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A Brief Summary of the Report on Montague, New York's, 77-Inch, 24-Hour January 11-12, 1997, Lake-Effect Snowfall

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1. Background:

During a 24-hour period on January 11-12, 1997, a NWS snow spotter, recruited to support a lake-effect snow study by the Buffalo National Weather Service (NWS) Forecast Office (WSFO BUF), reported six measurements of snowfall, which when summed, totaled 77- inches. Due to the unusual intensity of the storm, the measurement received national attention (Figure 1). In the days following the report, the NWS Buffalo Forecast Office declared the observation to be a new national 24-hour snowfal record.

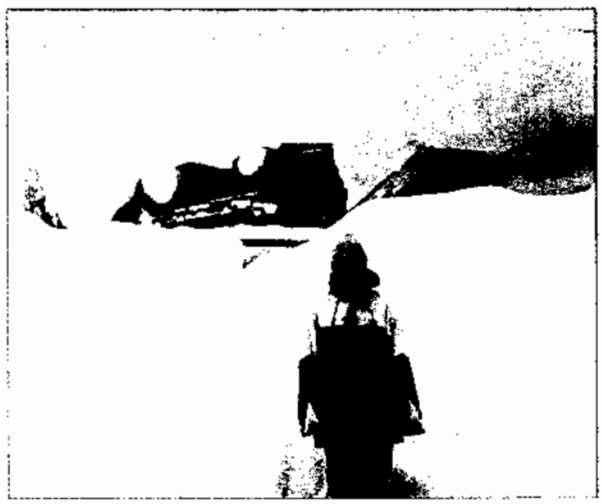

Figure 1: Local resident standing in front of Montague Inn after the event.

The national 24-hour snowfall record is considered by many to be the benchmark for the severity of snowstorms. Therefore, it was not surprising that the news of a new extreme record amount immediately generated nationwide controversy. Questions were raised concerning the validity of the 77- inch total and whether a local NWS office held the authority to declare a local observation a new national record.

The NWS quickly proceeded to organize a committee, which was composed of three NOAA employees and three external climatological community members. The committee was tasked with studying the Montague snowfall event and reporting on its validity.

The committee's extensive review of the Montague snowfall is briefly summarized here. Additionally, NOAA's response to the committee's recommendation regarding the validity of the 77-inch snowfall total is also presented.

The complete report of the committee's detailed evaluation of the storm and related issues was published on May 1, 1997 in a special 41-page report (NWS, 1997).

2. Introduction

The Tug Hill Plateau of New York State (locally known as "Tug Hill") has once again drawn national attention with reports of a record-setting "lake-effect" snowstorm. Historically, this area, located just east of Lake Ontario (Figure 2), has exhibited some of the heaviest and most intense snowfalls east of the Rocky Mountains. The area has long been notorious for its intense lake-effect snowstorms. Noteworthy snowfall totals from the area include a state record-setting published seasonal total of 467 inches at the NWS cooperative station at Hooker 4N (elevation 1,680 feet) during the 1976-77 winter season. Average seasonal snowfalls in the area are about 250 inches.

The elevated rolling surface of the 15 mile-wide by 30-mile long oval-shaped Tug Hill lies about 25 miles due east of Lake Ontario. The axis of the oval is northwest-southeast. Almost 600 square miles of the plateau lie at or above 1,500 feet, with maximum elevations reaching 2,000 feet (Figure 2). Tug Hill's proximity to a large unfrozen lake, its location directly downwind of the longest fetch over the lake, the significant size of the elevated area which induces upslope flow (Lake Ontario's elevation is 236 feet), and its elevationally driven cooler temperatures, all combine to produce prodigious amounts of snow in similar lake-effect events.

