

# Storms of Tropical Origin: A Climatology for New York State, USA (1851-2005)

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## Introduction

Tropical cyclones (including tropical depressions (<34 mph winds), tropical storms (<74 mph winds) and hurricanes (>74 mph winds)) are massive storms formed in tropical waters, capable of producing violent winds, flooding, and heavy amounts of rainfall. While these storms form at tropical latitudes they are a significant element making up the climatology of New York State. These storms bring with them damaging winds, heavy rains, and even re-shape coastlines. Hurricanes represent a real hazard to Long Island and New York City At 1,901.6 billion dollars, New York State is only second to Florida (1,937.4 billion dollars) in insured coastal properties. Experts have warned that a direct hit to New York City from a Category 3 hurricane could cause economic losses twice that of the 9-11 attack, and three times that of Hurricane Katrina.

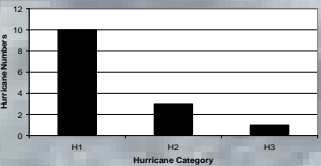
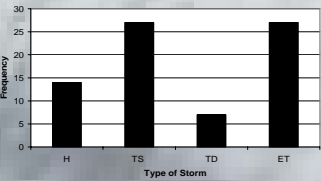
Less well known are incursions of decaying storms (a tropical storm or a tropical depression), or storms that lose their tropical characteristics and transit to extratropical cyclones. Although less common than frontal storms, extratropical cyclones also cause extensive damage, especially flooding associated with heavy rainfall. A well known example is hurricane Agnes (1972) that reached New York State as a tropical storm and produced rainfall amounts in excess of 15 inches, resulting in extensive flooding.

## Objectives

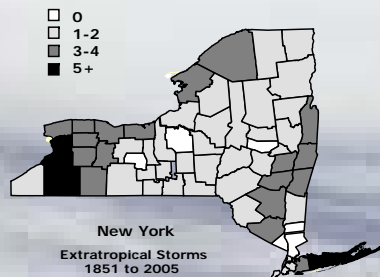
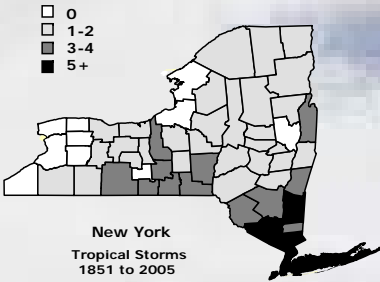
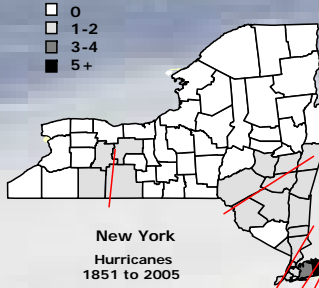
There are two objectives to this study. The first objective is to provide an exhaustive characterization of the frequency, intensity, and timing of storms of tropical origin that have reached New York State between 1851 and 2005. The second objective is to determine if there is evidence of a recent change in this characterization that might be linked to a changing climate. The implication is that a warming ocean may increase the frequency, intensity or timing of storms of tropical origin that reach New York State.

## Climatology

Seventy-six storms of tropical origin have passed over New York State between 1851 and 2005. Of these storms, 14 were classified as hurricanes. The remaining storms, although originating as hurricanes in the Atlantic or Gulf of Mexico, passed over New York State as weaker or modified systems.



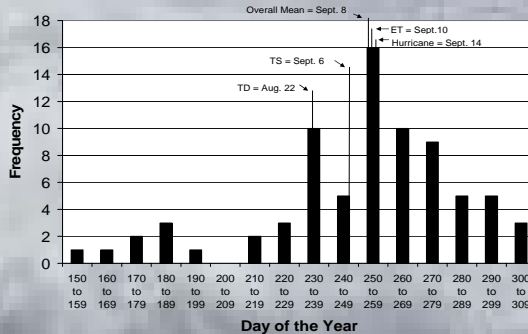
H1 (category 1 hurricane), H2 (category 2 hurricane), H3 (category 3 Hurricane), TD (tropical depression), TS (tropical storm), and ET (extratropical storm).



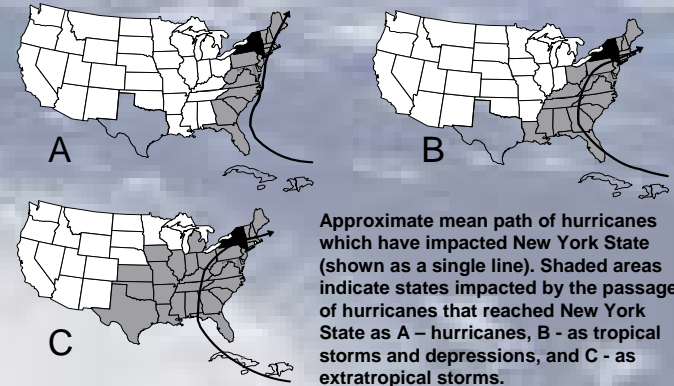
The extension of Long Island into the Atlantic Ocean has placed it in the path of 12 of 14 hurricanes. Only two hurricanes (occurring in 1878 and 1893) have impacted upstate New York. The 1878 hurricane holds the distinction of traveling the greatest distance over the state (90 miles), and the 1893 hurricane traveled the furthest west.

Tropical Storms passed over New York more frequently than hurricanes. While Long Island continued to receive the brunt of these storms, their frequency increased in southeastern upstate NY, and to a lesser extent in remaining upstate counties. Areas to the lee of the Great Lakes Lakes remain free of tropical storms

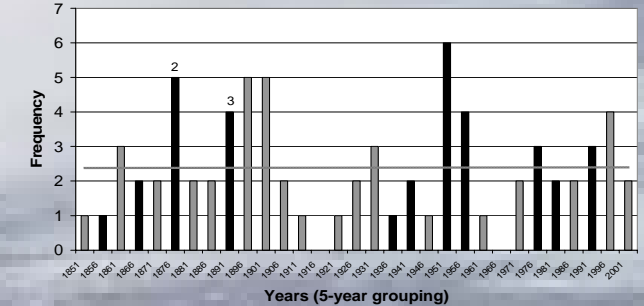
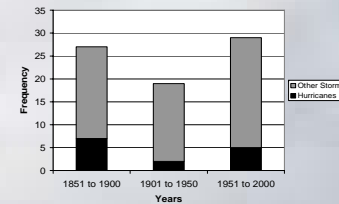
Extratropical storms (storms that lose their tropical characteristics and merge with mid-latitude cyclones) extend further into western New York, but continue to impact Long Island, and southeastern upstate New York. As with mid-latitude cyclones, extratropical storms appear to be deflected around the Adirondacks and the Catskill mountains



Frequency of storms of tropical origin. TD (tropical depression), TS (tropical storm), and ET (extratropical storm). Mean dates shown for each storm category. The intensity of storms of tropical origin that reach New York State appears to increase through the summer season.



## Evidence of a Changing Climatology



The frequency of storms of tropical origin is shown above. Groupings which include hurricanes are shown as black bars, multiple hurricanes are noted. The average frequency of hurricanes and storms of tropical origin (all types) is one in every 11 years and one in every two years, respectively. The stretch of years between 1906 and 1946 experienced the fewest number of storms. A flat trend line is shown for storm frequency between 1851 and 2005.

