
# Snowfall within Coastal Storms in the Northeast United States

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ENVIRONMENT ANALYTICS

## I. Background

Previous work by Stark et al. 2013 and Colle et al. 2014 indicates that snowflake characteristics vary among different regions of winter storms. Riming occurs when a snowflake falls through a cloud containing supercooled water droplets. The droplets adhere to the snowflake and freeze, progressively coating the snowflake. The degree of riming relates to how thick the coating is. Near the low pressure center, the degree of riming is greater.

## II. Dataset

We have been collecting radar and snowflake data at Stony Brook University (SBU) on the northern shore of Long Island in New York since December 2014. The instruments include a Multi Angle Snowflake Camera (MASC) and a vertically pointing Micro Rain Radar (MRR). We use reanalysis surface pressure fields to obtain the relative position of SBU to the low pressure center of the cyclone.

**Figure 1.** Multi Angle Snowflake Camera (MASC)

**Figure 2.** Micro Rain Radar (MRR)

Goal: To assess how detailed snowflake observations of types and degrees of riming compare among different regions storms.

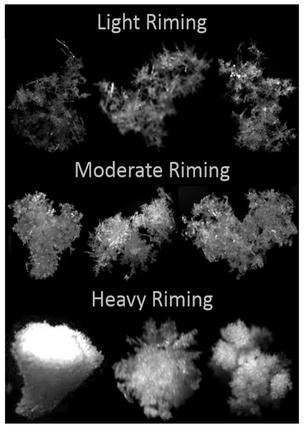



**Figure 3.** Snowflakes classified by degree of riming, ranging from light to heavy.

Figure 4

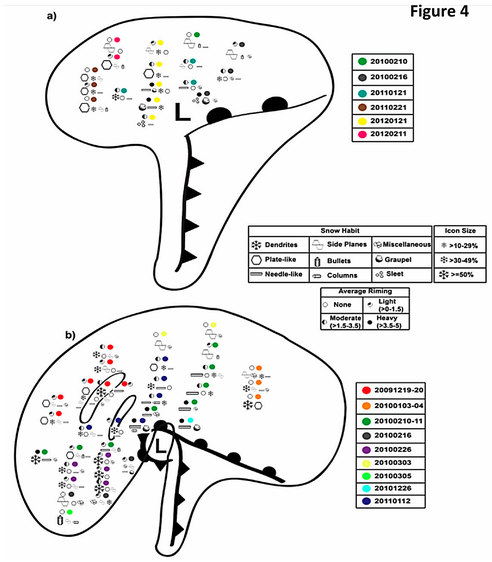



Figure 5

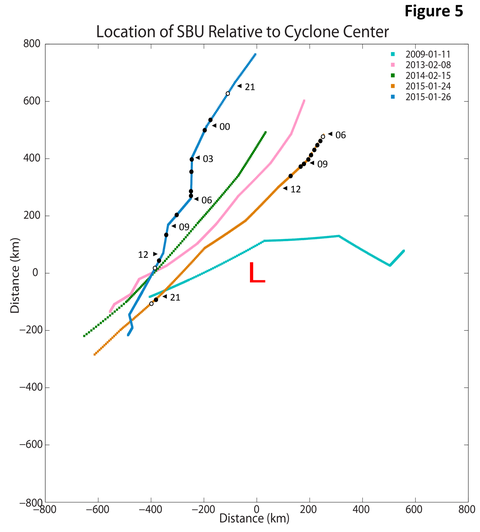



**Figure 4.** (Top Left) Observed snow relative to the cyclone from Colle et al. 2014 classified by storm, snowflake type, and degree of riming for (a) developing cyclone and (b) mature cyclone.

**Figure 5.** (Bottom Left) Locations of SBU relative to the low pressure center. Circles and UTC hour represent approximate location of images relative to the low pressure center. Nonshaded circles indicate first and last images, while shaded circles indicate all other images. (Note: Beginning of 2015-01-24 track extrapolated.)

**Figures 6 & 7.** (Top/Bottom Right) Time-height plots of MRR reflectivity (related to precipitation rate) and spectral width (measure of turbulence) at SBU with observed MASC images. Size below images indicates width of snowflake. Images in the figures are scaled to relative size.

