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A PDF based parameterization of microphysical variability in cumulus convective clouds

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Unbiased calculations of microphysical process rates such as autoconversion and accretion in mesoscale numerical weather prediction models require that subgrid-scale variability over the model grid volume be taken into account. This variability can be expressed as probability distribution functions (PDFs) of microphysical variables. Using dynamically balanced Large Eddy Simulation (LES) model results from cases of shallow and congestus cumulus clouds, we developed PDFs of the cloud water, droplet concentration, and rain water variables.
The fidelity of various PDF approximations was assessed by evaluating errors in estimating autoconversion and accretion rates. Biases in these microphysical process rates are assessed assuming different approximations of the 2D joint PDFs (JPDFs) which vary in their complexity.

In the presentation we will address the possibility of: 1) using a single PDF representing the whole cloud, and 2) using a universal PDF applied to different cloud types.