

An Analysis of Multiple Predecessor Rain Events Ahead of Tropical Cyclones Ike and Lowell: 10–15 September 2008

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An analysis of three predecessor rain events (PREs) that occurred ahead of North Atlantic tropical cyclone (TC) Ike and East Pacific TC Lowell during 10–15 September 2008 is presented. Each successive PRE was more intense than the previous. PREs #2 and #3 combined to produce all-time 24-h record rainfall totals at many locations, including Lubbock, Texas (190 mm) Wichita, Kansas (262 mm) and Chicago-O’Hare, Illinois (169 mm).

PRE #1 formed over Texas on 10 September in association with a decaying cold front, organized upon arrival of moisture from a disturbance over the Bay of Campeche, and matured beneath the equatorward entrance region of the subtropical jet (STJ). PRE #2 developed over the Texas Panhandle on 11 September, organized over Kansas and Missouri, ingested low-level moisture from the Bay of Campeche disturbance and middle- and high-level moisture from TC Lowell, and matured in the STJ equatorward entrance region. PRE #3 developed over Texas and northern Mexico on 11 September, merged with and absorbed PRE #2 over Kansas and Missouri, strengthened after ingesting moisture from TC Ike, and matured in the STJ equatorward entrance region.

Heavy rainfall associated with PRE #3 occurred ~1000 km north-northeast of TC Ike. The rainfall was especially heavy along a plume of moist air characterized by high precipitable water values that extended poleward from TC Ike to the Great Lakes near the juxtaposition of the nose of a low-level jet, low-level forcing for ascent along a warm front, the STJ equatorward entrance region, and an area of low-level vorticity generation. The cumulative bulk upscale effects of deep convection from all three PREs enhanced and “locked in” a downstream upper-level ridge over the Ohio Valley and a STJ over the Great Lakes and southern Canada.