A Footnote to Famous Weather History
The Exeter, New Hampshire Tornado of June 9th 1953
By
Jim Brewster, Meteorologist

Photo of the tornado damaged remnants of the Exeter Country Club
(Courtesy of the Exeter Historical Society)

Introduction

The period of June 7th through June 9th 1953 was one of the deadliest consecutive day tornado periods in the modern history of the United States. On the 7th of June, a strong storm system took shape over the central Plains states, where several tornados were reported on the northern edge of the classic "Tornado Alley" in eastern Colorado, Nebraska and Iowa. This storm system marched east, into an increasingly warm and humid airmass resulting in another round of tornados on June 8th over Michigan and Illinois. One such tornado was the major killer tornado that hit the Beecher neighborhood of Flint, Michigan taking 116 lives. The Flint-Beecher tornado ranks, to this day, as the last tornado to single handedly kill over 100 people.

The storm system continued it's eastward trek, and on June 9th, produced the great "Worcester Tornado", the only F-5 ranked tornado to hit any of the New England states. The Worcester event was impressive, and well worthy of its place in the annals of history, but there were other significant tornados and severe hail producing thunderstorms spawned by the very same meteorological conditions that day which have seen little notoriety. One of these tornados struck my hometown of Exeter, NH, causing 5 minor injuries and damaging or destroying a combination of 15 homes and businesses.

The Story

At the conclusion of a hot and humid late Spring day, a line of thunderstorms rolled into Exeter on a Tuesday evening. One thunderstorm cell entered the western part of town and pounded the area with heavy rain, and high winds. The storm then moved through The Oaklands forest, and at 5:20 pm, a strong tornado touched down on the property of Nellie Swasey just a few hundred yards from the Newfields Road entrance to Swasey Parkway. After pushing her home off its foundation, the tornado quickly crossed the Squamscott River and climbed Jady Hill. It blasted the Exeter Country Club, where the Tuesday evening women's league was just teeing off, then tore through the newly constructed homes of Country Club Estates near Ridgecrest Drive and Douglass Way. Automobiles at the country club were strewn about, (some moved 20 yards or more) and the garage at the Manix residence was destroyed.

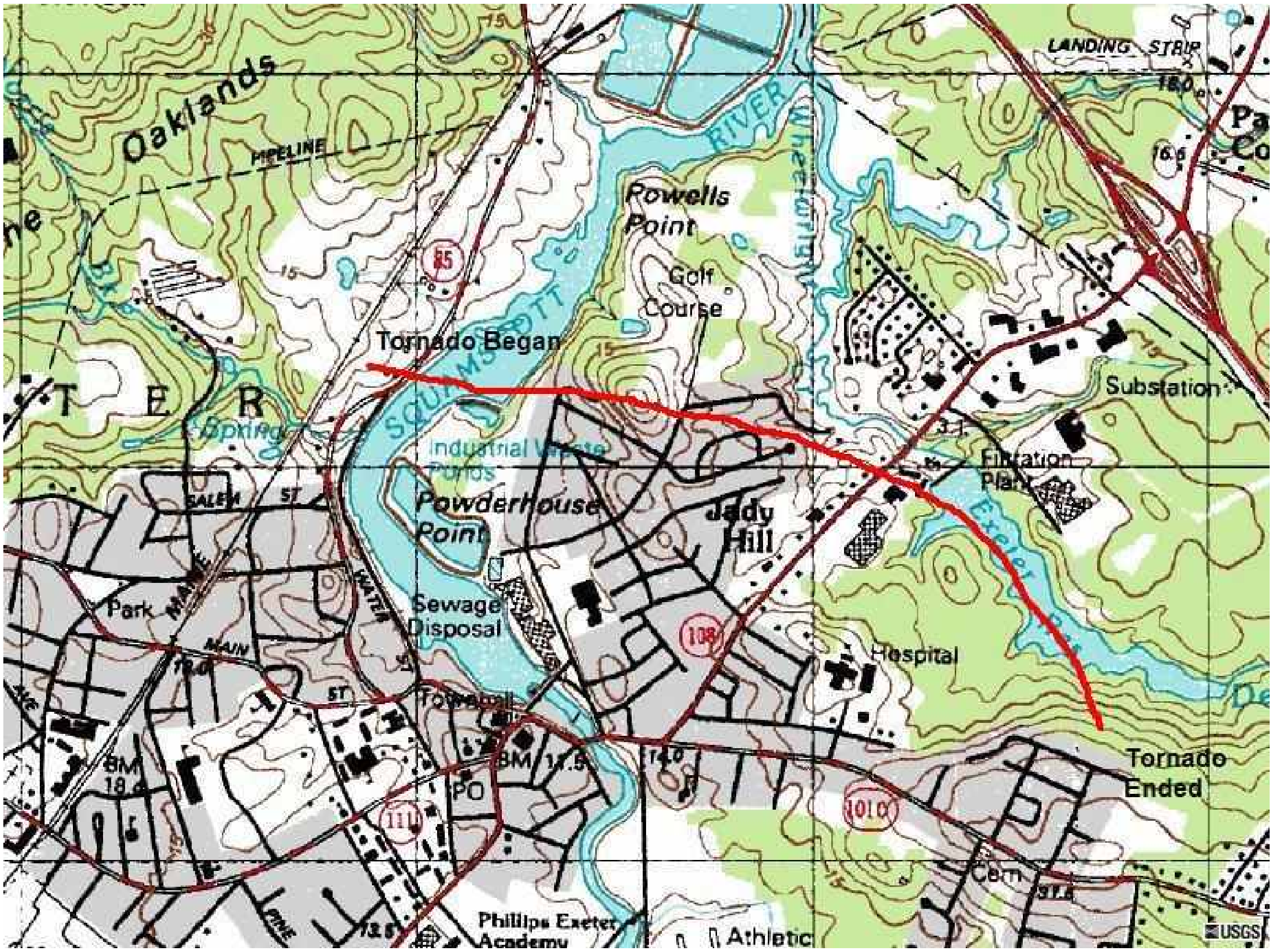
Damaged garage on Jady Hill Ave. Structure in the background has Country Club wreckage embedded in its roof.
(Photo Courtesy of Exeter Historical Society)

