

Atmospheric Composition and Convection Workshop

26 – 28 August 2014

Jet Propulsion Laboratory, California Institute of Technology

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Atmospheric convection and its impacts continue to present a significant challenge to modeling of both climate and atmospheric composition. The global impacts of convection on cloud fields and on the spatial distribution of water vapor and trace gases are large and poorly quantified, leading to significant uncertainties in radiative forcing and in the impact on global air quality. Atmospheric composition observations have been used to inform the modeling and parameterization of convective transport and associated chemistry.

However, the majority of these studies have been based on field-campaign data and the application of satellite-based composition observations to this problem is in its infancy, with only a few such studies published to date.

The goals of this workshop are:

- To increase the dialogue between the atmospheric chemistry and climate modeling communities, leading to improvements in convective parameterizations in global and regional climate and atmospheric chemistry models
- To build collaborations between (JPL) scientists engaged in atmospheric modeling of convection and those engaged in atmospheric composition observations
- To elucidate requirements for future space-based atmospheric science missions

The focus of the workshop will be on deep convection, for which satellite observations of atmospheric composition are likely to be more insightful than is the case for shallower convective systems.

First day (Tuesday 26 August 2014)

Introductions

8:30 am – Welcome, logistics, goals of workshop

Each 30 minute talk includes 20–25-minute presentation followed by discussions.

Topic 1: Modeling of convection in global, regional, and process level models

8:45 am – Review of the “state of the art” for the representation of convection in global climate models (*Leo Donner*)

9:15 am – Depiction of convection and convective transport in the WRF model (*Roy Rasmussen*)

9:45 am – Application of Large Eddy Simulation (LES) models to studies of shallow convection (*Georgios Matheou*)

10:15 am – Coffee break

10:45 am – A perspective from global cloud-resolving models (NICAM) (*Kentaro Suzuki*)

11:15 am – Limitations of Convective Parameterization Schemes in Global CRMs (*Bob Walko*)

11:45 am – A new Eddy Diffusivity / Mass Flux parameterization (*Joao Teixeira/Kay Suselj*)

12:15 pm – Lunch break

Topic 2: Diagnosing the depiction of convection in global, regional and process models

- 1:15 pm – Upper tropospheric cloud ice and water vapor as convective indices (*Hui Su*)
- 1:45 pm – Using observations of ozone and CO to diagnose convective parameterizations in global chemistry transport models (*Jennifer Logan*)
- 2:15 pm – Using water isotopes and CO to constrain convective parameterizations in the GISS model (*Robert Field*)
- 2:45 pm – Use of observations to evaluate model simulations of convection (*Gretchen Mullendore*)
- 3:15 pm – Coffee Break
- 3:45 pm – Convective simulations in regional models – intercomparisons and validation against airborne observations (*Mary Barth*)
- 4:15 pm – Diagnosis of convective parameterizations in single column model and cloud resolving models using trace gas observations (*Lesley Ott*)
- 4:45 pm – Evaluating CRMs using Satellite Data (*Johnny Luo*)
- 5:15 pm – Adjourn for day

Second day (Wednesday 27 August 2014)

Topic 3: The impact of convection on global atmospheric composition and dynamics

- 8:30 am – Global characterization of the interactions between deep convection and the environment (*Ed Zipser*)
- 9:00 am – Global Chemistry Transport Models (*Junjie Liu*)
- 9:30 am – Stratospheric water vapor (*Michael Schwartz*)
- 10:00 am – Coffee break
- 10:30 am – Impact of convection on gravity waves (*Joan Alexander*)
- 11:00 am – Fast process diagnostics and constraints on convective parameterization (*David Neelin*)

Transition to group discussions

- 11:30 am – Discussion of topics raised and charge to break out groups
- 12:00 pm – Lunch break

Discussion 1: Future opportunities for collaborative research

Two discussion groups, one focusing on convection in global models, the other on convection in regional/local models.

- 1:00 pm – Discussion: What scientific studies, using existing data and modeling resources, have the potential to advance the field and increase collaboration between the convection and composition communities?
- 3:00 pm – Coffee break
- 3:30 pm – Discussion continues / wraps up
- 4:30 pm – Groups recombine for summary discussion
Full group reconvenes for summary reports/discussions from the two groups. These should include assessments of what collaborative work can start now, what proposals could/should be written, whether we need to advocate for new/expanded research

programs, and whether there are other people in the community, or other communities, whom we should involve.

- 4:30 pm – Report from “global” group
- 4:45 pm – Report from “regional/local” group
- 5:00 pm – Any other topics arising from the day’s discussions
- 5:30 pm – Adjourn for day
- 7:00 pm – Workshop dinner, **venue TBD.**

Third day (Thursday 28 August 2014)

Review of future missions / opportunities of interest

- 8:30 am – An overview of the atmospheric science mission environment (*TBD, Duane? HQ representative?*)
- 8:45 am – Plans and concepts for future physical / meteorological observations (*Graeme Stephens, Bjorn Lambrigsten, David Diner, Simone Tanelli, Tony Mannucci?*)
- 9:30 am – Plans and concepts for future composition observations (*Nathaniel Livesey, Jessica Neu, Stanley Sander, John Worden*)
- 10:15 am – Coffee break
- 10:45 am – Assessment of future needs from the convection modeling community (*Sue van den Heever*)
- 11:15 am – Assessment of future needs from the convection modeling community (*Wei-Kuo Tao*)
- 11:45 am – Charge to second discussion groups
- 12:00 pm – Lunch Break

Discussion 2: Requirements for future missions

Divide into two groups, one on tropical convection, the other on mid-latitude.

- 1:00 pm – Discussion: What knowledge gaps will remain following the studies in discussion one? What are the implications for these gaps, and what new observations are needed to close them?
- 3:00 pm – Coffee break
- 3:30 pm – Discussions continue / wrap up
- 4:30 pm – Groups recombine for summary discussion
Full group reconvenes for summary reports/discussions from the two groups. These should include assessments of what studies are needed to bolster the case for enhanced measurements to advance this research area?
- 4:00 pm – Report from the tropical group
- 4:15 pm – Report from the mid-latitude group
- 4:30 pm – Any other topics arising from the discussions
- 5:00 pm – Summary of plans going forward
- 5:30 pm – Adjourn