

Central and Eastern U.S. Winter Storm

1-3 January, 2014

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Meteorological Overview:

Soon after the dawn of the New Year 2014, a winter storm that formed in the mid-section of the country began to intensify and move eastward, eventually spreading significant amounts of snow from the Midwest eastward through the southern half of New England. The main surface low pressure system associated with the event can be traced back to a wave of low pressure that formed near the Montana-Canadian border along an arctic front on the last day of 2013 (fig. 1). Over the next couple of days, the surface low remained weak while moving quickly south-southeastward along the arctic front as an upper-level trough began to amplify. Meanwhile, a long band of light snow, oriented from the central Plains east-northeastward into the lower Great Lakes, began to form and organize to the north of the arctic front (fig. 3). By late on New Year's Day, the surface low began to turn northeastward across Oklahoma as it rounded the base of the amplifying upper-level trough (fig. 1). The snow expanded in coverage and became heavier as the surface low slowly intensified and moved northeastward into the Ohio Valley early on 2 January (fig. 4c). Meanwhile, the associated upper-level trough continued to amplify but remained open (fig. 4a, b).

As the surface low approached West Virginia during the day on 2 January, a new low pressure center began to form on the eastern slope of the southern Appalachians in North Carolina, and the low in West Virginia quickly dissipated (fig. 1, 4d). The new surface low then began to intensify rapidly while moving off the mid-Atlantic coast in the late evening hours on 2 January and continued to intensify rapidly over the warm Gulf Stream the following day. In response, the snow in the northern Mid-Atlantic and southern New England became heavier during the night on 2 January. The intensifying storm also brought strengthening northerly winds and falling temperatures across southern New England where near blizzard conditions were experienced into the early morning hours on 3 January.

During the day on 3 January, the storm continued to intensify in the Atlantic but began to move away from the U.S. As a result, snow began to taper off in southeastern New England, but continued to linger into early in the evening near Cape Cod and Nantucket Island as the frigid air passing over the relatively warm ocean caused "ocean-effect snow". Snow showers eventually ended late in the evening as the storm moved farther off the East Coast.

Impacts:

The first major winter storm of the year brought significant snowfall to a large area extending from the Midwest eastward through southern New England. Light amounts of snow of less than 3 inches fell over the central Plains. As the storm became better organized, snowfall amounts increased to 4 to 10 inches over the Midwest, the lower Great Lakes, Ohio Valley, the northern Mid-Atlantic, to over a foot in parts of central/southern New England (fig. 2). Blizzard warnings were issued for Long Island, New York and parts of southeastern New England as the storm intensified rapidly off the East Coast. After the snow had tapered off, as much as two feet fell in the town of Boxford in Massachusetts. The storm forced the cancellation of thousands of flights and prompted the governors of New York and New Jersey to declare states of emergency. In the New York area, snowfall ranged from 6 inches in Central Park to over a foot on parts of Long Island, extending the holiday break for two more days for some students in the area. During the height of the storm, sections of the New York State Thruway and I-84 were closed. This snowstorm was also the coldest in recent memories for New England as the intensifying low pressure system pulled in more arctic air from Canada. Temperatures fell into the teens and single digits during the storm with strengthening northerly winds. Higher amounts of snow also fell on the south shore of the Lake Ontario, Lake Erie and Lake Michigan due to snow-enhancing effects from the relatively warm lake waters. At least 11 deaths were attributed to the storm. An animation of the snowstorm is available at the WPC Facebook page at:

<https://www.facebook.com/photo.php?v=632133570186896&set=vb.158734987526759&type=3&theater>

