

MESOSCALE WEATHER OBSERVING NETWORK
 PROVIDES SOURCES OF DETAILED METEOROLOGICAL
 DATA FOR ALBANY, NY AND ENVIRONS

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1. INTRODUCTION

A weather-observing network started by the author and the local TV meteorologist, Bob Kovachick, in May 1978 records daily temperature and rainfall data for an area of 60 x 70 miles (4,200 square miles) centered around Albany, NY. The rainfall event of March 21-22, 1980 produced some amazing differences in precipitation totals over the area. The density of the network permits close inspection of the rainfall amounts for this event, and the variation due to terrain. Comparison of the network data with that published by the National Climatic Center reveals some interesting differences in the analysis of the rainfall pattern. A brief description of the meteorological events during this storm sheds some light on noted precipitation maxima and minima. It is

believed that data from this mesoscale weather observation network could lead to some interesting discoveries about the local climate around Albany that may in the future be useful to the National Weather Service as well as to private meteorologists serving the community.

2. OBSERVING NETWORK

The author (at the time president of the local chapter of the American Meteorological Society - AMS) and the new TV-10 meteorologist made arrangements for a group of members of the Interior of Eastern New York Chapter of the AMS who were interested in keeping weather records to purchase inexpensive yet accurate maximum-minimum thermometers and rain gauges. The intent of the network, which was separate from those sub-

INTERIOR OF EASTERN NEW YORK CHAPTER OF THE AMERICAN METEOROLOGICAL SOCIETY WEATHER OBSERVATION NETWORK														Location # 1	
Drop in mail on the first day of next month — send to → Doc Taylor 226 Lake Hill Burnt Hill, N.Y. 12027										Month March		1980			
Date	Weather	Min. Temp.	Max. Temp.	Aver. Temp.	Precip. Total	Snow Fall 7 A.M.	Snow on Grd 7 A.M.	Date	Weather	Min. Temp.	Max. Temp.	Aver. Temp.	Precip. Total	Snow Fall 7 A.M.	Snow on Grd 7 A.M.
1	○	-3	15					17	⊕ZR]	24	38				5.0
2	○	-3	18					18	⊕R-	26	48		.12		2.0
3	○	-2	30					19	⊕	29	46				T
4	⊕	11	40					20	⊕-	26	58		.01		T
5	⊕S--	26	38		.06	0.1		21	⊕R+	38	49		2.75	1.0	
6	⊕	23	32					22	⊗S-	32	45		.36	1.0	1.0
7	⊕	24	44		.57		T	23	⊕	30	49				T
8	⊕R-	32	34		.51			24	○	30	52		.36		
9	⊕	30	37					25	⊕R-	34	40		.06		
10	⊕	19	47		.14	0.5		26	⊕	32	44			T	
11	⊕S-	26	34		.04	0.7	0.4	27	⊕	30	48				
12	⊕SW-	12	24				0.7	28	⊕	26	57		.07		
13	⊕	5	32		.84	8.5	T	29	⊕R-	39	44		.91		
14	⊗S-	23	34		.22	2.1	8.5	30	⊕	39	47				
15	⊕SW-	26	30		T	T	9.0	31	⊕	30	44		.02		
16	○	2	37		.01		7.0	⊗	Average	23.1	39.8	31.5	7.05	13.9	⊗

NOTES: Denote thunderstorm days with ⊗ in weather column.

Lowest Min. Date	-3 1,2
Highest Max. Date	58 20

Figure 1. Sample observer network data sheet.

