THE GREAT WINDSTORM OF 2 APRIL 1973 ON CANNON MOUNTAIN, NEW HAMPSHIRE

D. E. GLIDDEN

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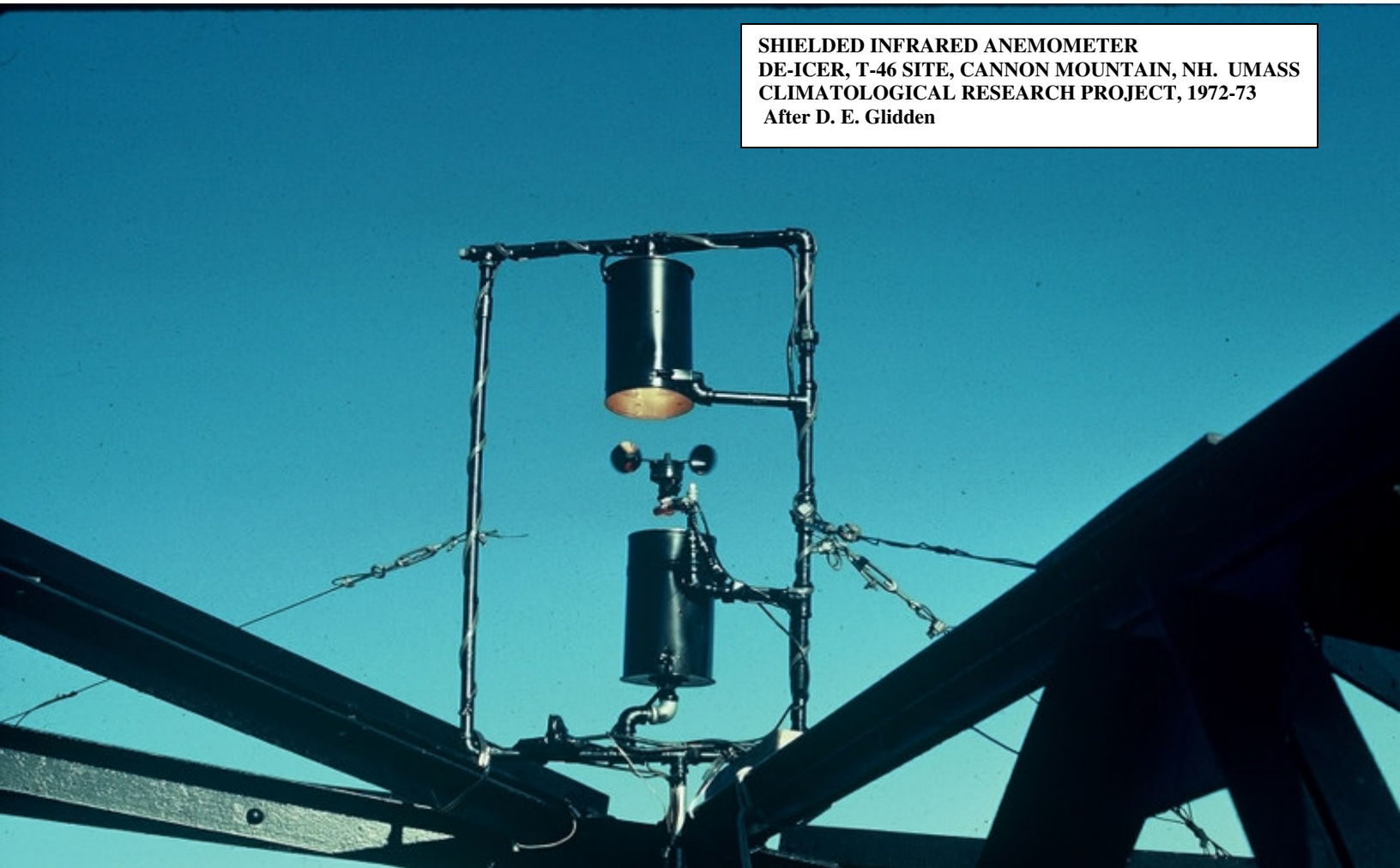
The Great Windstorm of 2 April 1973 on Cannon Mountain, New Hampshire is currently out of print, and is made available in PDF format in the interests of scientific research and public information requests. It is reproduced from the original 1974 text with an introduction and updated project photos.