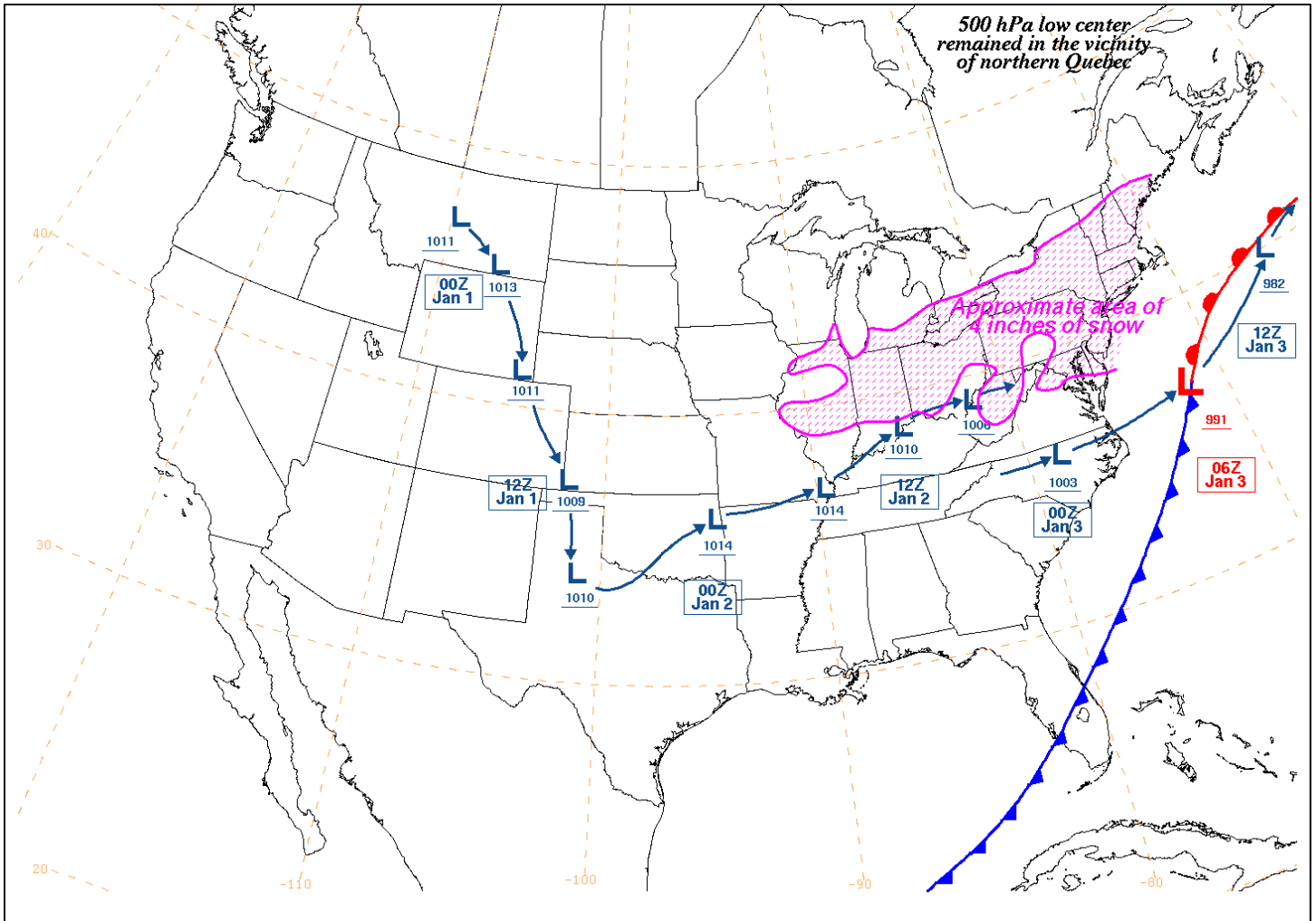


Fig. 1—An overview map of the storm showing the tracks and sea-level pressure values of two main surface low pressure centers, the approximate area of four or more inches of snow, as well as the frontal analysis at 06Z on 3 January, 2014. Note that the 500 hPa low center remained in the vicinity of northern Quebec.

