

Southwest to Northeast Winter Storm
January 29 - February 03, 2015
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Meteorological Overview:

A significant winter storm impacted a large swath of the country from the Southwest U.S. to the Northeast between 29 January and 03 February, 2015. For major cities like Chicago and Detroit this storm will be remembered as one of the biggest snowstorms to ever hit those areas. Over a foot of snow was observed from central Iowa to Down East Maine with a large area of 6 or more inches stretching back to the central plains (Fig 2.)

In the Southwest, snow began with the onset of moist southwesterly low-level flow intersecting the higher terrain of southern Colorado and northern New Mexico on 29 January. By 0000 UTC on 30 January, a 500 hPa trough was beginning to consolidate into a closed upper low off the southern California coast (Fig 1). This upper low moved northeastward toward southern Nevada and then southeastward into northern Mexico by 0000 UTC on 1 February (Fig 1). The upper low approaching the region set the stage for a prolonged upslope snowfall event. Moist southwesterly upslope flow into the region along with cyclonic vorticity advection generated snowfall across the region over a two day period, with up to 15 inches in New Mexico.

By 0000 UTC on 1 February, lee cyclogenesis began in central Colorado with the southern stream upper low phasing with a sharp northern stream trough. At the surface, a low began to develop along an arctic front that overspread the High Plains (Fig 1). A sharp east-west oriented baroclinic zone set up across the central plains and the collocation of the baroclinic zone with a jet entrance region led to precipitation overspreading the region. The surface low rode along the sharp baroclinic zone as it crossed the U.S (Fig 1). With further phasing of the upper-level trough by 0000 UTC on 02 February, a coupled jet entrance and jet exit configuration allowed for further strengthening of the baroclinic zone. A southerly low level jet of greater than 50 knots over the Ohio valley delivered a fresh supply of warm and moist air above the low level arctic air mass which led to vigorous vertical motions in the cold sector and mesoscale banding north of the surface front. A band of 10-20 inches was observed along the axis of strongest low level frontogenesis from eastern Iowa through southern lower Michigan (Fig 2). Strong low level easterly flow off Lake Michigan likely enhanced snowfall across the Chicago area as well.

The surface low was located over western Pennsylvania by 1200 UTC on 02 February with snow overspreading the Northeast. The upper-level dynamics favored continued strengthening of the surface low during the day with a coupled jet entrance/exit region aloft generating large scale ascent. A secondary surface low developed on the Delmarva Peninsula by 1500 UTC on 02 February and this low rapidly intensified as it moved northeastward off the southern New England coast later that evening. With the low south of Cape Cod, strong easterly flow off the Atlantic Ocean helped to transition from an east-west oriented baroclinic zone to a coastal front in New England. Warm and humid air over the western Atlantic was forced up and over the coastal front resulting in intense snowfall rates. A secondary maximum of 10-20 inches was observed from eastern Connecticut to Down East Maine (Fig 2).

Impacts:

Travel was impacted for a number of days as this storm crossed the country. At least 3,000 flights were canceled due to the storm with 1,600 of those coming from Chicago area airports. For Chicago, this was the fifth largest snowfall in history with 19.3 inches and for Detroit it placed third with 16.7 inches. Heavy snow also impacted Boston, which received 16.2 inches and Buffalo with 14.1 inches.