Dave Glidden is a Field Specialist in Wind and Mountain Climatology, and has conducted wind studies for the National Park Service in Rocky Mountain National Park in Colorado. More recently, he has pursued field work on the variability of mountain winds and gust factors in Denali National Park in Alaska. A strong advocate of women in the sciences, he has been fortunate to have many women share in the excitement and rewards of field work. (Laura Capella, a former Observatory EduTrip ATL in mountain climatology during the early 1990's, assisted Dave during his 1995 field studies in Denali.) He specialized in Mountain Climatology at the University of Massachusetts/Amherst, where he directed a climatological research project in the White Mountains of New Hampshire, which included extensive field studies from the Presidential to the Franconia Ranges. Also while at UMASS, he investigated severe glacier winds in the early 1970s near the Icy Bay area of southeast Alaska. He has published studies and articles on mountain winds and climatology, and has been actively involved, through the Observatory, in trying to improve the participation of girls and women in the sciences. He has been associated with the Mount Washington Observatory since 1970, and has led winter EduTrips in mountain meteorology and climatology since their beginning some 14 years ago. When not in the field, Dave has been Head Coach of women's soccer at the collegiate level.



SHIELDED INFRARED ANEMOMETER
DE-ICER, T-46 SITE, CANNON MOUNTAIN, NH. UMASS
CLIMATOLOGICAL RESEARCH PROJECT, 1972-73
After D. E. Glidden

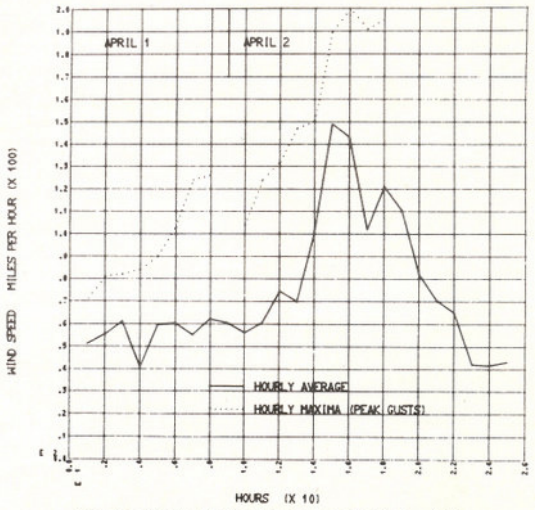
CANNON MOUNTAIN INFRARED ANEMOMETER DE-ICER UNDER HEAVY RIME LOADS, AND PRIOR TO DE-ICING SUPPORT STRUCTURES, WINTER 1972-73. NOTE ICE-FREE CUPS SPINNING BENEATH UPPER LAMP, WHILE UPPER 3-CUPS ARE ENCASED IN RIME

UMASS CLIMATOLOGICAL RESEARCH PROJECT After D. E. Glidden

CANNON MOUNTAIN SUMMIT ANEMOMETERS AND INFRARED TEST ARRAY, WINTER 1972-73
UNIVERSITY OF MASSACHUSETTS CLIMATOLOGICAL RESEARCH PROJECT After D. E. Glidden

CANNON MOUNTAIN PROTOTYPE INFRARED DE-ICER. HEAT TO THE LEXAN CUPS ARE REGULATED BY THERMISTORS WITHIN THE HUB ASSEMBLY, WHICH CONTROL TWO 500-WATT LAMPS THROUGH A RHEOSTAT UMASS CLIMATOLOGICAL RESEARCH PROJECT, 1972-73 After D. E. Glidden

THE GREAT WINDSTORM OF 2 APRIL 1973 ON CANNON MOUNTAIN, NH



Average hourly wind speed at Cannon Mountain NH, from 1600, 1 April to 1600, 2 April 1973.

Instrumentation and Calibration

Type: Maximum, Inc. 3-cup generator.

Calibration: Prior to and following the 2 April storm by: Gordon White, Dover, Massachusetts; Wright Brothers wind tunnel, MIT; Air Force Cambridge Research Laboratories 200 mph wind tunnel.

Tests: The generator with its cups was driven at 1,800 rpm by a synchronous motor which, according to data twice observed at the Wright Bros. wind tunnel at MIT, corresponds to 102.6 mph and which on this test read 106 mph and 54 mph with the scale doubler in the circuit. The scale doubling resistor was measured and found to be 1,040 ohms.

