Introduction
In this study, we investigate the roles of microphysics and cloud-radiative feedback (CRF) on the structure and intensity of model-simulated tropical cyclones (TCs). Cloud microphysics in TC simulations are important not only as a major source of latent heating but also as an important contributor to CRF. In tropical cyclones, radial outflow in the anvil advects the hydrometeors that cause the radiative forcing. This outward transport of hydrometeors and the associated CRF result in a radial extension of the associated radiative forcing and forms a positive feedback. More efficient outward transport of hydrometeors may serve to actively render it more unstable to convection beneath the anvil (Fovell et al. 2010, GRL). Therefore, as the first step of this study, we examine the sensitivity of the WRF-simulated TC intensity and structure to various radiation and microphysics parameterization schemes.

Model Setup
WRF-ARV is initialized with a weak axisymmetric vortex disturbance in an idealized tropical environment that is favorable for the vortex disturbance to develop into a hurricane. The initial mass and wind fields associated with the weak vortex disturbance are obtained by solving the nonlinear balance equation for the given sounding and winds. MWR, and the prescribed background thermal forcing. There is also sensitivity to the choice of microphysics at 72h for experiments with varying radiation schemes using the Ferrier, WSM3, and WSM6 microphysics schemes. Shown are 7h time averages centered at 24h (left) and 132h (right).

Summary
• The choice of microphysics scheme has a strong impact on the TC intensification in terms of timing as well as structure. By 48h, the SLP differed by over 25 hPa, while the max 10-m winds differed by 11 m s⁻¹, depending on the microphysics scheme applied. Differences in TC structure are apparent very early in the simulation (<12h).
• The impact of radiative processes on the tangential wind structure begins as early as 24h, but is greatest during the mature phase of the storm – after the anvil cloud has developed. Simulations with and without radiative processes have approximately the same max 10-m windspeed for the first 72h.
• Varying the microphysics scheme can result in different profiles of hydrometeor mixing ratios. Consequently, significant differences in net heating profiles and resultant TC structure may occur due to cloud-radiative feedback.
• There is also sensitivity to the choice of radiation scheme, as shown by variations in the precipitation rate and microphysics-induced diabatic heating profiles.
• Uncertainties in the representation of clouds and their interaction with radiation present a challenge for NWP model improvement. The interdependence of physical processes may require a “package” approach to model physics.