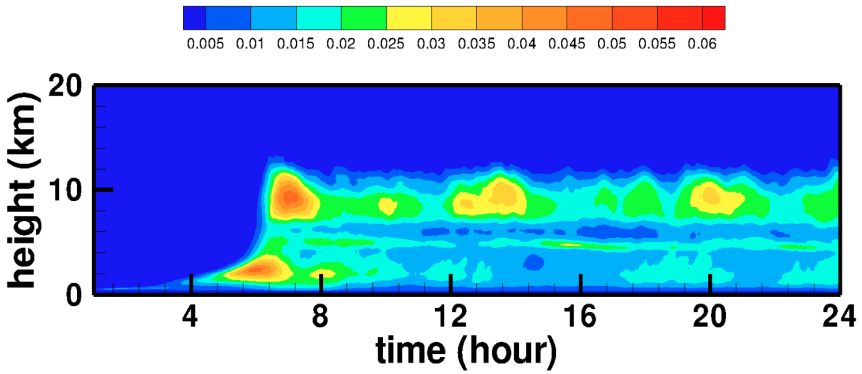
The Physical-Processes Working Group

1. Chin-Hoh Moeng: *Experimenting with SAM's CRM*
2. Anning Cheng: *Sensitivity of the Simulation of Boundary-Layer Clouds on the Vertical grid with a Higher-order Turbulence Closure*
3. Gabe Kooperman&Mike Pritchard: *Forecast simulations with a multiscale modeling framework*
4. Robert Pincus: *Spreading radiation calculations over time*
5. Hugh Morrison: *Impact of aerosols on cloud system-resolving model simulations of tropical deep convection*
6. Mikhail Ovchinnikov: *Cloud-aerosol interactions in a multi-scale aerosol-climate model*

1. Chin-Hoh Moeng: Experimenting with SAM's CRM

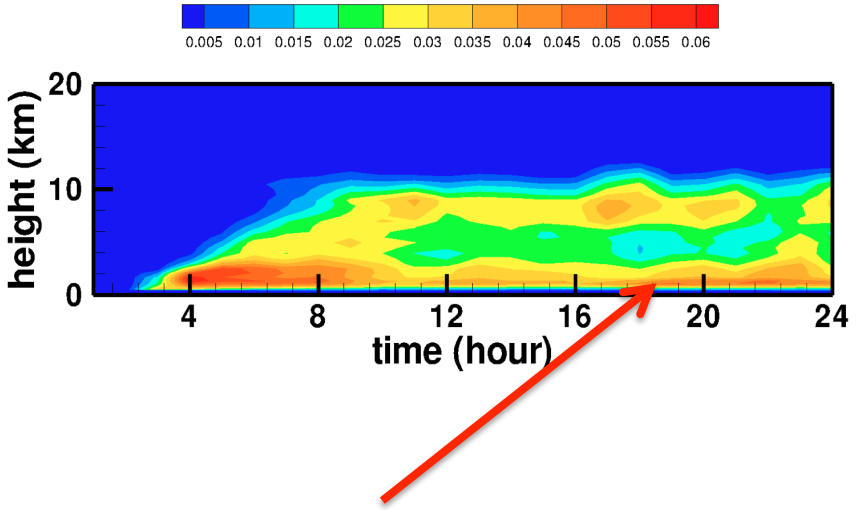
Comparison of cloud amounts

Giga-LES (benchmark)