## III. Data Analysis

Figure 6

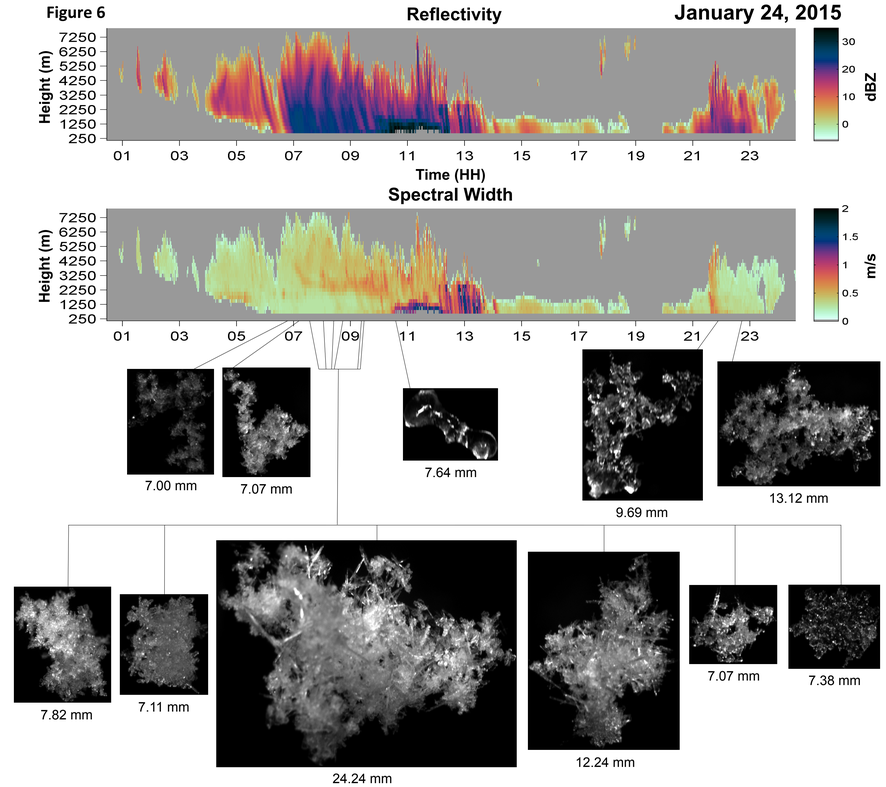
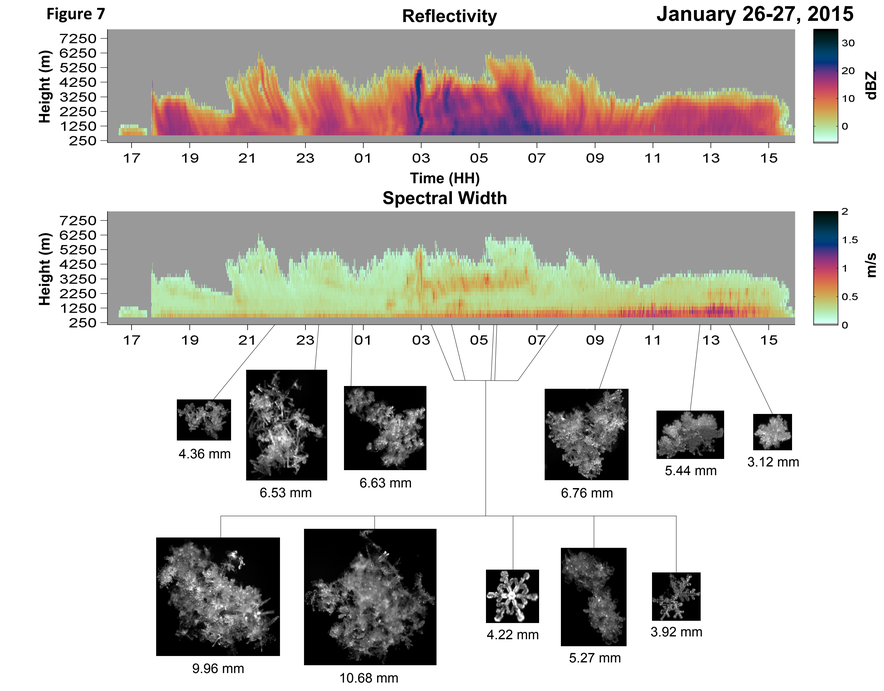



Figure 7




## IV. Results & Future Work

**January 24, 2015:**

- Periods of snowfall at the surface occurred when SBU was NE of the low pressure, then later when SBU was SW of the low pressure.
- Temperatures above freezing at the observation site caused snowflakes to partially melt at 09 UTC and fully melt by 11 UTC, resulting in liquid precipitation at the surface for an extended period of time.
- Degree of riming generally light to moderate, but riming can be difficult to assess as more melting occurs.

**January 26-27, 2015:**

- Snowfall at the surface occurred when SBU was NW and SW of the low pressure.
- Temperatures at the observation site remained below freezing throughout the storm.
- Degree of riming ranged from light to heavy, increasing as SBU became closer to the cyclone low pressure center.

**Comparison:**

- These results on the spatial variability of degree of riming agree with previous work.
- Many of the images contained aggregates, or jumbles of snowflakes.
- The largest aggregates from the January 24 storm are significantly larger than those that fell in the January 26-27 storm.
- Since many aggregates and few individual snowflakes were observed, predominant snow habit, or snowflake type, is difficult to determine.
- However, needles and six-sided dendrites as part of aggregates are visible in images from both events.

**Future Work:**

We plan further field data collection this coming winter and will incorporate automated methods to determine degree of riming in the analysis.

**References:**

Colle, B. A., D. Stark, and S. E. Yuter, 2014: Surface microphysical observations within East Coast winter storms on Long Island, New York. Mon. Wea. Rev., doi:10.1175/ MWR-D-14-00035.1.

Stark, D., B. A. Colle, and S. E. Yuter, 2013: Observed micro-physical evolution for two East Coast winter storms and the associated snow bands. Mon. Wea. Rev., doi:10.1175/MWR-D-12-00276.1.

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