

Northern Plains and Upper Midwest Winter Storm – February 10th-11th, 2013

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Meteorological Overview:

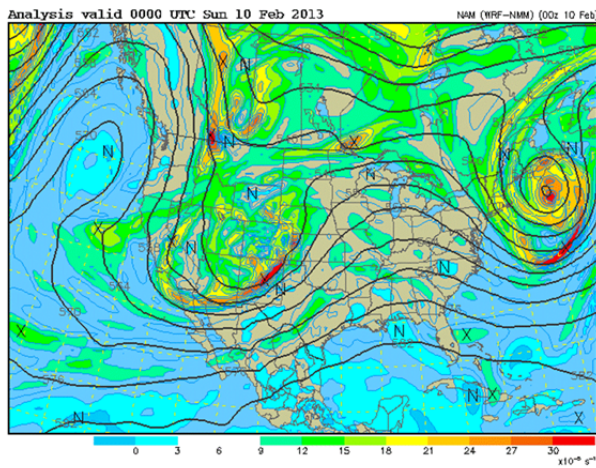
A powerful winter storm moved through the north central U.S. in early February of 2013, bringing heavy snows, gusty winds, and icing to portions of the Northern Plains and Upper Midwest. A mid-level trough triggered the event as it lifted out of the Southwest and initiated surface cyclogenesis in the lee of the Colorado Rockies beginning 00 UTC Saturday, February 10th (Fig. 1). The surface low deepened as it tracked steadily northeastward through the Central Plains on Sunday, February 10th, beneath the favorable left exit region of an upper jet streak extending from the Southern Rockies into Kansas (Fig. 2). Cold (warm) advection west (east) of the surface low sharpened the 500 hPa trough and allowed the surface low to continue to deepen while it moved into the Upper Midwest Sunday evening.

While the storm continued with its self-development cycle, surface winds increased as the pressure gradient surrounding the low increased, and moisture from the Gulf of Mexico feeding northward into the storm allowed for heavy rain and snow within the expansive precipitation shield. The warm Gulf air overrunning a sub-freezing air mass in place led to pockets of freezing rain and sleet across southern Minnesota and eastward into portions of the Upper Great Lakes. As the sharpening 500 hPa trough closed off over Nebraska, a band of intense snow developed within a deformation zone over the eastern Dakotas and Minnesota. The mid-level trough quickly became negatively tilted, and the surface low got pulled into the cold air as the system became vertically stacked. By Monday morning, 12 UTC February 11th, the storm started to track across southern Ontario, and the deep area of low pressure began to fill in and weaken.

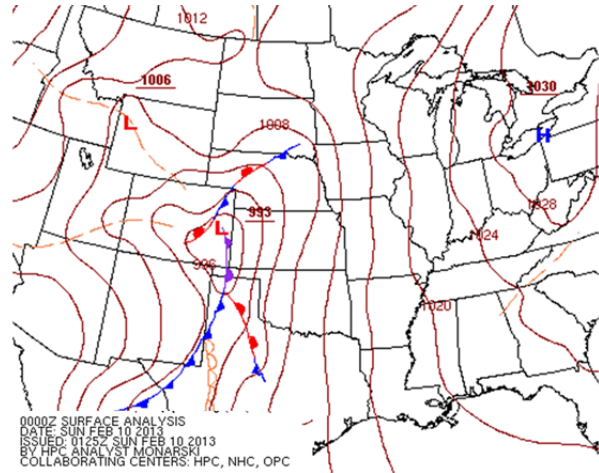
Impacts:

The winter storm that moved through the north central U.S. in early February not only came immediately after a major Northeast Blizzard (see event review for “Great Lakes and Northeast Major Winter Storm”), but this powerful storm also left a wide swath of greater than 4 inch snowfall accumulations stretching from north-central Nebraska to northern Wisconsin and the Minnesota arrowhead (Fig. 3). Several reports exceeding a foot of snow were recorded in the narrow deformation axis that set up over the eastern Dakotas and Minnesota (Fig. 3). Strong sustained winds, with gusts in excess of 50 mph, surrounded the deep surface cyclone. The high winds, combined with the heavy snow, created dangerous whiteout conditions. Periods of freezing rain and sleet also made for hazardous travel conditions over southern Minnesota and eastward into the Upper Great Lakes. Numerous roads and highways were forced to shut down across the region, including portions of Interstate 90 and 29 in North and South Dakota.

500 mb Heights (dm) / Abs. Vorticity ($\times 10^5 \text{ s}^{-1}$)

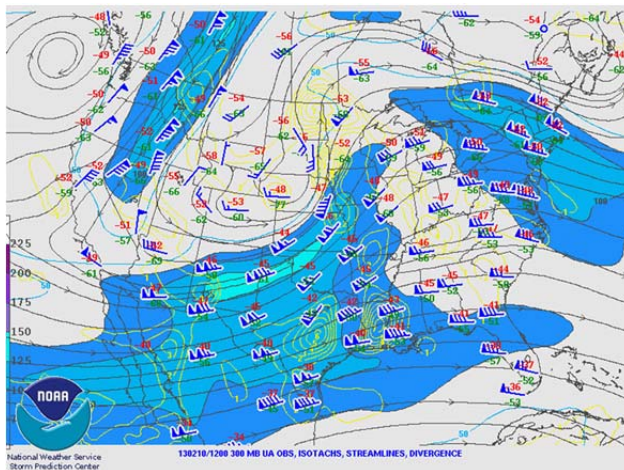


a.