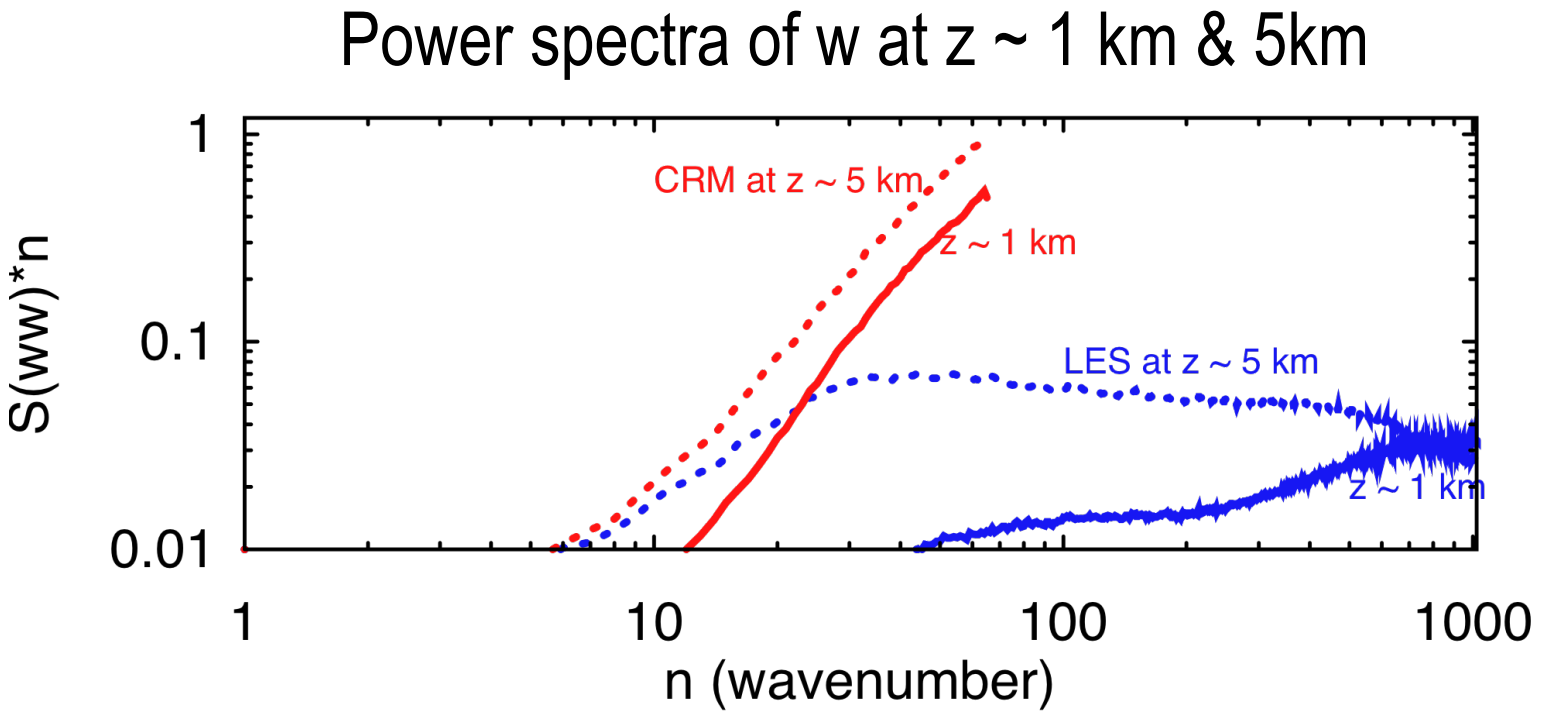
CRM run using SAM6.8.2

128 x 128 x 64 over 204.8 km x 204.8 km x 27 km



