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Natural Disaster Survey Report

THE PLAINFIELD/CREST HILL TORNAO

Northern Illinois
August 28, 1990



U.S. DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
National Weather Service, Silver Spring, Maryland

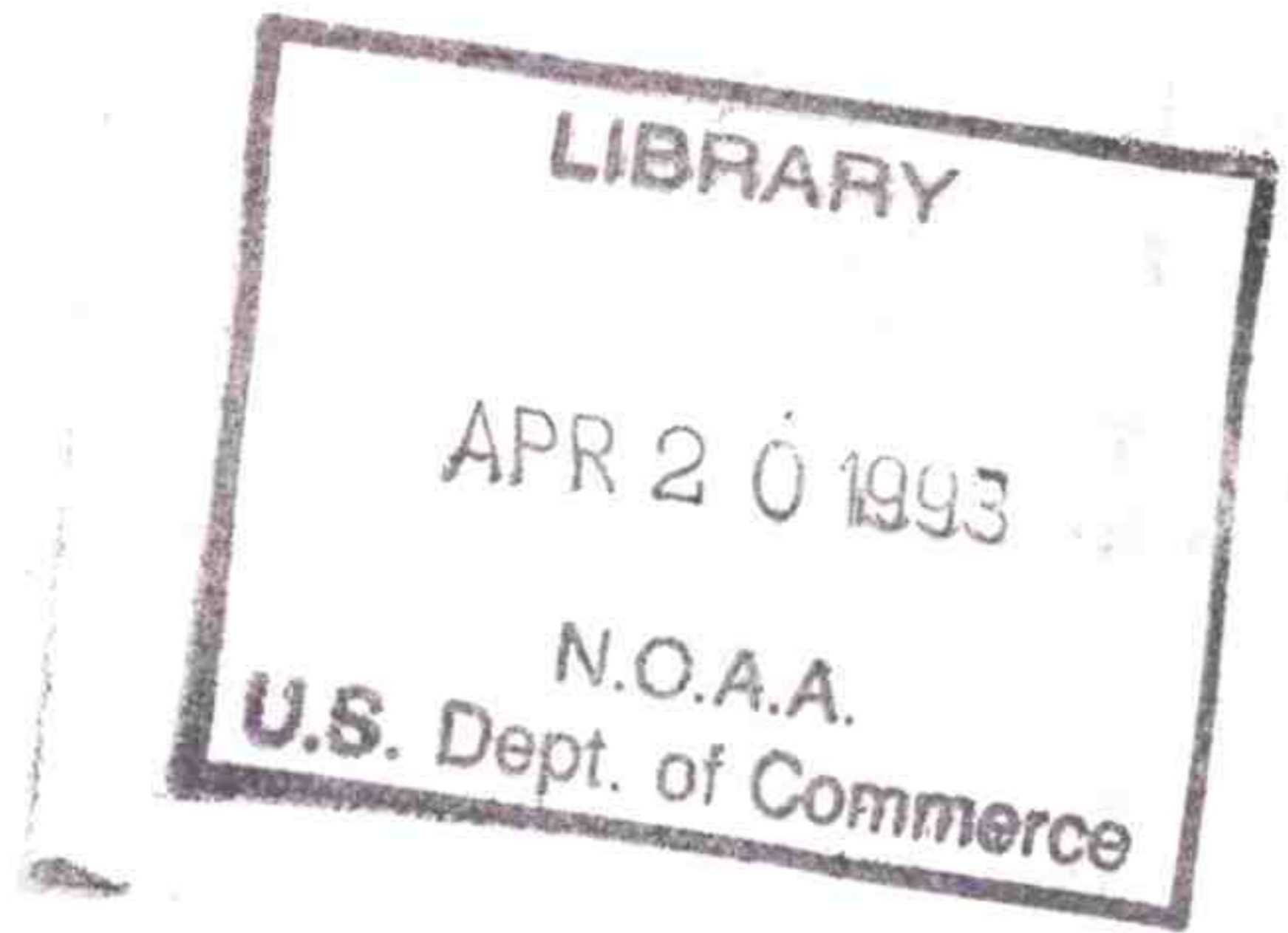


Cover: Panoramic photographs of the damage track of Plainfield/Crest Hill Tornado--provided to NOAA for use in this report by Robert E. Gorsich, M.D., Downers Grove, Illinois.

Top panel shows path of tornado damage from Plainfield High School (middle left) southeastward across two subdivisions of the town.

Bottom panel shows path of damage from extreme southeastern Plainfield (middle left) across I-55 through the Crystal Lawns Subdivision and eastward toward Crest Hill (middle right).

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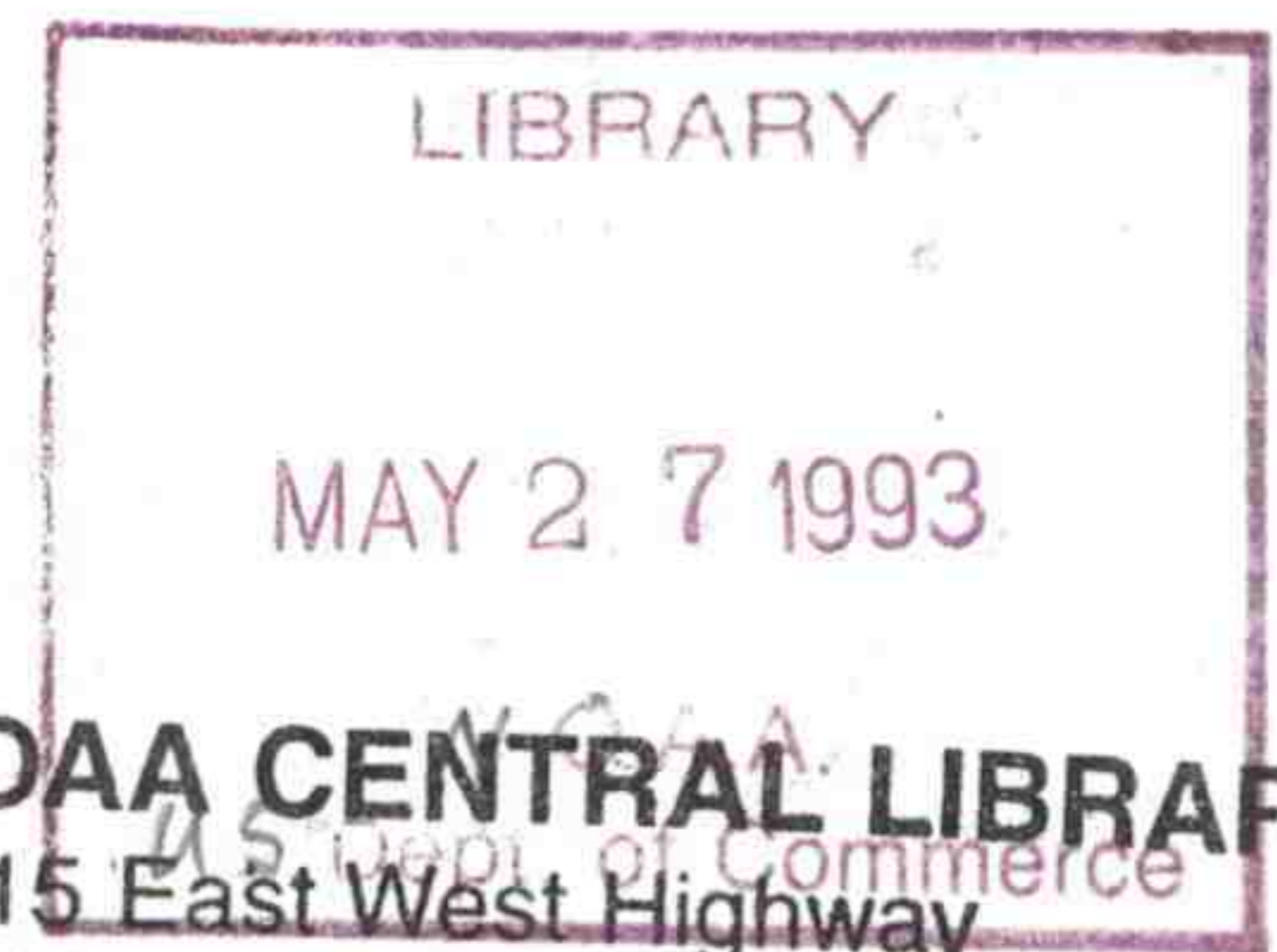
August 28, 1990

May 1991

U.S. DEPARTMENT OF COMMERCE
Robert A. Mosbacher, Secretary

National Oceanic and Atmospheric Administration
Dr. John A. Knauss, Administrator

National Weather Service
Dr. Elbert W. Friday, Jr., Assistant Administrator

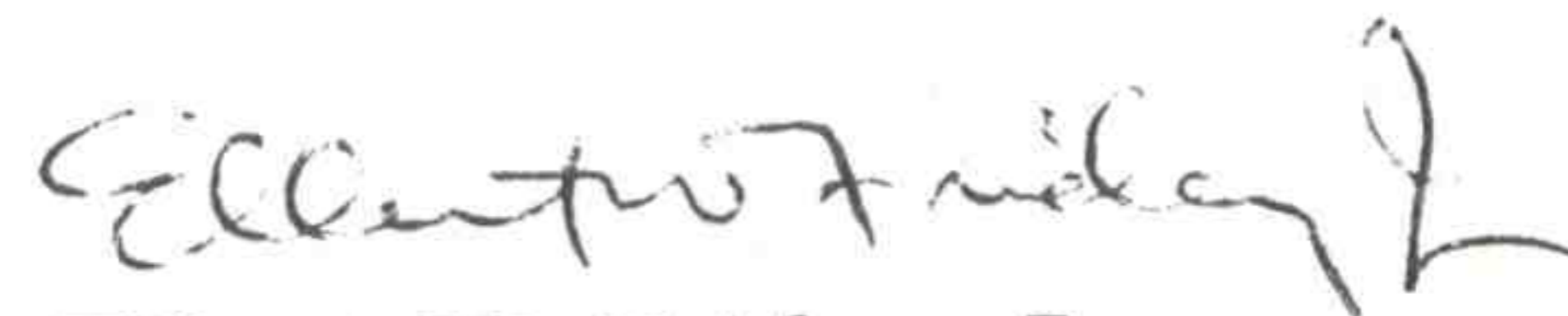


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PREFACE

Participation on a Natural Disaster Survey is both a rewarding and potentially trying experience. Witnessing the personal tragedy caused by a disaster and assessing services provided by the National Weather Service are responsibilities not taken lightly. Reports on natural disasters are very important in that they provide needed recommendations on how to improve warning service.

The Plainfield/Crest Hill tornado was a particularly difficult disaster to evaluate. I wish to express sincere appreciation to the Disaster Survey Team members for their thorough, professional, and unbiased review of the disaster and for their well thought out recommendations for improvements in National Weather Service warning services.



Elbert W. Friday, Jr.
Assistant Administrator
for Weather Services

May 1991

FOREWORD

This survey report on the tornado which struck northeastern Illinois on August 28, 1990, was prepared by a National Oceanic and Atmospheric Administration Disaster Survey Team following a 4-day visit to the storm site. The report is based upon information gathered by the team through a series of visits to National Weather Service Offices and during interviews with members of other agencies, organizations, and state, county, and municipal governments. The team thanks the county and municipal officials who took time from urgent disaster response duties to share their impressions of the event and interpretations of the effectiveness of National Weather Service watch and warning products. The team was impressed by the cooperativeness and candor of these officials who were working under conditions of high personal and organizational stress.

Although this document is not intended to chronicle the entire history of the tornado-producing thunderstorm system, it does assess the effectiveness of National Weather Service performance and products before and during the period of severe thunderstorms in northern Illinois. The report presents a number of findings, followed by related recommendations, based upon the team's survey. The recommendations could lead to more effective severe storm warning and forecasting procedures in northern Illinois.

