

## **Midwest to Eastern U.S. Winter Storm**

**20 – 22 January, 2014**

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**Meteorological Overview:** During the early evening hours on 20 January, 2014, a shortwave developed at 500 hPa and a preexisting cold front at the surface was progressing quickly southward. Behind the front, very cold arctic air was advecting across the Northern Plains and the Upper/Middle Mississippi Valley. As these two features interacted, snow began to fall across the Middle Mississippi Valley by 0000 UTC on 21 January and spread into the Midwest and Upper Great Lakes overnight as the shortwave moved east.

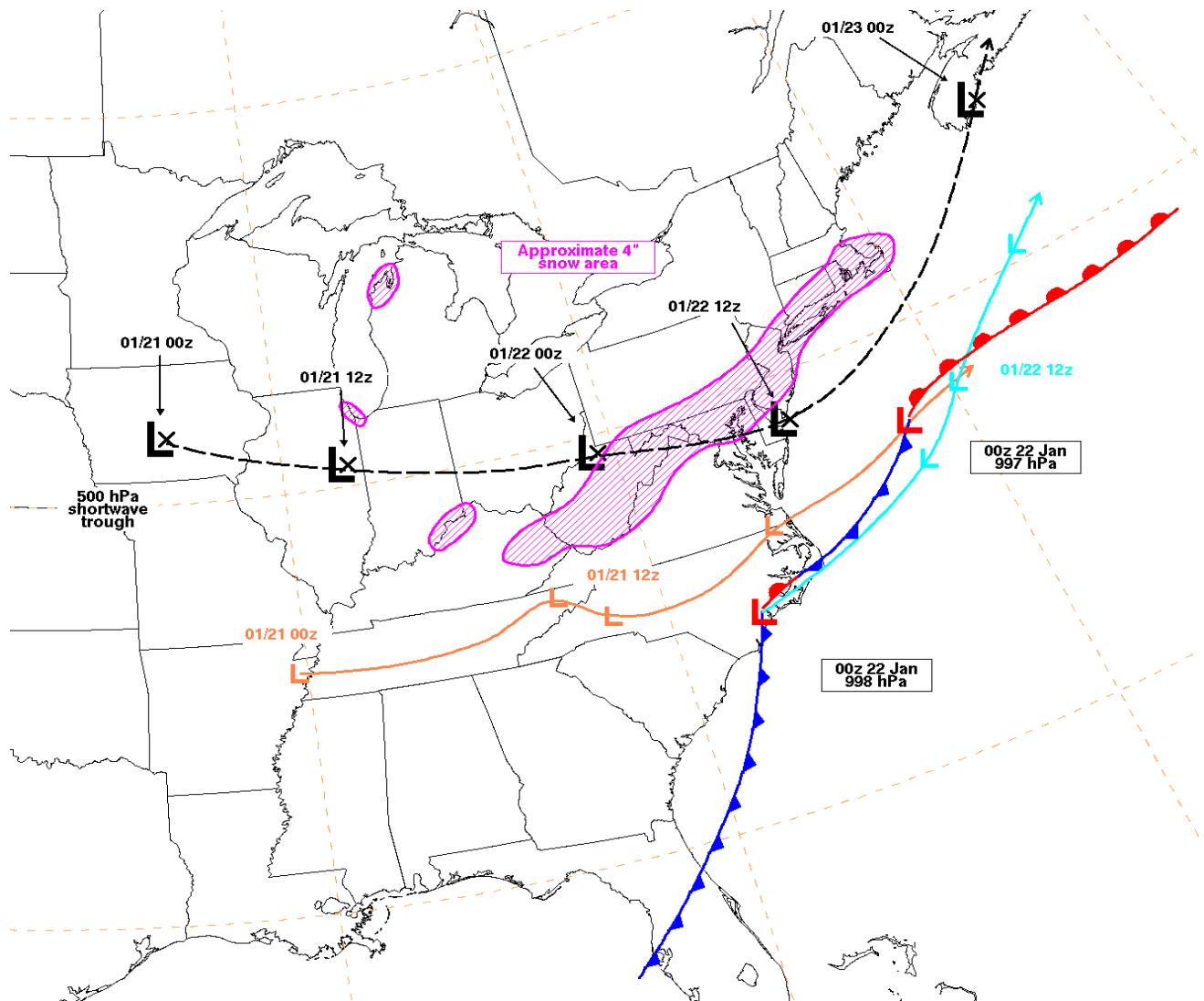
Just south of the above mentioned cold front, a second cold front was located across the Mid-Atlantic, Tennessee Valley, and into the Lower Mississippi Valley and Southern Plains. The southern portion of this boundary was moving east towards the Southeast U.S., while the northern portion remained quasi-stationary across the Mid-Atlantic. During the early morning hours of 21 January, the northern front, located across the Middle Mississippi and Ohio Valleys, began to dissipate and the southern front became dominant. A pair of lows (Figure 1, orange and cyan “L”s), one a bit stronger than the other, formed along the boundary by 0600 UTC on 21 January and tracked through the Tennessee Valley and into the Mid-Atlantic region during the day. Meanwhile, the shortwave at 500 hPa was making its way into the Ohio Valley and interactions between the shortwave and the surface front helped spread the snow from the Midwest into the Ohio Valley and Mid-Atlantic regions. As the upper level shortwave trough deepened, the surface lows deepened, leading to intensification of snowfall across the Mid-Atlantic region by 1200 UTC on 21 January, 2014 and lasting through 0000 UTC on 22 January, 2014.