Other homes sustained significant structural damage. The tornado continued on its two mile trek, tearing through Paquette's Market on Portsmouth Ave (vicinity of the plaza where New England Pizza is today) and then crossed Portsmouth Avenue.

Photo of the damaged Paquette's Market with cleanup in progress
(Courtesy of Exeter Historical Society)

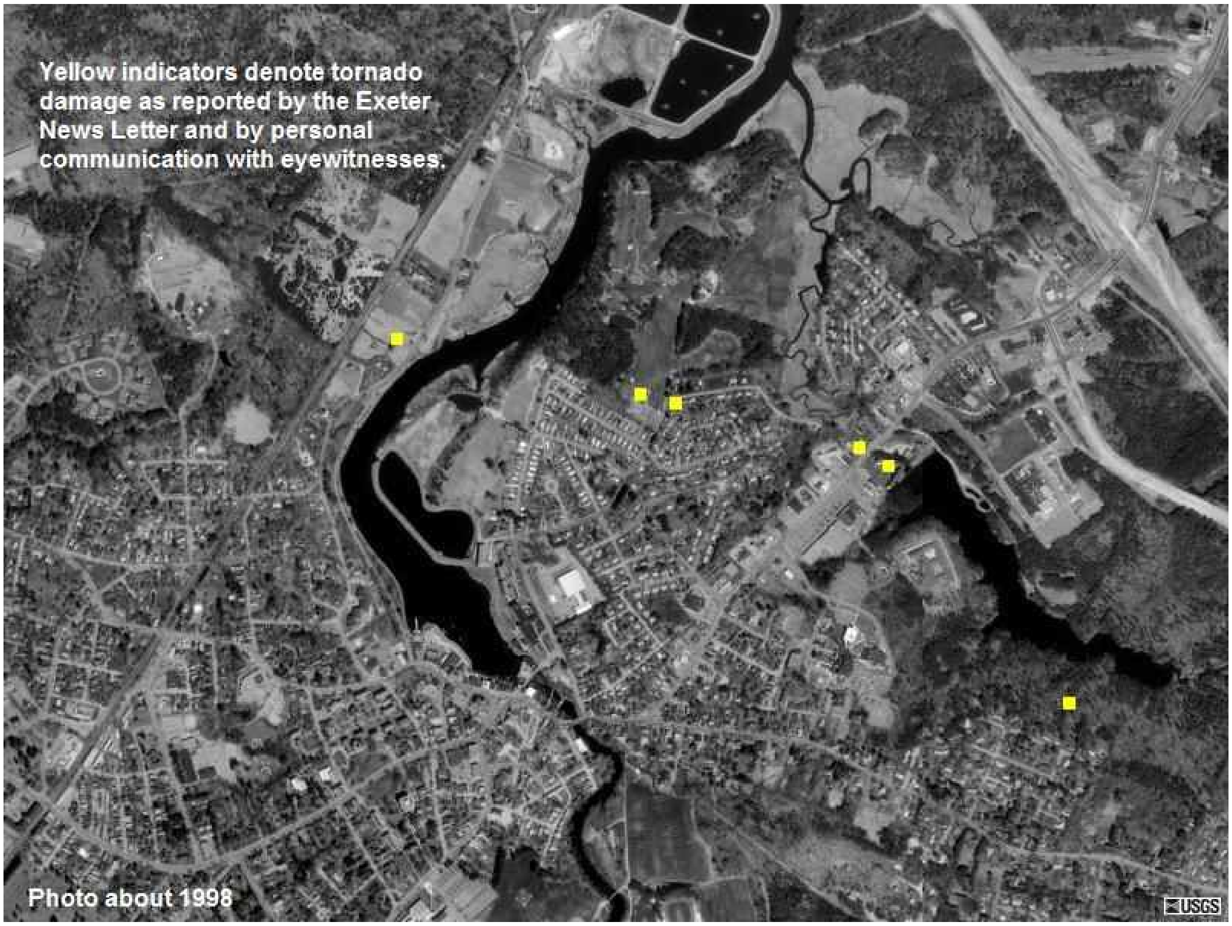
It then passed by the Wayne Colby residence, tossing large trees into the structure, and narrowly missing Mrs. Colby. The tornado then followed the southern shore of Water Works Pond, removing hundreds of gallons of water, and was last seen dissipating in the wooded area behind the Colonial Heights neighborhood on the north side of High Street. The *Exeter News Letter* reported that the tornado missed Exeter Hospital by 500 yards as it moved toward Colonial Heights. After the tornado struck, another severe thunderstorm cell moved over Exeter and pelted the area with large hail. My father, Bill Brewster, an Exeter police officer on duty at the time, estimated most of the hail to be the size of quarters, with some ping pong balls thrown into the mix. Mr. Brewster was outside of Moore's Shoe Store at the time the tornado was tearing across Jady Hill. Although he remembers hearing "a roaring noise", the downtown buildings blocked his view of this locally historic event. He, and police Chief Hoyt, responded first to the Swasey residence, and were subsequently pelted again with large hailstones.

The following topographic map shows the approximate track of the tornado that cut a path through town of about two miles long and 100 yards wide.



Topographic map with approximate tornado track.
(Map generated from USGS terraserver)

The satellite view (circa 1998) below shows locations of significant damage as reported by the *Exeter News Letter* and personal correspondence. Both maps are oriented roughly west to east from left to right across the page. The left most yellow square denotes the initial touchdown of the tornado at the Swasey home, followed by square markers at the Country Club, Jady Hill Avenue damage, Paquette's Market, the Colby house and tree damage behind Colonial Heights.



Satellite photo showing damage locations.
(Picture generated from the USGS terraserver)

The Meteorology Behind June 9th, 1953

There are several key ingredients needed for the atmosphere to produce severe thunderstorms. Instability, lift and wind shear must all combine in just the right proportions to bring damaging weather to New England, especially the seacoast regions. Most of the time, severe weather and tornados are thwarted by the typical summertime easterly winds off the cool ocean waters. On June 9th 1953, however, all of those necessary ingredients came together perfectly with the end result logged forever in the history books. The atmosphere boiled with high heat and humidity near the earth's surface during the afternoon hours, while colder and very dry air was being blasted across New England in the upper levels of the atmosphere on unseasonably fast jet stream winds. Even the most experienced "Tornado Alley" forecasters of the central Plains states would have been impressed by the atmospheric setup that day.

