

Breakout Session Report
ARM/ASR User and PI Meeting
March 16-20, 2015

Session Title: CLWG CloudPhase Breakout

Session Date: Monday, March 16, 2015

Session Time: 2:00pm

Summary Authors: Gijs de Boer

Main Discussion

The CloudPhase group met for 75 minutes on Monday, March 16, and spent approximately 45 minutes discussing main instrument and data product needs and desires, and the final 30 minutes discussing efforts related to the ongoing March 11–12, 2013, stratiform cloud case study period. The instrument and data products discussion was lively and focused on stratiform clouds, with a focus on the water budget of mixed-phase stratiform clouds and ice crystal properties. The central themes covered are listed below under the “Needs” section. The case study discussion was led by Heike Kalesse, who presented a few slides to summarize progress and led discussion on current efforts and “next steps”, which are outlined in “Action Items” sections below.

Needs

Specific instrumentation and data needs were discussed by the group. These represent not only items necessary for advancement of the current group case study activity, but also items raised by individual PIs as being important for their research efforts. Included in this discussion were:

1. Radar needs/desires
 - a. Characterization of differences between new and old systems, and between different systems deployed at different sites. This was deemed as critical for the construction of extended data records and detection of changes to cloud properties
 - b. Initial and continued calibration of North Slope (BRW, OLI) radar systems
 - c. Potential addition of x-band wavelength vertically pointing radar systems at North Slope sites. This would help to reduce uncertainty with respect to quantitative ice mass retrievals, and could improve detection and characterization of ice crystal properties (i.e. habit) and precipitation rates
1. Surface Precipitation needs/desires
 - a. Support was stated for the installation of improved surface precipitation suites at Oliktok Point and Barrow. Specifically, information on ice crystal size distributions, fall speed and density (similar to BAECC set up) were cited as interesting. This could substantially aid estimation of precipitation mass flux, a quantity that is central to improving our understanding of mixed-phase cloud lifetime.
 - b. Questions were raised (but not necessarily answered) on the best use of the MASC for improvement of precipitation rate estimation.
 - c. A general desire to evaluate a variety of precipitation sensor arrays in order to understand uncertainties and benefits of different sensors was raised.
1. UAS/tethered balloon needs/desires

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- a. Substantial discussion on potential uses for UAS and tethered balloons arose from the group. Opportunities to use these platforms at Oliktok were generally viewed favorably. Specific measurements of interested listed by the group include:
 - i. Aerosol properties (concentration, size distribution, composition (e.g. filter sampler))
 - ii. Thermodynamics
 - iii. Cloud microphysics (likely from balloon)
 - iv. Measurements of various quantities in the cloud-top region
 - v. Turbulence and dynamics in stratiform clouds and Arctic boundary layers
- a. It was mentioned that these systems provide the benefit of being able to operate at altitudes that are generally considered to be too low for manned aircraft, filling a critical void.
- b. It was mentioned that surface-based evaluation of sensor packages makes sense and that characterization of sensor package performance should be completed before adding the complexity of having them operate on balloons or aircraft.
1. Profiling needs/desires
 - a. A specific desire to enhance water vapor profiling capabilities was discussed. This could be obtained through the Raman Lidar.
1. Fall velocity
 - a. There was some discussion centered around our ability to estimate crystal fall velocity using the MASC. No firm conclusions were made.
 - b. It was mentioned that the Finland dataset provides an interesting viewpoint, and that ARM should put resources towards similar measurements at other sites
1. Funding needs/desires
 - a. Specific mention of a need for funding of MASC software development was discussed
 - b. Additionally, processing of the ACME-V microphysics and aerosol datasets should be supported.

Future Plans

The group will continue to pursue the March 11-12 stratiform case study from NSA. A core group of contributors have performed substantial analysis on this case using modeling and observational tools. Future plans regarding a potential LES intercomparison based on the current case study period were discussed, but it was determined that we should first complete our analysis of the observations and mesoscale simulations.

Action Items

1. Transition of case study analysis into one or more publications

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2. Additional work on understanding the roles of the upper level cloud and aerosols in the March case study.
3. A list of next steps for the ongoing case study was produced and is outlined below.

Next Steps for Case Study

- check into presence of Gravity Waves (→ influence on cloud dynamics!)
- KAZR offset issue (will contact K. Johnson and Nitin again until it is solved)
- contact Ed Eloranta about his estimation of Ni for comparison
- height-colour-coded back trajectories
- will contact Dave Turner about AERI-LWP data
- will contact Ann Jefferson and John Ogren about more aerosol data (aerosol composition)
- sea ice lead satellite photo?
- surface flux plots
- nice sounding plots
- will check into calculation of mean W (in-cloud only?)
- estimation of Ni
- plots of 40m tower meteo variables
- KAZR spectrum width plots
- adjust CCN to observed changes
- rerun ECMWF SCM with cloud fraction variation and AERI-LWP.