The Cannon Mountain system was subsequently tested in the Air Force Cambridge Research Laboratories 200 mph wind tunnel, and thereafter reconnected to the generator which at this point did not have the cup assembly in place. The system was again operated at 1,800 and 3,600 rpm by means of synchronous motors and the readings taken as follows:

RPM	*Reading (mph)*	*Reading With Scale Doubler*
900	54	27
1,800	104	55.5
3,600	pegged	105 (pegging gently)

Notes: Original calibration data for all tests sent to: William M. McMurray, NOAA, EDS, National Climatic Center, Asheville, NC 28801 following request dated 26 July 1973.

EARLY INFRARED ANEMOMETER CONFIGURATION TESTS ON MT. WASHINGTON, NH (1970s)
SITE: SOUTHEAST END OF TV BUILDING, OVERLOOKING TUCKERMAN'S RAVINE **After D. E. Glidden**

INFRARED ANEMOMETER CONFIGURATION TESTS, OLD MT. WASHINGTON OBSERVATORY TOWER (1970s) **After D. E. GLIDDEN**

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The Great Windstorm of 2 April 1973 on Cannon Mountain, New Hampshire

D. E. GLIDDEN, *University of Massachusetts*
*Climatological Research Project**

Cannon Mountain looking west-northwest from Franconia Notch.

The Great Windstorm of 2 April 1973 on Cannon Mountain, New Hampshire

D. E. GLIDDEN, *University of Massachusetts Climatological Research Project**

View southwest from Twin Mountain with Franconia Range and Cannon Mountain obscured in a cap cloud.

On the morning of 2 April 1973, a severe storm gripped the summit of Cannon Mountain, New Hampshire, with recorded gust maxima exceeding 199.5 mph (89 m/s). This extreme speed is believed to be the third highest recorded at a surface station which has been supported by subsequent documentation of instrument calibration, following the extremes registered at Mount Washington, New Hampshire, on 12 April 1934 and near Thule, Greenland, on 8 March 1972.

The most severe winter storm of 1972–73 in the Cannon Mountain area began on a mild note on 31 March 1973. At 2130 EST, the summit went into a cap of light fog with a SSE flow of 18 mph and a temperature of 33°F. Reduced sea level pressure was steady at 29.97 in (1014.9 mb), having varied only .03 in (1 mb) over the past 48 hours.

By 0600 on 1 April, the average wind speed was up to 33 mph from the SSE, with gusts to 42 mph. Station pressure had dropped only .06 in during the night. Winds picked up slowly through the day.

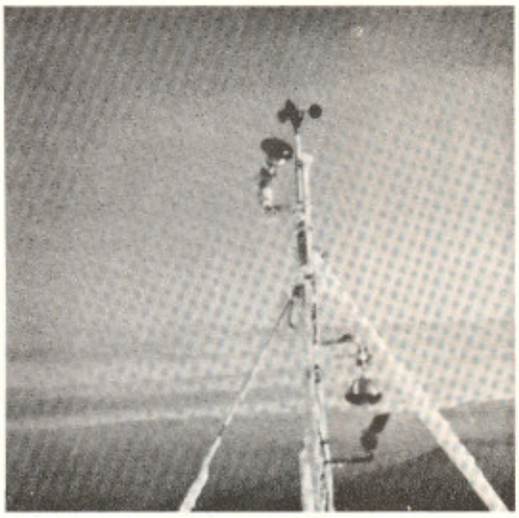
At 1600, Harry Simonds and I arrived at the Mountain Station to work a joint shift. Dense fog with mixed rain and ice pellets prevailed outside, and average wind speeds were 50–60 mph, having backed slightly to SE.

It became evident by 2130 that we were in for a "big blow" with gusts over 100 mph and pressure falling rapidly. Although average speeds were increasing slowly, gustiness and high turbulence rose rapidly at 2000. The outside temperature had dipped to 31°, and our riming-icing warning lights came on which activated our infrared de-icing lamps and let us know of potential anemometer icing conditions. Outside a driving mixture of freezing rain and snow was in progress, while inside inter-station doors began to bang and general vibration noises increased.

From 2300 to 0100 on the 2d, a slight decrease in average flow and a sharp drop in gusts were noted, although turbulence seemed to be increasing. We made a trip topside to check for icing and met with fantastic gusts. With the aid of a 0.5-in. safety line, an ice

* D. E. Glidden was Principal Investigator, University of Massachusetts Climatological Research Project, White Mountain National Forest, Twin Mountain NH. The project was also supported by Mount Holyoke College, the U.S. Forest Service, and the State of New Hampshire. Glidden's present address is Rocky Mountain National Park, Estes Park CO 80517.

Maximum three-cup anemometer and direction transmitter atop summit station. Primary exposure: 34 ft above geographical summit and 12 ft above summit station—excellent exposure in all directions.