Problem #1: too much low cloud amount

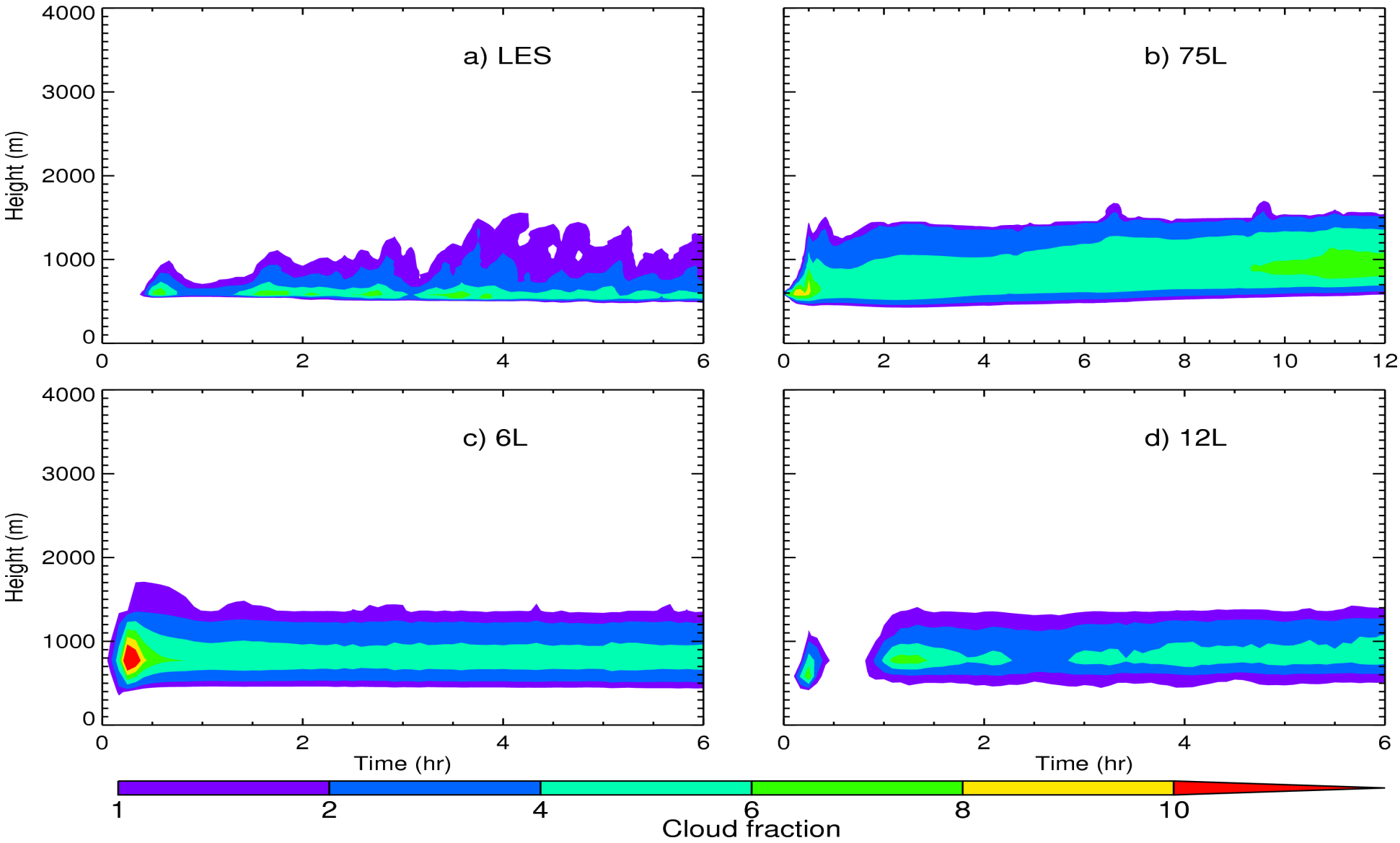
1. Chin-Hoh Moeng: Experimenting with SAM's CRM