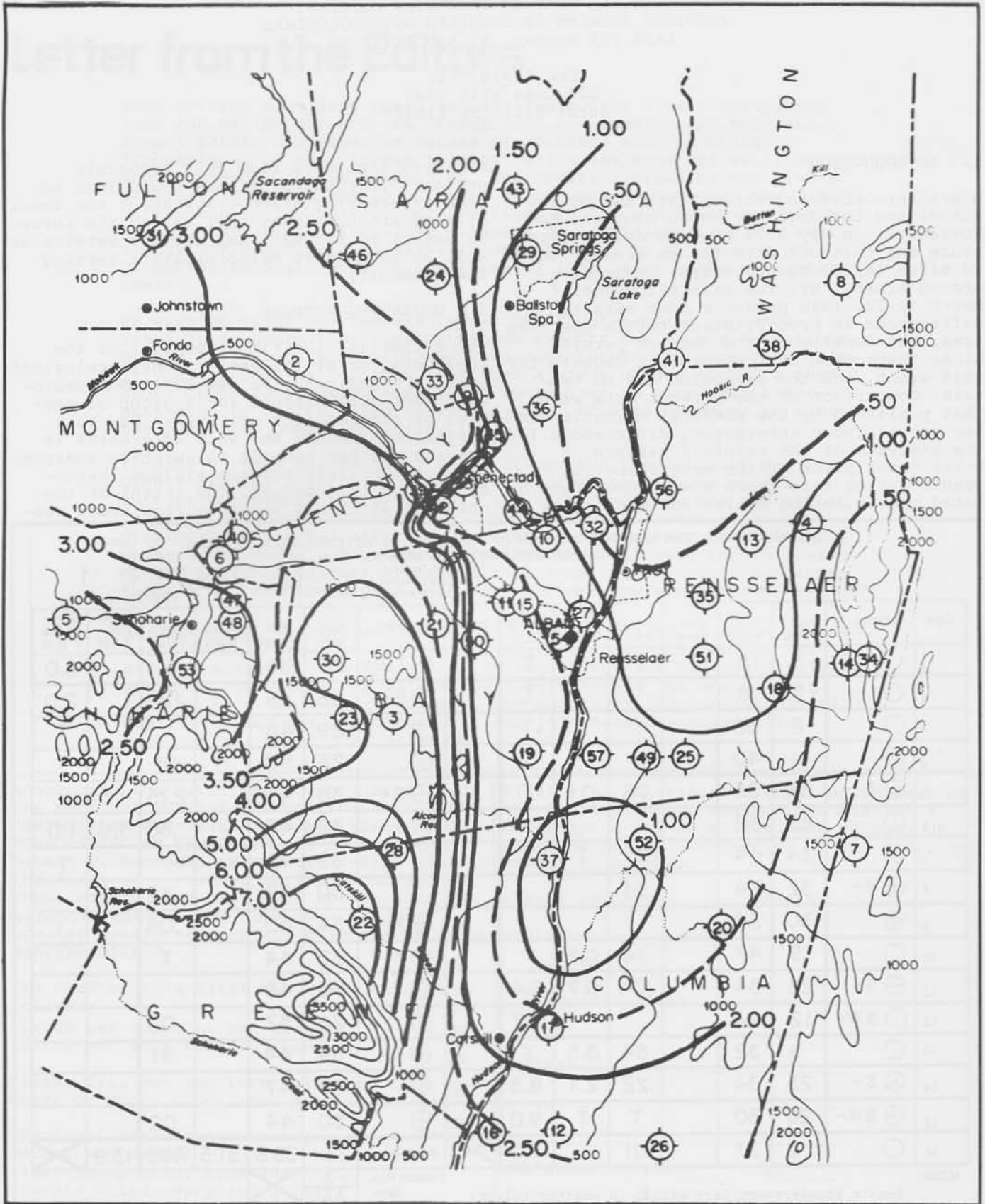


Figure 2. Precipitation Analysis, March 21-22, 1980.

station observers for the National Weather Service (NWS), was to collect weather data on a smaller scale, and hopefully learn more about the local climate. Some of these observers also provide real-time data for the TV-10 weather program similar to that done at station KSTP in Minneapolis/St. Paul, MN (2). The number of observers in the network grew the first year from about 30 to 45, and now stands at 57. Each observer takes daily observations of maximum and minimum temperatures and the 24-h precipitation total. Other data, such as snowfall and the number of thunderstorm days, are also recorded on the observer sheet (Figure 1). At the end of the month, the data sheets are mailed to the author, who in turn plots and analyzes the data. A copy of the analysis is sent to all observers as well as to the NWS at Albany, and to a local newspaper that publishes the map. The data is also being used by the State University at Albany for research in thunderstorm patterns around the area. The NWS has been given the phone numbers of many of the observers so that forecasters may have access to real-time data when needed. This might be especially useful in times of severe weather, when the lead forecaster might want to call an observer in a location where radar shows a heavy thunderstorm. In the last few months, awareness of the network has spread. One request for data from the network stemmed from the need by a local real-estate broker for data about recent rainfall in an area not covered by the NWS network.

3. SYNOPSIS OF THE MARCH 21-22 EVENT

24 hours before the onset of heavy rain in eastern New York, a low-pressure system was centered in western Tennessee. A sharpening

and fairly fast-moving upper-air trough accompanied this system.

By 12Z on Friday the 21st, the primary system had moved to West Virginia, while a secondary storm showed signs of developing in Virginia, on the eastern side of the mountains. The upper-level trough was lifting out to the east and was in a negative-tilt position. Retarding the normal north-east movement of a storm in this position was a large, high-latitude blocking high-pressure system over Labrador and the North Atlantic Ocean between Labrador and Greenland. During the afternoon of the 21st, the heaviest rains commenced over the network.

