THE FEBRUARY 1994 ICE STORM IN THE SOUTHEASTERN U.S.

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Abstract

In February 1994, an unusually severe ice storm struck the southeastern portion of the United States. The storm was the result of a typical icing scenario for that part of the country--a quasi-stationary front near the Gulf of Mexico coast with 'overrunning' moisture into the relatively cold air north of the front. However, this ice storm was very unusual in two respects: 1) Its areal extent was much greater than usually found in ice storms, and 2) the rainfall amounts were much higher than one would expect for such an event. As a result, over $3 billion in estimated damages and costs were inflicted by the storm.

This report describes the storm in some detail, with a state-by-state summary of the damages. Precipitation amounts and minimum temperatures recorded by cooperative and National Weather Service sites are summarized. Finally, the datasets used in summarizing the storm are briefly reviewed as to their usefulness in studying such an event. These datasets can be quite effective in studying ice storms and other severe weather events.

Keywords

Ice, storm, climatology, freezing rain, meteorology, utilities, structures.

1. Introduction

In February 1994, the southeastern portion of the U.S. was struck by a severe ice storm of unusual duration and severity. The ice storm resulted in over $3 billion in damages to the area, including tremendous damage to the electric utilities and communications industry in the area. This report provides details and climatic data for this event. All references to ice thickness refer to total thickness on a horizontal surface (or top to bottom over a cable) rather than radial thickness. This is due to actual radial thickness rarely being measured.

The ice storm resulted from a typical icing scenario: a nearly stationary front with overrunning moisture producing freezing precipitation in colder air near the surface to the north of the front. However, this storm was very unusual in that its areal extent was much greater than usually found in ice storms, and the precipitation amounts were much higher than usually found in ice storm situations, with some amounts exceeding 125 mm for the event (see Table 1).

Table 1 - Precipitation Amounts (melted, in mm) For Feb 9-13, 1994 For Stations With At Least 125 mm (most fell on Feb 9-11)

ALABAMA:

Huntsville	153
Russellville	144
Haleyville	139
Addison	137
Moulton	136
Hodges	136
Hanceville	135
Athens	132
Hamilton	131
Belle Mina	130

MISSISSIPPI:

Amory	151
Vaiden	141
Minter City	139
Abbeville	136
Verona	133
Fulton	132
Baldwyn	132
Iuka	131
Ripley	131
Pontotoc	130

TENNESSEE:

Shelbyville	198
Norris	189
Kingston	165
Tullahoma	161
Pulaski	149
Lafayette	149
Jefferson City	148
Livingston	147
Jamestown	147
Monteagle	146
Tazewell	144
Winchester	143
Allardt	141
Oak Ridge	140
Dayton	138
Rogersville	137
McMinnville	135
Oneida	133
Morristown	130
Portland	130
Bristol	129
Lenoir City	129
Lewisburg	127

2. Discussion

The ice storm began in the western sections of the Southeast on the 9th and gradually spread eastward into Tennessee, Mississippi, and Alabama. These three states suffered the worst damage before the storm continued northeastward through the Carolinas, Virginia, and Kentucky. A large temperature gradient across the front (some temperature drops of 20-30 degrees Celsius from the previous day's readings occurred) contributed to the strength of the storm. Figure 1 shows the storm total precipitation amounts, while figures 2 and 3 show the minimum temperatures observed during the peak of the storm.

Ice accumulations ranged from 2 cm to as much as 15 cm in parts of northern Mississippi--unusual if not unprecedented ice thicknesses in this area for a freezing rain event. However, since ice thickness is not a routinely measured parameter, historically accurate comparisons are impossible. This is a significant problem in attempts to develop freezing rain/ice climatologies.

Overall, the storm produced over $3 billion in damages and cleanup costs, and at least 9 deaths were attributed (directly or indirectly) to the storm. Also, well over 2 million customers were without electricity at some point, and 1/2 million were still without power 3 days after the storm. There were even some instances of residents without power for 1 month after the storm. Many homes, businesses, and vehicles were damaged by falling trees and limbs. Following is a state-by-state account of the destruction, for those states from which detailed information was available (some states provided much more detailed information than others):

- Alabama: A 7-county area of northwest Alabama was devastated by the storm. Numerous trees and limbs blocked roads making travel nearly impossible, and damage to homes and businesses was widespread. Due to the broad area with rainfall amounts of over 75 mm (some over 120 mm), flooding was also a problem, although not nearly as damaging as the ice. Total damages were estimated at nearly $500 million.

