Historic Autumn Mid-Atlantic to Northeast U.S. Winter Storm
29-30 October, 2011
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Meteorological Overview: A rare October snowstorm struck portions of the Mid-Atlantic and Northeast U.S. on 29-30 October, 2011. The storm brought more than a foot of snow to areas from northeastern Pennsylvania to southern Maine, with some areas of Massachusetts and New Hampshire receiving more than 30 inches of snow (Fig. 1). The storm occurred as a strong upper-level shortwave trough was moving through the Ohio River Valley and became negatively tilted as it approached the east coast (Fig. 2a). The storm was a classic Nor'easter, as a surface low developed off the coast of the Carolinas during the early morning hours of 29 October and moved northward along the coastline, rapidly deepening in the process. A surface analysis from 00 UTC on 30 October (Fig. 2b) shows the surface low centered off the coast of New Jersey, with a pressure of 993 hPa. Early in the event, a coastal front extended from the Virginia coast northward to Cape Cod. This boundary weakened and was no longer analyzed by 21 UTC on 29 October. Enhanced vertical motion as moisture from lower latitudes streamed northward and crossed this coastal front may have enhanced precipitation in some areas. By 12 UTC on 30 October (not shown) the surface low had deepened to 977 hPa south of Nova Scotia. As the intensifying surface low passed east of New England, wind gusts of more than 50 mph were recorded along the coast. The highest wind gust of 69 mph was measured at Nantucket, MA. The surface low reached its peak intensity of 976 hPa at 15 UTC on 30 October just east of the southern tip of Nova Scotia.

Precipitation began falling across the Mid-Atlantic States during the early morning hours of 29 October. Initially, the precipitation was falling as snow only at the higher elevations of the Mid-Atlantic States. As the surface low moved northward up the coast, winds at the surface backed from northeasterly to northwesterly across much of the Mid-Atlantic region, allowing colder air to advect southeastward. This cold air advection changed the precipitation from rain to snow in the foothills of Virginia, Maryland, and Pennsylvania. Dynamic cooling, where intense vertical motion associated with heavy precipitation bands results in a cooling of the atmospheric thermal profile may have also contributed to the changeover from rain to snow across the Mid-Atlantic region. Farther north, precipitation began across New England by midday on 29 October. Colder air was already in place across interior New England, therefore precipitation began as snow for all but the coastal areas. The heaviest snow fell in a band from eastern Pennsylvania and northern New Jersey northeastward to southern New Hampshire and Maine. This band of heavy snow was associated with the northern portion of a band of intense 850-700 hPa frontogenesis, north of the surface low. Several snowfall records were broken across the region, including in Central Park, NY, where the 2.9" accumulation was an all-time snowfall record for the month of October.

Impacts: Since this storm occurred in late October, when trees in many areas of the Mid-Atlantic and Northeast had not yet lost all their leaves, substantial downed trees occurred, resulting in downed power lines and loss of power for more than 3 million people. Some locations were still without power more than a week after the storm ended. The storm resulted in 39 deaths, both directly and indirectly. A few of the deaths occurred when people froze to death in their homes, others occurred due to carbon monoxide poisoning as people attempted to heat

their homes by alternative means. Additionally, air travel was severely disrupted. This included several planes that were stranded on the tarmac at the Hartford airport for up to seven hours.