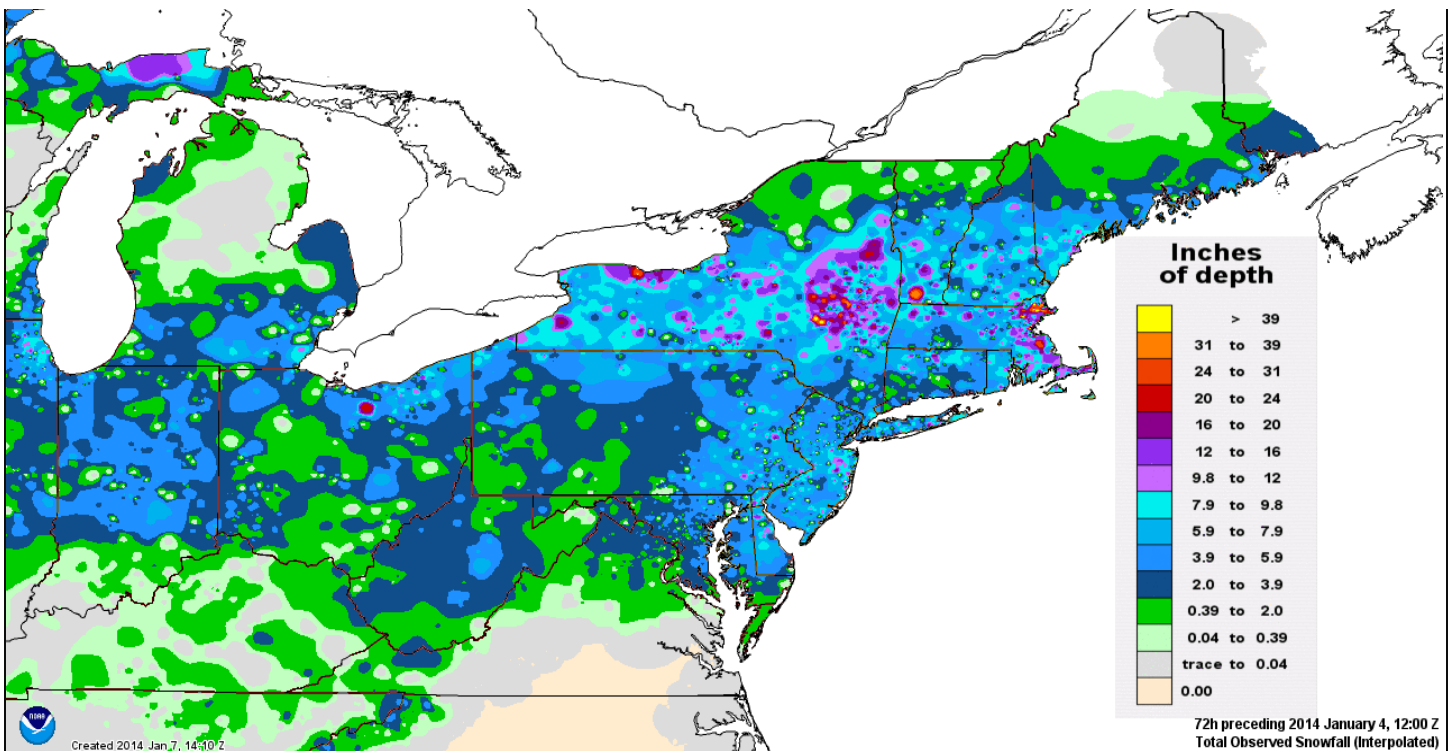


Fig. 2—A map of observed snowfall reports for the 72 hours preceding 12Z on 4 January, 2014 (NOHRSC).