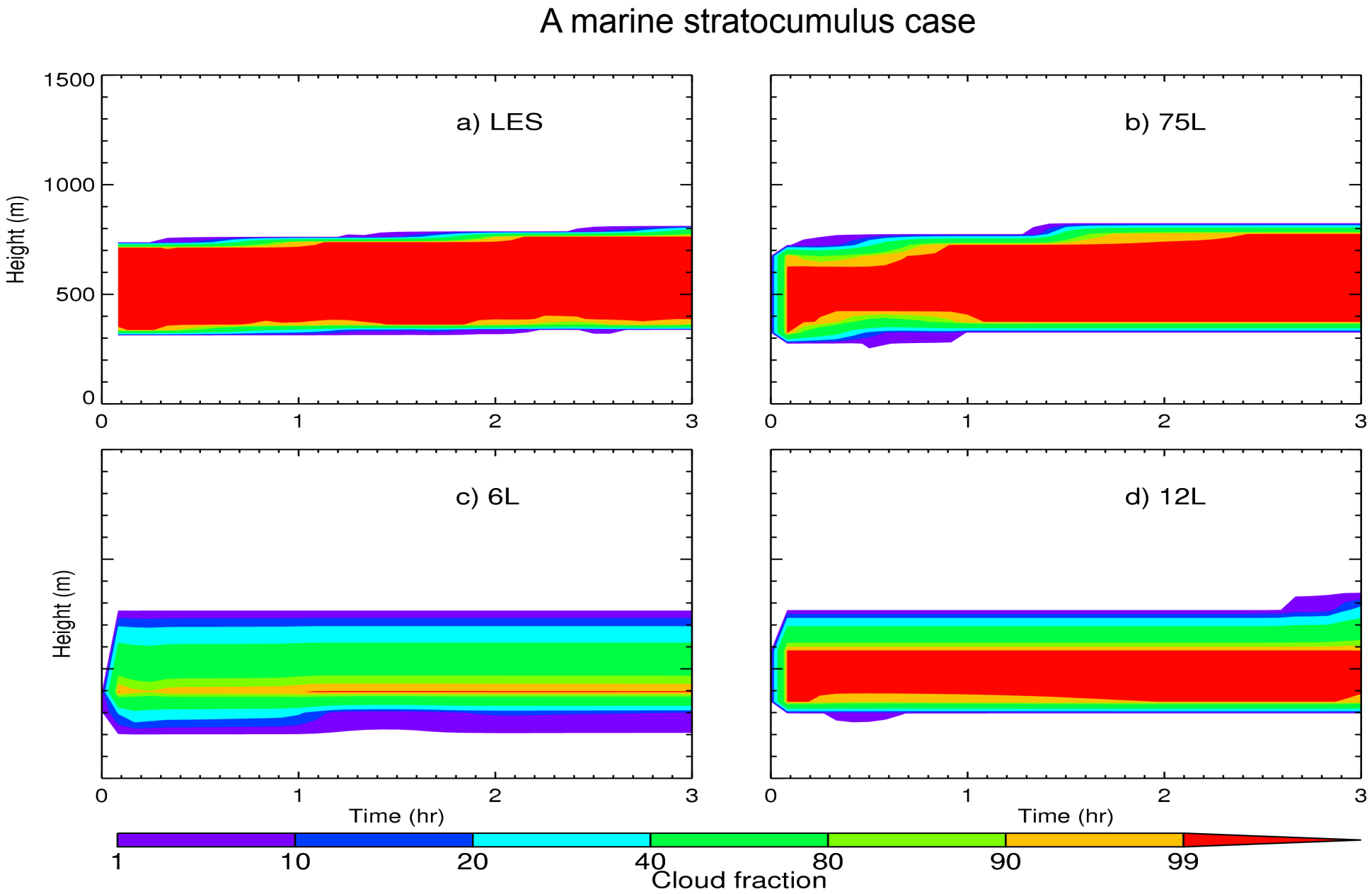
Problem #2: too much w-variance near the CRM grid cutoff