Around 0000 UTC on 22 January, the previously weaker of the two lows was located along the coast of southeast North Carolina (more western “L” along the front on Figure 1). Once the low moved off the coast (Figure 1, cyan “L”), it became the dominant low as it underwent intense cyclogenesis in the Western Atlantic. As the low tracked towards the northeast and rapidly deepened, the heavy snow spread up the Northeast coastline impacting areas from southern New Jersey to Boston, Massachusetts. The snow along the coast ended during the afternoon hours of 22 January, as the cyclone moved northeast into the North Atlantic.

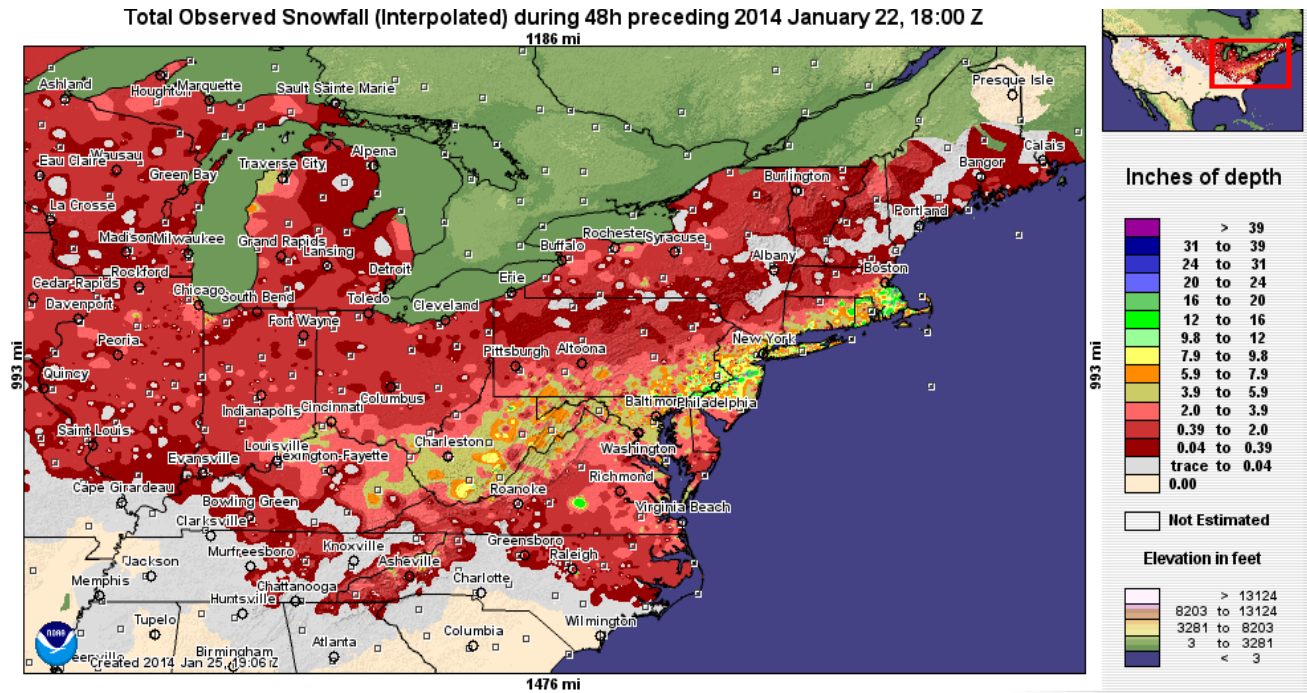
Overall, this storm impacted a large portion of the contiguous United States, with 18 states receiving at least 2 inches of snowfall between 20 January and 22 January, 2014 (Figure 2). Winter Storm warnings were issued for all or part of 13 of those states. Generally, the Midwest and Ohio Valley received relatively light snowfall, with most places receiving between 1 and 4 inches. Exceptions to this include local areas near Chicago and Northwest Michigan where favorable flow across Lake Michigan may have helped a few places reach 8 inches. The bulk of the snow from this system fell in an area extending from the Central Appalachians northeastward into Southern New England (Figure 3). The highest totals for the entire event, however, appeared in a narrow band along the heavily populated I-95 corridor from Philadelphia to Boston, where many places saw over a foot of snow. Some localized areas even received over 20 inches! In addition to the heavy snowfall, strong gusty winds west of the low pressure center resulted in

