Southern Plains to Ohio Valley Winter Storm
5-7 December, 2013
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Meteorological Overview:

Late 4 December into early 5 December a 500 hPa low developed near the North Dakota-Canada border and tracked northeastward, reaching northern Ontario by late 5 December (*Fig. 1*). South of the low, a positively-tilted upper level trough extended back into the Southwest. Embedded within the base of this broader trough, a shortwave trough moved across the Southwest on 5 December into early 6 December before reaching the southern Plains later in the day.

During the evening of 4 December as the upper-level low formed and tracked to the northeast, a surface low tracked from the upper Midwest through the upper Great Lakes into southern Ontario by the morning 5 December. A trailing cold front extended back through the Ohio valley into the lower Mississippi valley and southern Plains early 5 December. This front progressed further to the south and east, reaching south Texas and the western Gulf coast by that evening. Temperatures fell sharply behind the front. High temperatures on 5 December were in the 20-30s across Oklahoma, northwest Arkansas and north Texas. On 6 December temperatures remained near or below freezing from central Texas to Ohio – correlating to 20-30°F below normal for parts of the region and a stark contrast to the 60-70s that were observed earlier in the week.

As the low level winds increased ahead of the aforementioned shortwave trough moving through the Southwest, moisture from the Gulf of Mexico was drawn back north of the front. A weak surface low developed along the front and further enhanced the warm air and moisture advection east of the low track, while furthering the cold air advection to its southwest. In response to the enhanced warm air and moisture advection, precipitation began to develop on 5 December across north Texas, Oklahoma into Arkansas, southern Missouri and the Ohio valley. Moderate to locally heavy precipitation developed and continued into 6 December from northeastern Texas and eastern Oklahoma into the Ohio valley as this moisture interacted with an area of strong low level frontogenesis (*Fig. 2*) and upper-level divergence along the right-entrance region of an upper jet maximum (*Fig. 3*).

Widespread snow accumulations of 4 inches, with local amounts of up to 13 inches, were observed from eastern Oklahoma to central Ohio (*Fig. 4)*. South of the heavier snow accumulations, a wintry mix was reported, with sleet amounts of 1-3 inches recorded across parts of northeastern Texas, eastern Oklahoma, northern and central Arkansas and southeastern Missouri. Freezing rains, with ice accumulations of 0.25 inch or more, were reported across portions of northeastern Texas, southwestern Oklahoma, western Arkansas, western and central Tennessee, western and central Kentucky and southern Indiana and Illinois.

Impacts:

Hundreds of thousands lost power due to the storm. In North Texas alone, a quarter-million customers were left without power, causing many businesses to close. The weather also forced more than 1,000 cancelations at Dallas-Fort Worth International airport – one of the nation's busiest airports and a key hub for American Airlines. The Dallas Marathon, scheduled for the

following Sunday and expected to draw 25,000 runners, was cancelled due to the storm's impacts. Authorities in Texas and Oklahoma reported at least three weather-related traffic deaths.

