

with the West Coast 20-21 February, 2019 developed a potent
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A 500 hPa trough digging through the West Coast 20-21 February, 2019 developed a potent area of low pressure and associated cold front over southern California and southern Nevada by late 21 February. During this time a separate frontal boundary was positioned over the Gulf Coast and Lower Mississippi Valley, which was providing focus for moderate to heavy rain with the overrunning of deep Gulf moisture. The system progressed through Arizona and New Mexico on 22 February then quickly exited the Southern Rockies by early morning of 23 February. Strong divergence aloft and the nose of 110kt jet streak enhanced the surface convergence and orographic lift across the Southwest. A narrow band of mid-level moisture feeding into the area helped maintain production of very heavy snow.

The fairly stacked low continued to deepen as it rapidly lifted through the Central Plains. This drew the southern boundary northward, meanwhile a surface low developed along the boundary near the Carolinas. Snow became widespread over the Plains and Midwest, and as the pressure gradient tightened, gusty winds caused localized blizzard conditions. With deep moisture continuously surging northward over the warm front, moderate to heavy rain persisted across the Lower Mississippi, Tennessee and Ohio Valleys and increased across the Southeast and Mid-Atlantic as that surface low traveled northward along the Eastern Seaboard.

The primary low then tracked through the Middle Mississippi Valley and into the Great Lakes region on 24 February spreading the moderate to heavy snow to parts of the Upper Mississippi Valley, Midwest, Great Lakes and Northeast. There were several hours where the snowfall intensified as a direct result of strengthening surface convergence, the strongest 700 - 500 hPa vertical motion and concentrated divergence aloft aligning; this allowed a narrow band of much higher snow amounts from southeast Minnesota to northern Michigan. The leading low reached its minimum pressure at 972 hPa by 0000 UTC 25 February, 2019 as it tracked from the Great Lakes to Quebec, while the secondary low moved through the Northeast and was positioned offshore between Maine and Nova Scotia. As the occluded front weakened over Quebec and parts of Maine, the low offshore became the leading low and continued to track through the Canadian Maritimes. Wrap around flow from the departing low allowed snow to linger across portions of Maine and favored higher terrain of northern New England.

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The path of this winter storm covered 1,149,327 square miles and affected a population of 66,711,436 people. Nationally, this winter storm was deemed as notable per the Northeast Snowfall impact Scale (NESIS) for having a Regional Snowfall Index (RSI) value between 1 and 3. Regionally, the Upper Midwest had an RSI of 2.801 with a rank of 91. The RSI for the Northern Rockies and Plains was 1.846 with a rank of 150. The Southwest, which is not

included in the NESIS, had substantial impacts; some locations had an excess of 3 to 4 feet in accumulation.

Areas west of Las Vegas measured 6 to 9 inches, with 24 inches observed at the higher elevations of Mount Charleston, Nevada. The Las Vegas strip had measurable snow for the first time in 10 years - with 0.8 inch recorded at the McCarran International Airport. The foothills outside of Los Angeles had light snow as well. Record-breaking snow amounts were recorded across many locations in Arizona, especially at several mountain locations where they picked up multiple feet of snow. The Flagstaff airport was buried in 3 feet of snow and forced its closure. On average, the town of Payson receives about 2 feet of snow over the course of the winter season; however, that amount fell on one day. Travel in and out of this area was halted leaving many travellers stranded and in need of finding shelter. Snow as far south as Tucson is rare, but 30 inches was measured at Mount Lemmon. Thousands of residents across the region lost power due to the heavy snow and ice that accumulated on the power lines. Heavy snow across the region led to numerous road, school and business closures across the Southwest. The Associated Press reported that a stretch of highway north of the town of Durango was closed for avalanche control near Wolf Creek, a popular ski area. The heaviest snow fell during a peak commuting period causing additional traffic problems.

According to USA Today in excess of 2300 flights had been cancelled and over 6300 delayed nationwide as of Wednesday evening, February 20th, with the widespread disruptions continuing into Thursday. The airports with the most significant impacts were Baltimore (BWI), Dulles (IAD) and Reagan (DCA) with more than one-third of the daily flight schedule nixed. A narrow window of intense snow resulted in over 130 flights cancelled and more than half were delayed at Minneapolis/St. Paul (MSP) as the snow fell faster than the crews could clear the runways. Other affected airports included Philadelphia (PHL) with cancellations exceeding 15%, LaGuardia (LGA) 20%, Newark (EWR) 15%, John F. Kennedy (JFK) 10%, Chicago - O'Hare (ORD) 16% and Midway (MDW) 12%. Lesser disruptions were also noted at St. Louis (STL), Cleveland (CLE), Columbus, OH (CMH), Rochester, New York (ROC), Richmond, Virginia (RIC), Greensboro, North Carolina (GSO) and Madison, Wisconsin (MSN).

The intense wind caused blowing and drifting of snow across much of the Plains and Upper Midwest creating treacherous travel conditions. Poor visibility and road conditions lead to multiple crashes along I-80 near York, Nebraska eventually leading to closures in both directions between Grand Island and Seward on Saturday, February 23rd. A major pileup also occurred on I-41 near Neenah, Wisconsin involving 131 vehicles and left dozens injured.

Snowfall from this event pushed the monthly record at Minneapolis/St. Paul International Airport into the top spot with 31.7 inches month-to-date. This surpassed the previous record of 26.5 inches from 1962. Omaha, Nebraska tied an all-time December- February snowfall record of 44.3 inches after observing 7.5 inches near Eppley.

The strong winds contributed to downed trees and power outages to hundreds of thousands of homes and businesses across the Northeast- some homes and cars were heavily damaged

from the trees crashing down in gusts near 60 mph in Massachusetts. It was also reported that by Sunday, February 24th the wind had pushed large ice floes from Lake Erie onshore and against homes in Hamburg, NY. Huge waves were observed on Lake Superior from the high wind speeds.