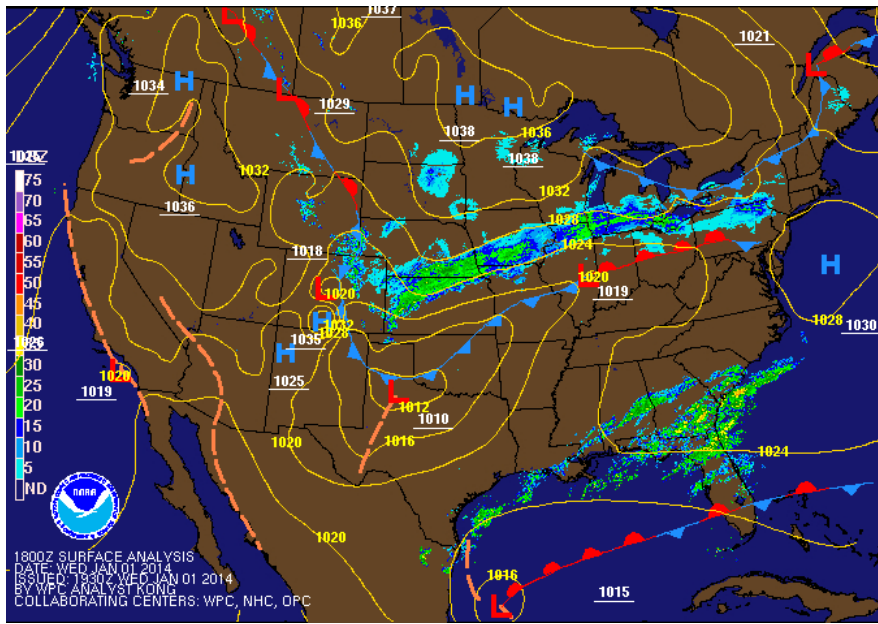


Fig. 3—Surface analysis and radar composites at 12Z 1 January, 2014

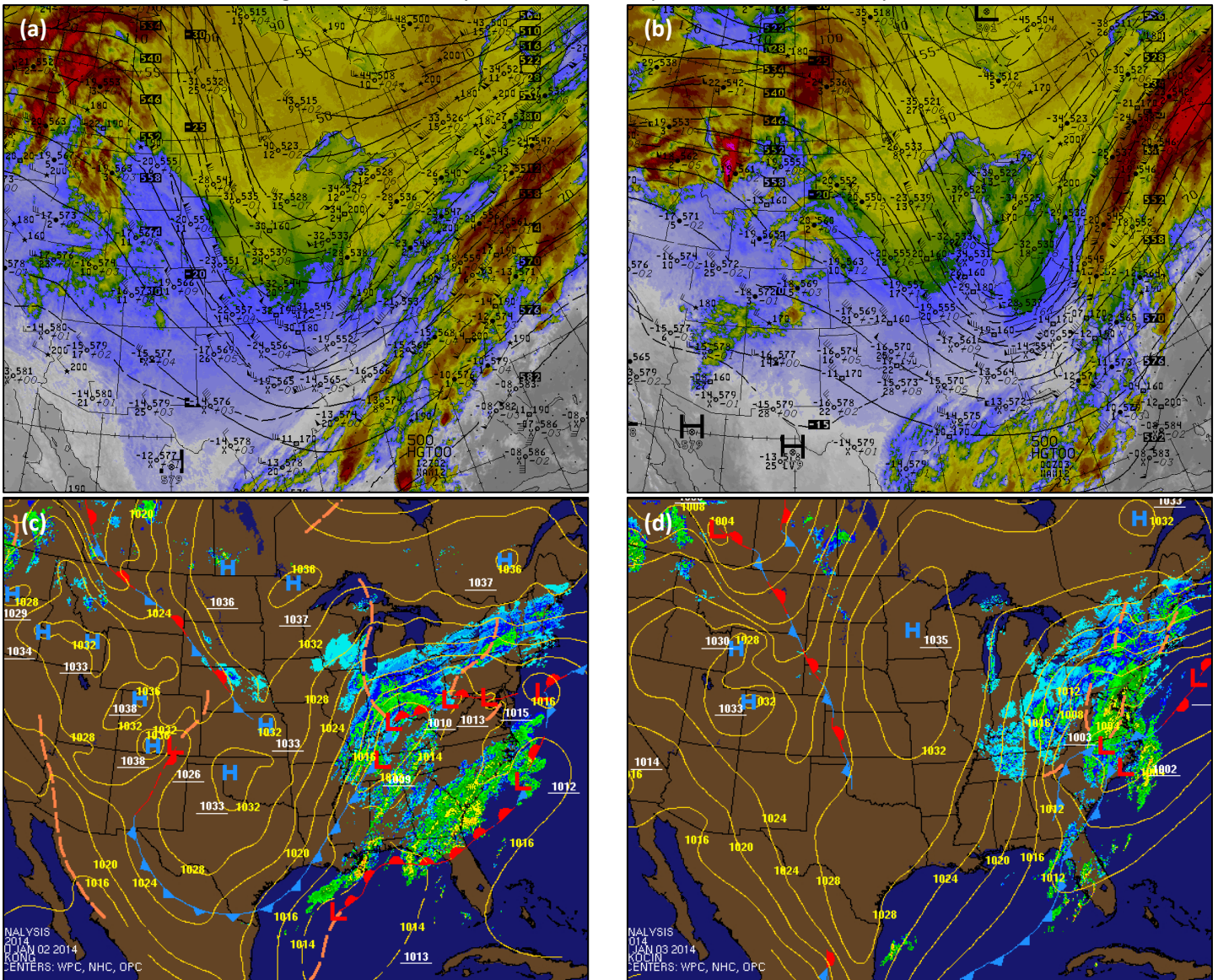


Fig. 4—500 hPa analyses and GOES-East infrared images at (a) 12Z on 2 January, 2014 and (b) 00Z on 3 January, 2014. Surface analyses and radar composites at (c) 12Z 2 January, 2014 and (d) 00Z 3 January, 2014.