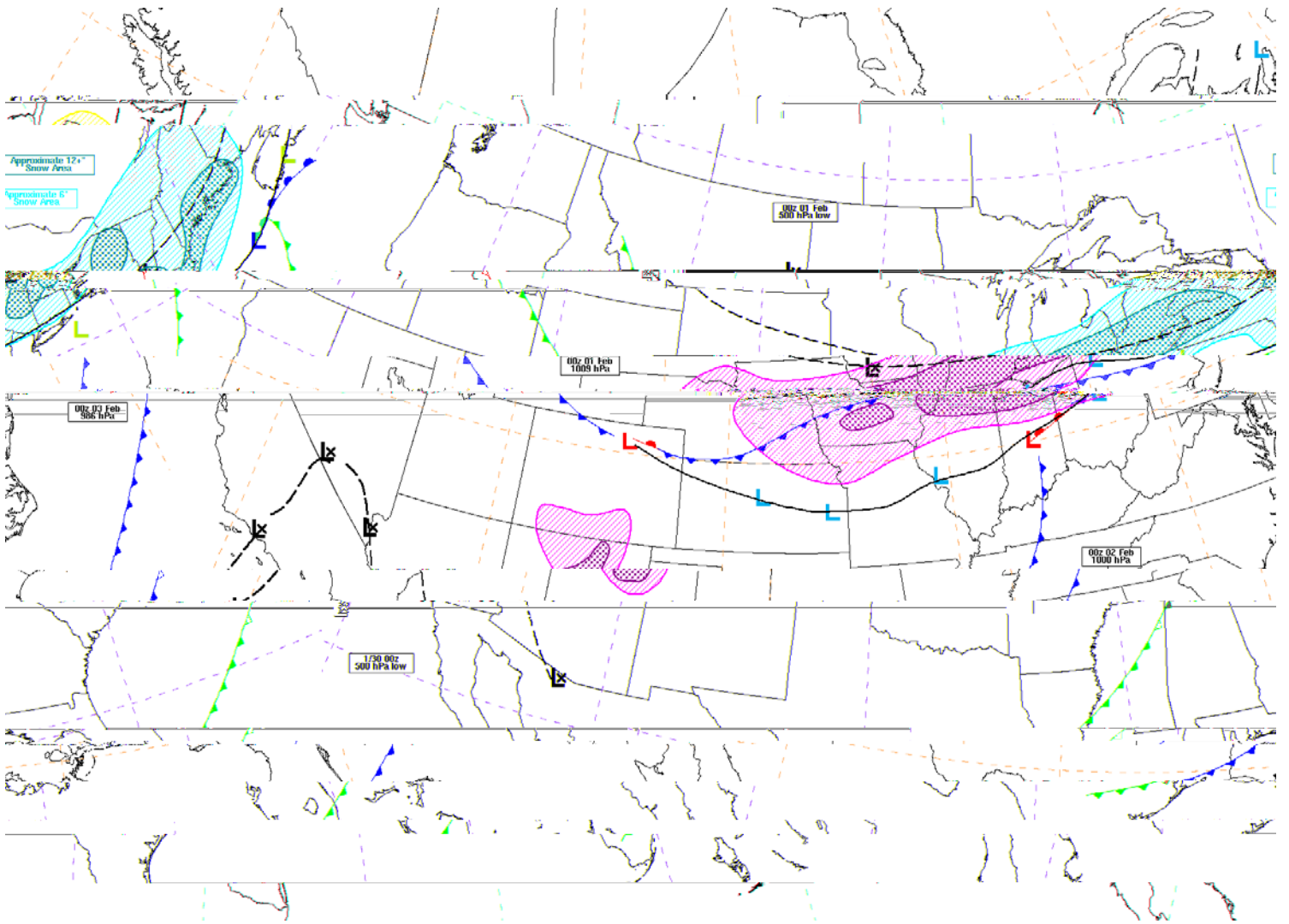


Figure 1. 500 hPa low tracks (black), surface low track (light blue), surface frontal analysis at times listed, 6" snowfall area (pink shaded regions), and 12" snowfall area (purple shaded regions).

NOHRSC Snowfall Analysis
72-hour Accumulation Ending 2015-02-03 12 UTC

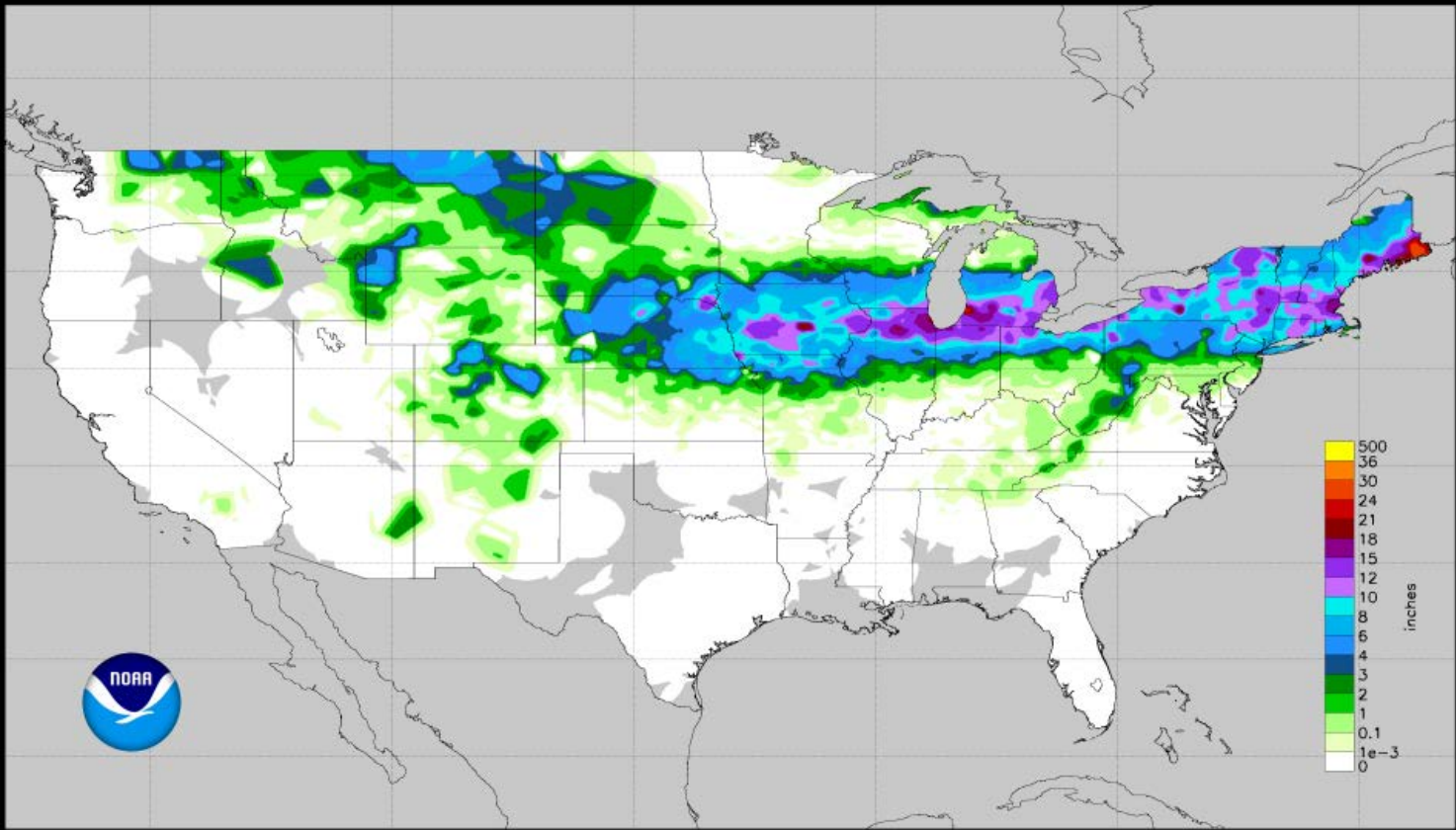


Figure 2. NOHRSC snowfall analysis of 72 hour accumulation ending 1200 UTC on 03 February, 2015.