Evaluation of a challenging warm season QPF month at HPC: June 2009

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The Hydrometeorological Prediction Center's (HPC) Day 1 quantitative precipitation forecast (QPF) threat score for the 1 inch threshold in June 2009 was the lowest in ten years (0.131). This study examines why the threat score was so low and investigates in detail where and why the forecasts were in error. Particular focus is placed on the overall synoptic pattern of June, the common weather phenomena associated with HPC forecast errors, and the kinds of errors observed. A brief case example will be presented illustrating the commonly observed issues.

Fourteen days during the month of June when the daily threat score was less than 0.09 were identified for further investigation. Select operational/ensemble model guidance and radar imagery were locally archived and available for a majority of the days of interest. Other data including satellite imagery and upper air/surface observations were retrieved from internet sources. In addition to these data, the NCEP/NCAR reanalysis provided monthly means and anomalies at important atmospheric levels. The month featured a 160% of normal zonal wind at 250mb located across the Upper Midwest along with 120% of normal precipitable water values across the Central U.S. Above normal precipitation was observed from the Central Plains into the Ohio Valley, where a majority of the one inch forecast errors were observed. The three primary categories of precipitation tied to the erroneous one inch QPF were found to be connected with convection (67%), synoptic scale boundaries (28%), and stratiform (5%). Primary errors observed were due to position and magnitude, with some contributions from timing and duration. The reasons for forecast difficulty varied among a range of issues including uncertainty in MCS development, mishandling of MCVs, unforecast mesoscale boundaries, incorrect placement of synoptic scale boundaries, and numerical guidance induced convective feedback. This study illustrates the wide variety of forecast challenges associated with warm season quantitative precipitation forecasting, and highlights that on any given day, any number of possible forecast errors must be considered.

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