The Disaster Survey Team

TABLE OF CONTENTS

		<u>Page</u>
Preface	.....	ii
Foreword	.....	iii
Acronyms	.....	vi
The Disaster Survey Team	.....	viii
Executive Summary	.....	ix
Findings and Recommendations	.....	xi
Chapter 1	Plainfield/Crest Hill Tornado--The Event and its Impacts . . .	1
Chapter 2	Meteorology of the Event	13
Chapter 3	Warnings and Forecasts	27
3.1	Discussion of Services	32
Chapter 4	Preparedness, Dissemination, and Response	38
4.1	Preparedness--WSFO Chicago	38
4.2	Preparedness--External User Groups	41
4.3	Media Dissemination	42
4.4	User Response	43
Appendix A	Chronology of Releases Related to the Plainfield/Crest Hill Tornado	A-1
A-1	Releases of the National Severe Storms Forecast Center . . .	A-1
A-2	Releases of WSO Rockford	A-7
A-3	Releases of WSMO Marseilles	A-13
A-4	Releases of WSFO Chicago	A-18
A-5	Releases of WSFO Indianapolis	A-26

TABLE OF CONTENTS (Cont'd)

		<u>Page</u>
Appendix B	Chronology of Actions/Reports	B-1
B-1	The Actions/Reports at WSO Rockford	B-1
B-2	The Actions/Reports at WSFO Chicago	B-2
B-3	The Communication Log at Marseilles WSMO	B-5
B-4	Special Radar Scans of the Storm Taken at Marseilles WSMO	B-7
B-5	The Communication Log at NSSFC	B-8
Appendix C	Product and Information Dissemination	C-1
C-1	Emergency Service Agencies	C-1
C-2	Radio Stations	C-3
C-3	Television Stations	C-5
Appendix D	Preparedness Activities WSFO Chicago	D-1
D-1	1989 Preparedness Talks	D-1
D-2	1990 WPM Appearances	D-2
Appendix E	Summary of Fatalities	E-1
E-1	List of Individuals	E-1
E-2	Map Showing the Locations of the Fatalities	E-2
E-3	Map Showing Locations of Major Damage	E-3
Appendix F	Persons Interviewed and/or Contacted by the Disaster Survey Team	F-1
F-1	National Weather Service Employees	F-1
F-2	Other Agencies/Institutions	F-2
Appendix G	NWS Staffing for Northern Illinois	G-1
Appendix H	Fujita Tornado Intensity Scale	H-1

ACRONYMS

AC	Convective Outlook
ADAP	AFOS Data Analysis Program
ADM	Alphanumeric Display Module
AFOS	Automation of Field Operations and Services
AP	Associated Press
BWER	Bounded Weak Echo Region
CD	Civil Defense
CDT	Central Daylight Time
cm	Centimeter
CWSU	Center Weather Service Unit
DCM	Data Communications Module
DMIC	Deputy Meteorologist in Charge
DST	Disaster Survey Team
ESDA	Emergency Services and Disaster Agency
FAA	Federal Aviation Administration
GOES	Geostationary Operational Environmental Satellite
GWARN	Generic WARNing System
ISP	Illinois State Police
ISPERNS	Illinois State Police Emergency Radio Network System
km	Kilometer
kts	Knots
LEADS	Law Enforcement and Dissemination System
mb	Millibar
MIC	Meteorologist in Charge
MMO	WSMO Marseilles
MOS	Model Output Statistics
NAWAS	National Warning System
NEXRAD	Next Generation Weather Radar
NGM	Nested Grid Model
NOAA	National Oceanic and Atmospheric Administration
NSSFC	National Severe Storms Forecast Center
NWR	NOAA Weather Radio
NWS	National Weather Service
NWWS	NOAA Weather Wire Service
OAR	Oceanic and Atmospheric Research
OIC	Official in Charge

ACRONYMS (Cont'd)

PMO	Port Meteorological Officer
PPI	Plan Position Indicator
RADID	RADar Information Display
RHI	Range Height Indicator
RISOP	Rapid Interval Scan Operations
SDM	Station Duty Manual
SELS	SEvere Local Storms Unit
SRWARN	Southern Region WARNing System
UPI	United Press International
UTC	Coordinated Universal Time
VIP	Video Integrator Processor
WER	Weak Echo Region
WPM	Warning Preparedness Meteorologist
WRIST	Weather Radar Identification of Severe Thunderstorms
WSFO	Weather Service Forecast Office
WSMO	Weather Service Meteorological Observatory
WSO	Weather Service Office
WSR	Weather Service Radar
WSS	Weather Service Specialist

THE DISASTER SURVEY TEAM

After a significant severe weather event, such as a destructive tornado, a Disaster Survey Team (DST) may be assigned by the National Oceanic and Atmospheric Administration (NOAA) to evaluate the roles played by the National Weather Service (NWS), to provide an objective appraisal of the event, and to make relevant findings and recommendations. Such a team was asked to survey the Plainfield/Crest Hill tornado which struck in northeastern Illinois on August 28, 1990.

TEAM MEMBERS

Leader, **Robert A. Maddox**, Director, National Severe Storms Laboratory, Oceanic and Atmospheric Research (OAR)

Coordinator, **Linda Kremkau**, Program Assistant, Warning and Forecast Branch, NWS

Myron I. Berger, Meteorologist, Warning and Forecast Branch, NWS

T. Michael Carter, Consultant, Corporate Response Group, Inc.

Robert Elvander, Meteorologist, Next Generation Weather Radar (NEXRAD), Joint Systems Program Office, NWS

Kenneth Howard, Meteorologist, National Severe Storms Laboratory, OAR

Robert Jacobson, Meteorologist, Marine and Applied Services Branch, NWS

Michael Looney, Deputy Meteorologist in Charge, Denver, Colorado, NWS

Richard Przywarty, Area Manager/Meteorologist in Charge, Seattle, Washington, NWS

Jay Tebeau, Public Affairs Officer, NOAA Public Affairs

EXECUTIVE SUMMARY

The Event

On the afternoon of August 28, 1990, an intense tornado struck Kendall and Will Counties in northeastern Illinois. The storm produced severe property damage, while causing 29 deaths and more than 300 personal injuries. Damage in these two counties exceeded \$160 million, with the tornado's impact being most destructive and deadly from Plainfield to Crest Hill. The severe thunderstorm that produced the tornado also produced large hail and damaging winds along a nearly continuous path from west of Rockford, Illinois, to central Indiana. The storm produced severe weather in Illinois for more than 4 hours, making it not only unusually intense but very long-lived.

Although the large-scale meteorological environment did not appear supportive of supercell storms and possible tornadoes because of unfavorable wind shear in low levels, it was characterized by extremely large convective instability. However, the storm, as viewed by conventional weather radar, displayed distinct supercell characteristics throughout much of its life and produced at least five smaller tornadoes prior to the final, and most intense, one which struck Kendall and Will Counties. One or two of these occurred early in the storm event and produced confirmed damage near Rockford. A post-event, aerial survey indicates four small tornadoes occurred in rapid sequence immediately prior to the major tornado.

The weather event which occurred in northeastern Illinois on the afternoon of August 28 was unusually intense and climatologically very rare, resulting in an extreme service challenge to staffs of the National Weather Service offices at Rockford and Chicago. Between them, these two offices had severe thunderstorm warning responsibility for all of the Illinois counties struck by the storm.

Services

The National Severe Storms Forecast Center, located in Kansas City, Missouri, has responsibility for providing outlooks and watches for possible severe thunderstorms and tornadoes across the entire country. The morning outlooks concerning the potential for severe thunderstorms were very accurate. The center issued a severe thunderstorm watch just prior to the onset of the event that included all of northern Illinois. This watch remained in effect at the time of the Plainfield/Crest Hill tornado. Although the severe thunderstorm moving across

northeastern Illinois displayed supercell characteristics, staff at the center chose not to reissue this watch to include the threat of tornadoes. The reason was that the storm was isolated, and the tornado threat was being well-covered by local warnings issued at Rockford. Early in the event, the Weather Service Office at Rockford responded quickly and provided warnings for the second reported tornado and other severe weather associated with the thunderstorm. The Rockford office communicated with staff at the Weather Service Meteorological Observatory in Marseilles, Illinois, the site of the relevant network weather radar, to determine the storm's intensity and probable track. The office in Rockford received several very timely reports of a funnel cloud, a tornado touchdown, and other associated severe weather from the Illinois State Police, which helped them confirm the serious nature of the storm's threat.

As the storm moved into the warning area of the Weather Service Forecast Office at Chicago, the severe weather services provided were not as timely or accurate as they might have been. The first two severe thunderstorm warnings issued at Chicago were for locations that remained to the north and east of the actual path of the severe weather. The large hail, damaging winds, and tornadoes in southwestern Kane, northeastern Kendall, and western Will Counties occurred, essentially, without warnings of any type in effect. The last several minutes of the major tornado were covered by a severe thunderstorm warning that included western Will County.

During the time that the supercell storm was moving through Kane, Kendall, and Will Counties, neither the staff at Marseilles nor Chicago recognized severe thunderstorm signatures or indicators of the storm's tornadic potential exhibited by its radar echo. Few reports of severe weather, none of funnel clouds or tornadoes, were received at the Chicago office, contributing to slow recognition of the continuing serious threat this storm posed. The lack of spotter reports and limited flow of information in northeastern Illinois prior to and during the severe thunderstorm event, coupled with the failure of radar operators and forecasters to recognize the severe nature of the long-lived supercell thunderstorm, indicates that training and preparedness activities and severe weather program oversight had not been implemented effectively at Chicago during recent years.

The Disaster Survey Team feels strongly that careful consideration of the reasons why, for this particular tornado occurrence, warnings were not as timely or effective as they might have been, can lead to long-term improvements in the warning and forecast system. The team has developed an extensive series of "Findings" and "Recommendations" as part of its report of the Natural Disaster Survey. These are presented on the following pages. The body of this document provides detailed and sometimes technical information supporting the team's findings and recommendations.

FINDINGS AND RECOMMENDATIONS

Finding 1:

On August 28, 1990, a climatologically rare and unusually intense tornado struck Kendall and Will Counties in northern Illinois, causing 29 deaths and injuries exceeding 300, while producing more than 160 million dollars of property damage. (Chapter 1)

Finding 2:

The severe thunderstorm that produced the tornado developed near the Illinois/Wisconsin border shortly after 12:00 p.m., Central Daylight Time (CDT), and produced nearly continuous severe weather--including large hail, strong and damaging winds, and several tornadoes--as it moved southeastward across northeastern Illinois. The storm remained severe as it moved into Indiana during the late afternoon. (Chapter 1)

Finding 3:

A number of NWS offices were involved in various aspects of the severe weather watch, warning, and radar surveillance programs for the storm area on August 28 (i.e., the National Severe Storms Forecast Center (NSSFC) in Kansas City, the Weather Service Forecast Office (WSFO) Chicago, the Weather Service Office (WSO) Rockford, the Weather Service Meteorological Observatory (WSMO) Marseilles (MMO), and the Center Weather Service Unit (CWSU) Aurora, all in Illinois; WSFO Indianapolis, Indiana, observed the severe thunderstorm with its surveillance radar and issued products for Indiana, referring to the character of the storm that was moving across northern Illinois). (Chapter 3)

Finding 4:

The large-scale meteorological setting (e.g., approaching surface front and mid-level short-wave trough, extreme convective instability) documented by the 7:00 a.m., CDT, synoptic observations on August 28 was highly

conducive to the occurrence of severe thunderstorms. Because of this, the NSSFC upgraded its severe thunderstorm outlook to include a "moderate risk" for northern Illinois at mid-morning and then issued a severe thunderstorm watch at 1:28 p.m. that covered all of northern Illinois, valid through 8:00 p.m., CDT. (Chapter 2)

Finding 5:

The latest numerical model forecasts and standard meteorological observations available in real-time indicated that, based on current understanding, the vertical wind profile over the western Great Lakes Region would favor the occurrence of multi-cell strong wind and hail-producing thunderstorms rather than tornadic storms on the afternoon of August 28. (Chapter 2)

Finding 6:

Radar data, however, indicated that the tornadic thunderstorm possessed both severe and supercell characteristics (e.g., extreme echo intensities and heights, strong leading edge reflectivity gradient, continuous movement to the right of the mean wind that was indicated in Severe Thunderstorm Watch #691, bounded weak echo region (BWER), distinct inflow notch, and intense echo pendant) as it moved across northeastern Illinois. (Chapter 2)

Finding 7:

Given the explosive nature of the initial thunderstorm developments, staff of the WSO Rockford, Illinois, responded extremely well to rapidly evolving severe weather events on August 28. (Chapter 3)

Finding 8:

The severe weather products issued by WSO Rockford, in addition to being timely, were consistently well written, included excellent call-to-action statements, and provided valuable storm location/motion information for users. (Chapter 3)

Finding 9:

Communication and coordination among NWS offices and staff could have been more effective during the period of severe weather. For example, information provided to the DST by the NSSFC indicates that staff did not discuss with WSFO Chicago forecasters the decision not to reissue Severe Thunderstorm Watch #691 as a tornado watch; there was little discussion among the staffs at WSFO Chicago, WSO Rockford, and WSMO Marseilles concerning the character, behavior, and intensity of the severe thunderstorm moving across northeastern Illinois; the Automation of Field Operations and Services (AFOS) Alarm and Alert program at WSFO Chicago alerted issuances but was not programmed to display severe weather products issued by its WSOs and other nearby offices. (Chapters 3 and 4)

Recommendations:

The NSSFC should make a concerted effort to alert WSFOs if SELS (Severe Local Storms unit) forecasters feel that a localized tornadic threat has developed within a severe thunderstorm watch. In situations like this, unusually close coordination is needed to ensure that all affected offices are aware of the threat and how it will be dealt with (i.e., via a new tornado watch or through local warning actions).

