

## **Northern Plains and Northern Rockies Winter Storm 4-5 October, 2013**

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**Meteorological Overview:** On 4-5 October, a very early season blizzard struck the northern Plains and northern Rockies. Although this was not an unprecedented event, an early season snow storm of this magnitude had not occurred in over a decade.

On Thursday, 3 October, a closed 500 hPa low was beginning to move eastward from the Pacific Northwest towards the Northern Rockies and Northern Plains. At the same time, a 700 hPa trough over the Pacific Northwest strengthened into a closed low over the Northern Rockies by the evening of the 3<sup>rd</sup>. By the morning of 4 October, the 500 hPa low was approaching the Northern Plains with the vorticity maximum entering the Nebraska Panhandle (Fig 1). The dynamical forcing became ideal as an upper level jet streak moved over central Nebraska and South Dakota, which gave way to upper level divergence. Meanwhile, the 700 hPa low had strengthened significantly, and copious low-level moisture advected northward in advance of the low. The surface low developed in the central Plains and moved northward into south central Nebraska by the morning of the 4<sup>th</sup>. Snow had already begun to fall in the higher elevations in the Rockies and through portions of the northern Plains. During the day on 4 October, snowfall rates intensified as the 500 hPa and 700 hPa lows moved closer to the Dakotas. Blizzard conditions ensued by Friday afternoon, with heavy snow and strengthening winds as the pressure gradient began to tighten. The WFO Rapid City also reported thunder during the blizzard. Friday evening, winds gusts up to 70 mph were being reported along with 20 inches of snow!

By Saturday, 5 October, the mid and low-level lows became stacked over central South Dakota. By Saturday morning, the heaviest snow began to taper off in the northern Plains. The surface low with the occluded front began to move eastward, and by Saturday evening the event had come an end.

**Impacts:** By Saturday morning, Rapid City woke up to almost 44 inches of snow (Fig 2). Thousands of people were left without power throughout Wyoming and South Dakota. In addition, nearly 500 flights were grounded at the Denver International Airport. Major highways were shut down for multiple days while crews tried to clear the snow as quickly as possible. In addition, at least 80 people were stranded in their cars overnight. Another less publicized impact was that 75,000 cattle died due to multiple factors during the blizzard. This has been crippling to the ranchers, as it will take 2-3 years to fully recover from this loss. Finally, 3 people died in a traffic accident caused by snow in Nebraska.

