

**ATS Special Seminar**

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**Hosted by Sue van den Heever**

**3 p.m. Monday, April 18**

**ATS West 121 or Microsoft Teams**

**An Estimate of Convective Mass Flux from Satellite Observations: Methodology, Validations, and Applications to Convective Dynamics Studies**

Most current GCM cumulus parameterization schemes are based on the concept of convective mass flux. Yet, no global observations of this critical parameter exist at this time. To fill the vacuum, we developed a novel, satellite-based method to retrieve convective mass flux. The method is a hybrid approach that blends multiple information across the scales, including satellite observations of convective cloud properties, ambient sounding, and plume model simulations, and then combines them in a Bayesian manner to retrieve vertical profiles of convective vertical velocity ( $w_c$ ) and convective mass flux ( $M_c$ ). Two validation studies have been conducted to assess the mass flux retrieval method. First, the satellite-retrievals are compared with collocated ground-based radar wind profiler (RWP) observations collected by the DOE ARM program during the GoAmazon 2014/15 field campaign. Then, an Observing System Simulation Experiment (OSSE) was conducted using Large-Eddy Simulations. Both validation studies show that the satellite-based method performs reasonably well in retrieving  $w_c$ . Discrepancies will be discussed. The satellite-based estimates of  $w_c$  and  $M_c$  open up new opportunities for studying convective cloud dynamics globally. We will show two examples: one concerns the global patterns of  $w_c$ , and the other investigates the temporal variation of  $M_c$  following convective lifecycle. In addition, we will show a preliminary evaluation of a GCM simulation using the new convective mass flux dataset. Finally, we will discuss future opportunities for this line of study.

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