2. Anning Cheng: Cloud Evolution for BOMEX from CRM-IPHOC

A trade cumulus case

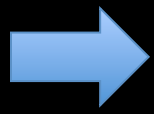


2. Anning Cheng: Cloud Evolution for ASTEX from CRM-IPHOC



3. Forecast simulations with a multiscale modeling framework

Gabe Kooperman, Mike Pritchard,
Richard Somerville & Marat Khairoutdinov

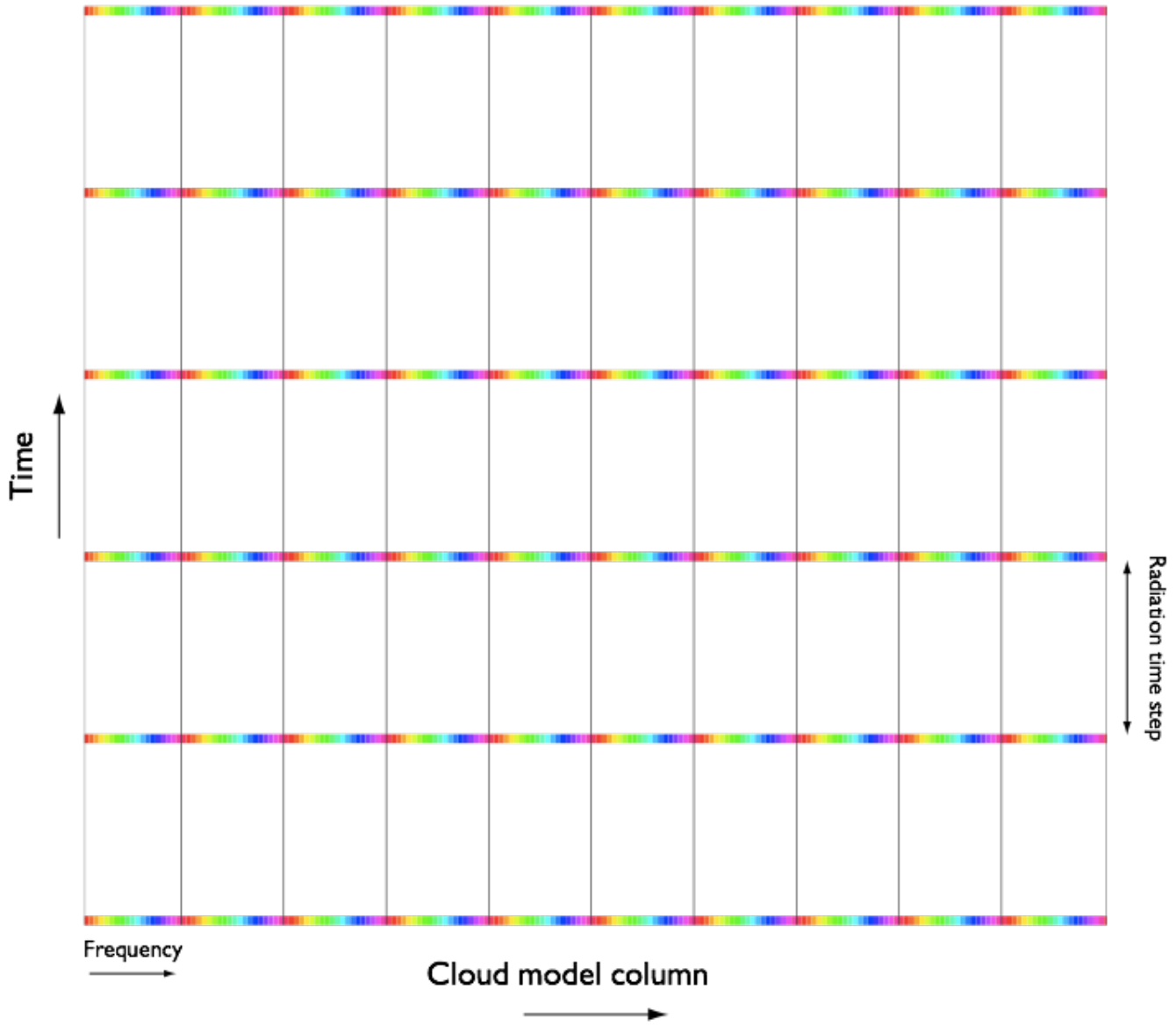


play movie

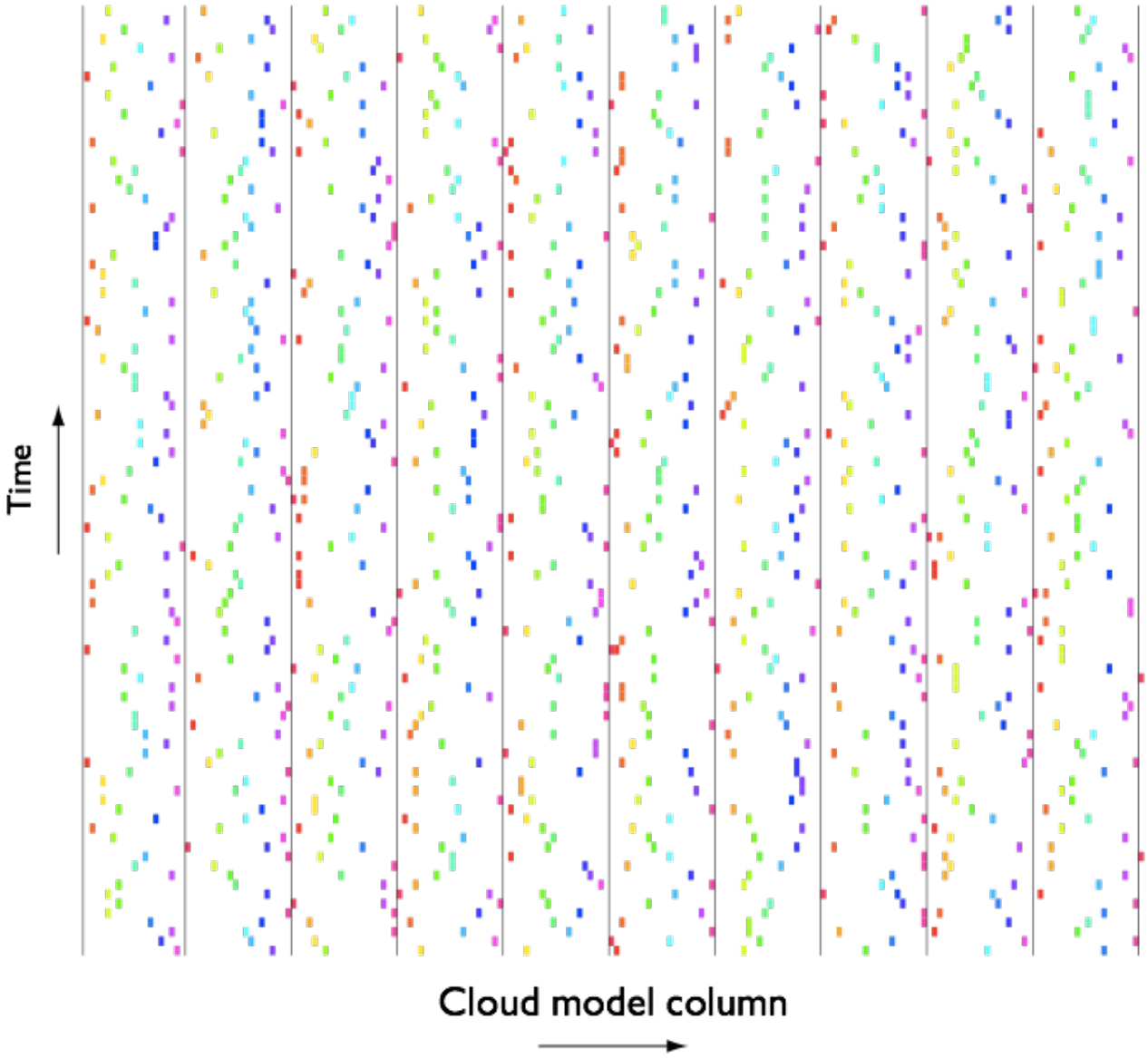
Forecast-SPCAM will be an efficient numerical test-bed, to explore and better understand:

- ❑ SP cloud structure biases
- ❑ Nature of MCS multi-grid propagation mechanism
- ❑ Fidelity of SP Latent heating during TOGA-COARE.
- ❑ Consequences of new SAM turbulence/microphysics once implemented in SPCAM.
- ❑MJO predictability (YOTC hindcasts)
- ❑ **< your idea here >**

Robert Pincus: Adapting LES radiation to models at large scales



Monte Carlo Spectral Integration (McSI)



- Moving McSI from idealized large-eddy simulations to global models
  - works in a general way
- but is harder than it seems
  - Perturbations aren't mixed efficiently at the surface;
    parameterizations can be more non-linear
- Smarter sampling can reduce large perturbations and make the method tractable

Cloud system-resolving model simulations of aerosol indirect effects on tropical deep convection