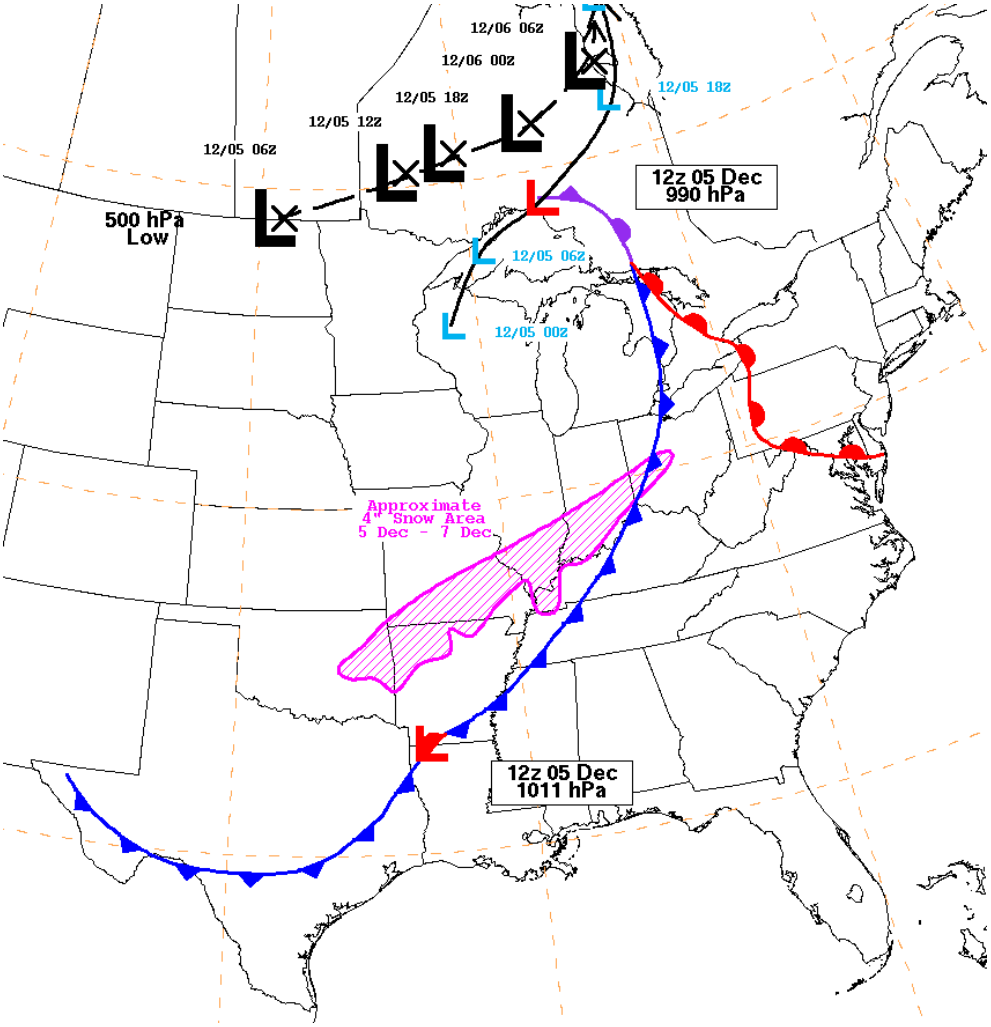

Fig 1: 500 hPa low (black L) track, surface low (blue) track, area of snow (magenta).

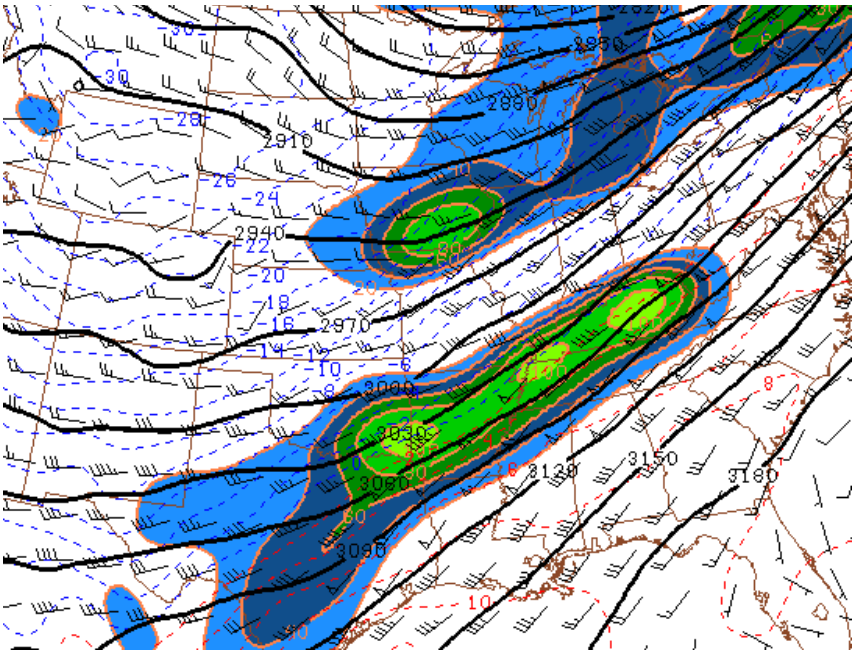

Fig 2: 700 hPa Petterssen frontogenesis (fill), height (black), temperature (blue) and wind at 12 UTC on 6 December 2013 (SPC).