- Arkansas: Southeast Arkansas was affected more severely than the rest of the state with some areas having almost every power pole downed by the ice. Approximately 120,000 customers were without power at some time during

the storm, and up to 2 weeks were required to restore power to some locations. Some power companies called this the worst ice storm in their history. Damage and cleanup costs were estimated at over $50 million.

- Kentucky: The south-central and southeast sections of the state were hardest hit. Ice accumulated to over 7 cm in some locations. Over 190,000 customers were without electricity at some point, with power not restored for over a week in some locations. Kentucky also reported 150 injuries for the event--the only state to officially report a significant number of injuries. Damage estimates were placed at over $50 million for the state.

- Louisiana: Northern Louisiana was hard hit with over 100,000 customers without power due to the storm. The Forest Service reported that 256,000 acres of forest were damaged by icing. This was the worst ice storm in Louisiana since 1983, with damage estimated at about $13.5 million.

- Mississippi: Northern Mississippi was probably the area of the Southeast hardest hit by the storm. Ice thicknesses of 7-14 cm were common and caused catastrophic damage in many areas. Over 120 mm of rainfall at some locations produced considerable flooding in addition to the ice damage. 3.7 million acres of commercial forests were severely damaged, with losses estimated at $1.3 billion. Urban tree losses were estimated at $27 million. 25% of the state's pecan crop will be lost for the next 5-10 years at an estimated cost of $5.5 million per year. Approximately 750,000 customers were without power at some point, with about the same number also without water. Electricity to some locations was not restored for 1 month. Utility damage was estimated at about $500 million, which places total damage and costs for the state at nearly $2 billion!

- North Carolina: The western and north-central parts of the state were most affected, with ice thicknesses generally less than 5 cm reported. Most of the damage was to utilities as over 100,000 customers were without power at some point--some for several days. Damage estimates were rather minor compared to other states--generally less than $10 million.

- South Carolina: Northwest South Carolina was the only part of the state significantly affected. Power outages to nearly 100,000 customers were reported, with some out for several days. Damage estimates were less than $5 million.

- Tennessee: A large portion of Tennessee was affected by the storm, with overall destruction ranking second behind Mississippi. Many locations experienced over 120 mm of rainfall, thereby creating flooding problems in addition to the icing. Shelbyville reported 198 mm--the maximum for the event. About 770,000 customers lost power for some period of time, with nearly a month required to restore all of the outages. There was one traffic fatality attributed to the storm when a tree fell on a moving car. Total damages/costs were placed at nearly $500 million.

- Texas: The northeast portion of the state was most affected by the storm, with over 30,000 customers without power at some point. Up to 10 cm of ice and sleet accumulated in some areas, and 2 fatalities were reported due to traffic accidents. Damages were estimated at well under $50 million.

- West Virginia: West Virginia was not as severely affected as states farther south, although about 50,000 customers were without power at some point. The southern part of the state received most of the damage, with damage estimates of less than $1

million overall.

3. Data Sources

The key dataset used in this study was the U.S. National Weather Service Cooperative Network dataset. It comprises over 8000 active stations reporting daily precipitation along with maximum/minimum temperatures. NCDC receives the data on monthly forms, key enters the values, and then performs quality control of the digital data. It is one of our most used and requested datasets.

NCDC, as part of the Federal Climate Complex in Asheville, NC, also makes available numerous other types of data. These include:

- Global surface and upper air observations.
- Global gridded analyses.
- Global satellite data.
- U.S. solar radiation, wind profiler, and NEXRAD data.

Our Products and Services Guide describes these data along with other services of interest to the atmospheric icing research community. This includes CDROM products, on-line (internet/www) data, and numerous publications. These and other National Climatic Data Center/Federal Climate Complex datasets/products are quite effective in climatic studies of significant weather events, and in attempts to develop climatological models for regions at greater risk for severe icing.

