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## 1. INTRODUCTION

Every year freezing rain events produce major damages in the United States which impact various weather sensitive user groups. During 1949 - 2000, freezing rain caused more than \$16.3 billion in total property losses in the United States (Changnon, 2003a).

A new CD-ROM product has been released which provides users with long-term data sets about freezing rain. Utilizing hourly freezing rain data, various summarizations have been developed such as the calculation of freezing rain events and their duration, the timing of freezing rain observations as well as a look into weather conditions associated with freezing rain.

## 2. FREEZING RAIN CD-ROM

A newly available CD-ROM product has been developed that contains long-term data sets about freezing rain and ice storms in the United States (Changnon, 2003b). The data sets are:

- the frequency of days per month with freezing rain at over 235 first order stations,
- the frequency of days per month with freezing rain at over 740 cooperative observer stations,
- the frequency of hours per month with freezing rain at over 235 first order stations, and
- ice storm loss data based on property insurance loss.

The days per month data sets covered the period of 1945 - 2000 while the ice storm loss data set covered the period of 1949 - 2000. Thanks in no small part to the data rescue efforts of the National Climatic Data Center's Climate Database Modernization Program, the hours per month data set covered the extended period of 1928-2001.

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## 3. ADDITIONAL HOURLY SUMMARIZATIONS

Having such a long record of hourly data provided the opportunity to produce additional hourly summarizations such as the mapping of hours per year with freezing rain. Additional summarizations included the calculation of freezing rain events and their duration, the timing of freezing rain observations, as well as an examination of concurrent weather conditions associated with freezing rain.

Figure 1 shows the spatial distribution of the average number of hours per year with freezing rain in the United States. Freezing rain minima occur in the West and South while freezing rain maxima occur in the Midwest, east of the Appalachia Mountains, and in the upper Northeast. This pattern is similar to that found by Changnon's (2003a) examination of average annual number of days with freezing rain.

Freezing rain events can be defined in many different ways. For this study, freezing rain events were defined as one or more hours of freezing rain separated by seven or more hours without freezing rain. On average, the United States experiences two freezing rain events per year. In the East North Central and Northeast regions of the U.S., there are an average of three and four events per year, respectively.

Figure 2 shows the distribution of the duration of freezing rain events. On average in the U.S., 38% of events lasted less than one hour while approximately 80% of events lasted six hours or less. The longest event found in the data set occurred in Caribou, ME, on January 13 - 15, 1956, and lasted for 49 hours.

Because of the nature of freezing rain, it was no surprise to see that freezing rain occurred most frequently when the dry bulb temperature was right at the freezing point (0° C / 32° F), the wet bulb temperature was -0.6° C / 31° F, and the dew point temperature was -1.1° C / 30° F. Freezing rain occurrences fell sharply with warmer temperatures and more gradually with cooler temperatures and rarely occurred at temperatures less than -15° C / 5° F or greater than 3.9° C / 39° F. Freezing rain also occurred most frequently around dawn during the

coldest part of the day with occurrences tapering off to a minimum in the afternoon during the warmest part of the day. These results are similar to those found by Cortinas et. al. (2000) in the Great Lakes Region.

Wind speeds during freezing rain events can contribute to the amount of damage received. The most frequent wind speed reported during freezing rain was 10 knots (12 mph) which occurred 11% of the time. Wind speeds over 52 knots (60 mph) have even been reported in Duluth, MN, during freezing rain events.

#### 4. CONCLUSIONS

Freezing rain events produce major damages in the U.S. every year. On average, the U.S. experiences two events each year with the Northeast region being the most frequently hit. Freezing rain events typically last less than six hours but can last more than 24 hours, increasing the risk for catastrophic damages. High winds also contribute to the amount of damage sustained during freezing rain events.

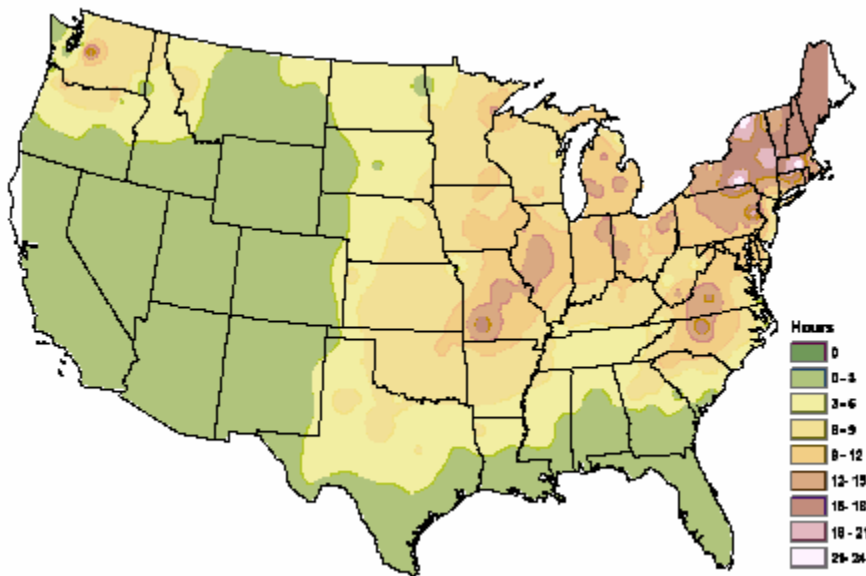
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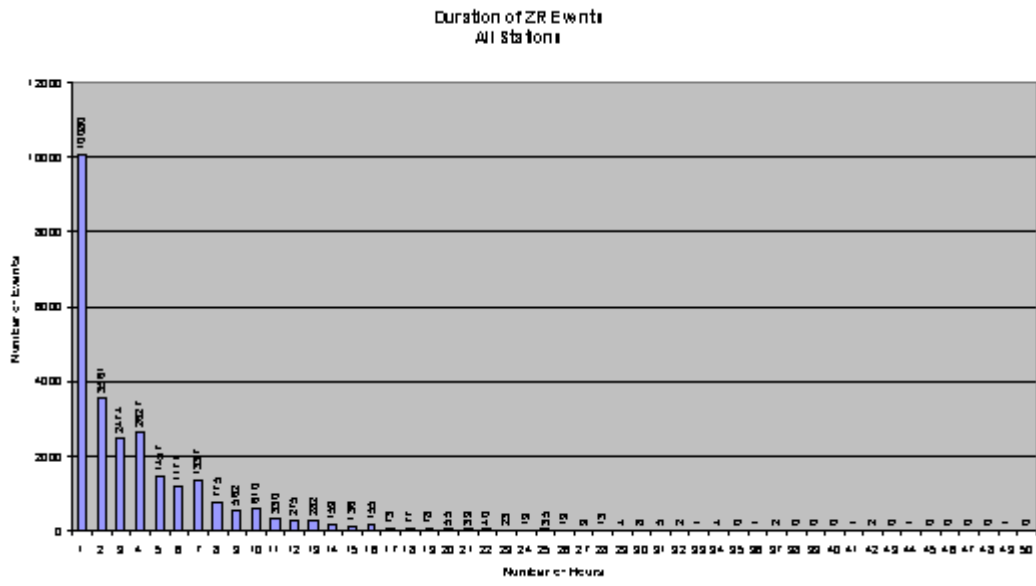
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**Figure 1.** Average number of hours per year with freezing rain in the United States.



**Figure 2.** Duration of freezing rain events in the United States.