

Rockies to Upper Midwest Winter Storm
2-5 December, 2013
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Meteorological Overview:

On 2 December, 2013, a vigorous Pacific storm system moved into the western U.S. (*Fig. 1*), spreading heavy rain and snow as well as high winds across areas from the West Coast to the Rockies. As the low pressure system crossed the Rockies, widespread heavy snows fell from the Bitterroots and Tetons southward to the Wasatch and the Colorado Rockies. The highest reported snowfall totals in this region occurred in Idaho, Colorado, and Wyoming, where maximum snowfall totals of 30 inches or more were reported (*Fig. 2*). Additionally, high winds in excess of 60 mph were widespread across many of the higher elevations in the western U.S., with winds as high as 81 mph reported at Pike's Peak, CO and 72 mph at Bear Peak, CA. The surface low peaked in intensity around 06 UTC on 3 December across western Wyoming, with a central pressure of 994 hPa.

By 4 December, the 500 hPa low associated with the system began to turn northeastward as it moved from the Rockies into the northern Plains (*Fig. 1*). At the same time, additional amplification of the 500 hPa trough occurred as another shortwave rapidly crossed the Rockies and entered the long wave trough axis. Early on 4 December, cyclogenesis occurred in the lee of the Rockies and a new surface low developed across eastern Colorado and quickly moved into the central Plains as it deepened. A band of 5 to 10 inch snows (with locally higher amounts) occurred from the High Plains in Montana eastward across the Dakotas and into the Upper Midwest, generally along and north of the track of the 700 hPa low. As the surface low passed across northern Wisconsin late on 4 December, lake effect enhancement of the snow occurred on the North Shore of Lake Superior in Minnesota. The track of the surface low, south of Lake Superior, resulted in strong easterly flow off the lake along the North Shore. As a result, snowfall amounts as high as 33 inches were reported in Two Harbors, MN, with a larger area of northeast Minnesota and northern Wisconsin receiving more than 12 inches of snowfall. The surface low deepened to a central pressure of 996 hPa across northern Wisconsin by 00 UTC on 5 December. It would continue to deepen as it moved northward into Canada, reaching a pressure of 984 hPa by late on 5 December across James Bay. In the wake of the storm system, bitter cold moved into much of the northern Rockies into the Midwest, with maximum temperatures in the single digits to below zero and minimum temperatures well below zero in many locations.

Impacts:

The winter storm caused significant impacts to travel in areas that received heavy snow. Driving was difficult to near impossible in some cases due to heavy snow and wind creating very low visibilities. Portions of several interstate highways had to be shut down in Wyoming. The storm resulted in some flight delays and cancellations at Denver International Airport, primarily of flights departing for mountainous locations which received the heavier snowfall. One person was killed in Minnesota in a vehicle accident that resulted from driving on the slick roads.