During severe weather situations, the WSFO Chicago lead forecaster/severe weather focal point should interact aggressively with affiliated WSOs, its CWSU, and other nearby NWS offices to monitor the current status and anticipated actions regarding severe storms and related products.

The WSFO Chicago should update its AFOS Alarm and Alert program to include all WSO statements and warnings from Illinois as well as from NWS offices in adjoining states.

Finding 10:

Critically important information concerning tower operations, controller observations, and the intensity of the severe weather occurrences at the Federal Aviation Administration (FAA)-controlled airport in Sugar Grove, Illinois, was not conveyed to WSFO Chicago until well after the event. (Chapter 3)

Recommendation:

The NWS, at all levels, should work closely with FAA officials to develop procedures that will ensure rapid, two-way communication of significant severe weather information between the two agencies.

Finding 11:

The WSMO at Marseilles was the primary source of radar information for use at WSO Rockford and WSFO Chicago during the severe weather of August 28. Staff of the WSMO provided important information concerning the radar-observed character of the severe thunderstorm to both WSO Rockford and WSFO Chicago. (Chapter 3)

Finding 12:

Early in its life, the storm displayed a BWER that was detected by MMO staff and reported to WSO Rockford. (Chapter 3)

Finding 13:

As the severe thunderstorm approached Chicago's area of warning responsibility, the station communication log indicates that MMO passed specific storm structure reports to the WSFO. These reports emphasized core echo locations, storm top heights, and the height to which the storm's Video Integrator Processor (VIP) level 6 echo extended. Information on the storm's movement was transmitted in MMO's radar observations. (Chapter 3)

Finding 14:

During the period of the development and life of the Plainfield/Crest Hill tornado, the storm was moving through an extensive ground clutter pattern exhibited by the MMO Weather Service Radar (i.e., WSR-74S radar, where the numbers indicate year of design and letters denote special characteristics--S for 10 cm (centimeter) wavelength, C for 5 cm wavelength, and D for Doppler). However, it is apparent from the WSR Plan Position Indicator (PPI) film that the storm was viewed several times at elevations above the clutter and a number of Range Height Indicator (RHI) scans were accomplished. (Chapters 2 and 3)

Recommendation:

Elevated scanning strategies should be used routinely when intense storms are located near the radar. Occasional operation of the radar in short-range mode can provide high-resolution detail and help both the operator and WSFO Chicago forecasters identify storm signatures. Although these procedures may cause some interruptions for external users, the NWS responsibility to use the radar for warnings and protecting life and property should take precedence.

Finding 15:

The WSR PPI film from Marseilles shows that the principal echo exhibited severe storm signatures, immediately prior to and during the tornado, that are usually associated with supercell thunderstorms and mesocyclones. Most of these radar signatures (see Finding 6) were not detected or recognized by staff at either WSMO Marseilles or WSFO Chicago. (Chapters 2 and 3).

Recommendation:

Management of the WSFO Chicago should work closely with its WSMO at Marseilles to ensure that all radar operators are well trained and drilled in severe thunderstorm detection procedures and cognizant of severe storm structures and signatures. The same applies for all WSFO Chicago forecasters. This training would help ensure more effective use of the remote radar's capabilities and provide a common base for improved communication among the radar operators and forecasters.

Finding 16:

The hotline communication system between WSMO Marseilles and WSFO Chicago did not function reliably early in the severe weather period. The staff of the WSMO had to call the WSFO on regular phone lines to provide radar information. However, regardless of this specific problem, the communication and coordination between the WSFO and its radar site could have been better. Given the severe weather history and the recognized unusual intensity of this storm, more frequent coordination calls were needed. (Chapter 3)

Recommendation:

Formal coordination guidelines should be established between the WSFO and WSMO. The WSFO should encourage effective communication and interaction by instituting frequent familiarization and exchange visits among the respective staffs.

Finding 17:

The NSSFC upgrade of its severe thunderstorm outlook for northern Illinois to a moderate risk at 1500 Coordinated Universal Time (UTC) was not reflected in the products issued by WSFO Chicago prior to the initiation of the severe weather episode. The staff did not issue a "State Severe Storm Outlook." The office issued refining statements and amended zone forecasts after Severe Thunderstorm Watch #691 went into effect. (Chapter 3)

Recommendation:

During the warm season, WSFOs potentially affected by severe thunderstorms should issue a morning State Severe Storm Outlook, characterizing the likelihood for severe weather over their area of responsibility using the NSSFC Convective Outlook (AC) products as guidance. State Severe Storm Outlooks should not be considered optional for "moderate" and "high risk" situations.

Finding 18:

The senior forecaster on duty is the "supervising meteorologist" and is responsible for all WSFO Chicago warning and forecast operations, including severe weather desk staffing and products if a storm event develops. This procedure was not implemented effectively on August 28. Responsibility for severe weather operations was assumed by the supervising meteorologist, i.e., the Deputy Meteorologist in Charge (DMIC), with help from an aviation meteorologist and the Meteorologist in Charge (MIC). Partly as a result of the direct operations role of senior station management, the public forecaster did not become closely involved in the decisions being made at the severe weather desk. During the severe weather episode, no single forecaster supervised, monitored, and coordinated closely the activities and decision-making processes

occurring at the aviation, public service, and the severe weather work areas. (Chapter 3)

Recommendation:

Management at WSFO Chicago should establish and enforce clear lines of authority and responsibility to be followed during severe weather operations. These guidelines should cover specifically situations in which senior station managers may be present in the forecast operations area.

Finding 19:

The WSFO Chicago issued a severe thunderstorm warning at 2:32 p.m., CDT, for northern Kane County as the severe thunderstorm approached the western portion of its warning responsibility area. At 3:23 p.m., CDT, WSFO Chicago issued a severe thunderstorm warning for southern Du Page County. Then at 3:37 p.m., CDT, another severe thunderstorm warning was issued for northeast Kendall, southern Kane, northern Will and southern Du Page Counties.

(Chapter 3)

Finding 20:

Although tornado or severe thunderstorm warnings were not issued prior to the occurrence of damaging winds, hail, and several tornadoes in southwestern Kane, northeastern Kendall, and much of northwestern Will County, severe thunderstorm warnings were in effect for the final few minutes (approximately 8 to 10 minutes) of the tornado in Will County.

(Chapter 3)

Finding 21:

Many of the warnings and statements issued by WSFO Chicago contained inaccurate or potentially confusing information concerning storm location, movement, its severe weather history, and counties and towns likely to be in its path. The DST feels that these problems reflect a low state of readiness in the overall severe weather program at WSFO Chicago. (Chapters 2, 3, and 4)

Recommendations:

In addition to the radar surveillance training recommended earlier, WSFO Chicago should conduct annual severe weather forecasting and warning workshops with attendees, including NWS employees from all WSOs, the WSMO, and the CWSU. The WSFO should attempt to draw upon local, regional, and national meteorological communities as workshop resources. Emphasis should be given to keeping all staff current in advances in severe storm forecasting procedures, e.g., use of AFOS Data Analysis Program (ADAP) products, hodograph and sounding analysis, etc.

Management at both WSFO Chicago and Central Region should conduct readiness reviews to ensure that national, regional, and local severe storm plans and procedures are well understood by staff and are implemented routinely.

The Chicago WSFO should conduct monthly and spot drills to sensitize the staff, local officials, and emergency response managers to proper severe weather watch and warning procedures and responses.

Finding 22:

Problems with the map background on the MMO PPI radar display monitor and with the Radar Information Display (RADID) monitor may have contributed to inconsistencies and inaccuracies in the warnings issued by WSFO Chicago. (Chapter 3)

Recommendation:

The radar monitors used at WSMO Marseilles and WSFO Chicago should be maintained so that displays are as accurate as is possible. At WSFO Chicago, both the RADID display and an accurate PPI monitor should be situated to allow easy viewing by the forecaster working at the WSFO severe weather desk.

Finding 23:

Because of the heavy precipitation and low cloud bases associated with the storm as it crossed Kendall and Will Counties, the visual identification of the major tornado was difficult. (Chapters 2 and 4)

Finding 24:

Several amateur storm chasers experienced very large hail and strong winds, while observing and filming wall clouds and funnel clouds prior to the touchdown of the principal tornado in Kendall County. However, no severe weather reports were made to NWS offices or to law enforcement agencies. (Chapters 2 and 4)

Finding 25:

Reports of severe weather occurrences between Rockford and Plainfield received at WSFO Chicago were of large hail and strong or damaging winds. Although the DeKalb Sheriff's Office reported a funnel cloud just north of DeKalb, this information was not transmitted or conveyed to WSFO Chicago by WSO Rockford. (Chapter 3)

Finding 26:

There were few spotter reports received while the storm was moving through the WSFO Chicago warning area. Reports that were made came principally from off-duty NWS employees. (Chapters 3 and 4)

Finding 27:

Most active severe storm spotter group members in northeastern Illinois live in Chicago or its immediate suburbs, limiting the effectiveness of the program. Spotter phone listings available at the severe weather desk were not up to date. (Chapter 4)

Recommendation:

The WSFO Chicago needs to invest considerable effort to establish better organized, well trained, and broadly distributed severe storm spotter

groups throughout their entire warning responsibility area. As part of this effort, severe weather desk spotter resource guides need to be updated.

Finding 28:

The Chicago area has a very large user population and is in a geographic region characterized by frequent severe weather events. The office does not have a Warning Preparedness Meteorologist (WPM) position dedicated to severe weather coordination and preparedness activities, and WPM focal point duties are assigned to one of the staff forecasters. (Chapter 4)

Recommendation:

The Chicago WSFO has such a large user population within its warning area and such diverse responsibilities that a dedicated WPM position is needed.

Finding 29:

The DST found that there was an overall lack of coordinated, comprehensive, or integrated county-wide procedures or structures in place for preparing for, or dealing with, possible severe weather occurrences within the counties struck by the tornado. (Chapter 4)

Recommendation:

The NWS should continue to encourage support of improved and coordinated severe weather preparedness procedures at all levels--state, county, and municipal. Staff from WSFO Chicago should visit local emergency response officials, especially officials having county-wide responsibilities, in each of their warning counties every year, preferably near the start of the severe weather season, to review past and planned interactions and severe weather operations.

Finding 30:

Local officials and emergency managers along with the general population appear to have given little attention to the severe thunderstorm watch and warnings. However, they all indicated that higher awareness and response levels would have been likely in reaction to a tornado watch and warnings. (Chapter 4)

Recommendation:

Storm spotter training should be provided to these officials so that they are aware of the damage potential of straight-line winds and downbursts.

Finding 31:

The statements and warnings issued by WSFO Chicago did not mention the tornado reports associated with the storm in the Rockford area. However, the severe thunderstorm warnings issued by WSFO Chicago included a reminder to users that severe thunderstorms can sometimes produce tornadoes unexpectedly. (Chapter 3)

Recommendation:

The importance of conveying the past severe weather history of storms to downstream emergency managers should be emphasized in WSFO Chicago severe weather drills.

Finding 32:

Although the principal communication path between the NWS and local officials (the Illinois State Police [ISP] Law Enforcement and Dissemination System [LEADS]) worked well, some messages were not relayed to all potentially affected districts. The NOAA Weather Wire Service (NWWS) and NOAA Weather Radio (NWR) appear to be underutilized by local agencies and officials in the area of the tornado. There were few established mechanisms in place to facilitate flow of information from local officials up to the NWS. (Chapter 4)

Recommendation:

The Chicago WSFO should routinely review and coordinate with appropriate State Police Districts procedures for using the LEADS, the Illinois State Police Emergency Radio Network System (ISPERNS), and the National Warning System (NAWAS) to distribute severe weather information. The office should also work with local officials to encourage use of NWR during threatening weather situations. The importance of two-way communication between the NWS and state, county, and local organizations and officials should be strongly established.

