Séminaire jeudi le 7 mai 2015 11:00 / Seminar Thursday May 7th 2015 11:00h

Sujet/Subject: Untangling microphysical impacts on moist convection applying a novel modeling methodology

Langue/language : Anglais/English

Conférencier/Lecturer: Wojciech W. Grabowski, (NCAR)

Résumé/Abstract:

Formation and growth of cloud and precipitation particles ("cloud microphysics") affect cloud dynamics and such macroscopic cloud field properties as the mean surface rainfall, cloud cover, and liquid/ice water paths. Traditional approaches to investigate the impacts rely on parallel simulations with different microphysical schemes or with the same scheme with different parameters. Such methodologies are not reliable because of the natural variability of the cloud field that is affected by the feedback between cloud microphysics and dynamics. We developed a novel modeling methodology, referred to as the microphysical piggybacking, to assess the impact of cloud microphysics on cloud dynamics and on simulated macroscopic cloud field characteristics. The main idea is to use two sets of thermodynamic variables driven by two microphysical schemes (or by the same scheme with different parameters), with one set coupled to the dynamics and driving the simulation, and the other set piggybacking the simulation, that is, responding to the simulated flow but not affecting it. We will present application of this methodology to cloud field simulations of shallow and deep convection. We will show that the new methodology allows assessing the impact of cloud microphysics on cloud field properties with unprecedented accuracy. By switching the sets (i.e., the set driving the simulation becomes the piggybacking one, and vice versa), the impact on cloud dynamics can be isolated from purely microphysical effects. We will show that the new methodology documents a rather insignificant impact of the assmed cloud droplet concentration on convective dynamics for the case of scattered unorganized deep convection. These results cast doubt on the dynamic basis of the deep-convection invigoration in polluted environments.