Early in the morning of June 9th, a low pressure system over the Quebec province was steadily moving east with its warm front, (the leading edge of a very hot and humid airmass) crossing eastern New York and entering Connecticut. The trailing cold front was cutting across western New York and moving through the Ohio. (Fig. 1)

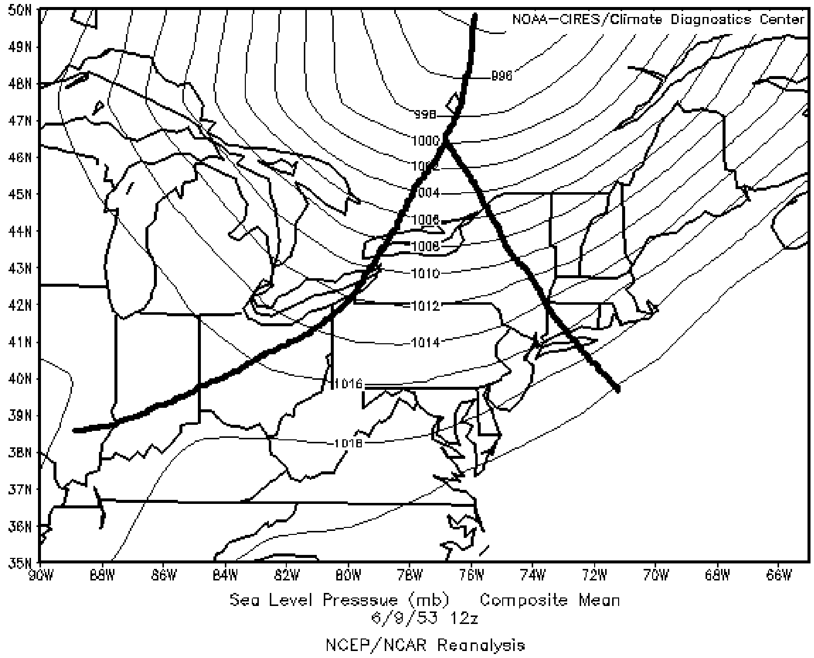


Fig. 1. Surface analysis chart for 0800 local time 9 June 1953
Heavy black lines denote warm, cold and occluded frontal positions.

Warm and humid air in the lower levels of the atmosphere was also beginning to advance east. Figure 2 shows temperatures at approximately 5000 feet above the earth's surface. Note the axis of yellow and orange colors extending from the Ohio Valley into New England, which denotes the warm air. A similar wedge of warm air was noted on surface charts not shown. At the same time, Figure 3 shows a tongue of high moisture values, as denoted by the darker blue and purple colors, extending northward to western sections of New England.

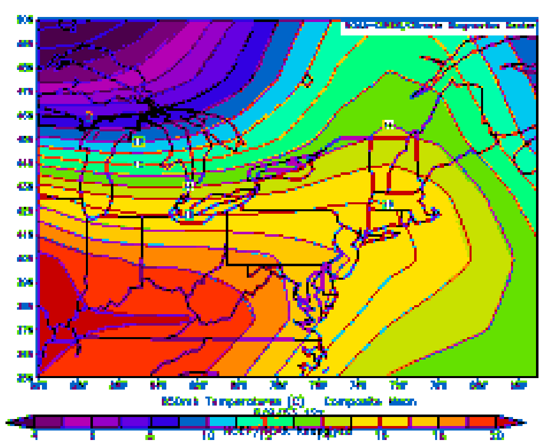


Fig. 2. 850 mb temperature contours for 0800 9 June 1953

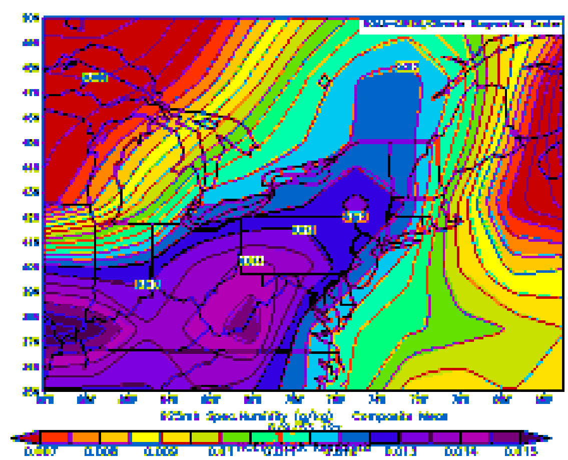


Fig. 3. 925 mb humidity contours for 0800 9 June 1953

In the upper levels of the atmosphere, a disturbance of low pressure was entering western New York during the early daytime hours on an easterly course toward New Hampshire. (Fig. 4) Simultaneously, a very strong jet stream of air at about 30,000 feet above the earth's surface was blasting across the northern tier of the United States as shown in Figure 5. Note the core of strong wind speeds extending from the Dakotas to western New York (yellow to red colors). This feature was ushering very dry and cold air in the middle part of the atmosphere toward New England. (Fig. 6) The relative humidity at about 15,000 feet over Michigan and western New York were dropping to as low as 20 percent!

