WINTER TEMPERATURES AND SNOWFALL AT CENTRAL PARK, N.Y., 1869 – 1976

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1. INTRODUCTION

Spar (1954) and Spar and Mayer (1973) have shown an apparent cycle to the January mean temperature in New York City, with a period of about twenty years. This cycle is superimposed on a linear upward trend of about 3.3°F per century. The authors stated they "know of no reason why January temperatures in New York City should exhibit a twenty-year cycle, and therefore can have no confidence in the persistence of such a cycle in the future." They went on to state, "Nevertheless, the existence of such periodic behavior, even for a short time, is of considerable interest from the viewpoint of long-range weather prediction and can hardly be ignored."

If future mean winter temperatures can be predicted, then perhaps something can be stated about the snowfall in future winters, given the predicted mean winter temperature.

This study presents the relationship between observed mean winter temperature at Central Park, New York, and observed total winter snowfall for the same location.

2. DISCUSSION

The observed mean temperature for a winter was computed by first averaging the daily maximum and minimum temperatures. These values were then averaged for the period December 1 through the end of February to obtain the average winter temperature. The total winter snowfall is obtained by adding the daily observed snowfalls for the same period.

A scatter diagram (Fig. 1) illustrates the relationship between the mean winter temperature and the total winter snowfall. The linear regression equation determined for the 107 data points plotted on the scatter diagram is:

$$Y = 90.07 - 2.08X$$

where Y = total winter snowfall (inches) and X = mean winter temperature. The correlation coefficient (r) between the two variables is -0.52. The mean winter temperature for the 107 years is 32.9°F, with a standard deviation of 3.0°F. The mean winter snowfall is 21.7 inches, with a standard deviation of 12.0 inches.

What can we conclude from information in the scatter diagram and the statistics presented above? The relationship between the mean winter temperature and total winter snowfall at Central Park, New York, is such that 27% of the year-to-year variation (r^2) in winter snowfall is explained by the year-to-year variation in mean winter temperature. This should not be surprising, especially for New York City where the mean winter temperature is close to the critical freezing value of 32°F. Of the 107 winters fifteen were more than one standard deviation (3.0°F) colder than the normal 32.9°F and seventeen were more than one standard deviation warmer than normal. For the fifteen cold winters, twelve had snowfall exceeding the normal value of 21.7 inches. The mean snowfall for these fifteen cold winters was 31.8 inches. For the seventeen warm winters, fifteen had less than the normal amount of snowfall. The mean snowfall for the seventeen warmer winters was 13.5 inches.

3. CONCLUSIONS

The above statistics clearly show that a greater than 3°F difference from the mean winter temperature in New York can be expected to have a considerable effect on

seasonal snowfall. It must be pointed out, however, that even if we could predict that a coming winter would be unusually cold or warm there is still the small possibility that we would be in gross error in predicting snowfall for that winter. In 1871-72, for example, the mean winter temperature was a cold 29.3°F, but only 8.7 inches of snow fell. In 1948-49, the mean winter temperature was a very warm 38.5°F and yet 42.4 inches of snow fell, making this one of the biggest snowfall winters in New York. How can these anomalies occur? For a cold winter, when we would expect a lot of snow, the storm tracks could miss New York City, resulting in below normal precipitation. For a warm winter, when little snow is expected, heavy snow could occur during a few days when the temperature is below freezing. This, in fact, happened in the 1948-49 warm winter when most of the snow fell during a few days in December.

4. REFERENCES

Spar, J., 1954: Temperature Trends in New York City *Weatherwise*, V 7, pp 149-151.

Spar, J., and Mayer, J.A., 1973: Temperature Trends in New York City: A Postscript. *Weatherwise*, V 26, pp 128-130.