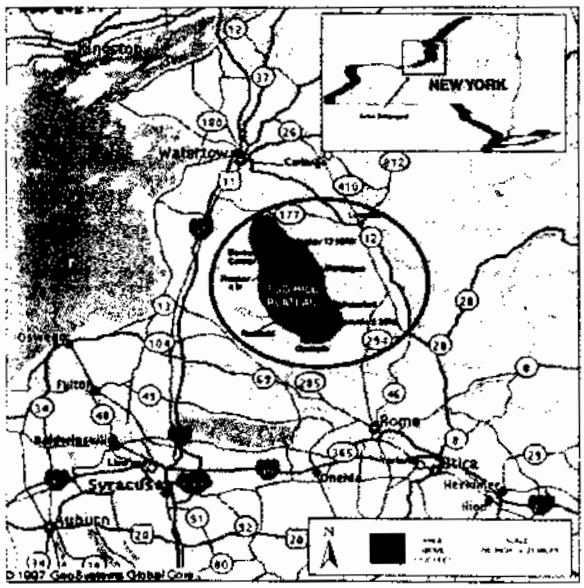

Figure 2: Map of Tug Hill area.

The Tug Hill Plateau was smothered on January 10-14, 1997, by one of the greatest lake-effect snow bursts ever recorded. The action began Friday morning (10th) with a frigid wind flow from the southwest (220 to 230 degrees), setting up an intense snow band over the St. Lawrence Valley. The band shifted south to Tug Hill Saturday (11th) as winds shifted to a more westerly component and stalled from late Saturday to midday Sunday (12th) (Figure 3). The snow continued into Tuesday (14th) before ending. Hourly amounts during the burst reached as high as 5-6 inches per hour. Unprecedented amounts of snow were reported from several NWS snow spotters. Four-day storm totals included 95 inches at Montague (elevation 1,850 feet), and 90 inches at both North Osceola (elevation 1,750 feet) and Redfield (elevation 1,700 feet) (Figure 5). The sparsely populated but recreationally popular area was buried by the storm.

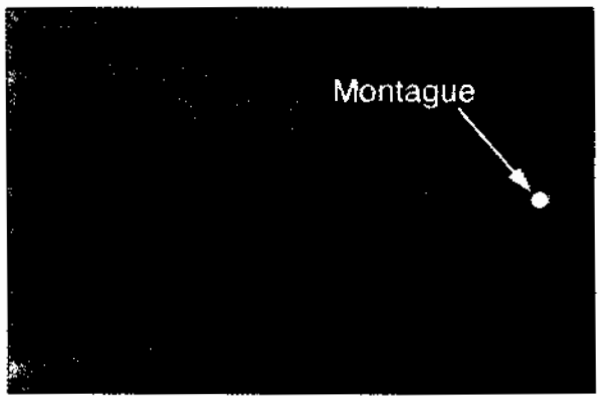

Figure 3: Goes 8 1KM VIS 12:45 EST Jan. 12, 1997. Lake Ontario snow streak.

Of special interest, and the subject of the committee's study, was the 77-inch, 24-hour snowfall total measured by an NWS snow spotter at Montague during the most intense period of the storm.

3. Evaluation of the Montague Snowstorm

The source of data that produced the 77-inch, 24-hour snowfall value was the sum of a series of six measurements phoned in to the NWS Buffalo Forecast Office (WSFO BUF) by the volunteer snow spotter at Montague (Table 1). With each measurement, the observer cleared his snowboard.

The average elevation in the Montague area is about 1,800 feet above mean sea level. The topography in the area can be best characterized as gently rolling, with woodland environments interlaced with open meadows and farms.

The Montague snowfall measurements were made in an excellent location for snow measurement, open, not affected by buildings, and with enough nearby trees to result in little drifting, even during relatively strong winds. The site is equipped with two 6-foot-high snow stakes about 20 feet apart. A 2-foot square snow board was located between the two stakes (Figure 4).

The summing of the six observations to get a 24-hour snowfall total is inconsistent with WSFO BUF's written instructions for spotters, which states: "Do not measure every hour and add them up...this would give an unrealistically high amount [for climatological records], every 6 or 12 hours would be fine (unless it's melting)." The called-in observations did appear consistent with the event-driven operational real-time reporting criteria also indicated in the same written instructions. It was noted that the observer did not sum the six observations himself and report the 77-inch, 24-hour amount. This was first done by The Weather Channel, then later checked and acknowledged by WSFO BUF.

Figure 4: Site where 77- inch snowfall measurement was made.