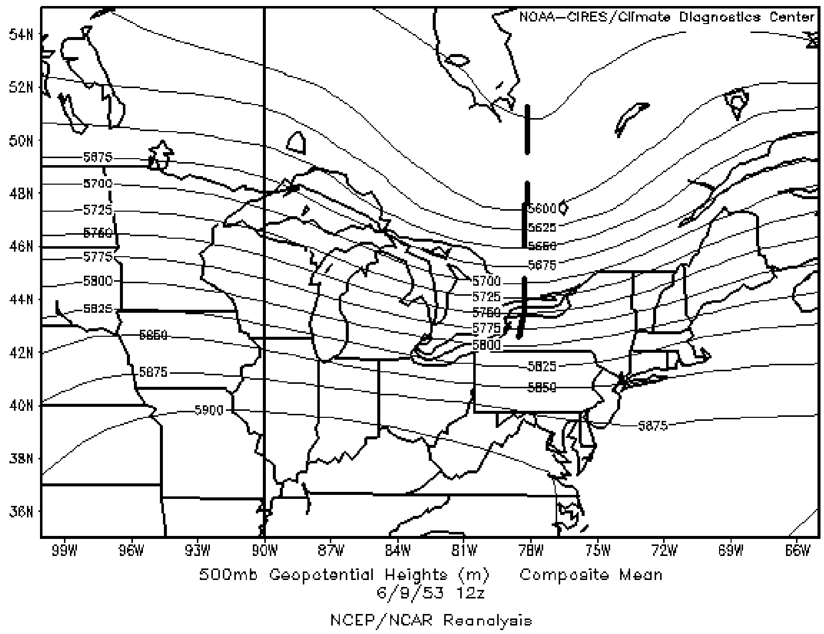


Fig. 4. 500 mb (~15,000 feet) height analysis for 0800 9 June 1953
Heavy dashed line indicates the axis of an upper level disturbance

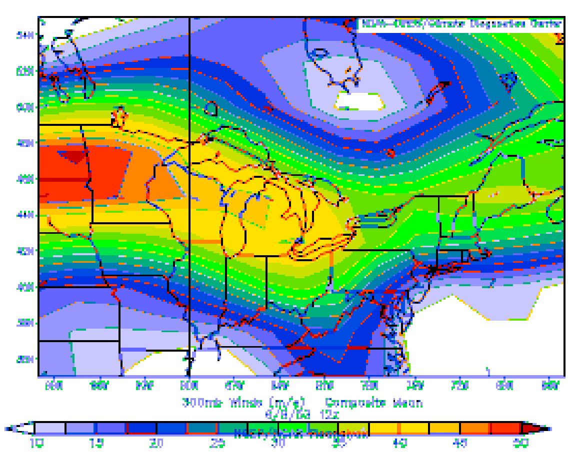


Fig. 5. 300 mb (~30,000 feet) wind speed contours

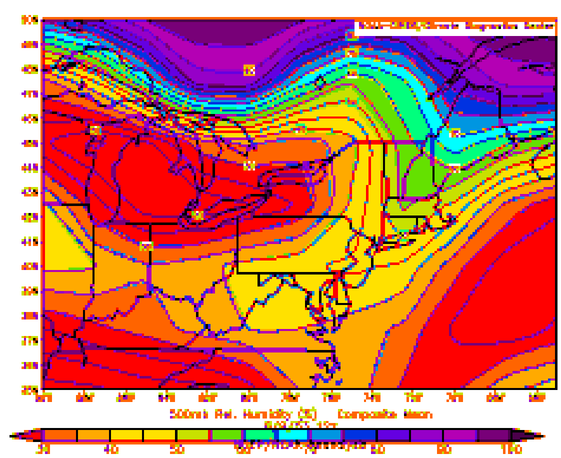


Fig. 6. 500 mb (~15,000 feet) humidity contours

By 2 P.M. local time, the warm front had moved across all of central and southern New England, and the trailing cold front was moving through central and eastern New York. (Fig. 7) The warm and moist air was entrenched over southern New Hampshire by this time, (Figs. 8 & 9) with the temperature and dew point at Concord, NH reported at 83 degrees and 67 degrees respectively (not shown). The *News Letter* reported the day as having been “an extremely hot and humid day” in Exeter.