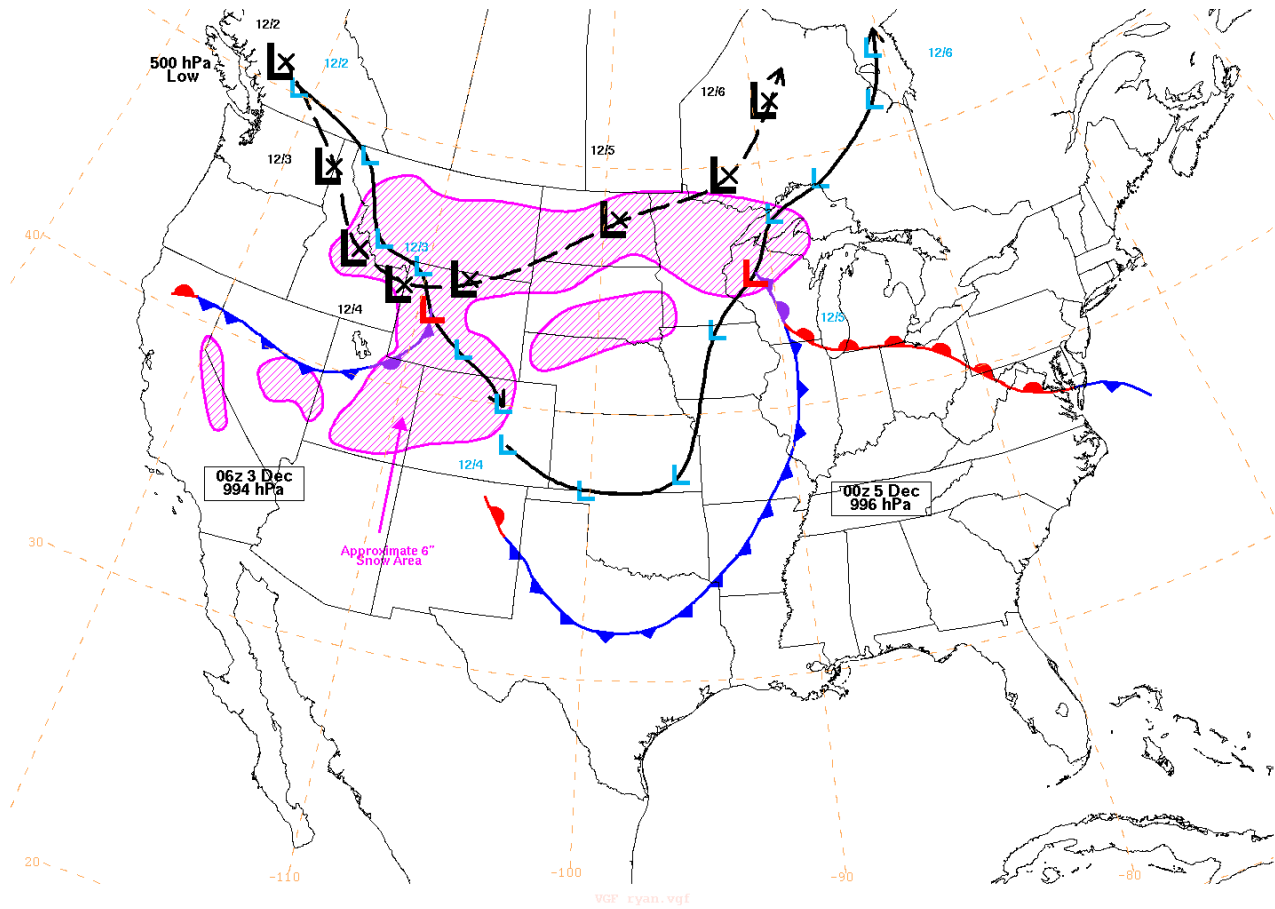


Figure 1: 500 hPa low track (black), surface low tracks (light blue), surface analyses at the most intense point of each respective surface low (across the contiguous U.S.), approximate areas receiving greater than 6 inches of snow (magenta). Positions at 00z of surface (blue) and 500 hPa lows (black) are indicated by dates.

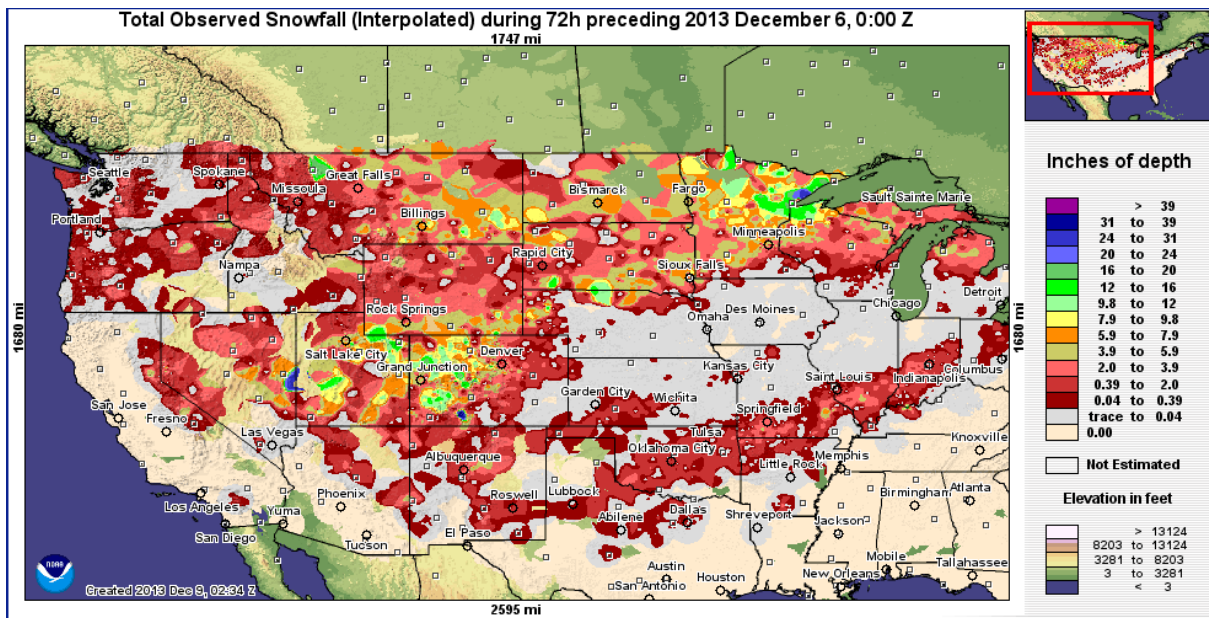


Figure 2: Snowfall analysis for 72 hours ending at 00 UTC 6 December, 2013 (NOHRSC).