During the night, the surface low-pressure system tracked from Virginia over Baltimore and New York City, then eastward to the south of Cape Cod. The upper-level trough closed off and moved eastward under the Canadian block. It is this latter feature that became important in the way precipitation was distributed over the network that night.

The heavy rains that fell on the Catskill Mountains (located in the southwest part of the network) resulted in the worst flooding situation since hurricanes Connie and Diane struck in 1955. Meanwhile, people in Washington County, 60 miles to the northeast, wondered what all the commotion was about, because all they received was less than a tenth inch of rain. Yet over the border in Vermont, some places, like Manchester, recorded about two inches of rain.

4. DISCUSSION OF RAINFALL ANALYSIS

Figure 2 is the analysis of the total rainfall for the storm. Elevation contours for

DATE / TIME	3/21/80 12Z	3/22/80 00Z	3/23/80 12Z	3/24/80 00Z
Height above surface in feet				
0	CALM	14014	32012	31012
1000	14520	15528	35513	32510
2000	14526	11547	04519	35509
3000	15530	10553	06028	02513
4000	16532	12550	07536	02020
5000	17033	12550	07538	02525
6000	18035	13080	09549	03031
7000	18035	—	10053	04531
8000	18027	—	11048	06033

Key - First 3 digits wind direction in degrees
Last 2 digits wind speed in knots

Figure 3. Winds Aloft Data for Albany, NY.

