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Hydrometeorological Analysis of Tropical Storm Hermine and Central Texas Flash Flooding, September 2010.

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Heavy rainfall and flooding associated with Tropical Storm Hermine occurred 7-8 September 2010 across central Texas resulting in several fatalities and extensive property damage. The largest rainfall totals were received near Austin, TX and immediately north where twenty four hour accumulations reached a 500 year recurrence interval. Among the most heavily impacted drainage basins was the Bull Creek watershed (58 km2) in Austin, TX where peak flows exceeded 500 m3 s-1. The large flows were produced from a narrow band of intense storm cells training over the small watershed for approximately six hours. Meteorological analysis along with Weather Research and Forecasting (WRF) model simulations indicate a quasi-stationary synoptic feature slowing the storm, orographic enhancement from the Balcones Escarpment, and moist air from the Gulf of Mexico were important features producing the locally heavy rainfall. The effect from the Balcones Escarpment was explicitly tested by conducting simulations with and without the escarpment terrain.

High resolution, gauge adjusted radar collected as part of a flash flood warning system was used to describe spatiotemporal rainfall patterns and force the Gridded Surface/Subsurface Hydrologic Analysis (GSSHA) model. The radar dataset indicated the basin received nearly 300 mm of precipitation with maximum sustained intensities of 50 mm hr-1. Roughly 60 percent of storm totals fell during two periods lasting a combined five hours. Stream flow showed a highly non-linear response to two periods of intense rainfall. GSSHA simulations indicate this can be partially explained by the spatial organization of rainfall coupled with landscape retention.