

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

Session Title: Vertical Velocity Focus Group (VVFG)

Session Date: Wednesday, March 18, 2015

Session Time: 1:30–3:30pm

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Main Discussion

The Vertical Velocity Focus Group (VVFG) met after a year during the 2015 ARM/ASR Joint User and Principal Investigator's (PI) meeting. The two basic objectives of the focus group are 1) to improve understanding of cloud dynamic-microphysics interactions, and 2) to produce observational targets (i.e., data products) suitable for evaluating models.

In the beginning of the session, progress on research projects led by seven PIs were highlighted. One research project used high-resolution model simulations to improve representation of sub-grid scale interactions between microphysics and dynamics in global climate models (GCMs). Two research projects were focused on retrievals of drop size distribution during heavy precipitating conditions. Two studies used high-resolution vertical velocity retrievals to calculate cloud top entrainment rates for stratocumulus topped boundary layers. One study was focused on comparing retrievals of vertical velocity made using aircraft observations and ground-based Doppler radar observations. One study was focused on retrieving vertical air motion from satellite observations. Broadly synthesizing, the group made significant progress in achieving the objectives during warm low-cloud conditions, heavy (deep) precipitating conditions, and cirrus cloud conditions. While fewer studies and fewer data products for mixed-phase clouds suggest difficulty in achieving both of the VVFG objectives for these conditions.

An overview talk was given by Hugh Morrison, National Center for Atmospheric Research, on how vertical velocity is needed to further understanding of dynamics-microphysics interactions and improving GCM simulations of deep convective clouds. The talk was well received and led to the conclusion that in addition to magnitude of vertical velocities, the depth (height) and width of the updrafts are crucial to for model improvement/evaluation and need to be quantified in the ARM data sets. This result provides excellent guidance to future research and data product development in deep convective clouds.

Pavlos Kollias, McGill University, gave a talk on potential use of ARM observations from scanning precipitation radars and Doppler lidars to retrieve vertical air motion and divergences during clear-sky convective conditions. The concept has been previously used in other non-ARM field campaigns. The discussion was fruitful and several modelers expressed interest in the potential experiment. The campaign requires minimal changes in radar scan strategies and will answer some crucial questions related to the ASR science plan. We intend to pursue the idea further and propose an intensive operational period (IOP) together with a few key members of the focus group and possibly involve PIs of the Plains Elevated Convection at Night (PECAN) field campaign.

The third and last talk in the breakout session was led by Ed Luke, Brookhaven National Laboratory, and gave a nice overview of the proposed algorithm for the integrated Vertical Velocity Best Estimate (VVBE) data product. The plan and algorithm were very well received by the focus group participants. Discussion after the talk was focused on the sites used as a testbed for VVBE and also the output variables of the data product. A first draft of the list describing the output variables of VVBE was generated during the discussion. The conclusion of the discussion was to develop a white paper describing

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the VVBE algorithm and plan, which would then be submitted to ARM as an Engineering Change Request (ECR) for review by ARM management.

Finally, there was some discussion around the future of the VVFG. The VVFG has accomplished several of its goals described in the initial white paper when the group was formed. The proposed VVBE will cover most cloud regimes, except for deep convection and mixed-phase clouds. While there is some developments in the area of deep convection, there is no current research for vertical velocity in mixed-phase clouds (to our knowledge). We discussed the potential for folding the remaining topics into the regime based focus/interest groups. The general consensus was that the focus group should remain as is because the topic would get lost in the larger groups. However, it would be appropriate for new topical experts to lead the advancement of the group and a white paper would need to be formulated with new science drivers.

Decisions

- To pursue a proposal to conduct an IOP for measuring clear-air, vertical-air motion from scanning precipitation radars.
- To submit an ECR for generating a VVBE data product.

Future Plans

- Develop a plan for the future of the VVFG.

Action Items

- Submit a white paper and ECR describing the VVBE data product.