Convective Processes Working Group

Co-Chairs

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Joint ARM User Facility and ASR PI Meeting

Monday, June 21, 2021

Photo courtesy of Ramón Alberto Acuña (SMN).

Mission

The mission of the Convective Processes Working Group is to document from observations and modeling, and thereby develop understanding of, the dynamical, thermodynamical, microphysical, and radiative processes that together determine the evolution of convective cloud systems from formation to dissipation, and to translate this understanding into methods for representing convective cloud processes in numerical weather and climate models.

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Research Themes

Convective System Transitions

- **Shallow to Deep (Liquid to Ice, Entrainment, Cold Pools)**
- **Mesoscale-Synoptic Organization (MCS Life Cycle, Cold Pools, MJO)**

Convective Dynamics

- **Observational Retrievals**
- **Entrainment, Detrainment, and Dilution**
- **Two-way Interactions with Microphysics and Surrounding Environment**

Aerosol-Cloud Interactions

- **Liquid and Ice Microphysical Effects**
- **Cloud Dynamical Effects**

Parameterization Evaluation and Improvement

- **Convection and Organization**
- **Microphysics**
- **Turbulence**

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2020 ARM/ASR PI Meeting Discussions

- A lot of focus on **updraft size, strength, and entrainment**, which are critical to shallow-to-deep transition, vertical transport, and cumulus parameterizations. There is a lot of progress currently happening in this area.
  - **Sensitivities to evolving environmental (thermodynamic, kinematic, aerosol) conditions** are not quantified.
  - A critical need to formulate new, better targeted **observational strategies**.
  - **Tropical, oceanic shallow through deep convection** is an ideal target.

- Other topics of discussion:
  - Interest in better utilizing **Doppler spectra**.
  - More **distributed profiling networks** for near-cloud meteorological information would be very beneficial.
  - ARM data is uniquely positioned to further tackle **stratiform-anvil-radiation research**.

- Not much consensus for prioritization of community data needs and directions apart from the need for **scanning radar retrievals and better-informed observations/modeling strategies.**

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Relevant Datasets and Sessions

- **Recent Field Campaign**
  - CACTI (orographic convection in Argentina) Oct 2018 – Apr 2019; adam.varble@pnnl.gov
  - LASSO (LES runs of CACTI shallow to deep cases); william.gustafson@pnnl.gov, vogelmann@bnl.gov

- **Upcoming Field Campaigns**
  - SAIL (orographic convection in Colorado Rockies) starts September 2021; drfeldman@lbl.gov
  - TRACER (coastal convection near Houston, TX) starts October 2021; mjensen@bnl.gov
  - SEUS (inland convection over the SE US) tentatively begins March 2023; seusteam@arm.gov

- **Breakout Sessions**
  - "Aerosol processes in deep convection: discovery to parameterization"
    - Convened by Manvendra Dubey, Jiwen Fan, Jim Smith, and Chris Cappa from 11 AM – 1 PM EST on Tuesday, June 22
  - "Improving understanding of deep convection life cycle with novel measurement and modeling approaches"
    - Convened by Zhe Feng and Jim Marquis from 11 AM – 1 PM EST on Wednesday, June 23

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