Finding 33:

Media response to the NWS watch and warnings was generally prompt. The severe thunderstorm watch and warnings were distributed primarily via "crawlers." Some stations did convey the messages with live "break-ins." (Chapter 4)

Finding 34:

Most media outlets in the Chicago area give less emphasis to severe thunderstorm products than they do to tornado watches and warnings. (Chapter 4)

Finding 35:

Although most TV and radio stations said they enjoyed a positive working relationship with the NWS, some smaller stations felt that it was difficult to get through to WSFO Chicago. Several stations felt that visits and some personal interaction with the staff of the WSFO would be useful. (Chapter 4)

Recommendation:

Management at WSFO Chicago should consider conducting an annual workshop or seminar for the media to increase severe weather awareness and prepare for the storm season. Visits to some stations may be appropriate.

Finding 36:

The detailed storm survey accomplished immediately after the disaster by T. Fujita and D. Stiegler provided invaluable information to the DST which was not able to begin its work at the site until the Friday afternoon following the tornado. This survey occurred only because Professor Fujita was able to obtain financial support for the work from the University of Chicago. (Chapter 1)

Recommendation:

Because of the extreme importance of highly detailed documentation of severe weather occurrences to support the operational implementation of the new WSR-88D radars, the DST feels that NOAA should develop a capability for executing very rapid response storm damage surveys during the 1990s.

CHAPTER 1

PLAINFIELD/CREST HILL TORNADO--The Event and its Impact

Plainfield and Crest Hill are located in northeastern Illinois approximately 25 miles southwest of downtown Chicago. Crest Hill is a suburb of Joliet, Illinois; whereas, Plainfield is a small community to the west in rural farm country. Both locations are within Will County and lie in the warning and forecast responsibility area of WSFO Chicago. The maps shown in figure 1.1 cover northern Illinois and indicate the locations of key towns and other features referred to in this report.

Tornadoes occur rather frequently in northeastern Illinois as illustrated by a composite plot prepared by Professor T. Fujita (see figure 1.2). There have been 34 previously reported tornadoes in Will County since 1950, and August tornadoes occurred in the greater Chicago area in 1956, 1958, 1960, and 1965. The tornado that occurred on August 28, 1990, was unusually intense and has been rated as an F-5 tornado by Professor Fujita (see appendix H) putting it in the most intense and destructive category of documented tornadoes. The rare historical nature of the event is emphasized by the fact that since 1950 there has been no documented August tornado in Illinois that was rated stronger than F-3 on the Fujita scale. Further, this was only the second August tornado to result in fatalities in Illinois since 1916. A tornado at Mattoon Lake, Illinois, killed six persons on August 21, 1977. (These historical data have been provided by F. Ostby of NSSFC.)

The tornado which struck Plainfield and then the Crest Hill area occurred from approximately 3:15 to 3:45 p.m., CDT, on Tuesday afternoon, August 28. The tornado produced a damage path that was oriented from northwest to southeast, again making it somewhat unusual. Tornadic storms in this part of the country tend to track from southwest to northeast during the spring season; however, during late summer, Illinois tornadoes tend to move from the west or northwest in about half of all cases. The length of the damage track was approximately 16 miles (refer to figures 1.3 and 1.4, again provided by Professor Fujita) with the tornado reaching F-5 intensity as it approached the western edge of Plainfield. Professor Fujita and his colleague, Duane Stiegler, conducted a comprehensive, aerial photographic survey along the damage path in Kane, Kendall, and western Will Counties on the morning following the tornado. Fortunately, the University of Chicago provided

funds for this survey. If it had not, the DST would have had little detailed "ground truth" information on the severe weather since it was not able to visit the disaster scene until the following Friday afternoon and Saturday.

The parent severe thunderstorm had produced a wide area of wind and hail damage over DeKalb, Kane, and Kendall Counties prior to the occurrence of the principal tornado. Four weak and short-lived precursor tornadoes occurred over the open farm country of southwest Kane County. Although the principal tornado began near Oswego in Kendall County, it did not cause serious injuries until it had moved almost 8 miles to the southeast. Much of the region along the track in Kendall County is also open farmland. However, heavy damage occurred in the Wheatland Subdivision, where few persons were at home, as the tornado entered Will County.

Four persons traveling along U.S. Highway 30 just to the west of Plainfield were the storm's first victims. The tornado then produced heavy damage, numerous injuries, and 25 additional fatalities along the remainder of its track with Plainfield and the Crest Hill area particularly hard hit. The photographs in figure 1.5 show examples of damage along the tornado track. Additional details are provided in appendix E, and a summary of the property damage is shown in table 1 below.

TABLE 1

Damage Produced by the Plainfield/Crest Hill Tornado
(information provided by the Joliet Herald-News)

	Deaths:	29
	Injuries:	300+
	Homes destroyed:	470
	Homes damaged:	1000+
<u>Township</u>	<u>Damage</u>	<u>Comments</u>
Plainfield	\$105 Million	915 homes damaged or destroyed
Wheatland	\$ 5 Million	64 homes damaged or destroyed
Troy	\$ 50 Million	Includes Crest Hill where 350 apartment units were destroyed
TOTAL DAMAGE	\$160+ Million	

When the tornado moved southeastward into Plainfield, it destroyed two Commonwealth Edison 345,000 volt transmission towers, leaving 65,000 customers without power. Emergency clean up, repair, and required protective measures were substantial along the entire tornado track.

As the tornado moved through Plainfield, it struck the town's high school, the Plainfield School District's Administration Center, and St. Mary's Elementary School, a private institution. The tornado also destroyed the St. Mary Immaculate Church, the church rectory, and its gymnasium in Plainfield. The Grand Prairie Elementary School in Crest Hill was also destroyed by the tornado. School was not in session; however, the first day of the new fall semester was scheduled for August 29. Enrollment figures exceed 1,500 students for the Plainfield schools destroyed, and the impacts of this event would likely have been much more catastrophic if it had occurred just one day later.

The severe thunderstorm, which produced the tornadoes in Kane, Kendall, and Will Counties, first developed shortly after noon along the Illinois/Wisconsin border northwest of Rockford. It rapidly intensified to severe levels and began to move southeastward. One or two tornadoes occurred near Pecatonica and Seward in Winnebago County and produced minor damage at about 1:42 p.m., CDT (or 1842 UTC) near the local State Police District Headquarters. Between 2:00 and about 2:45 p.m., CDT, the storm produced wind damage and particularly large hail (up to 2-1/2 inches in diameter) over Rockford, northwest DeKalb County, and north and east portions of the city of DeKalb. In addition to large hail and wind damage, a funnel cloud was reported just north of DeKalb by the County Sheriff's Office at 2:55 p.m., CDT. As the storm moved across southwestern Kane County, wind damage, large hail, and four small tornadoes occurred between about 2:45 and 3:15 p.m., CDT.

When the storm moved across western portions of Aurora, Illinois, it struck the city's FAA-controlled airport (which is located at Sugar Grove, about 10 miles west of downtown Aurora) at about 3:05 p.m., CDT. Tower controllers felt that they observed a "wall cloud" moving over the airport immediately before winds gusted as high as 80 to 90 mph, and they abandoned the control tower. (A "wall cloud" is a characteristic rotating cloud feature with a lowered base that attends mesocyclone circulations. Mesocyclones typify supercell thunderstorms and indicate that tornadoes are possible.) The damage at the airport in Sugar Grove was extensive and the controllers' actions and observations were possibly of critical importance. However, the only report that reached WSFO Chicago was one of large hail falling at the CWSU at 3:23 p.m., CDT. Information on the extent of damage at Sugar Grove was not received at WSFO Chicago until about 4:30 p.m., CDT.

While the damage was occurring at Sugar Grove (i.e., about 3:05 to 3:10 p.m., CDT) amateur severe storm chasers (a Mr. Paul Sirvatka, who is an instructor at the College of Du Page, and several of his students) observed and photographed a distinct wall cloud and several funnel clouds over and to the northwest of the airport. The chasers had earlier observed large hail, very high winds, a wall cloud, and funnel clouds south and east of DeKalb. Once again, this critical severe storm information was not reported to the NWS or to law enforcement officials.

The principal tornado developed from about 3:10 to 3:15 p.m., CDT, as a very strong gust front (associated with the microburst area shown on figure 1.3) wrapped around the south flank of the supercell and interacted with the mesocyclone/wall cloud that, as reported to the DST by Sirvatka, was now moving across the Oswego area. The tornadic thunderstorm may have produced several mesocyclones during its movement across northern Illinois. These appear to have developed on the south to southeast flank of the storm in association with the rapid advance of a strong gust front that characterized this region of the storm. This is not an unusual sequence of events for tornadic, supercell storms.

The final mesocyclone was the most intense of the series and produced the destructive tornado. The heavy rains and hail that trailed the gust front (golf ball to tennis ball-size hail was reported at and west of Joliet by an NWS WSFO employee at 3:40 and 3:45 p.m., CDT) were apparently drawn completely around the circulation of the mesocyclone obscuring the tornado itself. The only post-event report of a funnel cloud by persons along the damage track was from a resident of the Crest Hill Apartments. She said she observed several funnels swirling around her as the apartments were being destroyed. This would be consistent with the occurrence of a multiple vortex tornado. The damage survey of Fujita and Stiegler documented suction vortices at several places along the path, again indicative of an intense, multiple vortex tornado.

After the tornado dissipated in northwest Joliet, the parent thunderstorm continued southeastward and then eastward for the next hour and a half. Along this portion of its track, it produced substantial wind damage both east of Joliet and in Kankakee County. At about 5:15 p.m., CDT, the severe thunderstorm moved eastward into Indiana, continuing to produce severe weather. Thus, this particular storm produced nearly continuous severe weather across northern Illinois for a period of almost 4-1/2 hours.

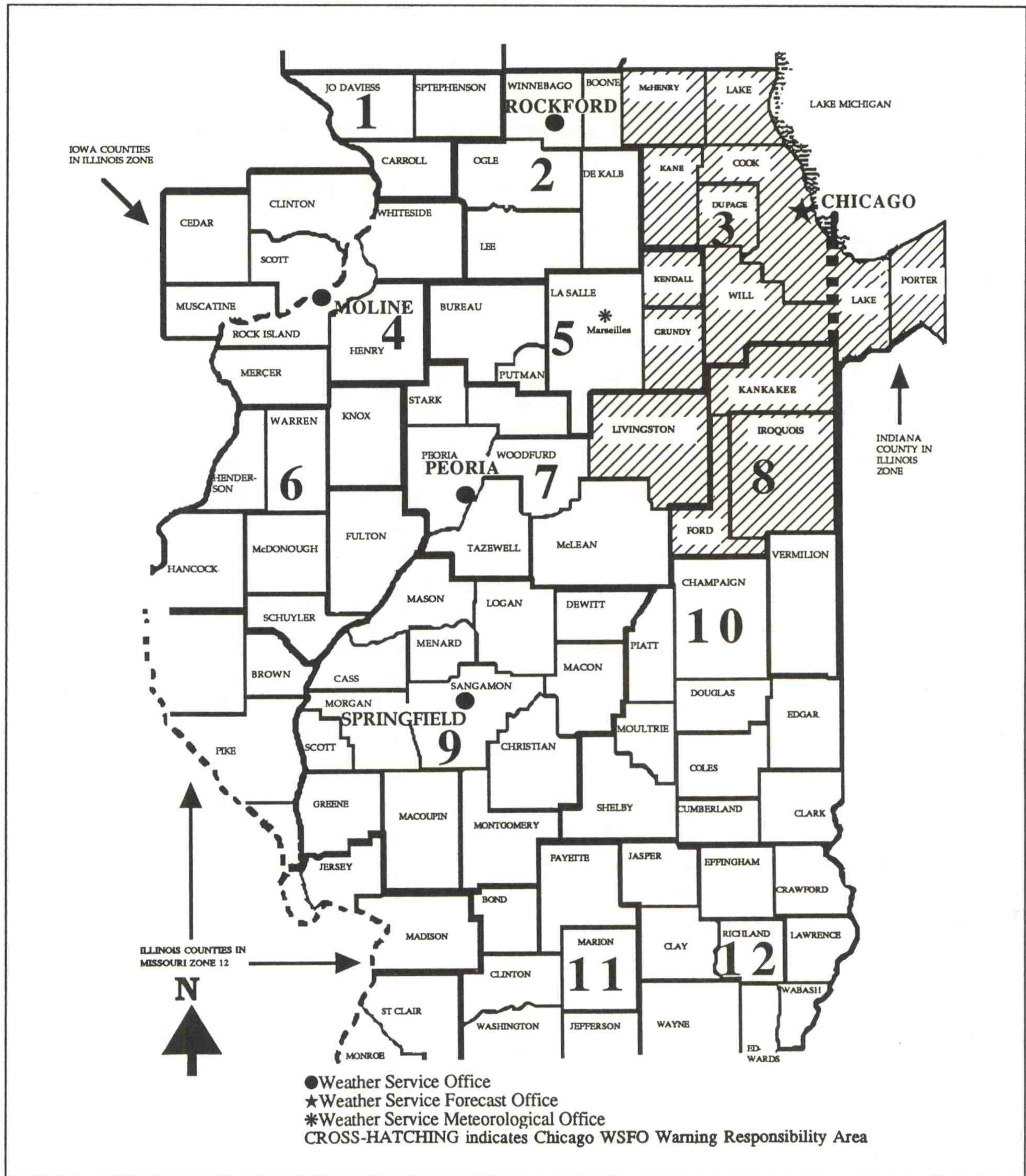


Figure 1.1a Map showing delineation of Illinois forecast zones. Counties for which WSFO Chicago has warning responsibility are cross-hatched.