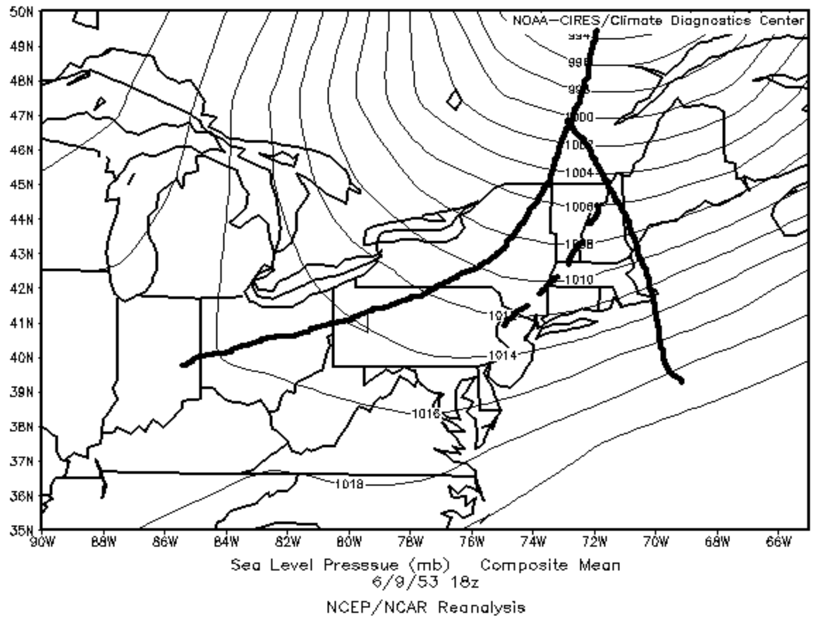


Fig. 7. Surface analysis chart for 1400 local time June 9, 1953
Heavy black lines denote warm, and cold frontal positions.
Dashed line denotes position of a developing squall line of thunderstorms.

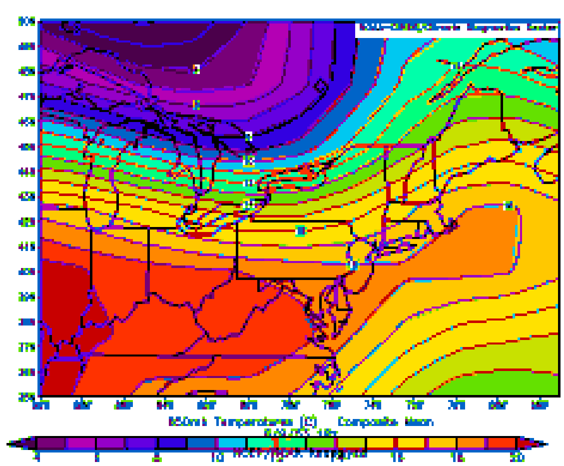


Fig. 8. 850 mb temperature contours
for 1400 9 June 1953

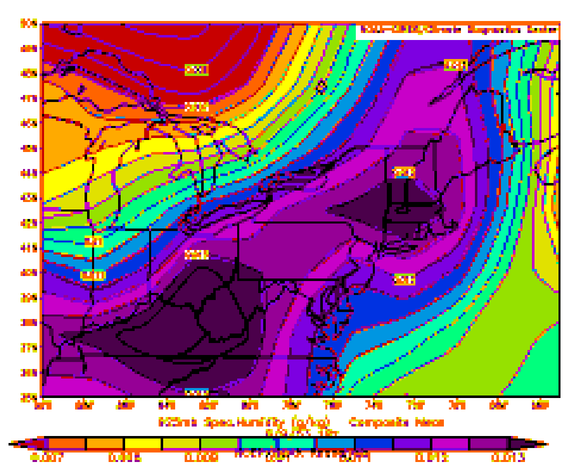


Fig. 9. 925 mb humidity contours
for 1400 9 June 1953

The strong jet stream (Fig. 11) continued to push drier air aloft (Fig. 12) into central and southern New England, and the upper level disturbance (Fig. 10) began to trigger thunderstorms in the warm and humid airmass over western New England. These storms fired up as a squall line of storms along a surface trough of lower pressure (dashed line in Fig. 7) over western New Hampshire and Massachusetts during the mid afternoon. This area of low pressure, combined with the disturbance moving overhead, focused the heat and moisture into a concentrated area, creating the lift necessary for storm development.

