The April 28, 2011 early-morning tornado and flash flood event in central New York and northeast Pennsylvania

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A case study of a rare, early-morning tornado and flash flooding event in central New York and northeast Pennsylvania is shown. The tornadoes in central New York on the morning of 28 April, 2011, marked the final stages of a historical tornado outbreak that had its greatest impacts during the afternoon on 27 April, over the southeast United States. The event in central New York began shortly before 0600 UTC on the 28th, as a short line of thunderstorms spawned two tornadoes over the southern Finger Lakes area, ahead of a cold front moving east from Ohio to western Pennsylvania and New York. Shortly after the initial tornado touchdowns, the line broke up, and evolved into a series of supercells, which produced three more tornadoes. The event culminated as a second line of storms developed and moved east across the area. The primary impact of the second line was major flash flooding across northern Pennsylvania and southern New York, although another tornado was reported with the line in northeast Pennsylvania.

Storms on this day developed downstream from a deep trough of mid-tropospheric low pressure over the Ohio Valley, and a cold front moving east from Ohio to western New York and Pennsylvania. The focus for upward motion appeared to occur downstream of the surface cold front, juxtaposed with a cold front aloft and weak surface trough. Environmental instability was modest, however the low-level wind fields were very strong, with an 850 hPa southerly wind component of 4 to 5 standard deviations above normal and 0-1 km wind shear greater than 50 kt. High resolution model reflectivity is shown, and compared to observed radar reflectivity patterns. In general, a wide variety of reflectivity patterns were indicated by various models at various times, however all of the model runs appeared to develop some kind of linear feature prior to 12 UTC. Observed, radar-indicated normalized rotational values are shown from the GR2 analyst software for the tornadoes in this case. A wide variety of evolutions were indicated, ranging from rapid spin-up of rotation at all levels prior to tornado touchdown in some cases, a more gradual lowering of rotation from mid-levels to low-levels in another case, and relatively weak rotation in another case.