

Science discussion

Main goals:

- Identify common areas being worked on among ARM/ASR funded groups to help facilitate collaboration
- Discuss role of ARM observations and new field campaigns in these areas, especially in light of recent CPMSG highlights and the 2020 ARM Decadal Vision
- Ideas for a future workshop?

Possible discussion topics

- Draft dynamics, structure, entrainment
- Upscale growth, convective organization, MCSs
- Convective microphysics, including aerosol impacts

General questions to keep in mind:

- What are key science questions related to the above topics, and what is the current ARM/ASR research addressing these? Can efforts be coordinated across ARM/ASR?
- Are there key measurement gaps that ARM is well suited to fill (measurements, convective regimes, etc.)?
- Are there specific working group recommendations we can make for the CPMSG?
- How can we maximally leverage recent and planned future ARM activities (e.g., field programs, long-term sites, LASSO, etc.) to address specific science topics?

• Draft dynamics, structure, entrainment

- Specific science problems: relation of entrainment to draft structure, environmental controls on draft dynamics and entrainment, controls on updraft width, role of wind shear, roles of aerosol, precipitation and ice microphysics
- What observational advances are needed to characterize draft structure/evolution? Are current directions and planned efforts sufficient? Is there an appropriate balance between detailed case observations and long-term statistics?
- How can LASSO-CACTI be incorporated into CPWG research? Specific suggestions (e.g., output/analysis)? Future directions?
- What ARM/ASR research is being directed to *downdrafts* (generally less studied than updrafts)?
- How can these results be used to evaluate/improve convection-permitting models?
- What are key missing pieces for improving convection parameterizations?



- **Upscale growth, convective organization, MCSs**

- Specific science problems: role of downdrafts/cold pools; coupling w/ large-scale features e.g. MJO, tropical waves; convective-stratiform partitioning; multiscale interactions w/ gravity waves, smaller-scale draft dynamics, entrainment, turbulence
- What observational advances are needed that may be possible within ARM (e.g., can we improve characterization of cold pools)?
- How can research on related CPWG topics (e.g., draft dynamics and entrainment, convective microphysics) inform ARM/ASR research on convective organization?
- Implications of convective organization for convection parameterizations?



- **Convective microphysics, including aerosol impacts**

- Specific science problems: microphysics-dynamics coupling, ice initiation and cloud glaciation, evolution of size distributions, anvil microphysics, coupling of convective/stratiform microphysics, properties/impact of rimed ice, aerosol-cloud interactions
- What is needed in terms of improved cloud/precip property retrievals, or improved aerosol measurements?
- Relation to other CPWG topics, particularly draft dynamics/structure (e.g. how does the thermal-like nature of convection impact microphysics evolution?)
- How can this research be used to improve microphysics schemes?
- Microphysics in convective schemes – what level of detail is sensible? What's needed to improve representation of microphysics in schemes?