M-PACE Model Intercomparison Breakout

March 27, 2007

Agenda

- Klein review of intercomparison status
- Morrison discussion of period A

New Submissions

- New Participants
  - NCAR SCAM (Xie)
  - NCAR SCAM with double moment ice microphysics (Liu, Penner, Ghan)
  - UKMO LEM (Shipway)
  - GSFC SCM (Sud) ← No data yet...
- Revised or Additional Submissions
  - DHARMA, CCCMa, ECHAM5, UWM, GFDL
  - UCLA/LaRC with Lin Microphysics

Deadline!

- March 30 (or very shortly after the meeting)
- Shortly after the meeting, the netCDF files of all of the model data interpolated to a common height-time grid will be available for both Period A and Period B

Microphysical Definitions

- Thresholds for cloud liquid (0.01 g/kg), ice, rain, snow, graupel (0.0001 g/kg) established for conditional averages (e.g. particle sizes, number concentrations) and grid-box mean mixing ratios
- Cloud and hydrometeor fraction are based upon these definitions

Rain/Snow in SCMs

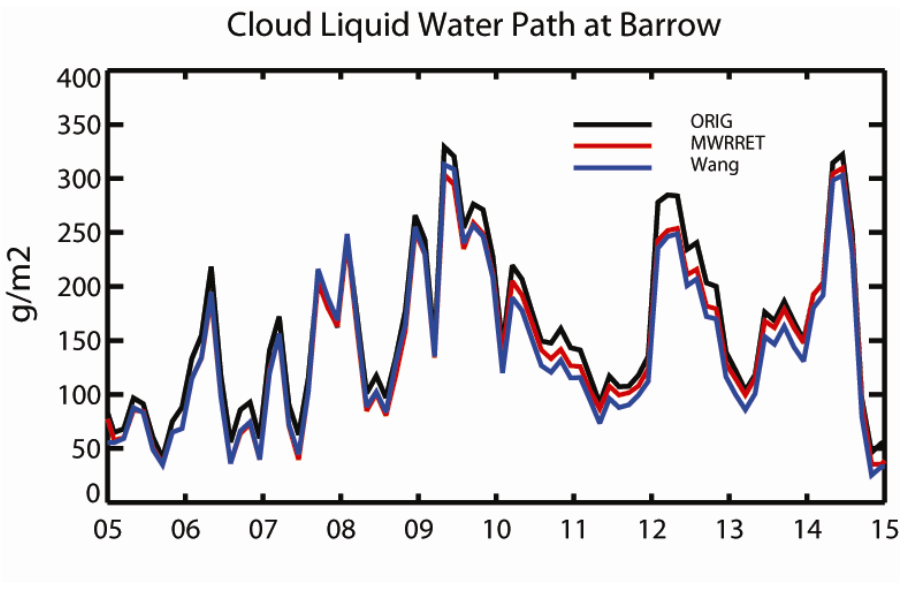
- Please include snow & rain water mixing ratios
- If you don’t have them, you can send just the vertically resolved fluxes (mass of liquid water equivalent per unit area per unit time) and we can convert them for you

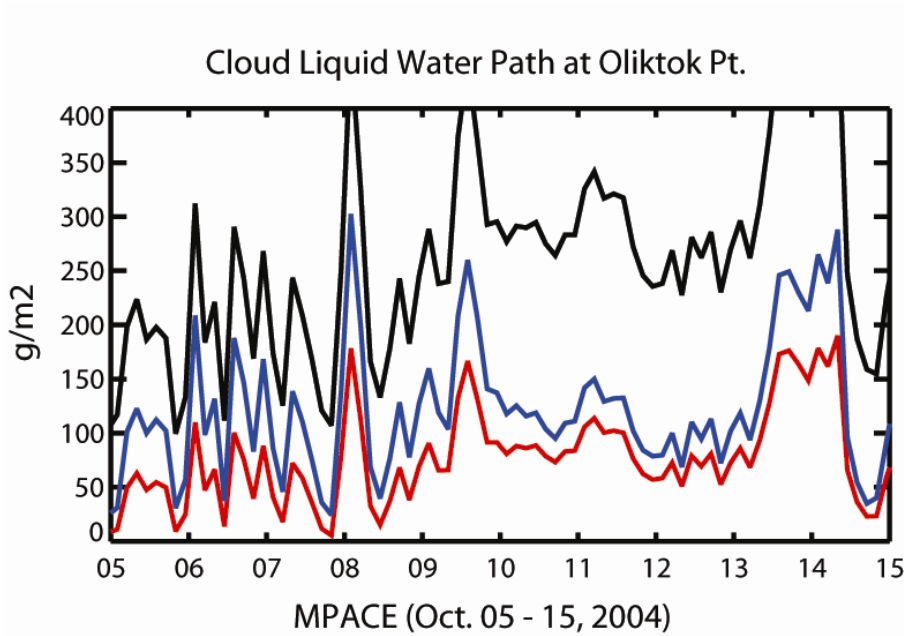
‘Ice’ effective radius

- The issue is how to weight the effective radius of ice, snow and graupel to report a single ‘effective’ radius
- Aircraft data do not count crystals with diameters < 53 microns – do any model definitions respect this?

