Cloud Properties Working Group Break Out Session

ARM Science Team Meeting

Louisville, KY

30 March 2009

The Chair's Objectives for CPWG

- Maintain continuity of "base" instruments – We're building a climatology!

- Advocate for sufficient programmatic support to make our measurements useful.

- Better retrieval vetting framework – moving towards Cloud Properties Best Estimate

- Build a stronger connection with the modeling community – Producing the products they want.

CPWG Breakout Agenda

30 March 2009, 3-5 pm

- 3:00-3:15 **Potential upcoming IOPs**
  - Precipitation IOP at SGP – Mike Jensen
  - Madden-Julian IOP at Manus – Chidong Zhang
- 3:15-3:20 **New PI introductions**
- 3:20-3:30 **Overview of upcoming ARM changes** – Matthew Shupe
- 3:30-3:40 **CMWG Product Needs** – Steve Klein
- 3:40-3:50 **CPWG Recommendations**
- 3:50-4:20 **Science Plan Topics and updates**
  - Introduction of Topics – Matthew Shupe
  - Discussion
- 4:20-5:00 **Creating Products from Measurements**
  - CPWG VAP update – Mike Jensen
  - BBHRP testbed – Sally McFarlane
  - Discussion

Potential Upcoming IOPs

Precipitation IOP at SGP – Mike Jensen

ACRF Madden-Julian Oscillation Initiation Experiment at Manus – Chidong Zhang

New PI Introductions

Data Product Priorities Identified by the Cloud Modeling Working Group

Steve Klein

CPWG Discussions

Doppler Spectra Usage:

- How big is the Doppler spectra community?
- Do they need special tools for identifying and subsetting spectra data?
- How will this community change as we increase our amount of spectra by an order of magnitude?

CPWG Discussions

Precipitation Measurement Instruments:

- AMF: Optical Rain Gauge
- AMF2: Optical Rain Gauge, Tipping Bucket
- Do we want disdrometers for the AMFs and/or a tipping bucket for AMF1?

CPWG Discussions

New ARM Science Plan Topics

Adjusting our ideas to accommodate new measurements

New ARM Science Plan Topics

Q1: Old, Long-standing Science Questions for the New ARM Science Plan: *cloud droplet spectral broadening, entrainment, vertical velocities, cloud-aerosol interactions, drizzle formation, and mass flux transports in shallow convection.* (Kollias; Albecht)

Q2: Growth of ice crystals in different environments: *Ice initiation, ice growth regimes, precipitation formation, mixed-phase cloud lifecycle*. (Korolev)

Q3: Global dimming and brightening: *How/why does this occur? What is the balance of aerosol and cloud contributions? Does this mask "global warming"?* (Long)

Q4: Observing and Understanding Precipitation Processes: *Precip. onset and spatial distribution, different precip processes, clouds + precip characterization* (Mace)

New ARM Science Plan Topics

Q5: What is the relationship between the surface fluxes, boundary layer flux profiles, mass flux, cloud structure, (especially the cloud fraction), and cloud reflectance in shallow convection? *Role of large scale forcing. Roles of soil moisture and ground water. Distinguishing shallow and deep convection.* (Miller)

Q6: Ice sedimentation rates: *Temperature dependence, effect of small particles* (Mitchell)

Q7: Quantifying the contribution of small ice crystals to the cirrus PSD: *Contribution of shattering, relation to fall speeds, implications for previous measurements.* (Mitchell)

Q8: Geoengineering of cirrus clouds (Mitchell)

Q9: Cold cloud phase partitioning: *Roles of temperature, vertical velocity, IN/CCN concentrations. Impact on precipitation efficiency, cloud longetivity, redistribution of atmospheric radiation* (Shupe)

Q10: Paradigm for evaluating model ice microphysics using observations (Wang)

New ARM Science Plan Topics

Ice Processes

Q2: Growth of ice crystals in different environments:(Korolev)
Q6: Ice sedimentation rates: (Mitchell)
Q7: Quantifying the contribution of small ice crystals to the cirrus PSD: (Mitchell)
Q8: Geoengineering of cirrus clouds (Mitchell)
Q10: Paradigm for evaluating model ice microphysics using observations (Wang)

Ice initiation
Ice growth regimes
Precipitation formation
Mixed-phase cloud lifecycle.
Ice particle fall speeds and dependencies
Contribution of shattering to PSD
Evaluating model ice microphysics
Geoengineering

New ARM Science Plan Topics

Shallow Cloud processes

Q1: Old, Long-standing Science Questions for the New ARM Science Plan: (Kollias; Albecht)

Q5: What is the relationship between the surface fluxes, boundary layer flux profiles, mass flux, cloud structure, (especially the cloud fraction), and cloud reflectance in shallow convection? (Miller)

Q9: Cold cloud phase partitioning: (Shupe)

Cloud droplet spectral broadening,
Entrainment and vertical velocities
Cloud-aerosol interactions,
Drizzle formation,
Relationship between cloud and BL structure
Mass flux transports in shallow convection.
Role of large scale forcing. Roles of soil moisture and ground water.
Distinguishing shallow and deep convection.
Phase partitioning as a function of temperature, vertical velocity, IN/CCN concentrations.
Impact of phase partitioning on precipitation efficiency, cloud longetivity, redistribution of atmospheric radiation

New ARM Science Plan Topics

Precipitation characterization/processes

Q4: Observing and Understanding Precipitation Processes: (Mace)

Precipitation onset and spatial distribution
Distinguishing different precip processes
Collocated cloud + precipitation characterization

New ARM Science Plan Topics

Cloud Radiative Effects

Q3: Global dimming and brightening (Long)

How/why does this occur?
What is the balance of aerosol and cloud contributions?
Does this mask broader global climate change?

CPWG Discussions

"Creating Products from Measurements"

- Update on CPWG VAPS – Mike Jensen
- BBHRP "testbed" concept – Sally McFarlane

Discussion Questions

How do we make progress on a Cloud Properties Best Estimate?

- What does it look like?
- What parameters?
- Unique or identical products for each site?
- How do we handle the AMF deployments?

What is the appropriate framework for vetting retrievals?

- Objective and consistent metrics?
- Frameworks: BBHRP testbed, in situ intercomparisons

Who facilitates this process?

- Individual Principle Investigators
- Infrastructure
- Focus Group?

Can we make (and prioritize) the following recommendations?

1) We need more infrastructure support at the National Labs to "run" the instruments and produce products

2) We need more science support to develop the necessary observational methods and higher order products

Closing Remarks

There will be two important breakout sessions that are not on the agenda:

1) "Consequences of the stimulus package for ARM science goals and the Science Plan." Chaired by Warren
   Wednesday, 2-3 pm, Main meeting room
2) "Creating higher-level data products from the stimulus package observations: Which ones and with what priority?" Chaired by the WG leads
   Wednesday, 3-4 pm, Main meeting room

Please submit highlights of your ARM research:
www.arm.gov/science/research/newrh.php