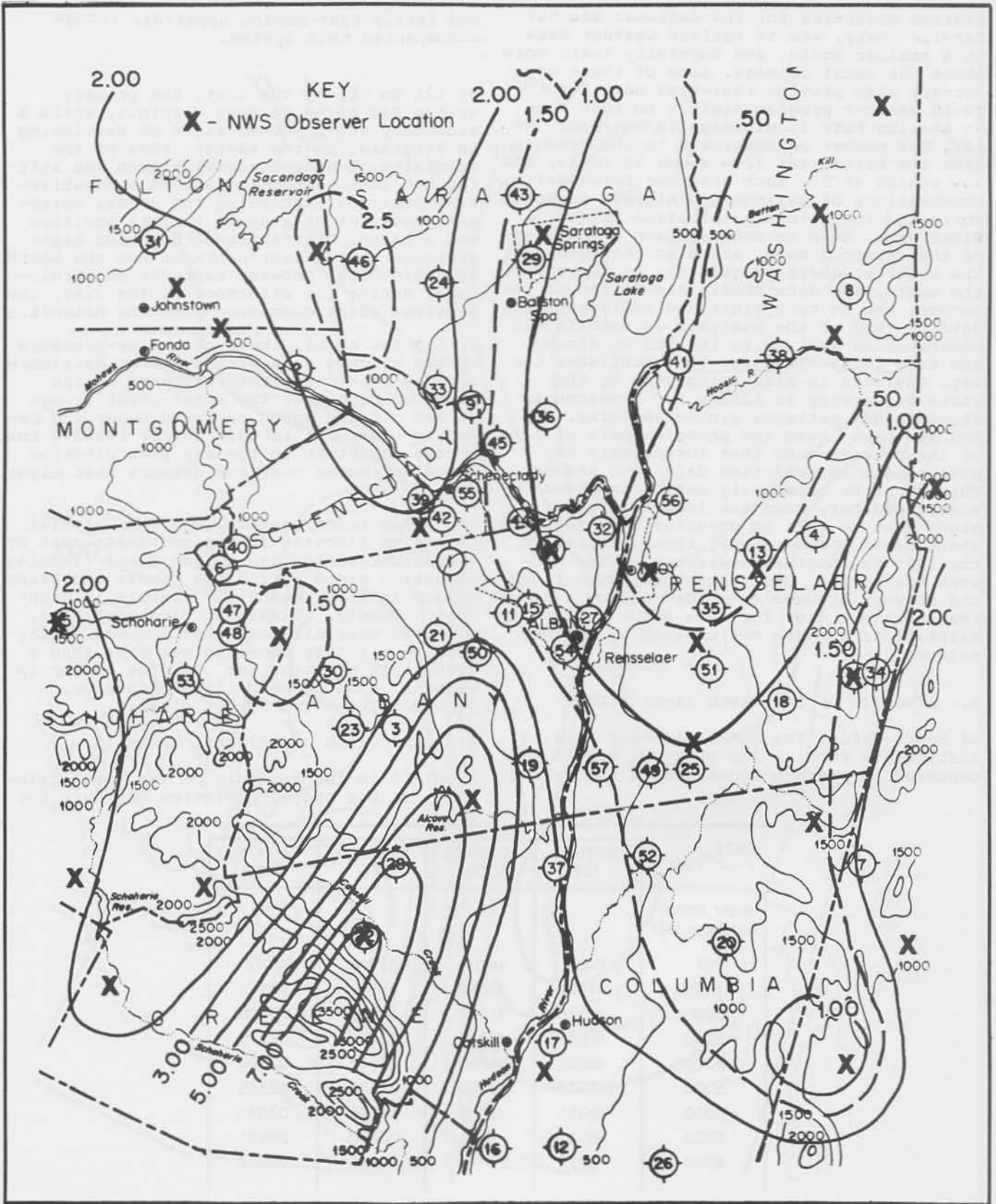


Figure 4. Precipitation Analysis from National Weather Service Data, March 21-22, 1980.

every 500 feet are included, as well as observer locations. As expected, maximum amounts fell in the northern Catskills in Greene County, with lesser amounts in the higher terrain of southwest Albany County. However, in complete contrast is the minimum of precipitation northeast of Albany, in Washington County. This minimum noses south down the Hudson River to northern Columbia County. Apparently there is a sharp demarcation between the light precipitation going west between observers 50-20, 42-39, and 36-9. Interestingly, this gradient in the isohyets is oriented N/S parallel to the general terrain features to the east along the New York-Massachusetts border.

Usually, synoptic systems passing through the northeastern United States generate varying precipitation patterns that generally show increasing amounts with higher terrain. However, this storm left a very pronounced minimum in higher terrain of Washington and Rensselaer Counties. It is theorized that this minimum and the N/S gradient to the west can be explained by the movement of the low center and the resultant low-level winds during the main precipitation event. As mentioned before, the track of the storms was peculiar in that when it reached New York City, it moved east in response to the blocking upper-level features. An inspection of the winds-aloft data from the Albany NWS for the period 12Z Friday through 12Z Saturday indicates a very persistent strong ESE low-level wind flow (Figure 3). During this 24-h period, the winds above the friction layer and below 850mb backed 90 degrees, and at their peak were more than 50 knots.

Due to the easterly track of the storm, it seems that the low-level winds (probably drawing in Atlantic moisture) did not back as quickly as might have otherwise occurred with a storm moving from New York City to Boston. It is theorized that the persistence of the easterly winds accounted for the orographic enhancement of precipitation in the Catskills, and for the minima observed by the network to the east.

The Berkshire Mountains rise to over 2,000 feet and run N/S through Massachusetts and into southern Vermont. It appears that the strong easterly flow over these peaks caused a dramatic downslope situation to develop in their lee. Precipitation was held from falling in this noted minimum area, and then let go at some distance to the west where the terrain began rising. This theory would account for the N/S gradients where the precipitation is noted to increase greatly to the west.

Compilation of the NWS network through climatic data for this event results in the analysis presented in Figure 4. This data

picks up the maximum and minimum areas similarly to those in our network, but there are important differences. One is the loss in defining the N/S gradient of increased rainfall. The 2 inches observed at Schenectady was just east of this line. The one observer on the Schoharie and Albany County who recorded less than 1.5 inches was apparently in the lee of the higher terrain to the east, and does not reflect the maximum recorded in the general area.

5. CONCLUSION

The need for dense meteorological networks to define precipitation regimes better is apparent by the results of this network. It might be possible through continued documentation of the minima in precipitation to the east of Albany during strong easterly winds to enable, for example, forecasters to tailor a heavy-snow forecast for areas west of the Hudson, and for lesser amounts to the east. Better knowledge of precipitation variation under different weather systems may reveal similar findings that can be used in forecasting for the area.

The current analysis (August 1980) is a perfect example of how the public is led to believe that, because the "official" rainfall at the Albany County Airport was 6.45 inches, their area probably had the same. However, a large area to the north received less than 2 inches for this period. It is hoped that both the NWS and the local TV and radio meteorologists will make use of the data both as real-time and climatological sources of weather information.

6. ACKNOWLEDGEMENTS

The author wishes to thank Carol Clas and Gary Lanphear for the drafting of the figures. Thanks also to Mrs. Lynn Gallant for typing the manuscript, and especially to the observers for keeping the weather records.

FOOTNOTE AND REFERENCE

1. The author is an air-pollution meteorologist with the New York State Department of Environmental Conservation in Albany, NY. In February 1980, he worked for the National Weather Service's Olympic Support Unit forecasting for the 1980 games.

2. Lyons, Walter A., 1978. Reporting Mesoscale Weather Patterns via TV Weathercasts in the Twin Cities. *National Weather Digest*, vol. 3, no. 3, pp. 14-19.

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