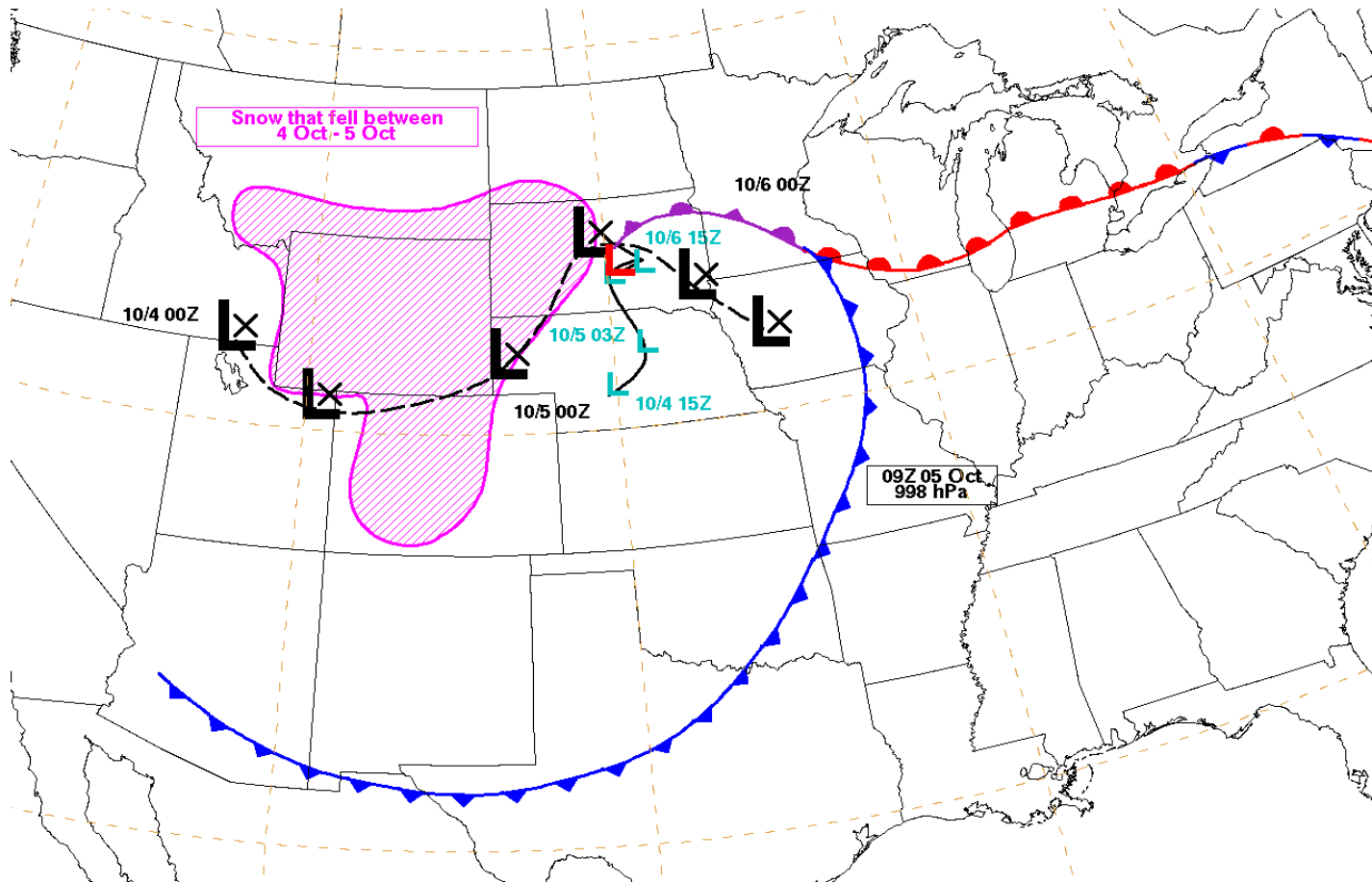


Fig 1: 500 hPa low (black L) track, surface low (blue) track, area of snow (magenta), and the surface front at its most intense point.

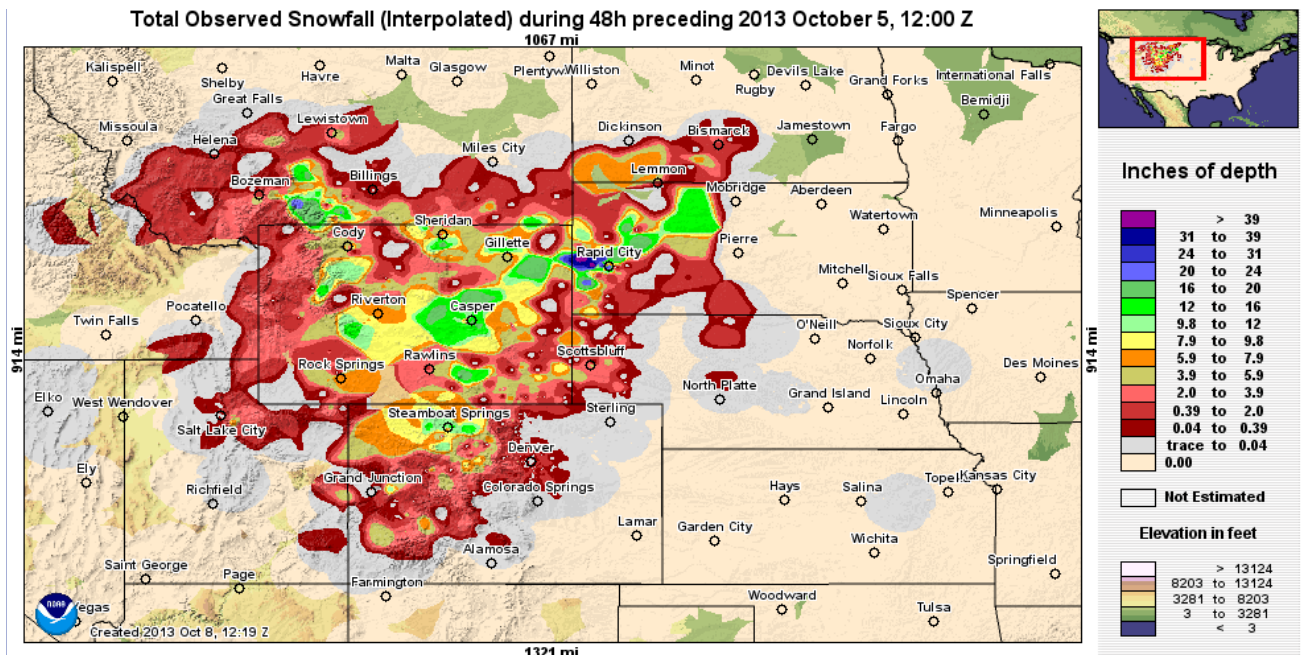


Fig 2: Snowfall analysis on 5 October, 2013  
<http://www.nohrsc.noaa.gov/>



Fig 3: Snow in front of the Weather  
 Forecast Office in Rapid City, SD  
 (image courtesy of NWS Rapid City)