4. Conclusion

As this report has shown, an unusually severe ice storm struck the southeastern U.S. in February of 1994. The damages were unprecedented in some areas, with electrical power outages for up to a month in duration. However, due to a scarcity of ice measurements in the past, it is difficult if not impossible to ascertain the recurrence interval for such an event.

Proxy information (statements by residents and utility representatives, other historical weather data, etc) would seem to indicate at least a 100-year event occurred in portions of Mississippi and Tennessee. In these hardest-hit areas, structures would probably never be engineered to withstand such an event due to economic realities. However, in nearby areas somewhat less severely impacted, this would not be the case.

We hope that data from this and other events, along with historical climatic data, can be used to model ice thicknesses based on routinely measured parameters. A project to attempt such modelling is now underway, with NCDC and the USAF Cold Regions Research and Engineering Laboratory being the principal participants.

Acknowledgements

The information for this report was collected from numerous sources, including the Climate Prediction Center, the National Weather Service, the Southeast Regional Climate Center, and various news media reports. For further information or data, please contact NCDC's Climate Services Branch: Phone 704-271-4800, Fax 704-271-4876, Internet orders@ncdc.noaa.gov. Also, various technical reports and on-line datasets are available via our Internet/WWW system (http://www.ncdc.noaa.gov).

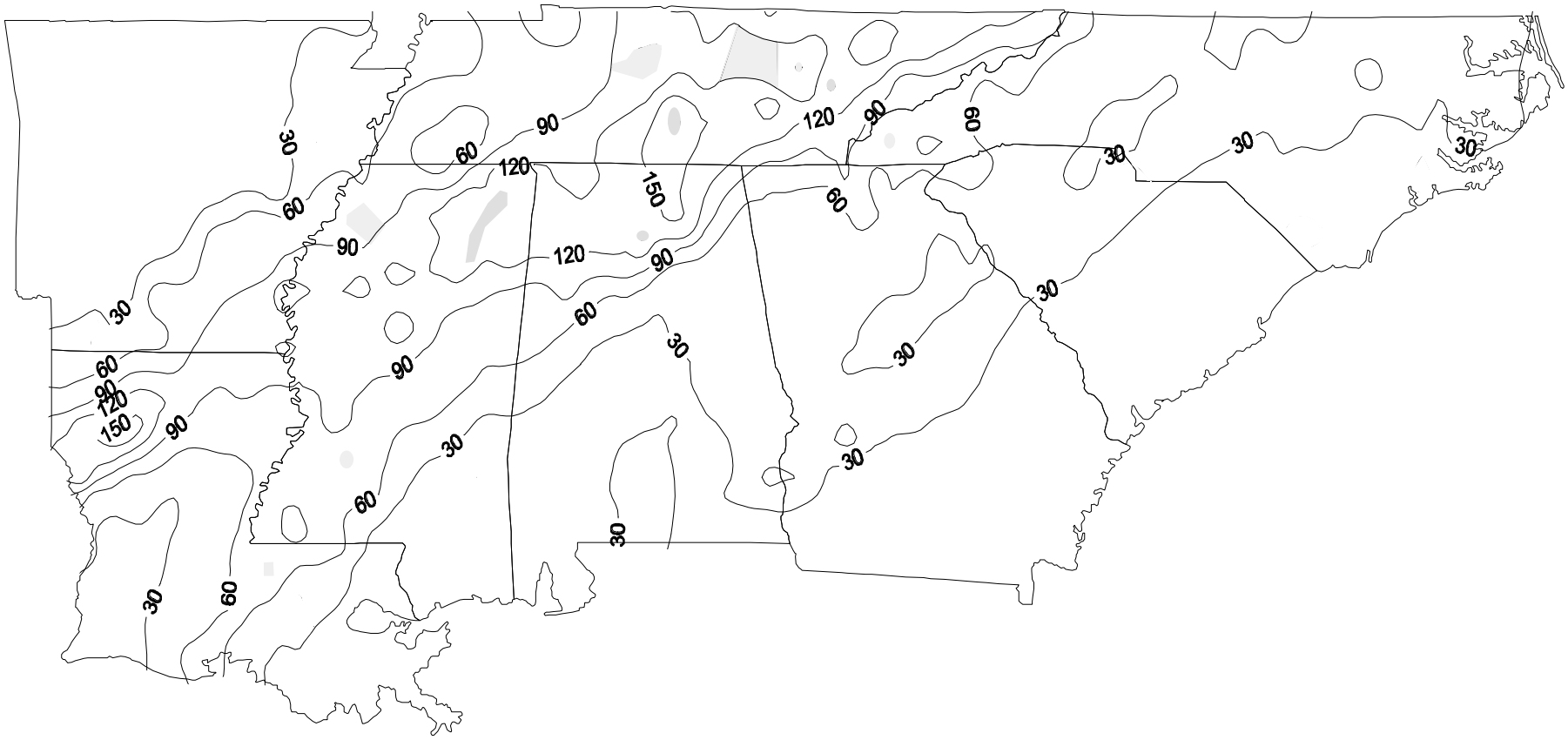

Fig. 1: Total precipitation (mm), February 9-13, 1994

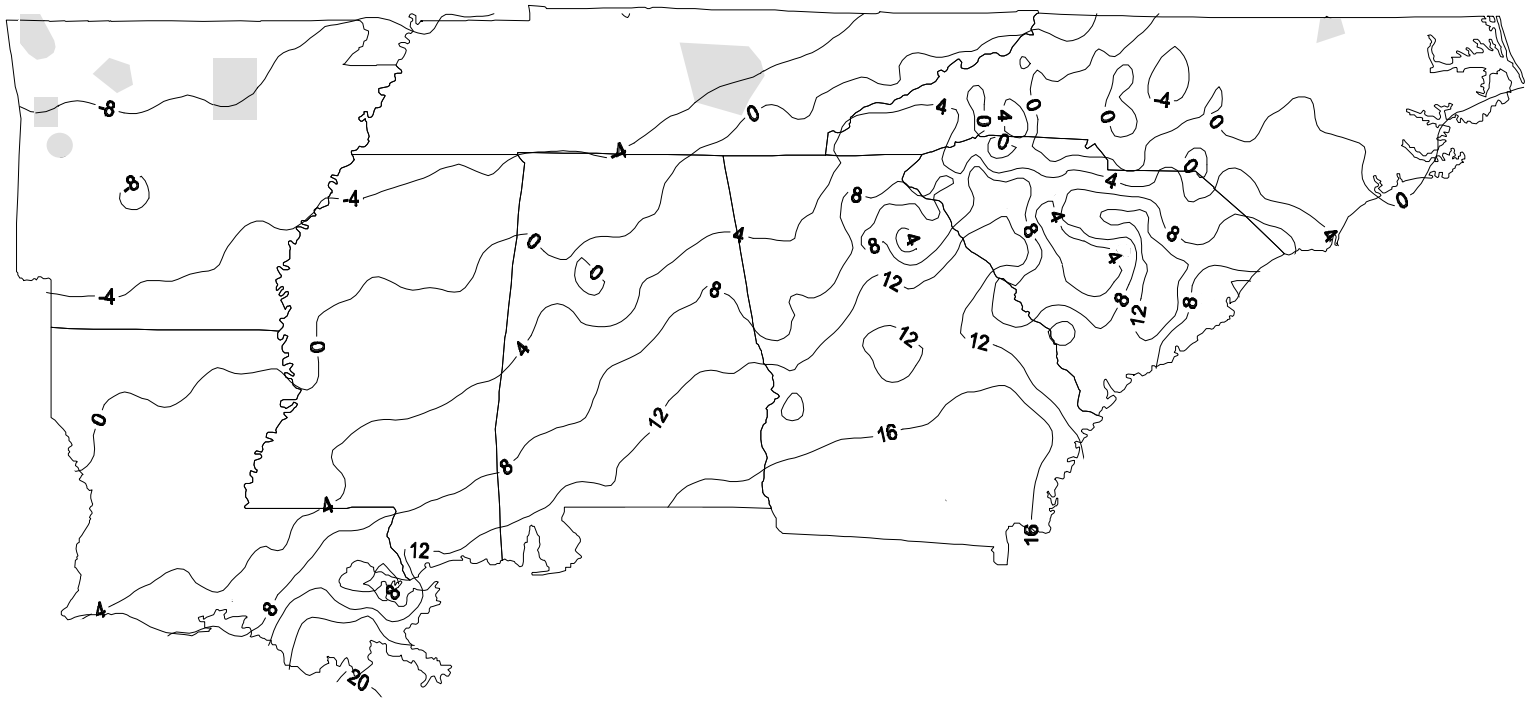

Fig. 2: Minimum temperature (C), February 10, 1994

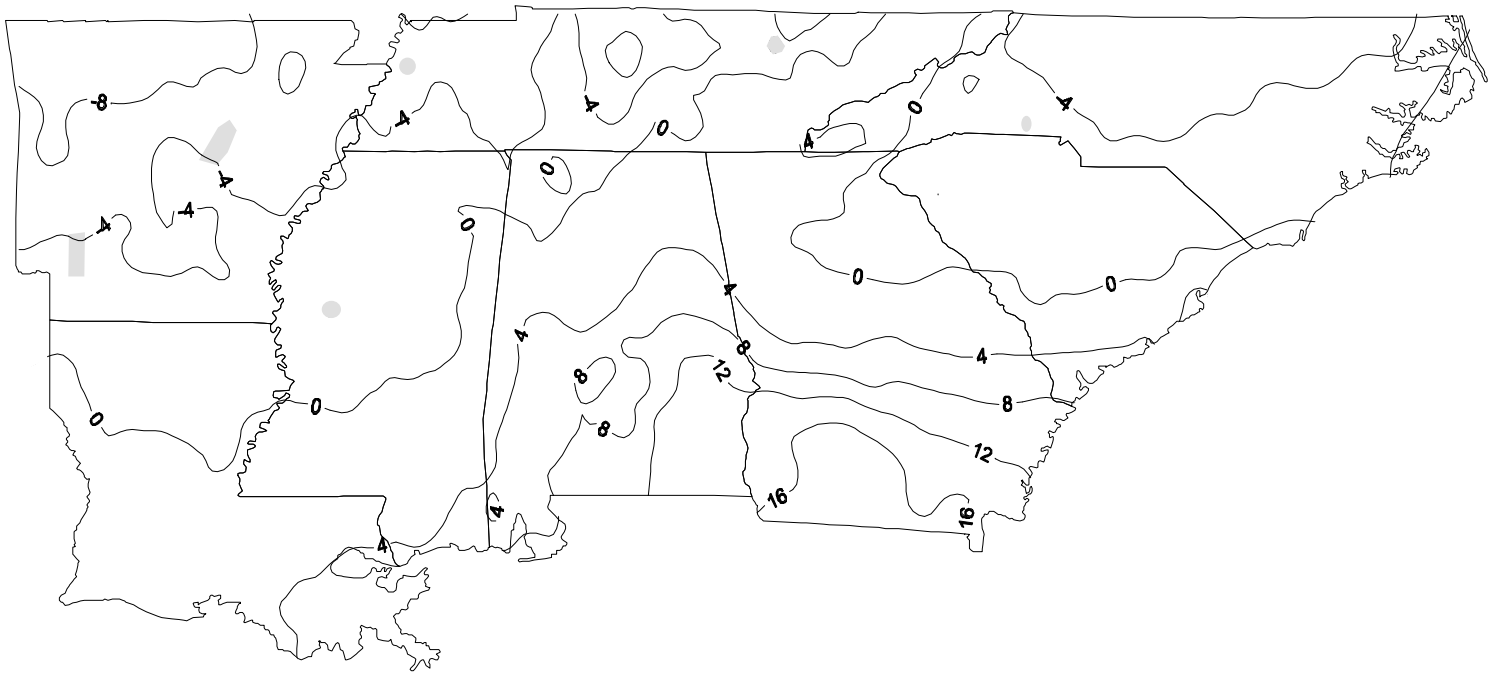

Fig. 3: Minimum temperature (C), February 11, 1994