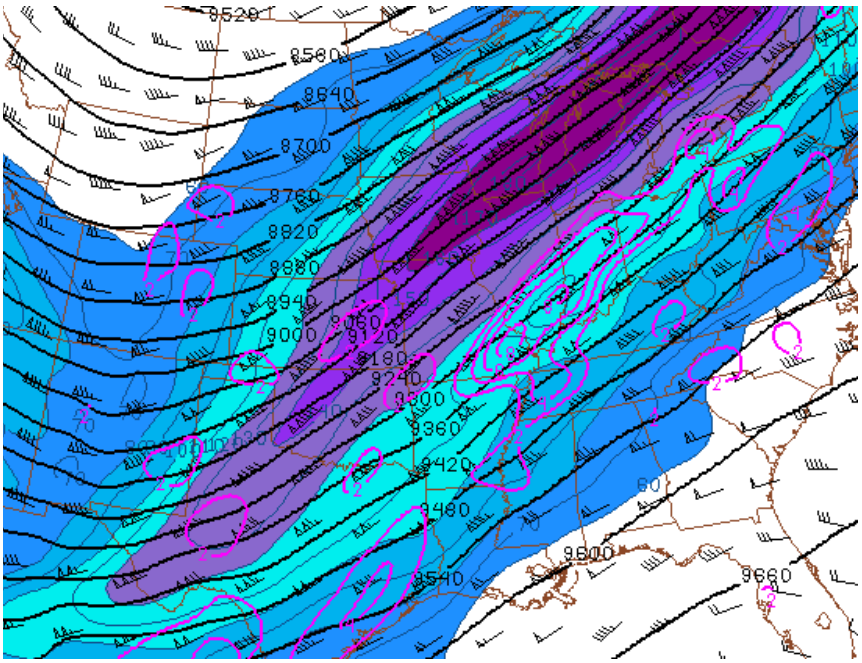

Fig 3: 300 hPa height (black), divergence (magenta) and wind at 12 UTC on 6 December 2013 (SPC).

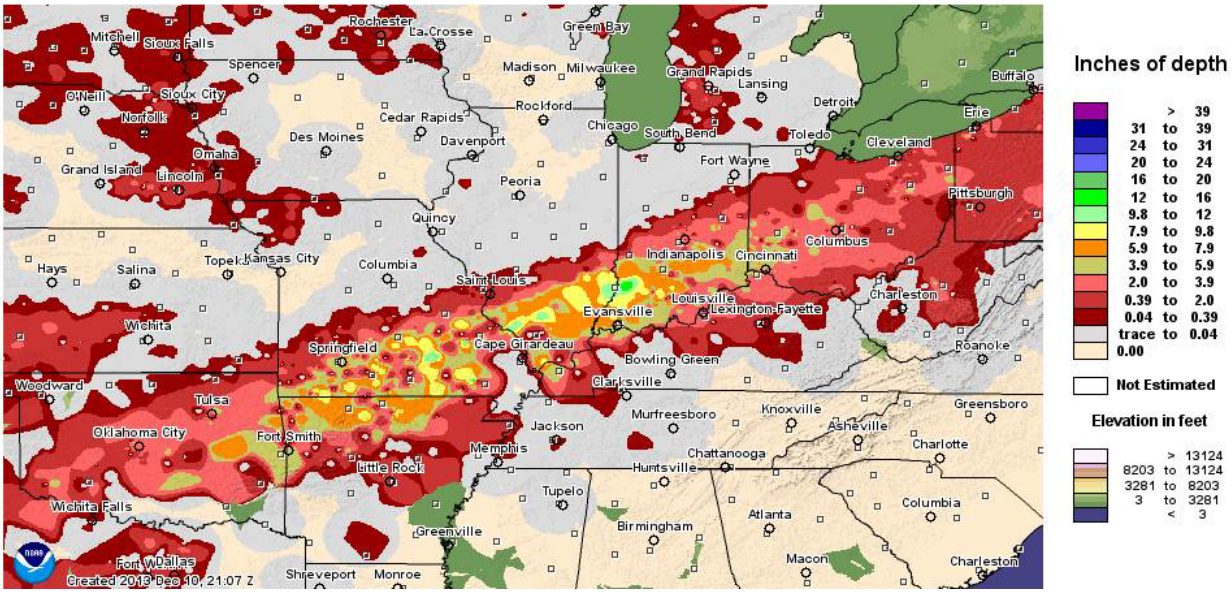

Fig 4: Total observed snowfall (interpolated) during 48h preceding 12 UTC on 7 December, 2013 (NOHRSC)