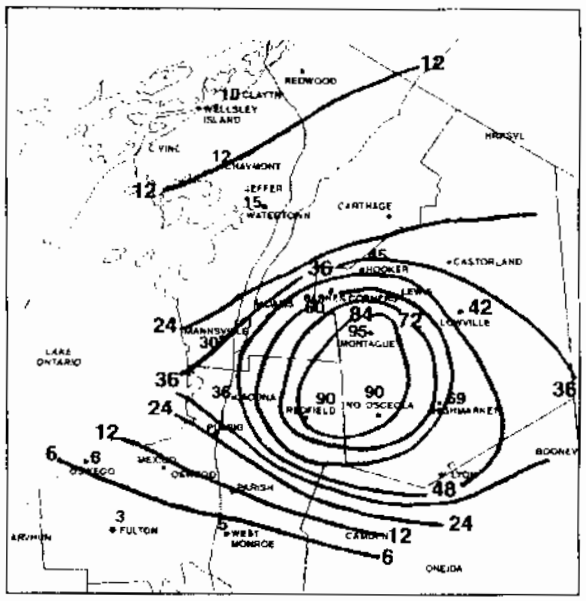

Figure 5: Event total snowfall map.

Although the spotter did not measure the liquid equivalent of the snowfall, all the evidence suggested that the snow that fell at Montague during this storm was of a very light, fluffy nature (low density) and accumulated to a great amount.

Date Jan. 1997	Time of Observation	Observation Interval	Snowfall (inches)
11	1:30 p.m. to 2:30 p.m.	1 hour	2
	2:30 p.m. to 5:30 p.m.	3 hours	6.5
	5:30 p.m. to 7:30 p.m.	2 hours	2.5
11-12	7:30 p.m. to 7:30 a.m.	12 hours	40
12	7:30 a.m. to 11:00 a.m.	3.5 hours	16
	11:00 a.m. to 1:30 p.m.	2.5 hours	10
Totals (11-12)	1:30 p.m. to 1:30 p.m.	6 in 24 hours	77

Table 1. Six Snowfall Measurements from the Montague, New York, Snow Spotter for the 24-Hours from 1:30 p.m. EST, January 11, 1997, to 1:30 p.m., January 12, 1997.

4. Committee Findings

The committee's extensive review of the January 11-12, 1997, Montague, New York, snowfall observations and related information suggests that the observer's measurements followed WSFO BUF's real-time operationally oriented guidelines for snow spotters, not climatological guidelines. The observer took and reported six snow measurements between 1:30 p.m. on January 11 and 1:30 p.m. on January 12, 1997 (five of which were within twelve hours), to support real-time NWS operations. The observer was exceptionally diligent.

However, an inconsistency arose when these six operationally oriented snow measurements were added to get a total for a 24-hour period. The resulting 77-inch snowfall amount was reported as a new national climatological record.

NWS standards for climatological observations of snowfall require that no more than four observations, taken with a maximum frequency of once every six hours, be summed within any 24-hour period to compute the total snowfall for that period. More frequent measurements taken by clearing the snow board tend to increase totals, especially when fluffy snow such as those in this Montague storm are involved. Recognized climatic snowfall records should be based only on observations that satisfy climatic data standards.

The six Montague observations taken on January 11-12, 1997, although measured individually in a valid scientific manner for supporting real-time NWS operations, were taken at intervals too frequent to qualify the sum of the six as an official 24-hour climatological snowfall amount.

The committee was also concerned that NOAA and the climate community have no formal mechanism in place to assess national meteorological and climatological records (extreme values). These records are now being considered as one measure of global warming.

5. Committee Recommendations

The committee recommended that the six January 11-12 Montague snowfall observations be recognized as valid, individual snowfall measurements that, when used in real-time by WSFO BUF, provided meaningful short-term snowfall intensity information for operational NWS programs. However, in consideration of the too-frequent snowfall measurement intervals summed to derive the 24-hour snowfall total, the committee further recommended that the 77-inch total not be recognized as an official climatological snowfall amount for that 24-hour period.

The Committee also suggested that the National Climatic Data Center should take the lead in setting up a committee that would be responsible for assessing observations as national meteorological/climatological extreme values.

The NWS accepted the committee's recommendations.

6. References

U.S. Dept. of Commerce, NOAA/NWS: Special Report: Evaluation of the Reported January 11- 12, 1997, Montague, New York, 77-Inch, 24-Hour Lake-Effect Snowfall; Mar. 1997, 41 pp.