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Observation, Modelling of Lightning Activity in Hurricanes

Colin Price[1], Yoav Yair[2*], Barry Lynn[3], Na'ama Reicher[1]

[1]Tel-Aviv University, Tel-Aviv, Israel, [2]The Open University, Ra'anana, Israel, [3]Weather It Is, Efrat, Israel

Modern global lightning detection networks enable us to monitor and investigate the lightning activity in areas where there is little or no coverage by local lightning location systems, such as the remote regions or the oceans. Hence, we are now better able to track and understand the complex connection between hurricane development and electrical activity in these dangerous storms. In a recent study (Price et al., 2009) it was shown that in category 4-5 hurricanes (typhoons), there is a clear increase of lightning activity approximately one day before the maximum intensity (lowest pressure, strongest winds) of the storm. Additional analysis confirms this initial finding, possibly allowing us to use real-time lightning observations to forecast the time of hurricane intensification. We have also started modeling lightning activity in hurricanes using the WRF mesoscale meteorological model. Numerical simulations of the electrical activity in hurricanes, employing microphysical parameterization of the charging potential (using the Lightning Potential Index, LPI; Yair et al., 2010) show a reasonable agreement with the observations of lightning for the few case studies we have analyzed thus far. Both observations and modeling results will be presented.

Price, C., M. Asfur and Y. Yair, 2009: Maximum hurricane intensity preceded by increase in lightning frequency, Nature Geoscience, doi:10.1038/NGEO477, 2, 329-332.

Y. Yair, B. Lynn, C. Price, V. Kotroni, K. Lagouvardos, E. Morin, A. Mugnai, and M. d. C. Llasat (2010). Predicting the potential for lightning activity in Mediterranean storms based on the Weather Research and Forecasting (WRF) model dynamic and microphysical fields, J. Geophys. Res., 115, D04205, doi:10.1029/2008JD010868.

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