

## Modeling condensation in cloud-scale models

## Wojciech W. Grabowski

NCAR/ MMM Boulder, Colorado

Condensation of water vapor to form and grow cloud droplets is the most fundamental process of cloud and precipitation formation. It drives cloud dynamics through the release of latent heat and determines the strength of convective updrafts. Cloud-scale models typically simulate condensation by applying two drastically different methods. The first one is the bulk condensation, where cloud water is assumed to exist only in saturated conditions and evaporates instantaneously when the air becomes sub-saturated. The second approach involves prediction of the in-cloud super- or sub-saturation and is typically associated with models that predict not only condensate mass but also relevant features of the droplet size distribution (e.g., models with the 2-moment microphysics or with the bin microphysics). However, predicting in-cloud super- or sub-saturation is numerically cumbersome. This talk will address the question whether the difference between the two approaches has a noticeable impact on convective dynamics. To answer this question with confidence, we apply a novel modeling methodology, the microphysical piggybacking. Piggybacking simulations with the bin microphysics for shallow non precipitating convection and the double-moment bulk microphysics for deep convection will be discussed. For the shallow convection, the differences in cloud fields simulated with bulk and bin schemes come not from small differences in the condensation but from more significant differences in the evaporation of cloud water near cloud edges as a result of entrainment and mixing with the environment. For the deep convection, model results show a significant dynamical impact of finite supersaturations and a strong microphysical effect associated with upper-tropospheric anvils. Implications of these results for modeling of convective dynamics will be discussed and a possible intermediate modeling methodology will be suggested.

> *This seminar will be webcast live at:* http://www.fin.ucar.edu/it/mms/fl-live.htm

Recorded seminar link can be viewed here: https://www.mmm.ucar.edu/events/seminars

Thursday, 15 September 2016, 3:30 PM

Refreshments 3:15 PM NCAR-Foothills Laboratory 3450 Mitchell Lane Bldg 2 Main Auditorium, Room 1022