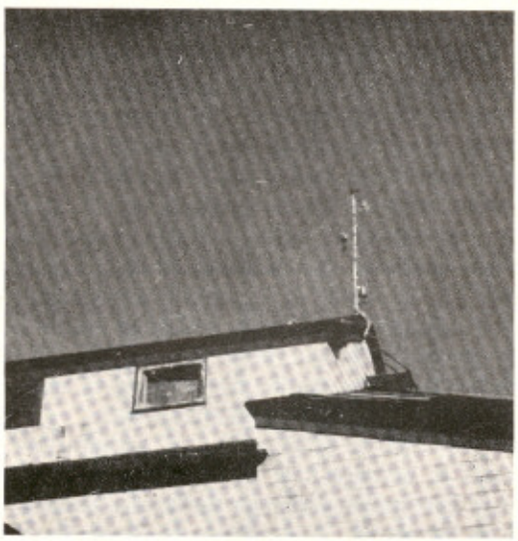


Close-up view of the exposure of Maximum anemometer and wind direction transmitter with infrared lamps to prevent icing.

load was removed from both 3-cup generators, the direction transmitter, and the mast and guywires. The infrared lamps seemed to take it from there.

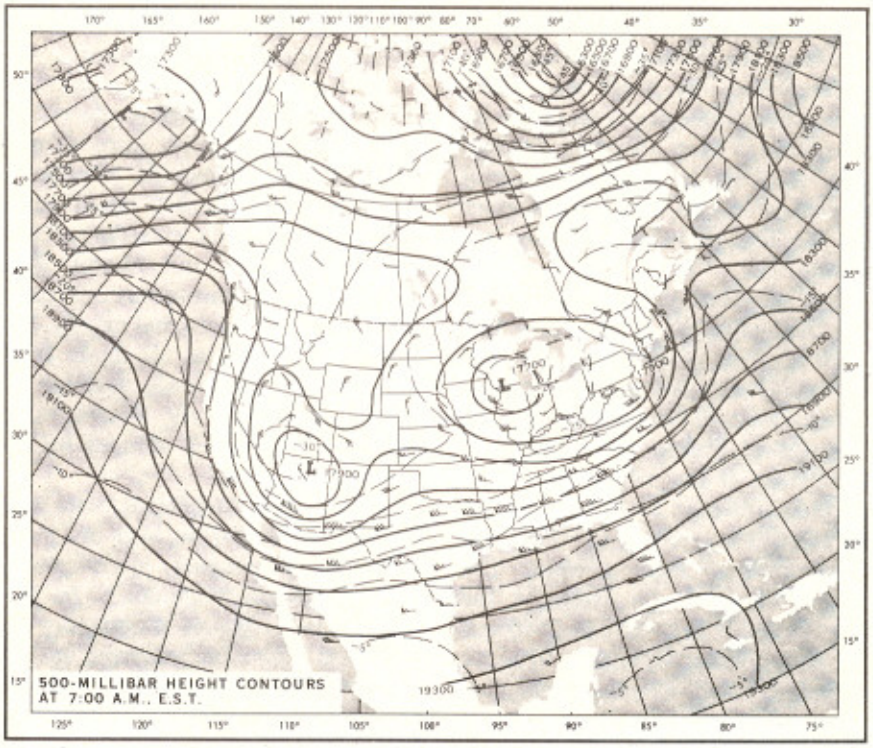
After de-icing, at about 0100, average speeds and gusts climbed sharply. The entire building began to shake and vibrate, and walls creaked, occasionally with the report of a shotgun as the wind load increased.

At 0400, precipitation and icing decreased, and visibility improved to permit us to observe the valley lights to the north. During the next two hours conditions became quite uncomfortable as average speeds climbed markedly and gusts exceeded 190 mph on two occasions, at 0555 and 0559. The station windows, somewhat protected from direct windflow, began bending in and out, and our heads felt great discomfort as the pressure waves wracked the building. During the next hour, from 0605 to 0704, the wind attained its greatest hourly flow with an average speed of 149 mph from the SE attended by concurrent pressure oscillations of .15 in.