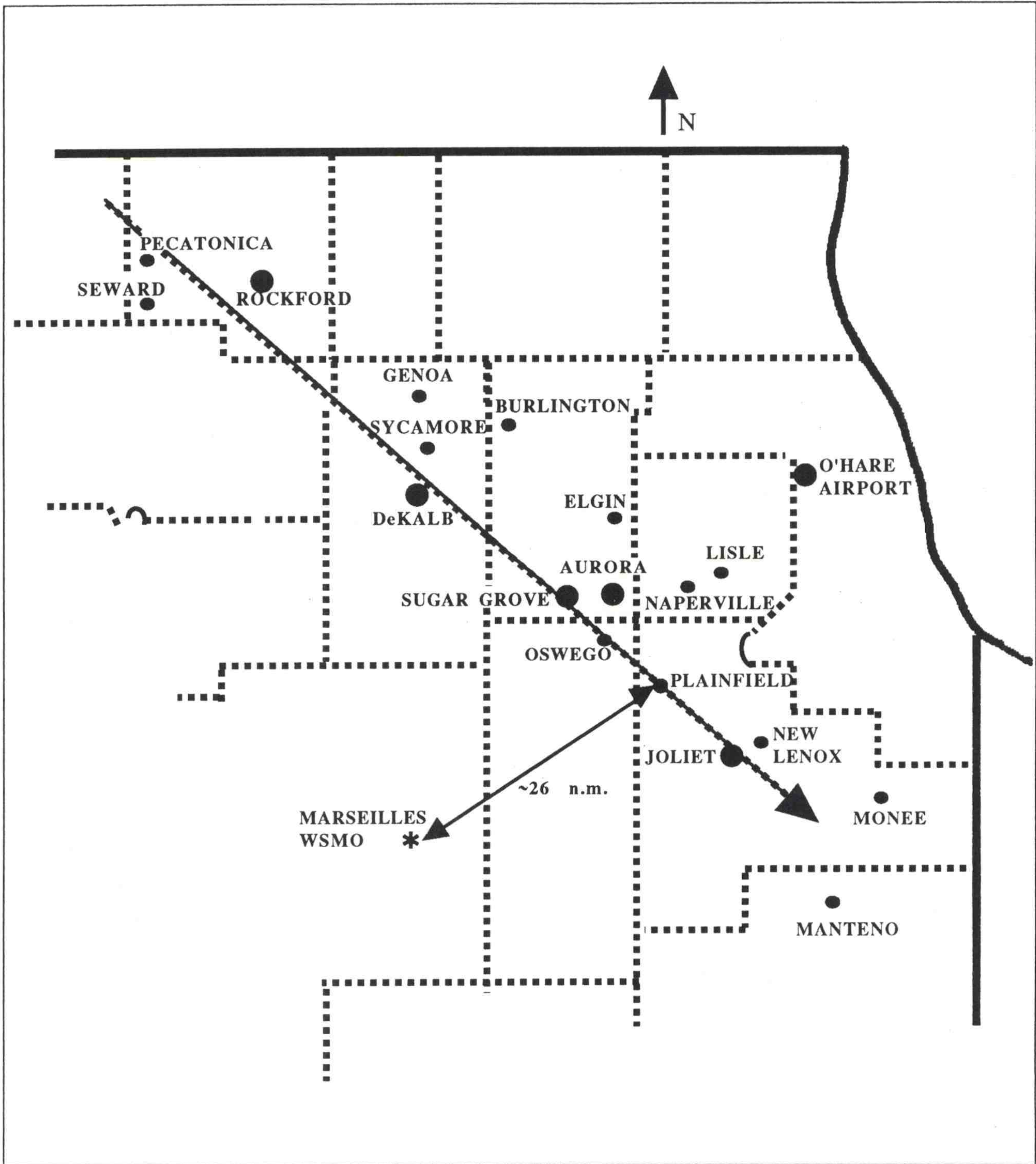
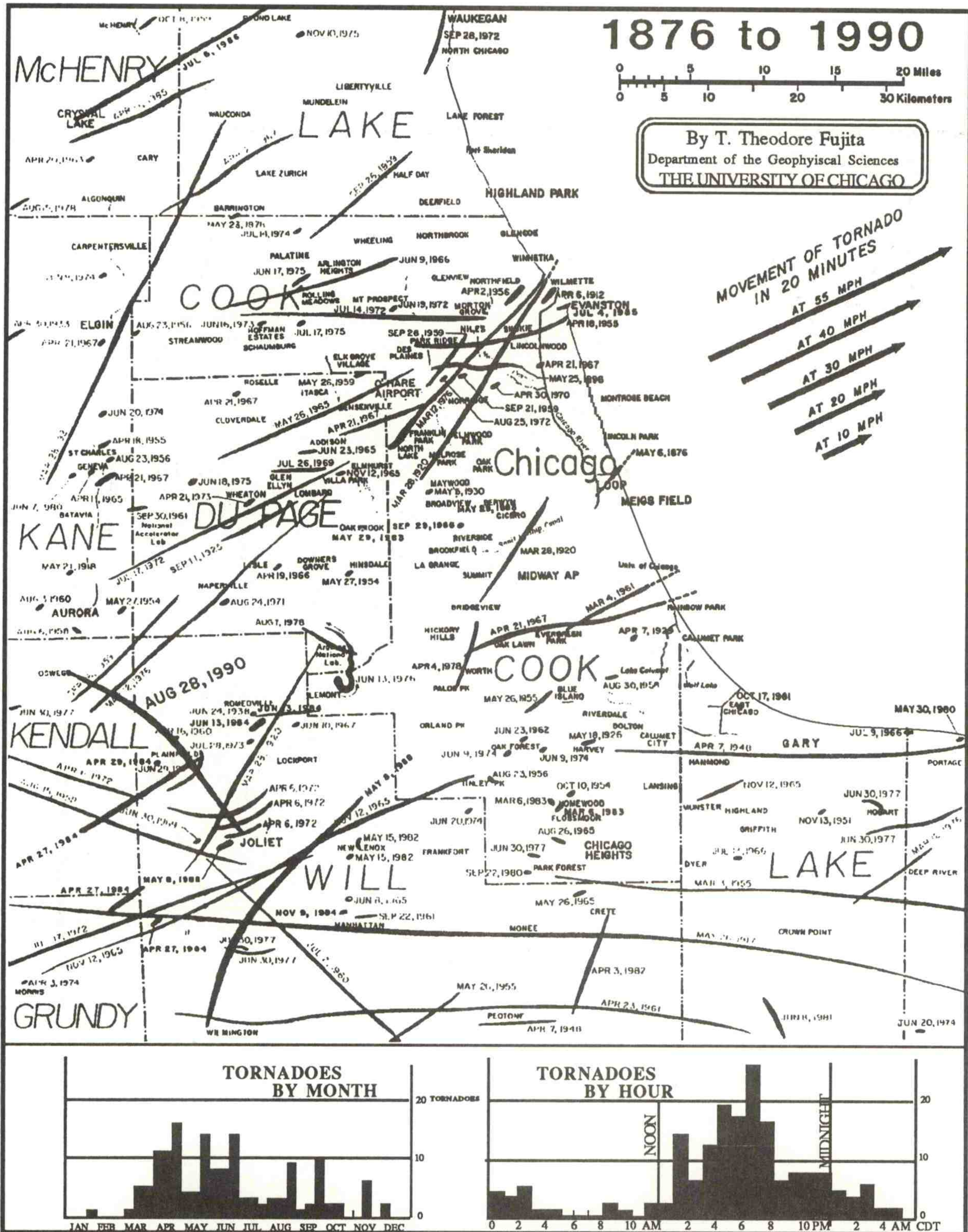
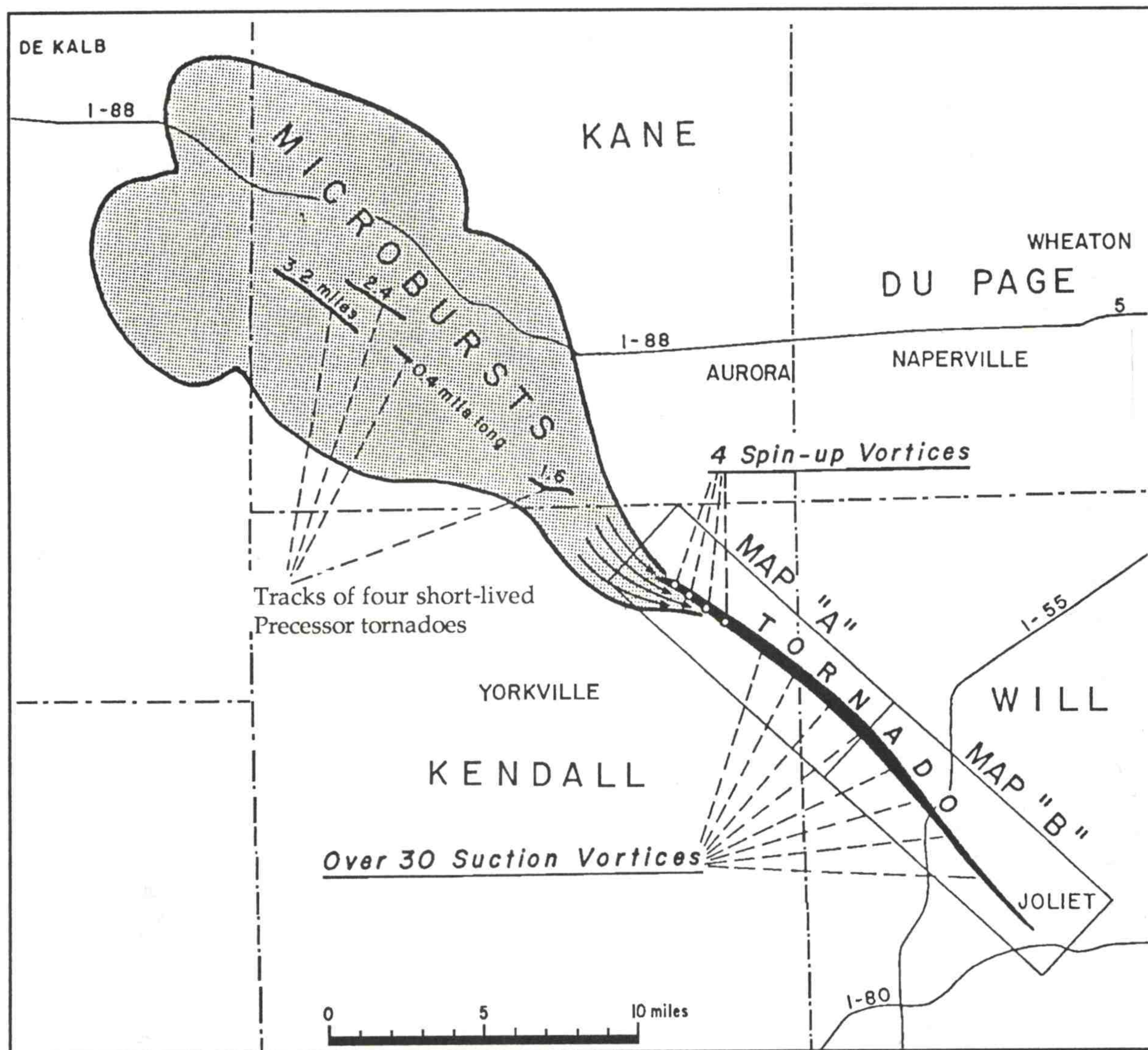


Figure 1.1b Blowup map of northeastern Illinois. Towns referred to in survey report are indicated. Approximate track of the severe thunderstorm is shown.