Blizzard warnings for areas near Cape Cod, Massachusetts, and very cold wind chill values for locations across the Northern Mid-Atlantic and Northeastern states.

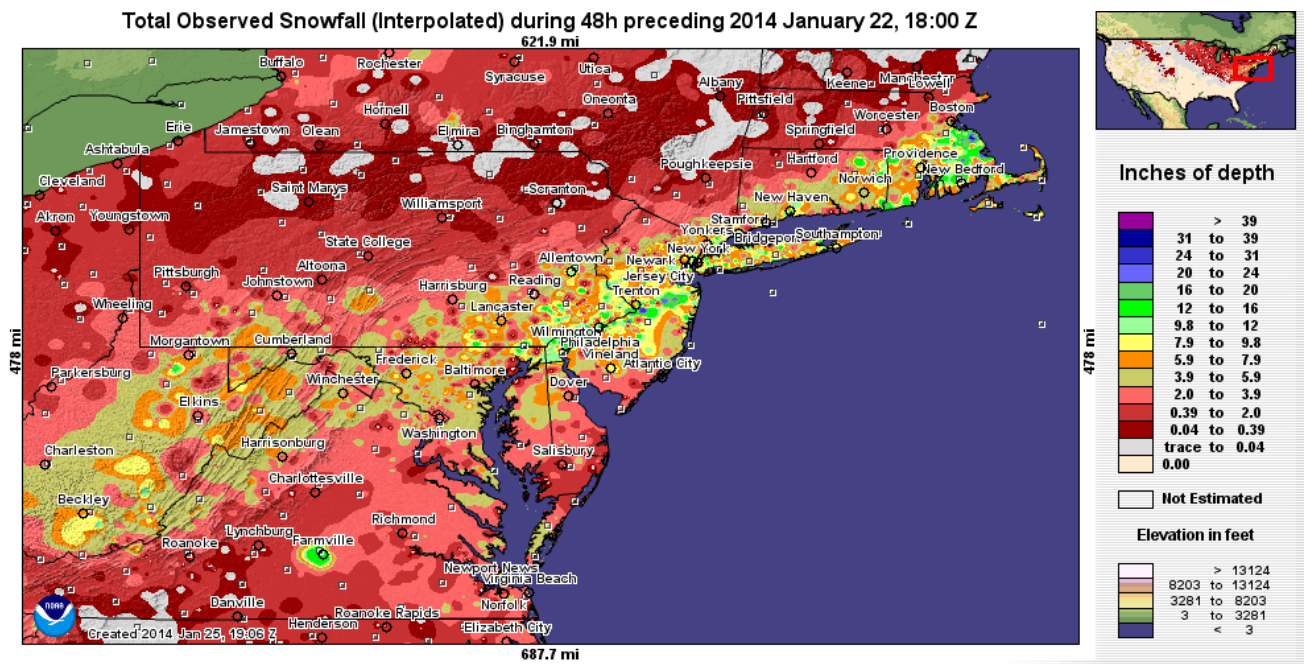
**Impacts:** The storm caused the shutdown of the federal government in Washington D.C., grounded thousands of flights, and closed schools across much of the Northeast U.S. on 21 January and 22 January. Near blizzard conditions in the larger cities of Philadelphia, New York City, and Boston, caused dangerous road conditions, significant traffic backups, and stranded thousands of motorists for hours on the roads. The storm was also blamed for at least one death in Maryland, as well as several other traffic accidents.



**Figure 1:** 500 hPa shortwave track (black), surface low tracks (orange, cyan), approximate area of greater than 4 inch snows (magenta), and the surface frontal position just before the second low moved off the coast and rapidly deepened



**Figure 2:** Snowfall analysis for 48 hours preceding 1800 UTC 22 January, 2014 (from NOHRSC)



**Figure 3:** Snowfall analysis for 48 hours preceding 1800 UTC 22 January, 2014 for Mid-Atlantic and Northeast regions (from NOHRSC)