

Northern and Central Plains Spring Snowstorm
April 8-12, 2013
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Meteorological Overview: A major spring snowstorm affected the northern and central Plains April 8-12, 2013. More than a foot of snow fell across seven states with a maximum of 30 inches in South Dakota (Fig 1). A strong cold front diving out of Canada created a strong thermal gradient in vicinity of the High Plains. Temperatures ahead of the front reached the 60's and low 70's across portions of Colorado before falling into the 20's within a few hours. This strong thermal gradient combined with coupled upper level jets and a deep mid level trough provided the forcing for heavy snowfall across a large region.

On April 8th at 1200 UTC, a trough at 250 hPa was digging into the western U.S. The jet max quickly rounded the base of the trough and by 0000 UTC on the 9th the downstream jet began to intensifying. The High Plains were situated in the left exit region of the jet max exiting the trough, and the downstream jet's right entrance region. The heaviest snowfall occurred from approximately 0000 UTC on the 9th through 0000 UTC on the 10th. This time period coincides with the best upper level dynamics due to the coupled jets (Fig 2). Heavy snow continued to fall across portions of the upper Midwest as the couple jet region pushed northeastward. A shortwave trough at 500 hPa digging into the southwest U.S. on April 8th deepened to a 548 dm closed low over the southwest by 1200 UTC on the 9th. Strong diffluent flow was evident at this time over the High Plains downstream of the closed low, likely aiding in initiating strong vertical ascent over the region. The closed low slowly progressed northeastward, tracking across the High Plains. A cold winter-like air mass moving southward out of Canada crashed into a warm and moist air mass from the southern plains. This resulted in a very strong baroclinic zone over the central high plains by 1200 UTC on the 9th (Fig 3). Heavy precipitation fell in the cold sector from northern Colorado to South Dakota where a strong north northeasterly low-level jet of up to 40 knots had set up. As the 850 low progressed into the upper Midwest, the strong baroclinic zone was oriented north/south from the low in Iowa and then east/west extending into the Great Lakes. Heavy precipitation was observed along both baroclinic zones. By 1200 UTC on the 10th, the system became vertically stacked, and ceased deepening. The mid-level trough took on a negative tilt and began to fill by 1200 UTC on the 11th. Heavy snow was still falling across the upper Midwest along the TROWEL (Trough of warm air aloft) feature that was evident by 1200 UTC on the 11th. Without the aid of upslope flow, snowfall totals only reached around a foot across the upper Midwest.

Impacts: The Central and Northern Plains received 1 to 2 feet of snow from an early spring snowstorm. Favorable conditions for heavy precipitation at each level of the atmosphere were collocated in the same region and combined with upslope enhancement produced impressive snowfall totals. Major metropolitan areas affected include Denver and Minneapolis, where 4 to 8 inches of snow fell. High winds, with gusts over 60 mph, were observed behind the cold front as it cross the Central U.S. A strong pressure gradient associated with the strong winds was evident at 1200 UTC on April 9th.

Figure 1. Snowfall from April 8-12. 2013

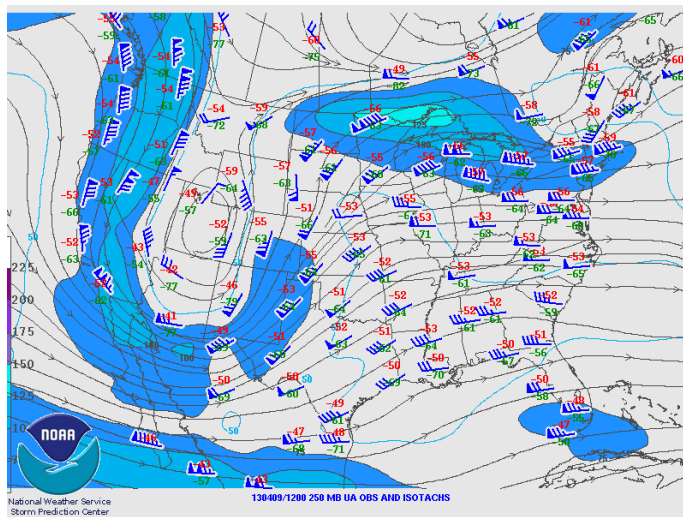


Figure 2. 250 hPa isotachs 4/09/13 1200 UTC

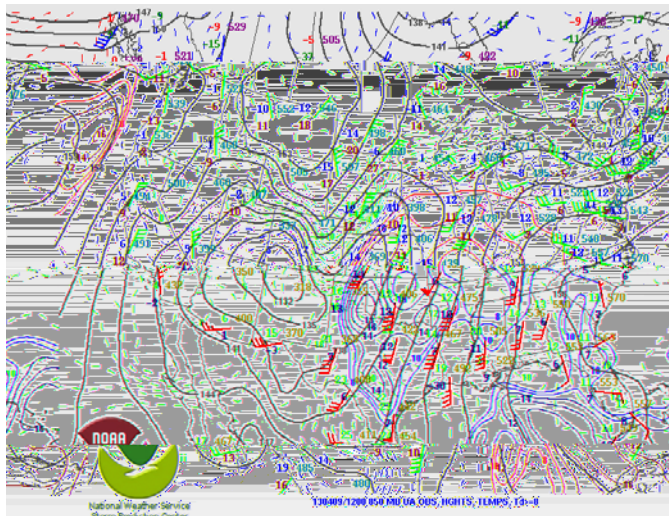


Figure 3. 850 hPa heights, temperature 4/09/13 1200 UTC