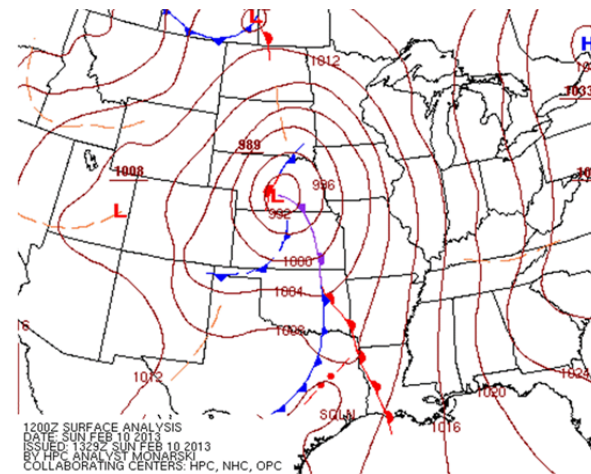


b.

Figure 1: 500 hPa heights (dm) and absolute vorticity (a) and analyzed surface pressures (isobars every 4 mb) and fronts (b) from 00 UTC on the 10th of Feb 2013 (Images courtesy of UCAR and WPC).



a.



b.

Figure 2: 300 hPa isotachs, streamlines, and divergence (a) and analyzed surface pressures (isobars every 4 mb) and fronts (b) from 12 UTC on the 10th of Feb 2013 (Images courtesy of SPC and WPC).

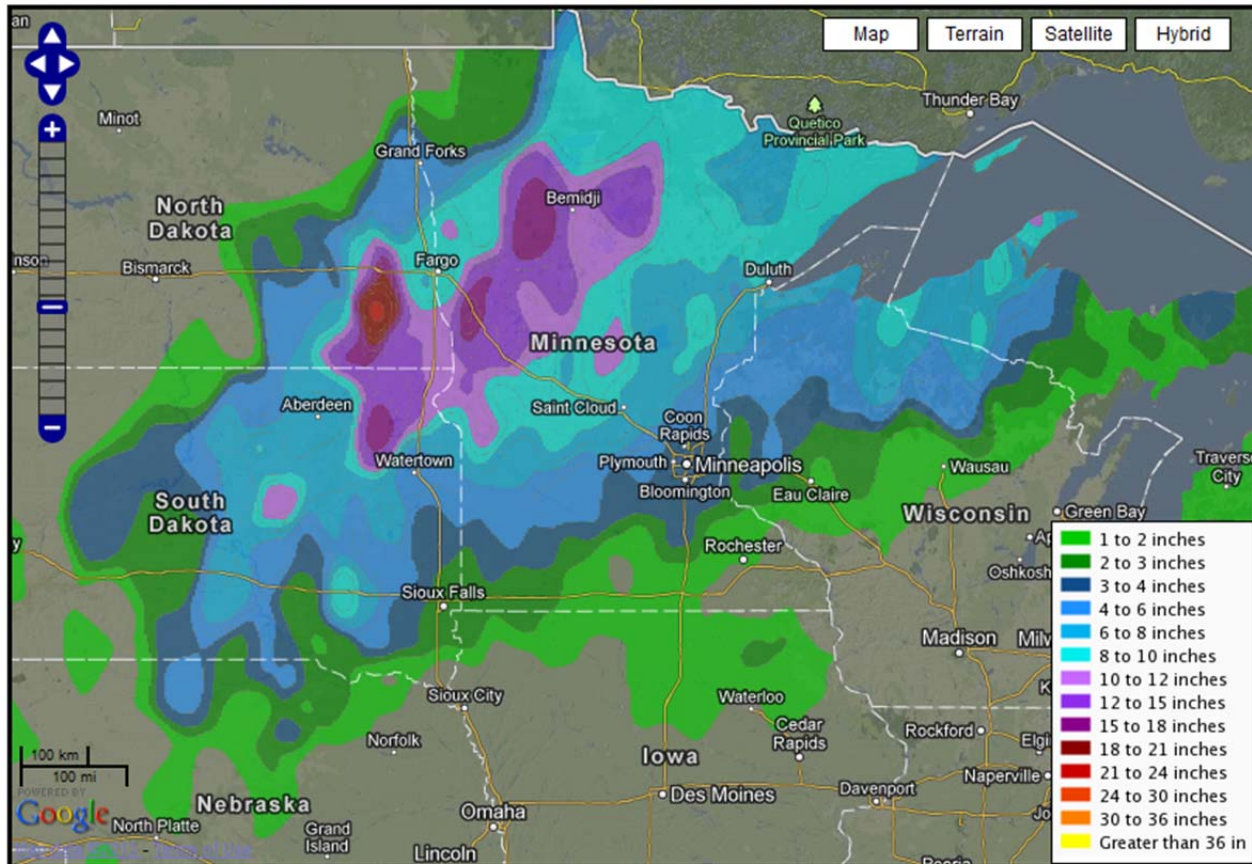


Figure 3: Observed 48 hour snowfall analysis ending at 12 UTC on the 12th of Feb 2013 (*Image courtesy of Southern Region Headquarters*).