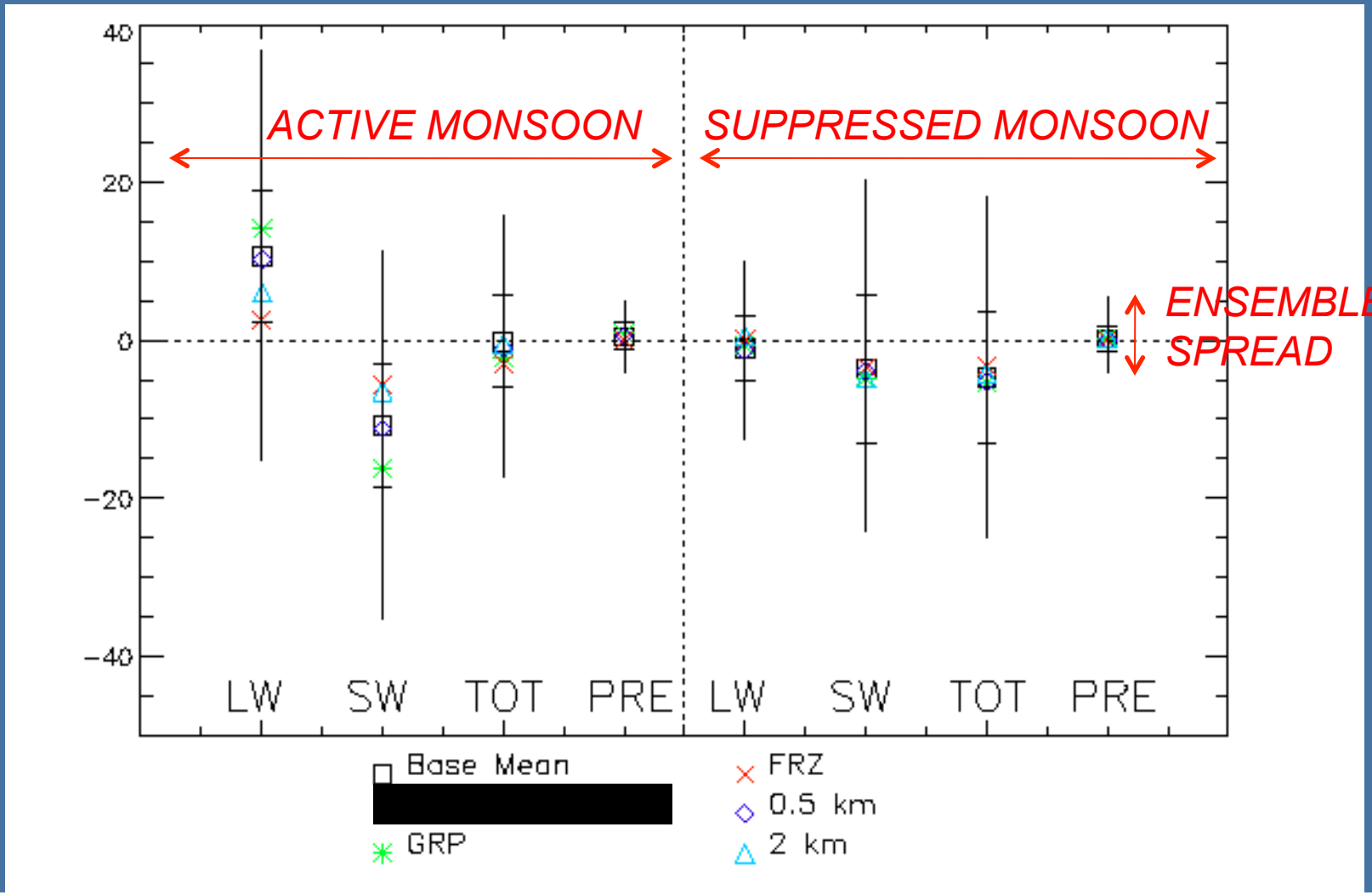
Hugh Morrison and Wojciech Grabowski

NCAR* (MMM Division, NESL)

*NCAR is sponsored by the National Science Foundation

CMMAP meeting, Jan. 12, 2011

- **240-member ensembles of simulations (pristine and polluted) with different initial seed for random noise**



There is limited impact of aerosol on forcing terms in the moist static energy budget, and hence not much change in the mean surface precipitation rate and updraft mass flux

→ strongly constrained by prescribed large-scale forcing and SST. Overall there is a small net upper tropospheric radiative heating with increased aerosols which slightly weakens convection.

Cloud-Aerosol Interactions in a Multiscale Aerosol Climate Model

Mikhail Ovchinnikov, Minghuai Wang, Steve Ghan, Richard Easter, Xiaohong Liu, William Gustafson, Yun Qian, Evgueni Kassianov, and Larry Berg (Pacific Northwest National Laboratory)

Vince Larson and Dave Schanen (U. Wisconsin-Milwaukee)