Produced and updated by Prof. Ted Fujita, The University of Chicago

Figure 1.2 Chicago area tornadoes that have occurred since 1876. Figure provided to NOAA by Professor T. Fujita, The University of Chicago.

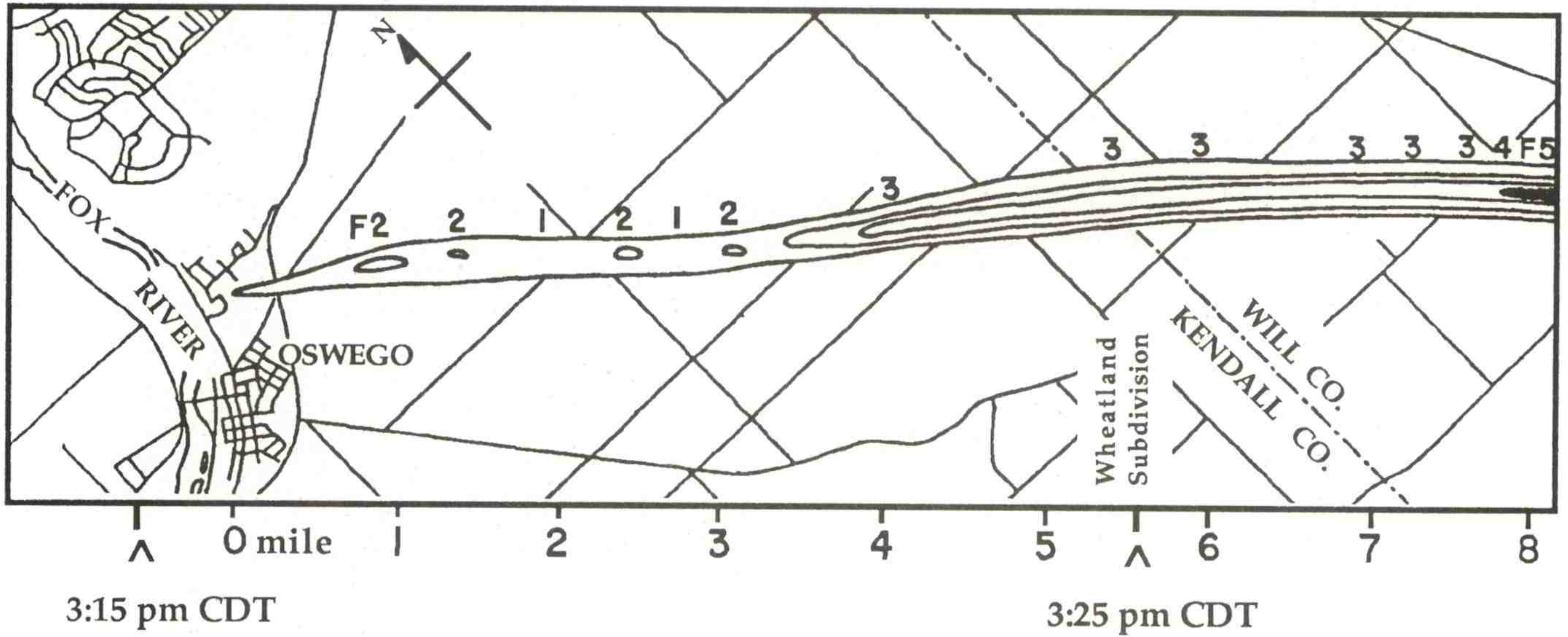


Produced by Prof. Ted Fujita, The University of Chicago

Aerial Photos on AUG 29 and 30 by Duane Stiegler

Figure 1.3 Results of Fujita/Stiegler damage survey from DeKalb to Joliet, Illinois. Figure provided to NOAA by Professor Fujita.

DAMAGE MAP "A"



DAMAGE MAP "B"

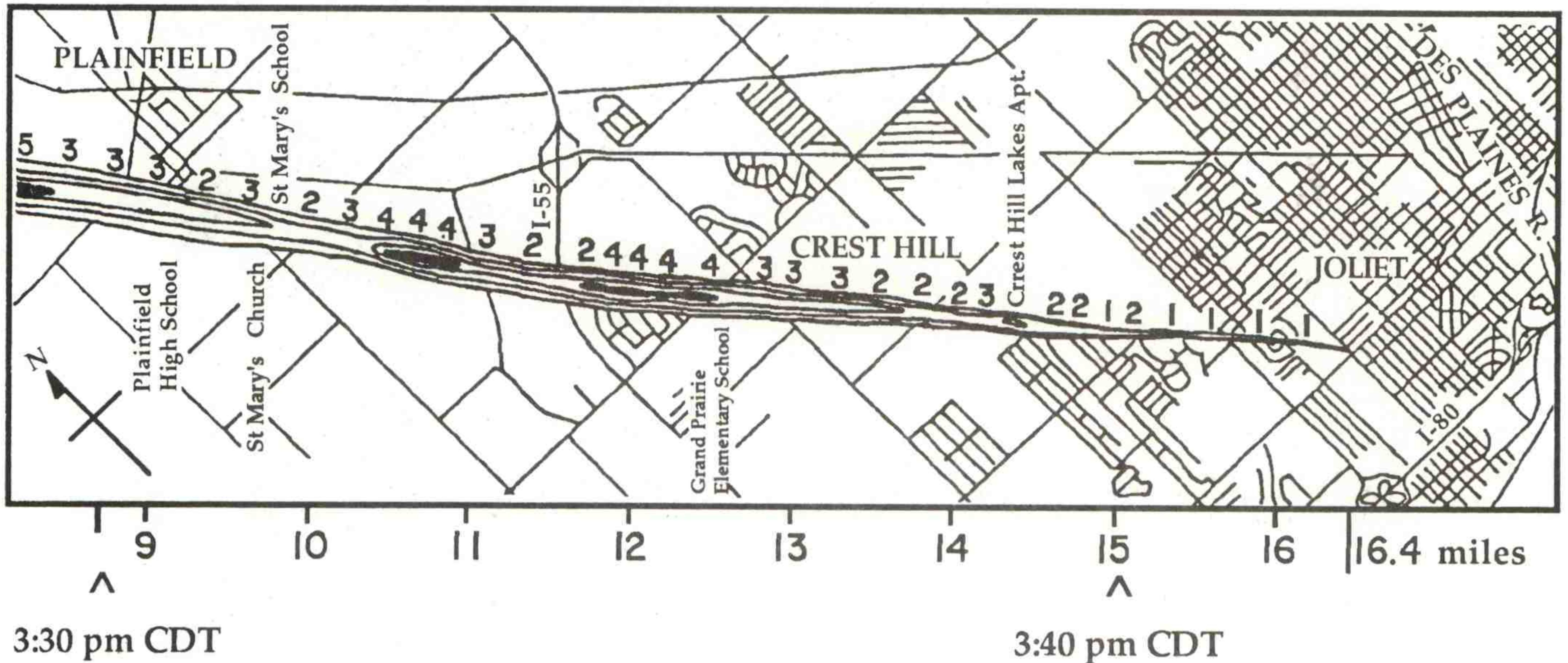


Figure 1.4 Detailed blowup of damage path of the major tornado. The Fujita F-scale damage ratings are indicated along the path as are several locations referred to in the text. Approximate times of the tornado occurrence are indicated along the bottom of the figure. Figure provided to NOAA by Professor Fujita.

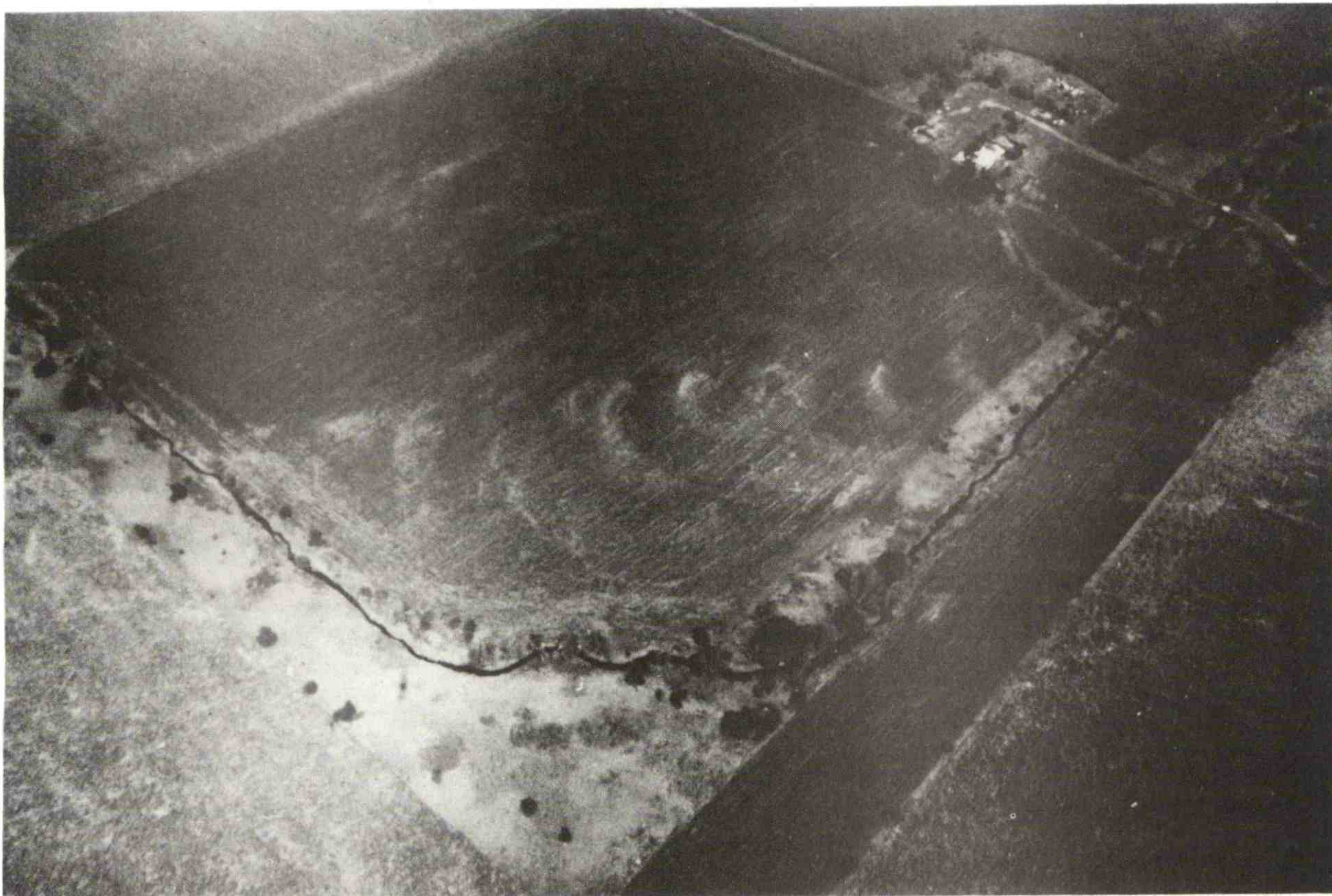


Figure 1.5a Suction vortex tracks in corn field near Wheatland Subdivision. Photograph provided to NOAA by Professor Fujita.

