A Comparison of the Polarimetric Radar Characteristics of Hurricanes Harvey (2017) and Florence (2018)

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Operational polarimetric radar data are used to compare the precipitation characteristics of Hurricanes Harvey (2017) and Florence (2018). NEXRAD radar data from Houston, TX (KHGX) and Morehead City, NC (KMHX) were processed using the Lidar Radar Open Software Environment (LROSE) package for quality control and PID identification to isolate observations of near-surface rain. Once radar gates containing rain were identified, domain distributions of various polarimetric variables and estimated drop size distribution (DSD) parameters were calculated through time. As expected from prior studies, the polarimetric radar observations from Harvey show a dominance of small-to-medium drops in high quantities. However, the microphysical characteristics were spatially and temporally inhomogeneous. DSDs consisting of larger drops were more common on 27 August 2017, whereas high number concentration DSDs were more frequent on 28 and 30 August 2017.
The distributions of ZH, ZDR, and DSD types observed during Florence exhibit broad similarities to Harvey, but the polarimetric distributions are narrower with fewer observations of strong ZH and ZDR values and high number concentration, large raindrop DSDs. Additionally, the polarimetric distributions did not vary much throughout the event; the shifts in the dominant DSD type observed during Harvey were not present during Florence. Compared to Harvey, the data suggest Florence had reduced coverage of deeper, vigorous convection. We hypothesize that the different tracks, decay rates, and surrounding deep-layer wind shear produce distinct precipitation structures that underpin the microphysical differences seen in Harvey and Florence.

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