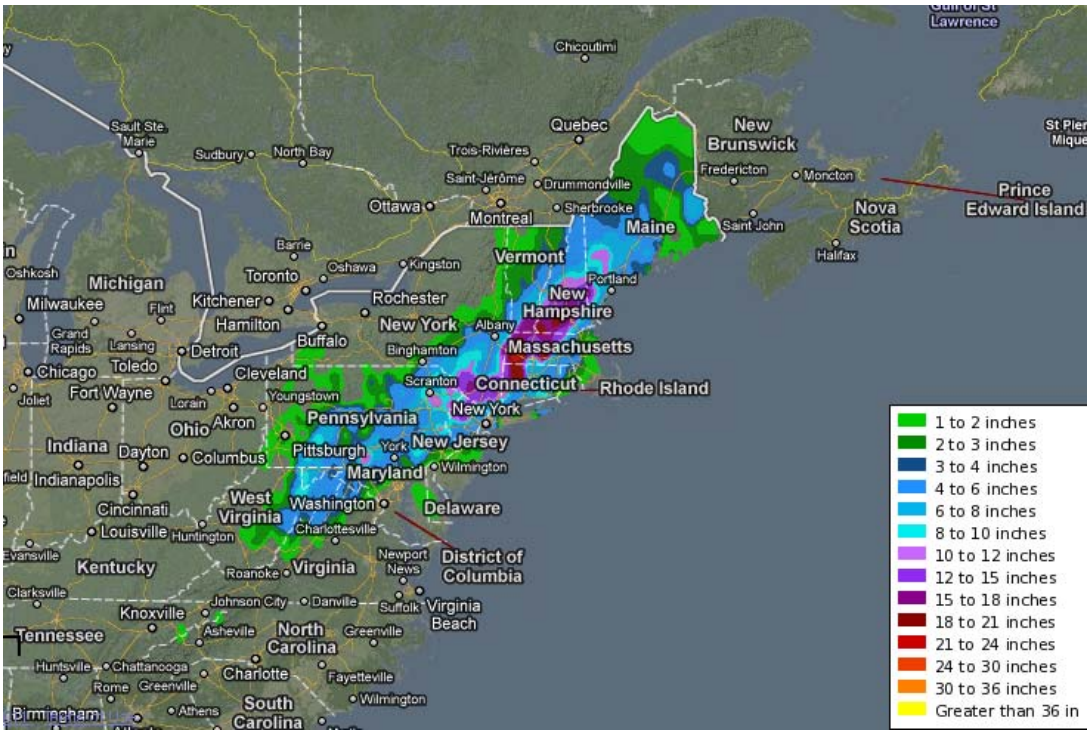

Figure 1: Storm total snowfall amounts for 29-30 October, 2011.

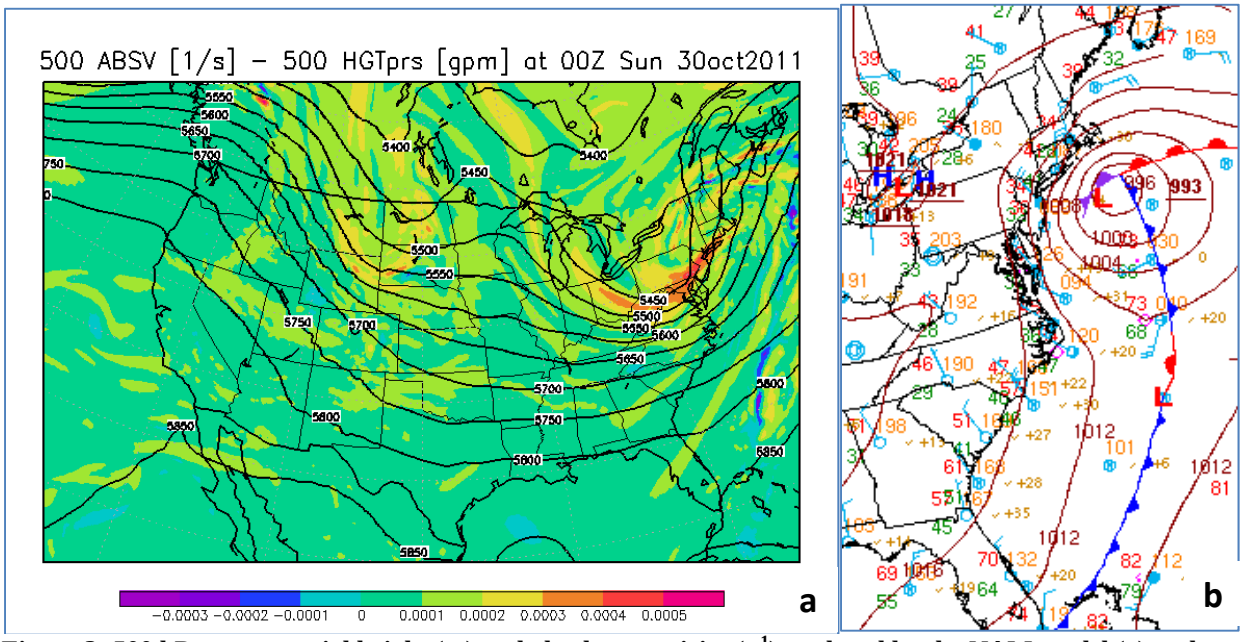

Figure 2: 500 hPa geopotential height (m) and absolute vorticity (s^{-1}) analyzed by the NAM model (a) and surface analysis (b) from 00 UTC on 30 October, 2011.