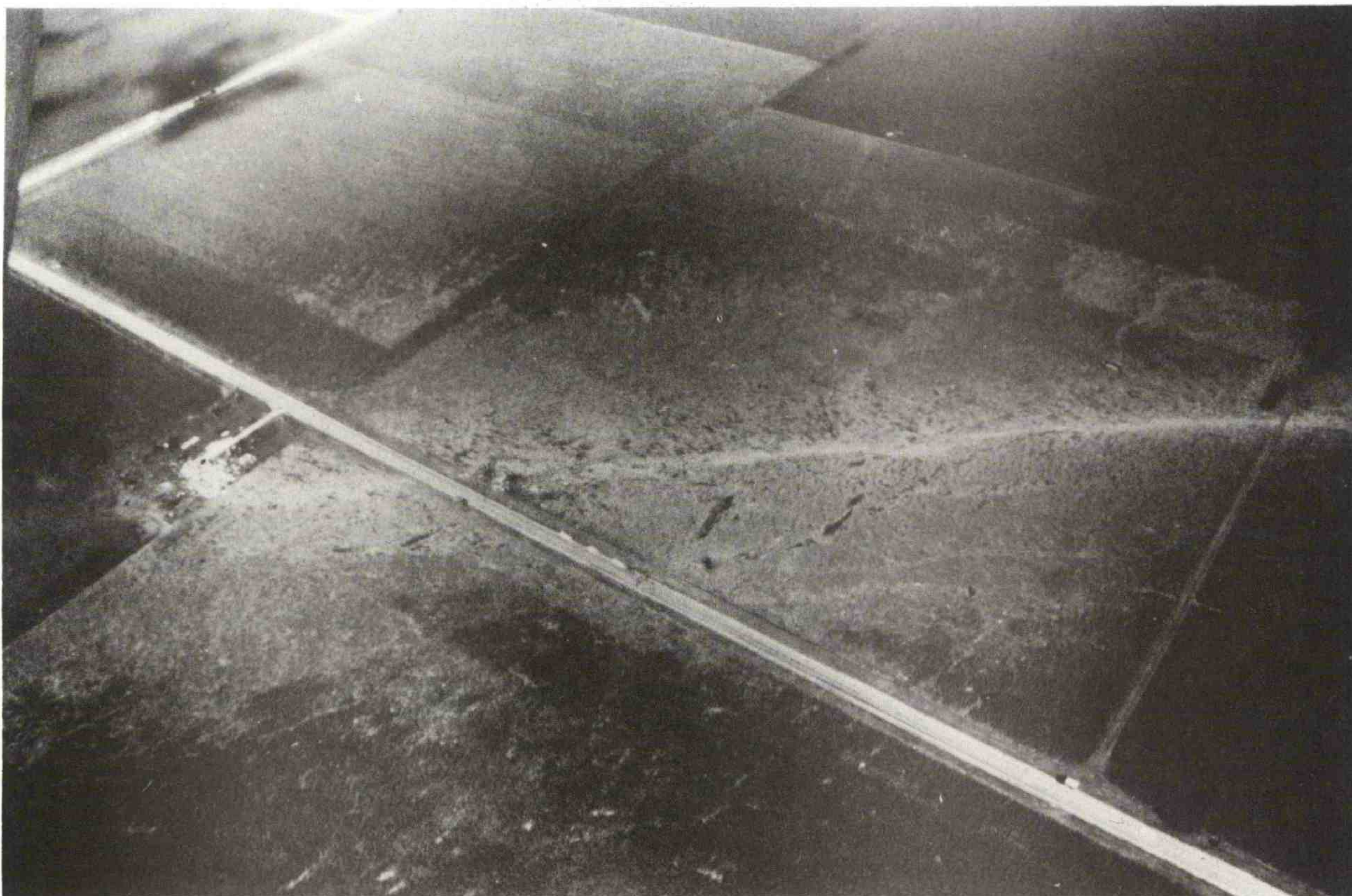


Figure 1.5b Intense damage area (F-5) on a farmstead and corn fields just northwest of Plainfield. Photograph provided to NOAA by Professor Fujita.

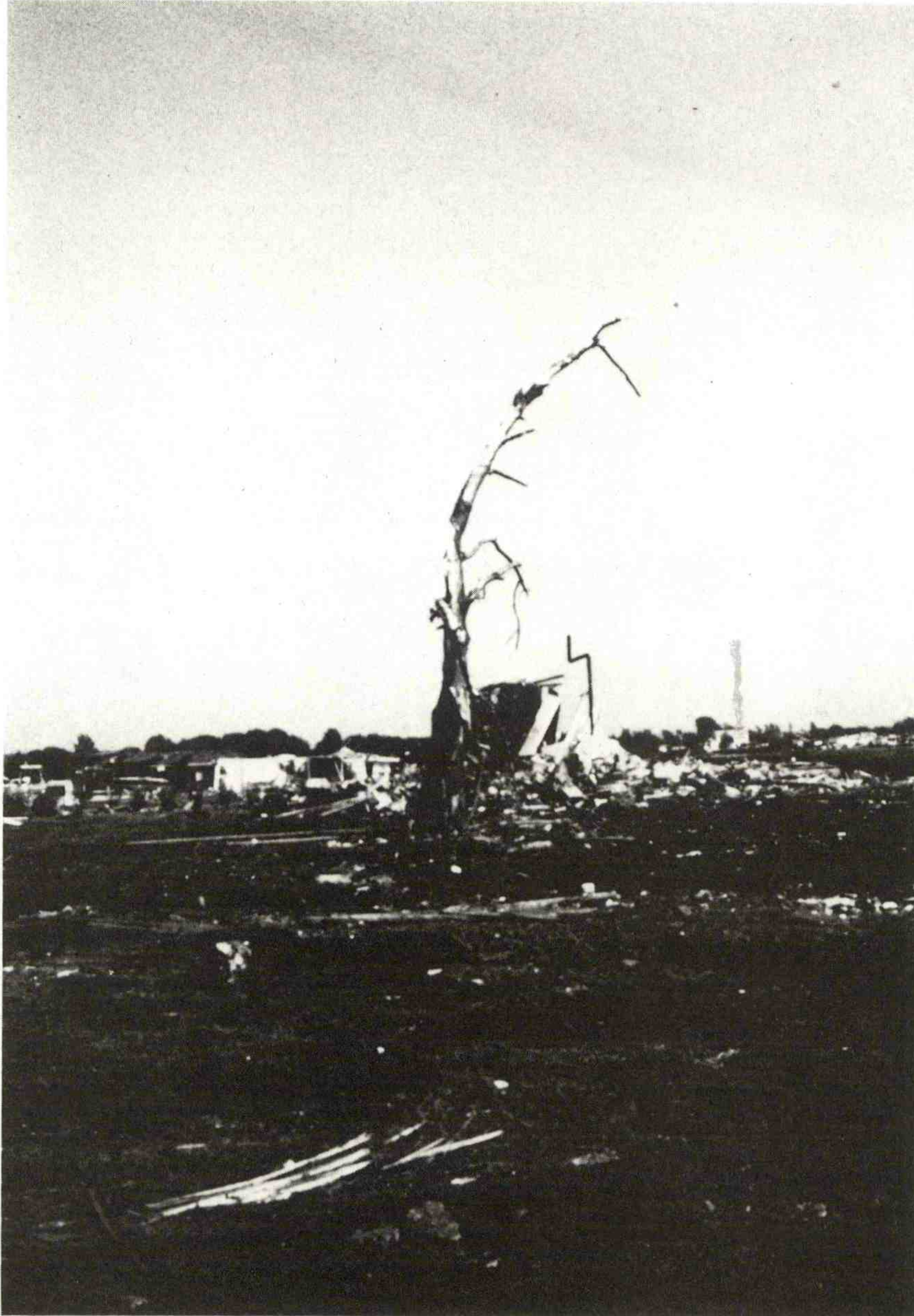


Figure 1.5c Damage near the Plainfield High School.
Photograph provided by Robert Jacobson, NWS.

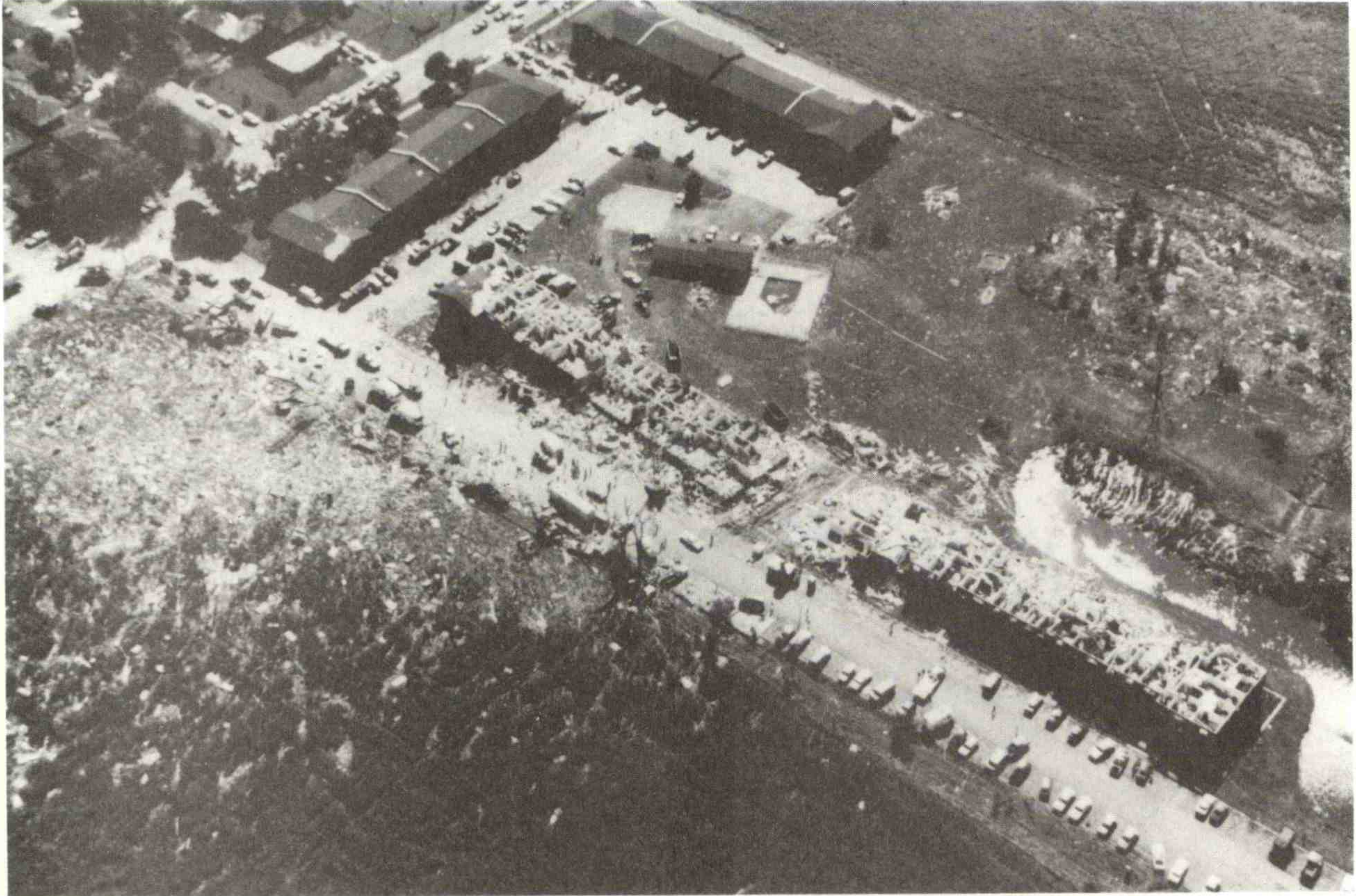


Figure 1.5d Damage to the Crest Hill apartment complex. Photograph provided to NOAA by Professor Fujita.

CHAPTER 2

METEOROLOGY OF THE EVENT

The meteorological analyses presented in this section were developed by the DST during a 3- to 4-month period following the on-site survey. The team has drawn upon interpretations of the severe weather setting that were provided by the NSSFC. It should be noted that the meteorological analyses and interpretations, since they were done after the fact, make use of all available information. Some of the charts and photographs shown in this section were not available to the staff of WSFO Chicago prior to the occurrence of the tornado.