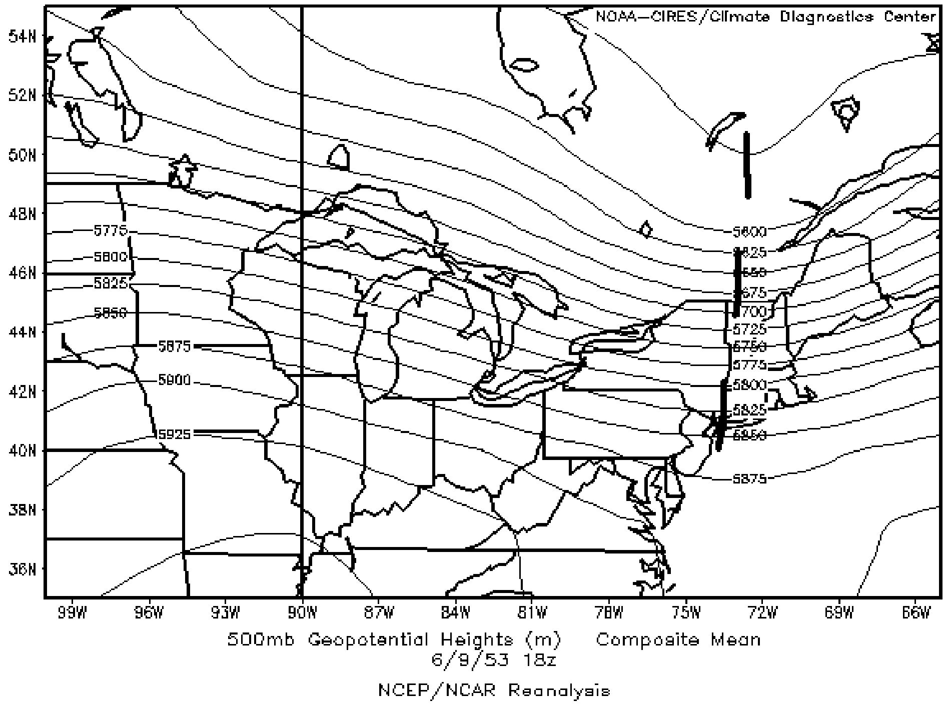


Fig. 4. 500 mb (~15,000 feet) height analysis for 1400 9 June 1953
Heavy dashed line indicates the axis of an upper level disturbance

