



## **Impact of Complexity in Cloud Microphysics Parameterizations on the Development of Tropical Cyclones**

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Development of tropical cyclones is very sensitive to uncertainties in the physical representation of cloud dynamics. This presentation highlights major results from a series of numerical experiments with the Advanced Research WRF (ARW) model that were carried out for the purpose of comparing and evaluating three types of microphysics parameterization (MP) schemes with increasing complexity: the single-moment bulk formulation, the double-moment bulk formulation and the spectral-bin formulation. We will first compare the sensitivity of the asymptotic behavior of the ARW-simulated intensification of an idealized tropical cyclone to the three MP schemes representative of the three types that are available and well tested in the WRF model. We will then compare the heating profiles and hydrometeor distributions from the three schemes. Finally, we will compare the assumptions embedded in the formulations of the three schemes. Using the results from the sensitivity experiments and the comparisons of the three schemes, we will discuss the issues and challenges that the research community is facing in improving MP schemes for accurate representation of convection in operational tropical cyclone prediction models.