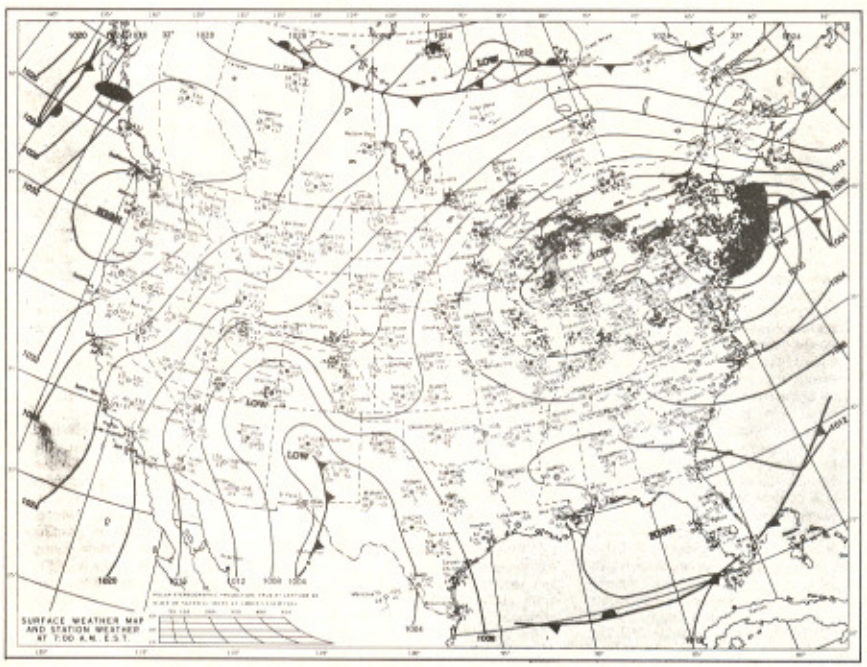


Southeast side of summit building. Note damaged window.

At 0614, having closed ourselves off in the instrument room on the north side of the building, we both witnessed the first gust to 199.5 mph, pegged at the maximum extent of the recorder calibration. The floor began to vibrate and the noise was deafening, and we talked about the south wall collapsing. It was about this time that the wind direction transmitter, infrared lamps, and secondary 3-cups were blown away and smashed to pieces on the north exposure. In addition, a small section of the roof was torn off, a transmitting antenna was bent to the north, and a window in the Tramway gallery above was exploded. It was probably during this same hour that a Belfort wind speed and direction system, which was mounted on the observation platform across from the summit tower, was disintegrated and its supporting mast



0700 EST, 2 April 1973



bent, despite being bolted to the platform and guyed. All except one infrared lamp with the primary generator on the tower was blown away, and another transmitting antenna on the south corner was bent about 35 degrees.

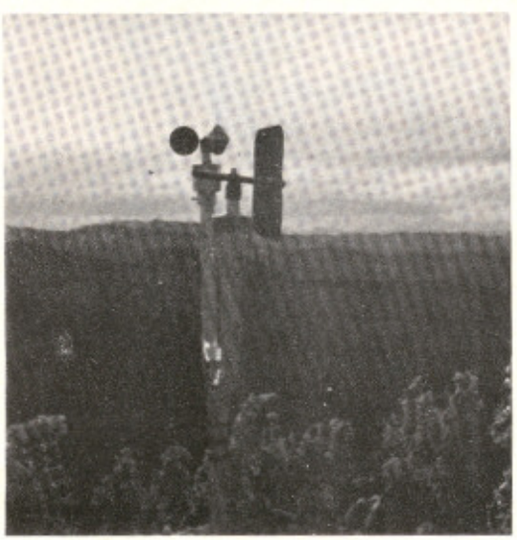
Above the station, the numerous boreal flora were snapped in two, supplying further evidence of the unusual nature of this extreme windflow.

At 0625, we observed the second gust to 199.5 mph. Although the temperature had dipped a few degrees, fortunately for our primary 3-cup anemometer, icing conditions ceased as far as we could determine, and we observed streams of broken fog blowing off the northwest slope of the mountain.

At 0631, the third gust to 199.5 mph occurred, and at 0633 a speed of 191 mph was sustained and timed for eight seconds. The fourth gust to the maximum extent of the recorder came at 0642. The fifth at 0650 was observed by Harry Simonds, and at 0704 we both witnessed and felt a tremendous gust which was pegged at 199.5 for three full seconds. This appears to be the point at which the flow attained its maximum speed, and probably exceeded 200 mph by some indeterminable value.

We experienced a station power failure at 0839, related to downed lines in the valley, while outside dense fog, snow, and blowing snow took over.

The average speed remained above 100 mph until 1000, a total of about five hours, after which the flow decreased rapidly and pressure commenced to recover.



Exposure of Belfort wind instruments.

