

Rockies to New England Heavy Snow
24-27 November, 2018
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Meteorological Overview:

A significant early-season winter storm spread snow nearly from coast to coast several days after the Thanksgiving holiday. The storm originated from a shortwave trough that quickly dug through the western states -- arriving as a low-amplitude but potent wave on the Pacific Northwest coast around 00Z November 24. At that time at the base of the trough, a sounding from Salem, Oregon measured a 99 knot wind at the 500mb pressure level; values that high have been previously observed, but it is in the upper several percent of the historical distribution at that sounding location. The strength of the mid-level jet was an indication of the strength of the digging wave. Over the next day, or through 00Z November 25, the shortwave approached and reached the Continental Divide, inducing lee cyclogenesis over Eastern Colorado in the process. Through the Intermountain West, conditions ahead of the shortwave favored a 12-24 hour period of focused vertical motion with positive vorticity advection aloft, and the exit region of a cyclonically curved upper level jet. Heavy snow accumulations were observed in higher elevations from the Cascades, to Idaho, southern Montana, Wyoming, northern Utah and Colorado. The highest snow total from the West was 60 inches from the Medicine Bow Mountains in southern Wyoming.

The surface low continued to organize as it developed east from Colorado into Kansas and Missouri. Although the lowest pressure did not fluctuate much, remaining between 992 and 996 millibars between 00Z November 25 and 00Z November 26, the frontal structure became much better defined as an Arctic high expanded south into the northern Plains from Canada. The rising pressure in the Northern Plains also contributed to a significantly increased pressure gradient on the poleward side of the cyclone in the central Plains. It was during this time period that a significant band of heavy snow developed in a region of increasing frontogenesis on the north side of the low. Blizzard conditions also began to materialize as the heavy snow became aligned with the strongest pressure gradient. Numerous reports of blizzard conditions were logged by National Weather Service offices in Kansas, southern Nebraska, northern Missouri, southern Iowa and northwest Illinois. Wind gusts in this region were notably high for a winter storm; away from the influence of mountains, the gusts reached as high as 68 mph in Concordia, Kansas. The low began to occlude as it ejected northeast into Illinois, and then continued to move on into the eastern Great Lakes, reaching western Lake Ontario around 00Z November 27. Throughout the two-day track across the middle of the country, a strong band of frontogenesis to the poleward side of the low sustained a band of heavy snow, and this eventually produced a swath of 6-12 inches of snowfall from northern Kansas into Lower Michigan, including the north side of the Chicago metro area. Locally higher amounts were reported, as high as 17 inches in Oskaloosa, Iowa. The snowfall pattern was noteworthy for its sharp gradients on the northern edge in Iowa, Illinois and Wisconsin, likely due to a combination of dry air to the north and a nearly stationary pivot point of the narrow heavy snow band. For

example, just 20 miles to the northwest of Oskaloosa, Iowa (where 17 inches of snow was reported), less than an inch of snow was reported just north of Pella.

Around 00Z November 27, a secondary coastal low began to form near the triple point in the frontal structure of the overall cyclone. This low quickly became dominant while the other low decayed inland. The minimum pressure fell 10 millibars in 12 hours, by 12Z November 27, while the low was approaching Boston. The strengthening low focused strong warm air advection aloft into New England just to the north and northeast of the low position, and produced a period of heavy snowfall. Accumulations of 6 to 12 inches were common from the Adirondacks into Vermont, New Hampshire, and interior Maine. As the low continued to push off to the northeast beyond 00Z November 28, cold air advection over the still relatively warm Great Lakes produced some lake effect snow downwind of Lake Erie and Ontario that enhanced snowfall totals in those areas. Outside of the lake effect belts, the highest snow total in the Northeast was 18 inches near Rochester, Vermont.

Impacts:

Widespread blizzard conditions were reported in the Central U.S. from far western Kansas into northwest Illinois, a region nearly 700 miles in length and as much as 200 miles wide in the Plains. Due to the dangerous weather and zero visibility, numerous roads were closed, including large sections of interstate highways like I-29, I-70 and I-80 (["https://www.nbcnews.com/news/weather/snowstorm-stunts-travel-midwest-blizzard-conditions-n939861"](https://www.nbcnews.com/news/weather/snowstorm-stunts-travel-midwest-blizzard-conditions-n939861)). The blizzard conditions with this storm were noteworthy because they generally occurred southeast of the region most commonly affected by blizzards, according to a climatological study (["https://journals.ametsoc.org/doi/pdf/10.1175/JAMC-D-15-0350.1"](https://journals.ametsoc.org/doi/pdf/10.1175/JAMC-D-15-0350.1)). The I-70 corridor from north-central Kansas into northern Missouri does not experience blizzards as frequently as areas just to the west (in the High Plains of western Kansas and Colorado) and to the north (in Nebraska and Iowa).

The wind-driven heavy snow caused numerous flight cancellations as well, with over 1000 cancellations in the busy Chicago airports alone (["https://www.chicagotribune.com/news/local/breaking/ct-met-chicago-blizzard-power-outages-metra-20181127-story.html"](https://www.chicagotribune.com/news/local/breaking/ct-met-chicago-blizzard-power-outages-metra-20181127-story.html)). The impact was magnified because much of the snow in the Plains and Midwest fell on Sunday, November 25th, the last day of the post-Thanksgiving weekend and one of the busiest travel days of the year. Furthermore, the combination of strong wind gusts and wet, heavy snow produced widespread power outages. In the Chicago area, 350,000 customers lost power during the storm³. Tens of thousands of customers lost power elsewhere in the storm; for example, in Kansas 67,000 customers lost power (["https://www.npr.org/2018/11/26/670731727/winter-storm-slams-midwest-with-snow-causes-thousands-of-flights-to-be-cancelled"](https://www.npr.org/2018/11/26/670731727/winter-storm-slams-midwest-with-snow-causes-thousands-of-flights-to-be-cancelled)).

The storm produced 5.8 inches of snow at Kansas City on November 25, which was the second snowiest November calendar day on record. November snow in Kansas City is not unprecedented, but also not common; only 7 of the preceding 20 Novembers had measurable

snow there. To the northeast, Rockford, Illinois had a snowfall total of 11.7 inches, making it the biggest November snowstorm on record. Chicago O'Hare measured 8.4 inches total for the storm, which is the 5th largest two-day November snowfall total for the city of Chicago.