New Data

- LWP from MWRRET (Dave Turner et al.) and from Zhien Wang



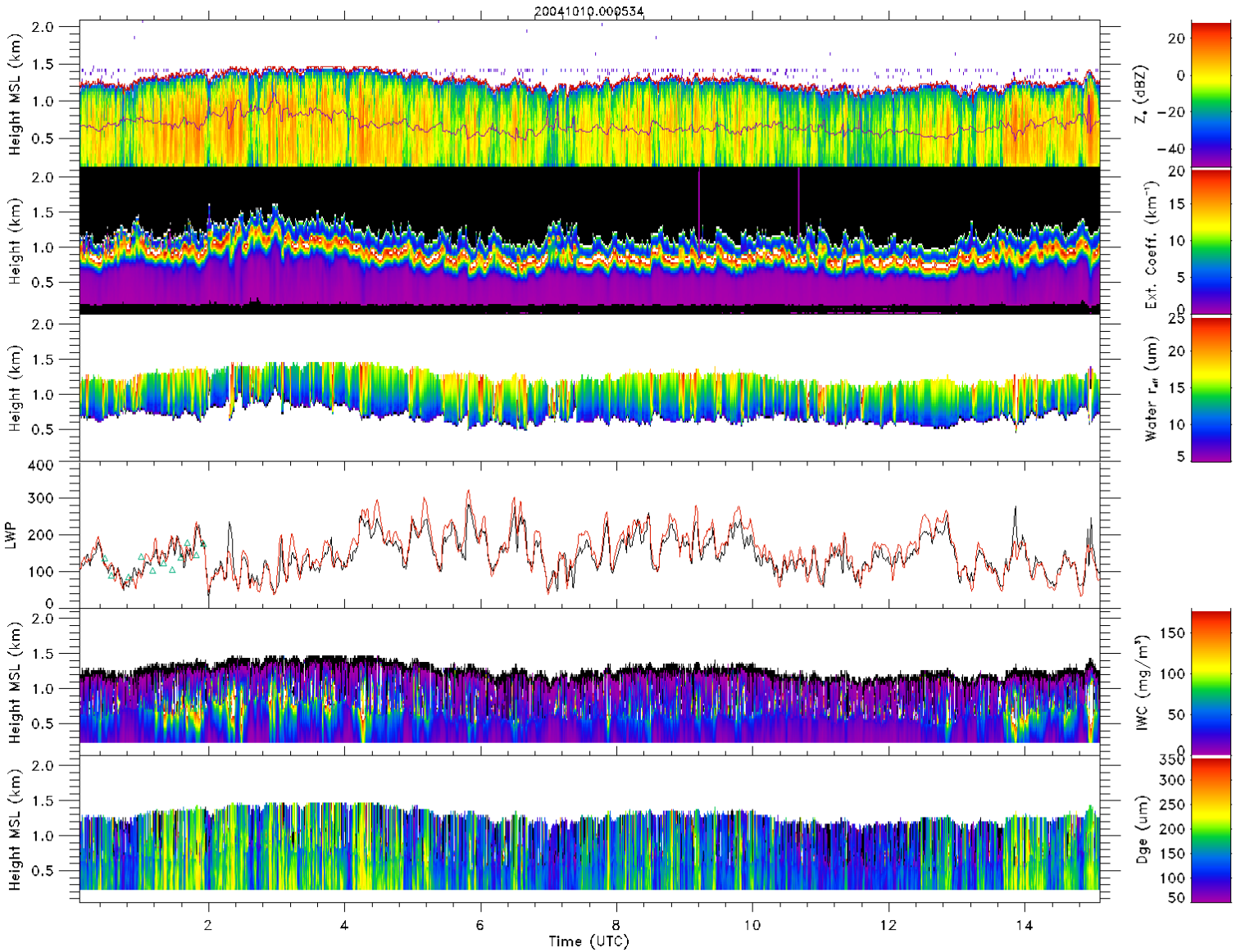


- New aircraft data from Greg McFarquhar to be processed after the meeting

What vertically resolved retrieval data to use?

- We want something to add value, but…
  - Aircraft is ‘ground truth’
  - We don’t want to perform an intercomparison of different retrieval methods
- The data might different between Period A and B
- What might we get?
  - PDF of cloud liquid / ice water content & particle size
  - Joint PDFs of liquid vs. ice?

Retrievals of Zhien Wang



Tentative Paper Plan

- Klein to write a paper for Period B
- Morrison to write a paper for Period A

Period B Paper to Include…

- Case description
- Model documentation
  - Microphysical survey
- Composite model vertical structure of cloud in normalized height coordinate
  - Will define cloud base to be the first level where the liquid water > 0.01 g/kg
  - Will define cloud top to be the highest level where cloud fraction > 0.5
- Sensitivity studies
  - Ice microphysics disabled
  - Higher vertical resolution

Microphysical survey

- Key to understanding differences?
- What to include?

