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Modeling Lightning Activity in Hurricanes

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In a recent study Price et al. (2009) have shown that lightning activity in intense hurricanes precedes the maximum sustained winds in the eye of the storms by approximately 30 hours. In this paper we attempt to further this study by modeling the lightning activity in hurricanes using the Weather Research and Forecasting (WRF) meso-meteorological model, using explicit cloud microphysics, and a lightning scheme developed by the authors (Lynn et al., 2012). The model successfully simulates the growth and decay of hurricanes, and accurately forecasts their development, tracks and intensities. While the simulated lightning spatial distribution in hurricanes cannot be well verified with available global lightning networks, the modeled lightning patterns in hurricanes agree well with previous case studies showing lightning in the eye-wall and rain bands. In addition, in relation to the Price et al. (2009) study, the model also shows the maximum lightning activity occurring before the maximum sustained winds of the storms, with a similar lag of 30 hours often shown in the model simulations. While forecasting of hurricane trajectories is well reproduced by many models, hurricane intensity is less well forecast. Hence, these results imply that lightning forecasts using the WRF model may significantly improve the forecasts of hurricane intensification and decay.