1.23 LEVERAGING RADAR OBSERVATIONS TO PROBABILISTICALLY INFORM NEW CLASSES OF MICROPHYSICAL PARAMETERIZATION SCHEMES

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We present work on using profiling radar Doppler spectra and polarimetric radar to develop and constrain new classes of microphysical parameterization schemes, using Bayesian parameter estimation methodologies to robustly quantify scheme uncertainties. We are motivated by clear and persistent biases in existing microphysics schemes, as well as by the richness of profiling and polarimetric radar data. In one case, we develop a liquid (i.e. rain and cloud) microphysics scheme designed such that both its parameters and its structural complexity are capable of being constrained by observations. We present how such a constraint is implemented in an idealized framework, and will discuss opportunities and challenges with using real radar observations to inform the scheme's structure and sensitivities. We also show initial results from work combining polarimetric and profiling radar data to constrain ice microphysical processes of a particle property predicting ice microphysics scheme. We consider vapor growth, riming, and aggregation, and simulate observed cases where individual processes are considered the dominant source of hydrometeor property and size distribution evolution. Our model is coupled to a detailed ice scattering database capable of modeling the polarimetric radar signatures of combinations of diverse crystal habits. In all cases observational uncertainties are fed into the Markov Chain Monte Carlo parameter estimation framework that simultaneously constrains our model parameters and estimates their respective uncertainties.