

## **Southern U.S. Heavy Rainfall Event – March 20-23, 2012**

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**Meteorological Overview:** A deep cyclone across the Western U.S. and strong ridging from the Intermountain West eastward was a mainstay fixture during the middle of March 2012. Such a synoptic setup lead to an expansive 500-mb closed low on 20 March 2012 (03Z) which cut-off over the Four Corners region; thus allowing the flow to split. With the primary steering flow anchored to the north over Canada, this cut-off low would spend the next few days drifting slowly to the east while helping build higher heights downstream (Figure 1a). The result of this highly meridional jet configuration would allow temperatures and dew points more reminiscent of late Spring to supplant itself across much of the eastern halves of the U.S. and Canada (Figure 1b). Record warmth blanketed this region, especially from the Northern Plains to the Upper Great Lakes. During a period from 13 March, while this pattern was evolving, through 22 March, high temperatures were on average 30-40°F above average which lead to several daily and monthly records being broken. In fact, International Falls, MN had three days in the upper 70s (17-19 March) which each broke the former record daily high temperature (73°F) for the month of March.

While the record warmth experienced for such an extended period of time was newsworthy, yet another artifact of this synoptic regime was the heavy rainfall which ensued from the Southern/Central Plains to the Southeastern U.S. The meridional orientation of the tropospheric flow lead to the transport of deep-layered moisture from the subtropics up to the middle of the country. Precipitable waters (PW) were near record values 1.25-1.50” readings commonplace. In fact, the Little Rock (LZK) sounding on 21 March 2012 (00Z) indicated a PW of 1.60”, which ranks between the 99<sup>th</sup> percentile (1.47”) and record value (1.76”). In addition, the sounding depicted a nearly saturated atmosphere up to ~425 mb (~6.8 km or -20°C), unidirectional winds extending throughout much of the troposphere, with warm-rain processes dominating the event. The unidirectional winds in place paralleled the surface boundary keeping the front in a nearly quasi-stationary state for much of the multi-day period. The tropical surge of moisture resulted in very large standardized anomalies of many atmospheric parameters. For instance, on Figure 2, the observed PW values exceeded 40 mm (1.57”) over sections of the Lower Mississippi Valley with even some 30 mm (1.18”) plus readings punching into the Lower Hudson Bay. Such values easily surpassed the 4 to 5 standardized anomaly maximum presented in the legend on Figure 2. This combination of deep-layered moisture with a steering flow parallel to the surface boundary lead to multiple occurrences of back-building and training convection across the Southern/Central Plains and Lower Mississippi River Valley during the 20-23 March 2012 time period.

**Impacts:** Excessive precipitation across portions of TX, OK, LA, and MS developed along a slow-moving frontal boundary (Figure 3). Fortunately this event helped alleviate some of the drought concerns which had been ongoing over the region. In addition to the anomalous precipitation, severe weather also impacted the Lower Mississippi River Valley where the SPC indicated there were 29 tornado reports on 20-21 March 2012. Despite the active period of weather, only a pair of flood-related fatalities were reported in the state of AR.

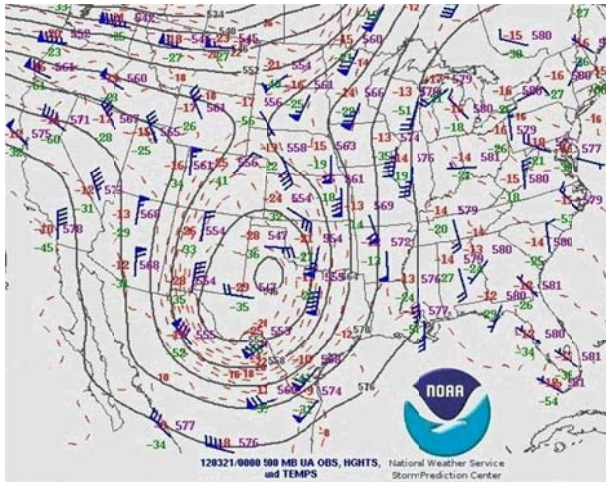


Figure 1 (a): Storm Prediction Center (SPC) 500-mb hghts/temps/UA [21 March 2012 @ 00Z]