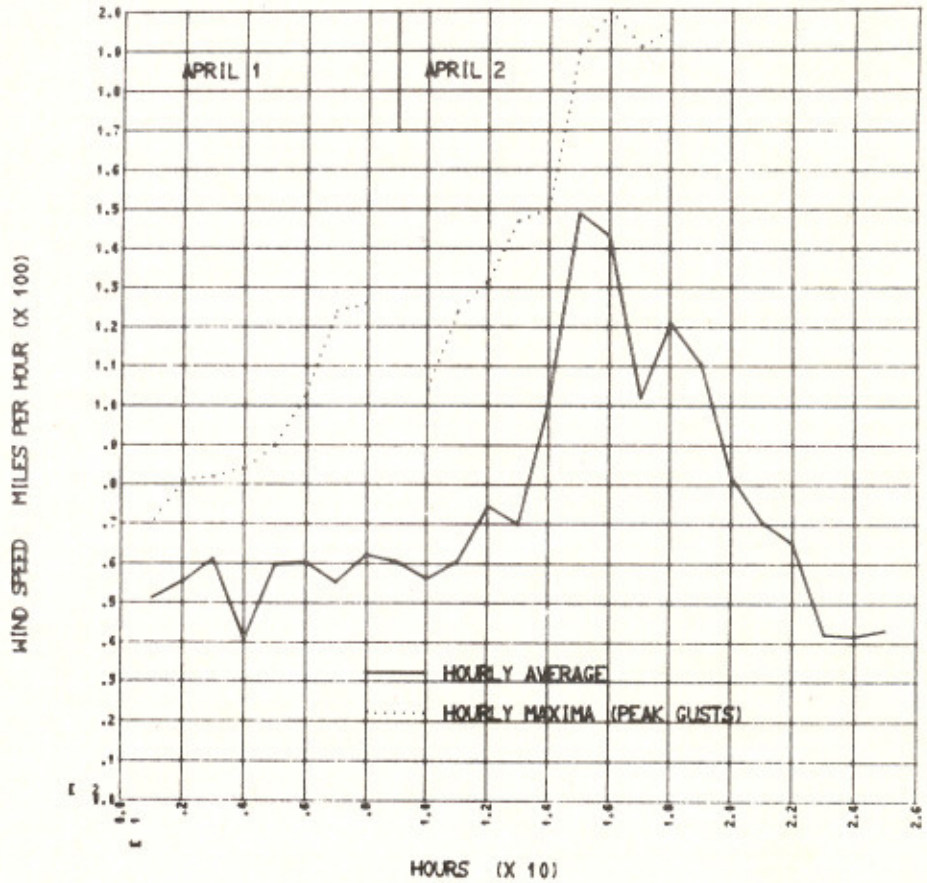
The significance of the storm is evident. The intensity with which it affected the Franconia Notch area, with gusts recorded well over 100 mph below the summit, was not anticipated from the 500 mb or surface synoptic charts. Gusts exceeding 100 mph on Cannon Mountain and Mount Washington are not unusual phenomena. From detailed analysis of other data and storms, basic conclusions of the White Mountain research effort indicated that these extreme winds on Cannon Mountain are related to a severe downslope component induced by the Franconia Range.

The synoptic conditions were similar to those that produced the blow of 12 April 1934 on Mount Washington, just 20 miles to the east of Cannon Mountain. In the recent storm in 1973, Mount Washington monitored a peak of 130 mph from the east, but due primarily to differences in exposure, surrounding topography, and instrumentation no direct comparison can or should be made. The project has identified some striking differences in both windflow and direction characteristics, under varying synoptic conditions, between Mount Washington and Cannon Mountain.

In reference to a footnote comment by Stansfield (1972) that "in the past 38 years with anemometers of recent design no speed has exceeded 186 mph (161.7 knots) . . ." on Mount Washington, this investigator would like to offer that the present position of the Mount Washington Observatory is not conducive to recording the extreme speeds. It is probable, and tests conducted by me on the summit during May 1973 support this, that a change in exposure rather than instrumentation was responsible for the reduction in gust maxima, although the latter may have had some effect. This is reflected in the Observatory's records which indicate a higher frequency of extreme maxima from the W-NW in recent times than from the SE. Maxima from SE were higher at the former exposure at the Old Stage Office closer to the eastern rim of the summit.

Reference

Stansfield, John R., 1972: The severe storm of 8–9 March 1972 at Thule Air Force Base, Greenland. *Weatherwise*, 25-5, 228–32.



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