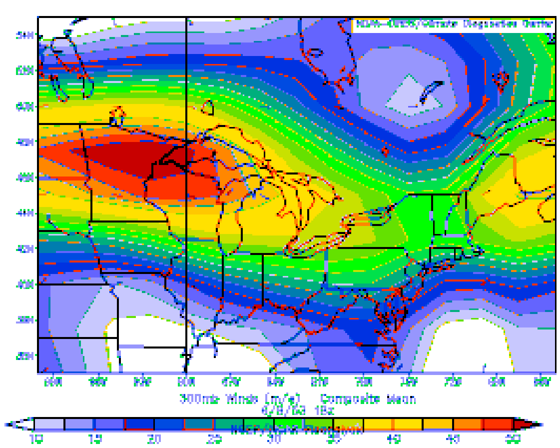


Fig. 11. 300 mb (~30,000 feet) wind speed contours

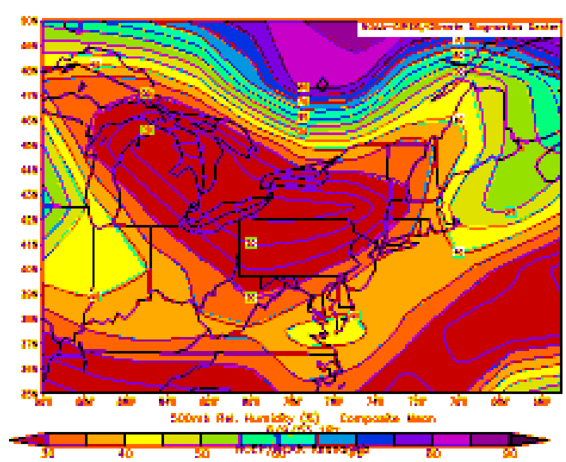


Fig. 12. 500 mb (~15,000 feet) humidity contours

The weather charts showed that by mid afternoon, the key ingredients were in place over New England for a major tornado outbreak. The atmosphere had sufficiently heated and moistened up in the lowest few thousand feet near the earth's surface, while cooler, drier air was moving in over the top of those sultry conditions. This contrast in vertical temperature and moisture differences provided the extreme instability necessary for long lived, intense thunderstorms. Storms developed early in the afternoon over the Monadnock Region and steadily marched east toward the Seacoast. These storms were reported to contain large hail between the sizes of mothballs to golf balls, which is typical under the noted atmospheric conditions. In this environment, strong updraft storms can repeatedly lift raindrops into the colder and drier air of the upper atmosphere causing them to refreeze into larger and larger hailstones. Another critical ingredient for severe weather, and especially tornados, is wind shear. We can also glean from the surface and upper air charts presented, that there was sufficient turning of the wind direction from the surface to the jet stream level, and also a significant increase in wind speed. The orientation of the pressure lines on the surface chart (Fig. 7) show that surface winds were out of the southwest, and this was also recorded by weather observers in Concord, NH where winds were from the southwest at 18 knots (not shown). Local effects caused by Exeter's proximity to the ocean may have even turned the wind direction a bit more southerly. In the mid levels of the atmosphere (Fig. 10) the wind tends to follow the analyzed height lines on the weather map, and thus the direction can be implied to be west-southwest. Upon reaching jet stream level (Fig. 11), the winds were out of the west, and were likely to become nearly northwest later in the afternoon. Figure 11 was contoured to show wind speed, with the color contours denoting speeds of about 70 knots over the area, with higher speeds coming toward New Hampshire from upstate New York. Variations in wind direction and speed from southerly at the surface to westerly at the jet stream level are very favorable for rotating thunderstorms, and possible tornados.

Summary

This document was written to commemorate the 50th anniversary of the Exeter tornado of June 1953. Basic meteorological charts and analysis were presented to show the mechanisms that presumably caused the thunderstorms and the tornados on that day. Unfortunately, due to the restrictions of the science at that time, the people of Exeter had no Warning statement, and no preemptive Watch, or "heads up" statement was in effect that day. At the time, New England meteorologists had never seen these conditions in such an extreme fashion before, and a tornado warning had never previously been issued in the region. The first tornado forecast actually had only been developed 5 years earlier. The Weather Bureau (now National Weather Service) meteorologists of 1953 did, however, do an outstanding job identifying these clear cut severe weather signatures, and the general forecast for the day stated that strong afternoon thunderstorms were likely. The tornado events spanning those few days in June were a strong catalyst to the modern severe thunderstorm and tornado Watch and Warning program we have today. Doppler radar and comprehensive spotter and communication networks today would have easily been able to detect the tornados of this magnitude with enough time to provide a warning.

The Exeter tornado is listed as the strongest tornado (F3 ranking on the Fujita scale) to strike Rockingham county and is tied as one of the strongest to hit anywhere in New Hampshire. The deadliest tornado in the Seacoast region was the July 4th 1898 tornado that hit Hampton Beach and devastated the popular roller skating rink. The storm killed 3 and injured 120 people. Many of these folks were Exeter residents enjoying an evening of skating. The last reported tornado to strike Rockingham county occurred in 1978…..also on June 9th. (Addendum: Last confirmed tornado 5/21/2006 vicinity of Hampton Falls)

Acknowledgements

The author thanks the Exeter Historical Society for allowing permission to use local photos from their collection, and for the time invested in finding these pictures and sending them to him. Thanks also to Maria Fiori for aquiring the (Penn; 1955) reference from the SUNY Oneonta library and her time spent searching and copying it.

References

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www.tornadoproject.com

About the Author

Jim Brewster is an Exeter, NH native (EAHS class of ’86) and holds a B.S. degree in meteorology from Lyndon State College, VT. He is currently a senior meteorologist with the National Weather Service Forecast Office in Binghamton, NY.