CMMAP Low-Cloud Breakout Session

Brian Medeiros
CSU/UCLA

Matt Wyant
UW

With partial input from Bjorn Stevens and Chris Bretherton

- Status report and future goals
- Focus on short term tactics

Initiatives

- Understanding low-cloud feedbacks in (earth-like) SP-CAM
- Understanding low-cloud feedbacks using aquaplanets
- Using the GCSS approach to develop an a-priori *SAM/SCM*.
- Model reformulations (delocalized physics, high vertical resolution, embedded LES)
- Connecting to observational data-sets
- Aerosol and Microphysical Impacts

Mid-term milestones from Kauai

- Time-Series from Aquaplanet output (April 1); just done

- Aqua-SP-CAM climate sensitivity run (May 1); done

- Data pow-wow (June 1); (?) (mini-break-out meeting?)

UW low-cloud plans for the next six months

- Continue climate sensitivity runs with 2D&3D CRM & LES
    - Work out problems with forcings.
    - Do these runs show the same sensitivity as SP-CAM?
    - Perform sensitivity studies to understand the mechanisms of the cloud response

- Create an intercomparison climate-sensitivity case from SP-CAM (also potentially useable by GCSS-CFMIP) for SCM and LES. Test it with CRM and SCAM.

UW-plans for the next six months (continued)

- Continue analysis of SP-CAM polar low-cloud sensitivity
- Write up what we've done

Low cloud-feedbacks using Aquaplanets

Review of progress since February:

- Extension of comparison of CAM and AM to vertical distribution of clouds, including composite soundings conditioned on RICO-like conditions.

- Aquaplanet simulation with SP-CAM completed, only cursory analysis so far.

- Prototype forcing timeseries derived from CAM aquaplanet.

preview of next 6 months

- Continue to characterize aquaplanet forcing/response
  -Additional analysis of CAM/AM simulations
  -Extend analysis to SP-CAM

- Further development of rich forcing dataset
  -Mean and time-varying forcing for different latitudes and/or
                                   regimes
  -Distribute more widely to CMMAP community to get feedback
  -Consider observational constraints for model evaluation.

- Begin SCM (and/or CRM and/or LES) with results from forcing
  dataset

- Suggestions from theme members?

Model Reformulation

- *Can we use the MMF as a means to embed LES in the GCM?* Develop framework for allowing CRM to be delocalized from grid of CAM; thus allowing for the use of embedded LES and or the use of the CRM at only select latitudes (Bjorn is starting this)

- Develop SAM test bed for this using SamSimilarity (or big Brother SAM). Here we will use SAM as both the large-scale and CRM to address vertical resolution issues.(this framework is computationally more convenient at the moment for vertical resolution sensitivity studies). Beta-plane aqua-SAM as a testbed for delocalization strategies (i.e., running baby SAM on a different grid) (Peter Blossey?)

Connection to Observational Data Sets

Observational constraints

- – Charlotte is working on comparing low-cloud CAM/SP-CAM to ISCCP/Reanalysis
- – Cloud-Sat? Cloud objects?

Aerosol/Microphysical Impacts

- How do parameteric & physical (aerosol/chemistry) assumptions affect the low-cloud response?