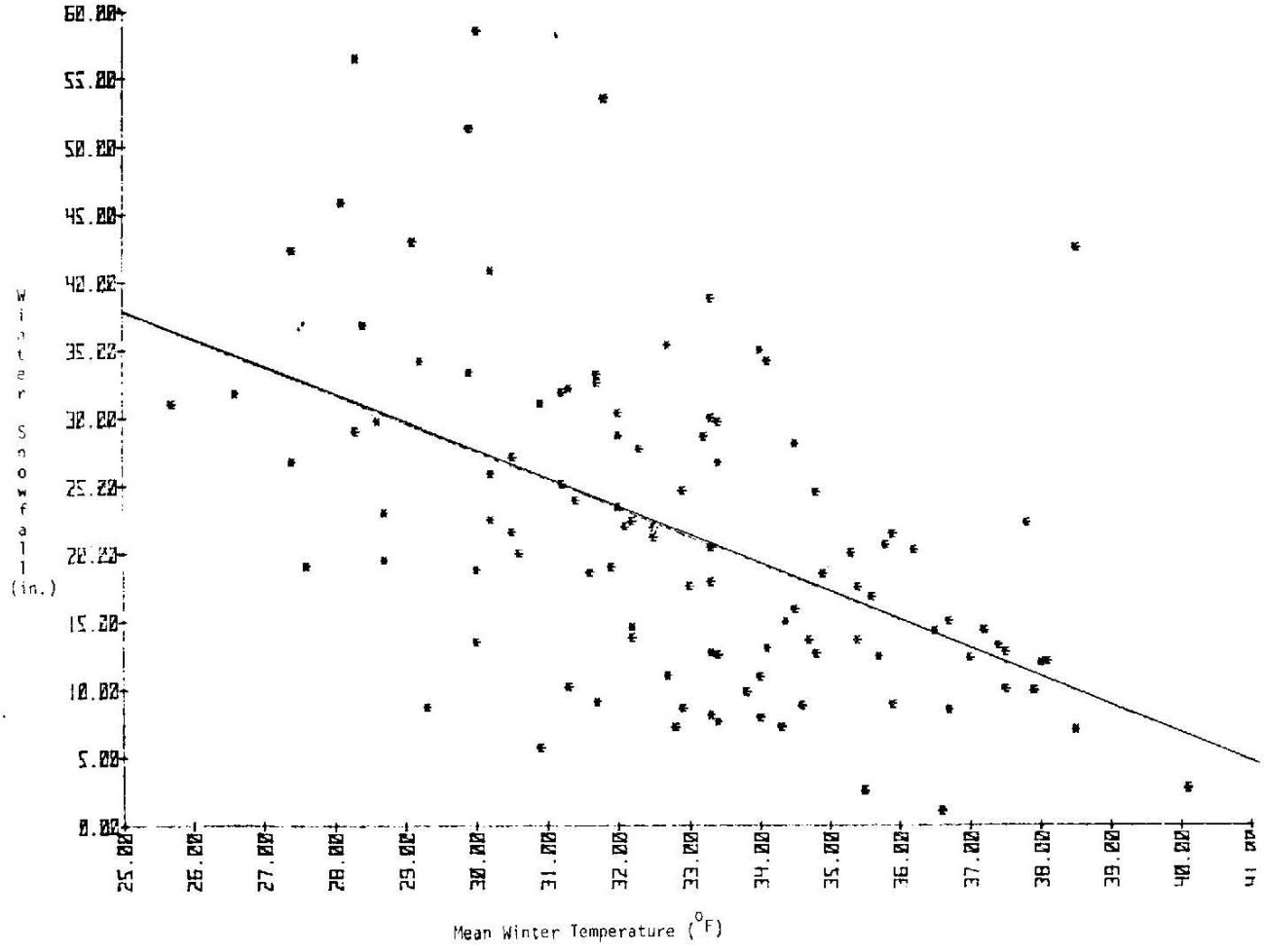

Figure 1. Mean winter temperature vs winter snowfall in New York City (Central Park, 1869-1976).