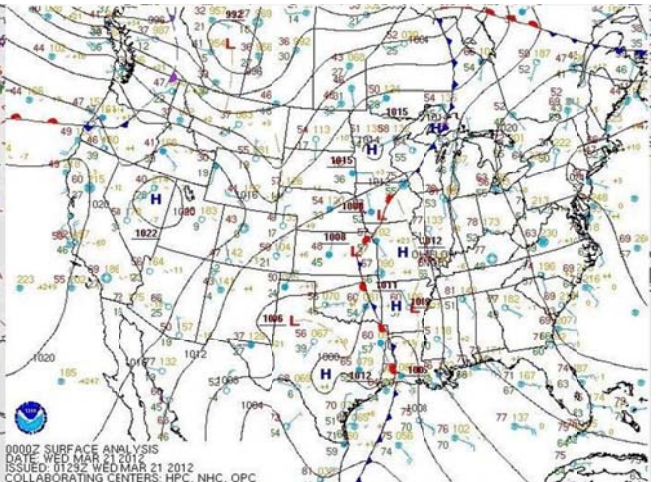
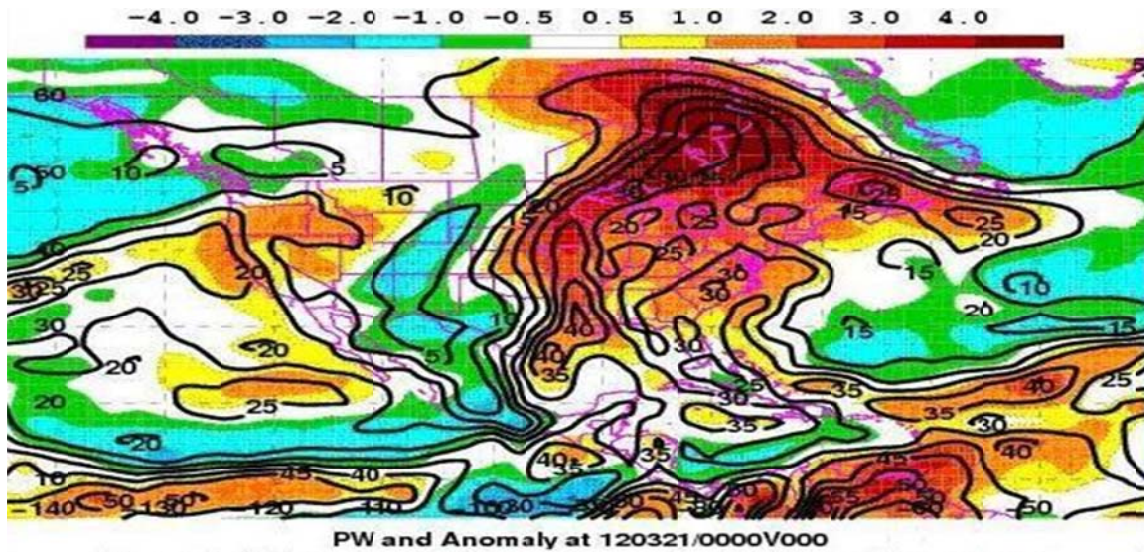
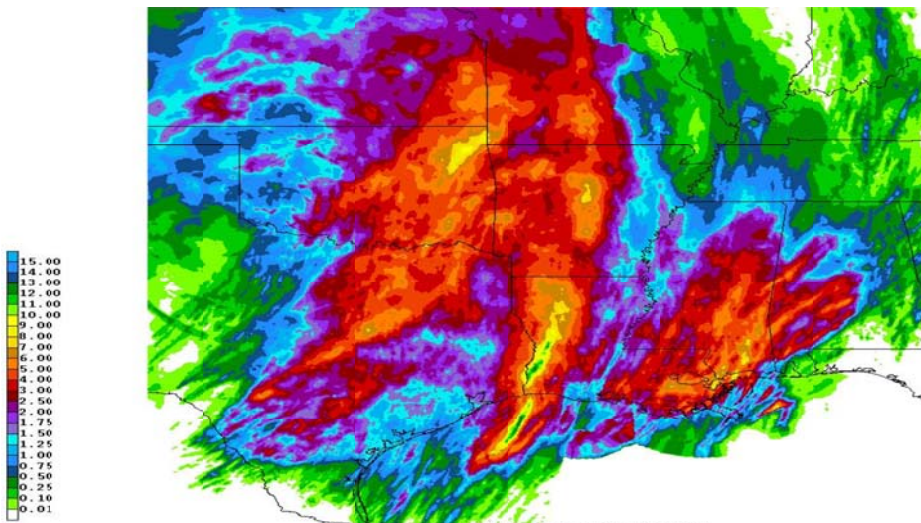


Figure 1(b): Hydrometeorological Prediction Center (HPC) surface analysis [21 March 2012 @ 00Z]



PW and Anomaly at 120321/0000V000  
 Figure 2: University of Albany-Atmospheric Science Department  
 PW standardized anomalies [21 March 2012 @ 00Z]



120323/1200 96-HR TOTAL OF 6-H CCPA QPE (IN)  
 Figure 3: Quantitative Precipitation Estimation (QPE) covering the period from 19-23 March 2012 [valid time: 12Z]