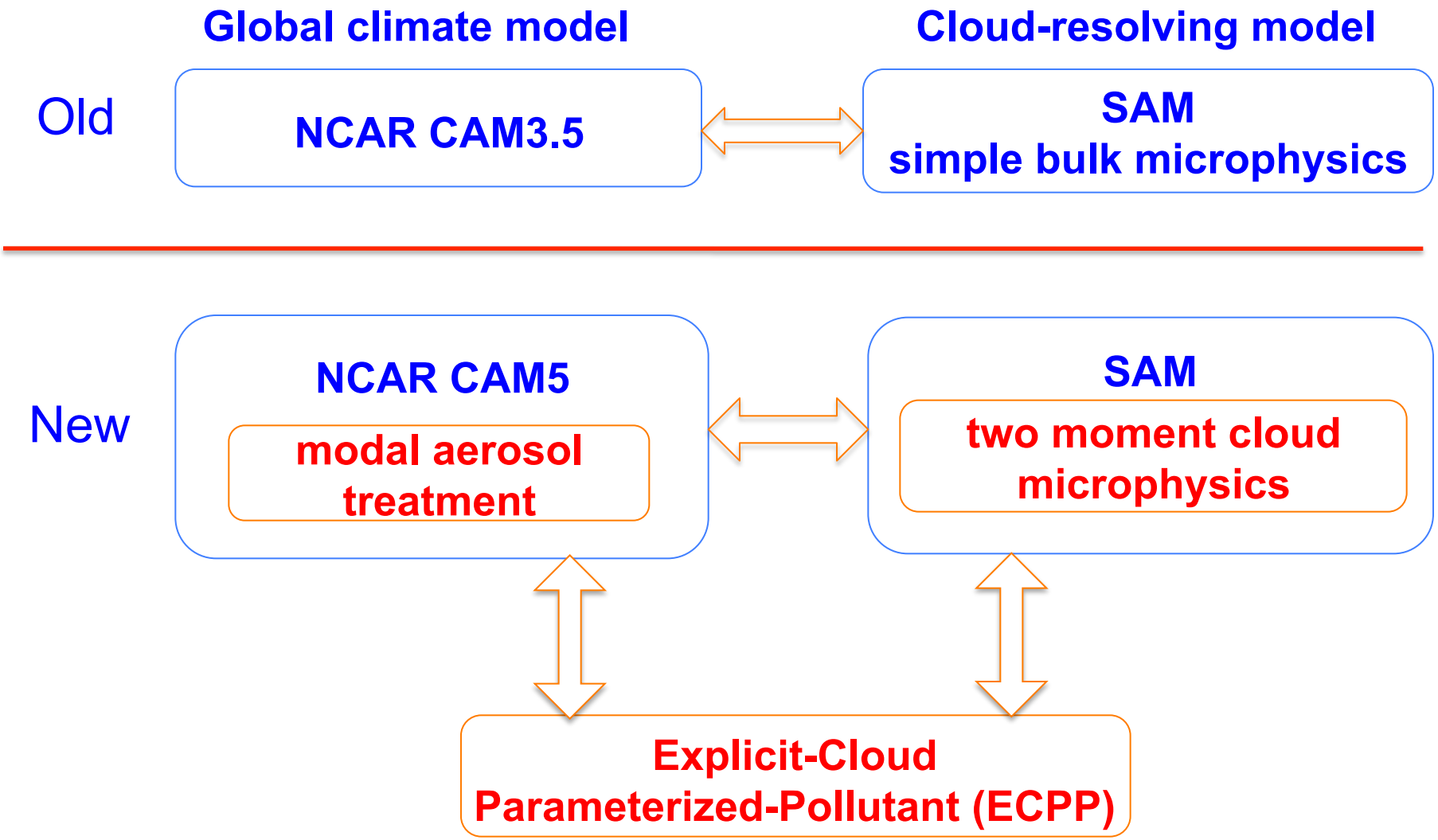
Hongbin Yu (U. Maryland – Baltimore County)

Hugh Morrison (National Center for Atmospheric Research)

Marat Khairoutdinov (State U. New York – Stonybrook)

CMMAP STM, Berkeley, January 2011

We have extended the original MMF to treat aerosol-cloud interactions ...



without the computational cost of embedding aerosols in the CRM.

Some unique features of PNNL MMF

- Aerosol effects on both stratiform and convective clouds are explicitly treated.
- Droplet activation is calculated at each CRM grid point, using CRM-scale vertical velocity.
- Aerosol processing by convective clouds is explicitly treated by using cloud fraction, vertical mass flux, cloud water and precipitation from CRM statistics.
- Aerosol water uptake is calculated at each CRM grid point, which accounts for the subgrid variation in relative humidity within each GCM grid cell.

(See Wang et al., 2010, *Geosci. Model Dev. Discuss*. for details)