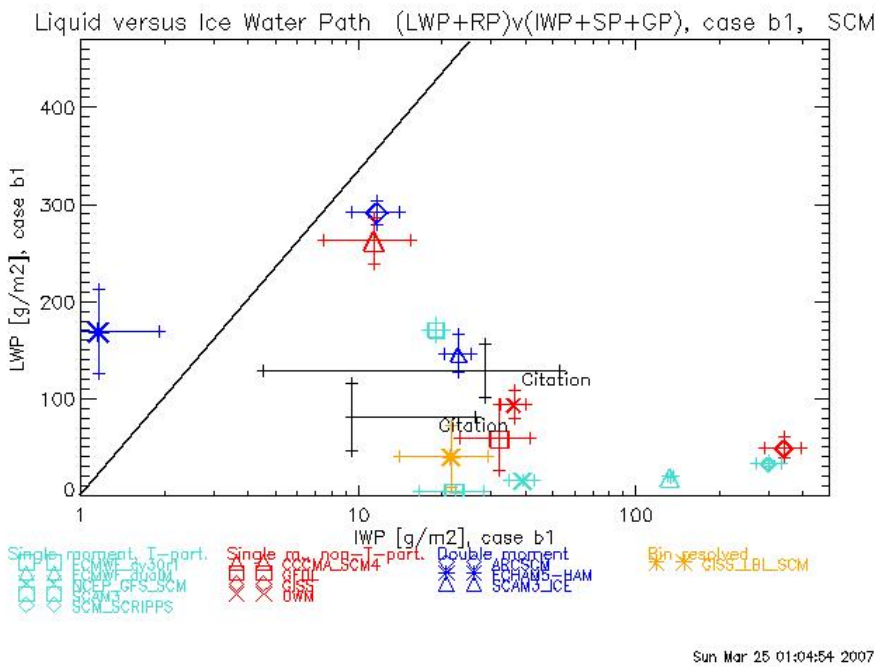
Microphysics scheme	R1
No. of prognostic variables	4
Prognostic variables	q_c, q_i, q_r, q_s
Specified size distribution shape	*c*, *i*—monodisperse *r*, *s*—exponential
Condensation/deposition	*i*, *s*, *r*—vapor diffusion; *c*—saturation adjustment
Collection between hydrometeor species	Continuous collection
Ice multiplication	No
Droplet–rain autoconversion	Kessler (1969) type
Cloud ice–snow autoconversion	Kessler (1969) type
Particle fall speeds	*c*—none; *i*—HD90; *r*—LO69; *s*—LH74
Cloud ice concentration/ice nucleation	Diagnostic Fletcher (1962)

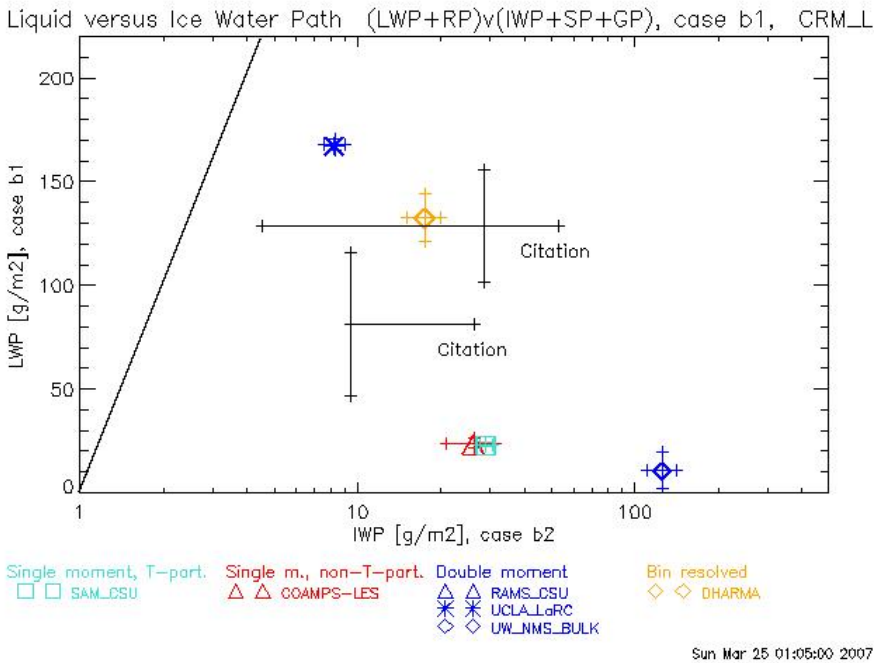
What does we need to know without documenting everything?

How do we handle the different types of schemes (e.g. bin vs. bulk)?

from Morrison and Pinto (2006)

Selected Period B Results





- All results are available from intercomparison web page

Harrington's Sensitivity Idea

- Jerry suggests a further microphysical sensitivity study to understand differences
- Require all models use a single set of ice parameters:
  - Fall speed
  - Number concentration and size used in the ice crystal diffusional growth equation