The large-scale flow pattern over the United States was dominated by a large 500 millibar (mb) high that extended essentially from southern California eastward to North Carolina. This ridge had been flattened over the north-central and northeastern United States by a series of short-wave troughs that tracked from western Canada eastward across the Great Lakes. The Nested Grid Model (NGM) 24-hour forecast valid at 7:00 p.m., CDT (note that UTC equals CDT, plus 5 hours over Illinois) on August 28 (see figure 2.1) indicated that another in this series of short-wave troughs would be approaching the Great Lakes Region on the afternoon of August 28. The NGM also indicated that a cold front would be moving southeastward across the Great Lakes states in conjunction with the short-wave trough. The short-wave trough and its accompanying strong upper-level jetstream were forecast to "dig" slightly to the southeast, amplifying the 500 mb pattern. Thus, the large-scale cold front was expected to push south and eastward, ending several days of fairly stagnant, hot humid weather in the upper Midwest.

The evening 850 and 500 mb charts (figure 2.2) at the valid time of the forecast maps show that the NGM handled the large-scale pattern evolution quite well. The 850 mb front stretched from Colorado to Michigan and was just moving into northern Illinois. There did appear to be a double short-wave trough structure with one trough extending from Hudson Bay southward across Indiana; portions of this feature which affected the United States were very weak. A trailing short-wave trough appeared to be located over the upper Midwest. Temperatures at 500 mb had cooled several degrees over the Great Lakes Region, e.g., the temperature at Peoria, Illinois, had decreased from -4 to -7 degrees Centigrade (C) during the preceding 24 hours. The warm mid-level temperatures had acted to

suppress convection, particularly over Iowa and northern Illinois, on the day preceding the tornado. Thus, the strengthening of the large-scale cold front as the 500 mb trough-ridge pattern amplified, coupled with mid-level erosion of the capping inversion, indicated an increasing potential for thunderstorms along and ahead of the front.

In addition to these aspects of the meteorological setting, the thermodynamic potential that had developed over the Great Lakes Region for intense storms was substantial. The morning upper-air sounding at Peoria, Illinois (figure 2.3a) was extremely unstable. The lifted parcel, given a reasonable forecast of afternoon temperature and dewpoint, exhibited lifted indices of -8 at 500 mb, -12 at 300 mb, and -10 at 200 mb. Further, the projected area of negative buoyancy below the level of free convection was not great. Thus, the morning upper-air data indicated a substantial potential for severe thunderstorm activity had developed in the Great Lakes Region (the Flint, Michigan, upper-air data were slightly more unstable than Peoria's).

The vertical structure of the upper-air winds, however, was not as favorable for severe storms as were the thermodynamics. The low-level flow was from the west-southwest to west at only 15 to 25 knots (kts), with a layer of weaker winds present from 700 to 400 mb. At upper levels, winds veered to west-northwesterly at 70 kts at 200 mb, indicating substantial shear in the upper troposphere. A weak shear environment was present in the lower troposphere. The overall setting thus appeared very favorable for the occurrence of multicell thunderstorms, with large hail and damaging winds a definite threat.

The evening sounding at Peoria (figure 2.3b) was released a bit more than 2 hours after the tornado but still within the unstable air mass that supported the storm. It shows even greater instability than the morning data indicated and that mid-level winds had increased in speed substantially. The degree of instability available if a storm with a strong gust front lifted air at the surface directly into its updraft is extreme. The morning and afternoon wind hodographs (figure 2.4) indicate little potential for tornadic storms (particularly for the afternoon sounding) because of the straight-line character of the shear profiles. A rapidly veering and strong shear profile below about 3 kilometers (km), i.e., one characterized by positive helicity, is most favorable for supercell storms and mesocyclone formation. But, it is the "**storm relative**" hodograph that is physically important, and these hodographs (also figure 2.4) show more tornadic potential. These storm-relative data were derived after the fact using the observed storm motion. However, the Plainfield/Crest Hill thunderstorm did move consistently 30 to 40 degrees to the right of the steering level winds (steering level winds were approximately 280 degrees at 35 kts--see text of Severe Thunderstorm Watch #691 in appendix A-1.3) for much of its life. This type of systematic right-movement is a well-known characteristic of supercell thunderstorms.

The life cycle of the thunderstorm, from inception through the tornado occurrence at Plainfield/Crest Hill, is illustrated in figure 2.5 through satellite imagery. The imagery depicts the rapid growth of the storm from 12:46 to 2:46 p.m., CDT. The satellite data, even in this static display mode, indicate that the Illinois storm is moving more slowly and more toward the south than is the strong storm that had developed at the south end of Lake Michigan. Infrared satellite images (not shown) of the storm consistently displayed a very pronounced "warm wake" signature at the storm top, indicative of a very intense and likely severe thunderstorm. The primary storm appears to have interacted with several converging lines of cumulus that the satellite imagery indicates were over north-central Illinois during the early afternoon. A detailed surface analysis for 2:00 p.m., CDT (figure 2.6--carefully done after the event) shows that the surface patterns present over northern Illinois were very complex. This analysis indicates that a trough, or convergence line, along which some of the cumulus clouds were aligned, did intersect the storm track.

Animated presentations of the imagery, of the type only available at NSSFC in real-time, indicate that the divergent outflow at the storm summit may have been rotating cyclonically during the period from about 3:00 to 5:00 p.m., CDT, which would be indicative of very intense cyclonic rotation within the storm's updraft.

Photographs of individual frames from the PPI film of the WSR-74S Marseilles network radar (MMO is located approximately 26 miles southwest of Plainfield--refer to figure 1.1b) are shown in figure 2.7 and careful, after the fact, scope tracings of the PPI reflectivity are shown in figure 2.8. These radar data illustrate much of the storm's life and several important aspects of its structure. At 1:46 p.m., CDT (figure 2.7b) the low-level PPI (0.5 degrees elevation throughout this sequence except for the 11 degree scan shown in figure 2.8d) display shows a very intense storm that displays a distinct downwind "v-notch" and a strong reflectivity gradient along the south flank of the cell. These characteristics are both severe storm indicators. During the period from about 1:00 to 2:30 p.m., CDT, the storm displayed supercell structural characteristics, exhibiting a very pronounced weak echo region (WER) and at times a distinct BWER. This conclusion is based partly upon examination of Collins Doppler radar data that were not available to WSFO Chicago in real-time (obtained from the United Airlines Meteorology Group). However, the radar operators at MMO identified the BWER, recognized its significance, and notified WSO Rockford (see chapter 3 and appendix B).

Around 2:45 p.m., CDT (figures 2.7c and 2.8b) overall echo structures were very complex and more multi-cellular in character than earlier. However, the principal echo continued to exhibit the "v-notch" signature and a strong reflectivity gradient on the south side. Interpretation of the display and storm structure at this time is complicated by the presence of additional cells north and west-northwest of the

principal echo. Further, the echoes are moving into the extensive ground-clutter pattern of the MMO radar. The radar has detected a very pronounced gust front moving out of the main echo and a trailing boundary along which the secondary cells are aligned. The rapid movement (i.e., strength) of the gust front is apparent on the radar PPI film but is not as obvious when viewed in static displays.

The low-level PPI scans taken at 3:02 and 3:12 p.m., CDT (figures 2.8c and e) and the elevated scan taken at 3:05 p.m., CDT (figure 2.8d) illustrate some aspects of the vertical structure of the storm during this period. The 11 degree elevation scan captures key features of the reflectivity field at an altitude of approximately 35,000 feet above the ground, indicating that the storm has a pronounced front and right-front flank overhang of extremely strong echo. Thus, the storm displayed a very pronounced WER, again typifying an intense supercell thunderstorm.

The severe character of the low-level storm structure at 3:12 p.m., CDT (figure 2.8e) is quite pronounced, with a distinct right flank appendage of high reflectivity and a definite inflow notch in the high reflectivity gradient at the leading edge of the storm. This type echo structure is considered indicative of a supercell with probable low-level mesocyclone. These features are closely correlated with the tornado track and indicate that the tornado developed to the left (with respect to the storm's movement) of the high reflectivity appendage and within the inflow notch.

About 3:20 p.m., CDT (figures 2.7d and 2.8f) the principal echo had moved away from the weaker cells to the northwest and continued to display very distinct supercell characteristics. When viewed with respect to the cell motion, a very large "inflow notch" and right flank extension (appendage) of strong echo reflectivity are still present. Although a Kavouras monitor display of NWS radar data has slightly degraded horizontal resolution, the storm structures mentioned above were apparent in a Kavouras display of this particular storm at 3:11 p.m., CDT (see figure 2.9).

Many of these analyses give some indication of the potential value of the observational and display capabilities that will be available following the modernization of NWS operational observation and analysis/display systems. The co-analysis and animated display of WSR-88D (the new Doppler radars being procured by the NEXRAD program) radar data with surface observations and rapid-sequence satellite data would, in the opinion of the DST, have indicated clearly the unusually severe aspects and tornadic potential of this particular storm.

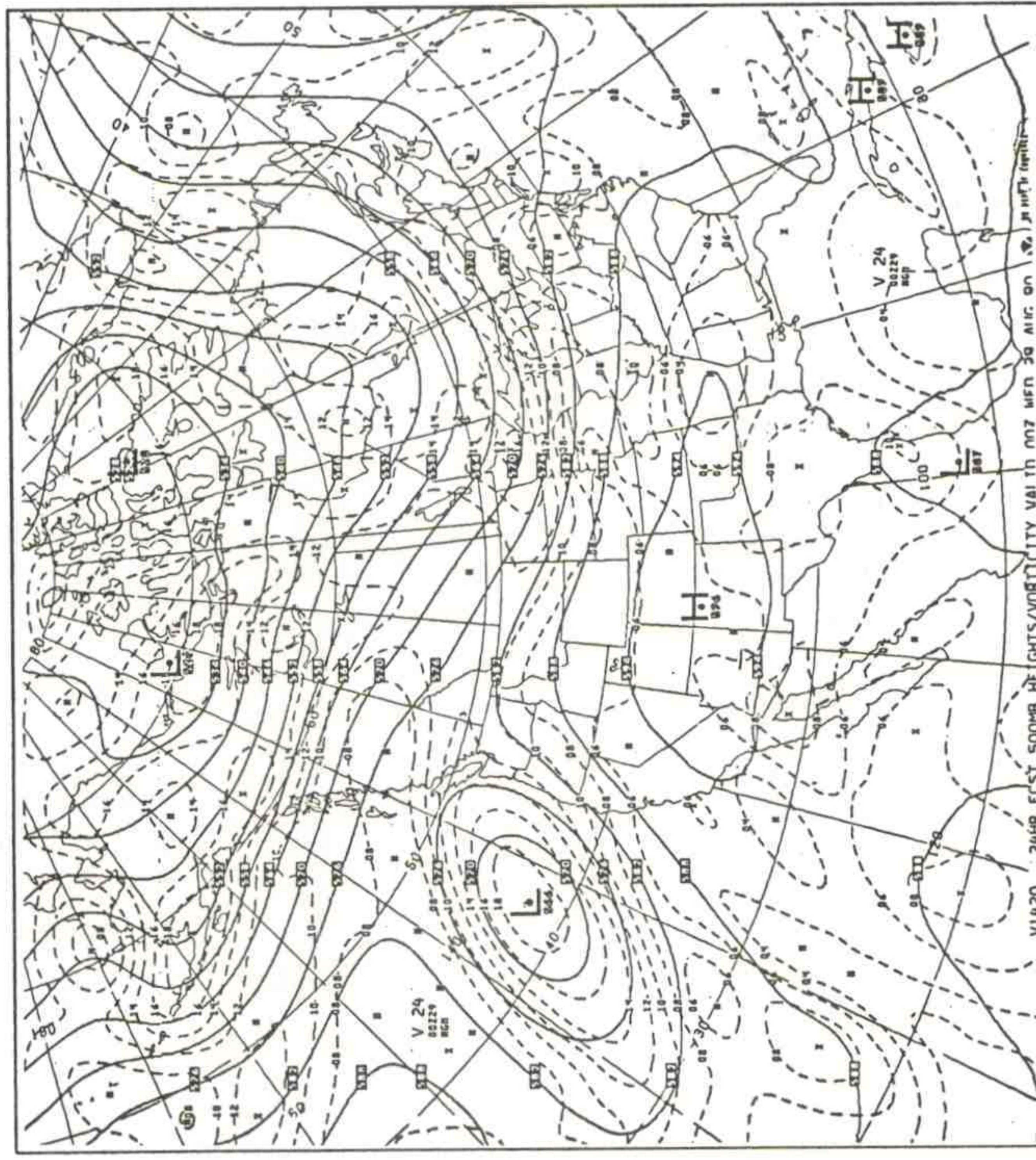
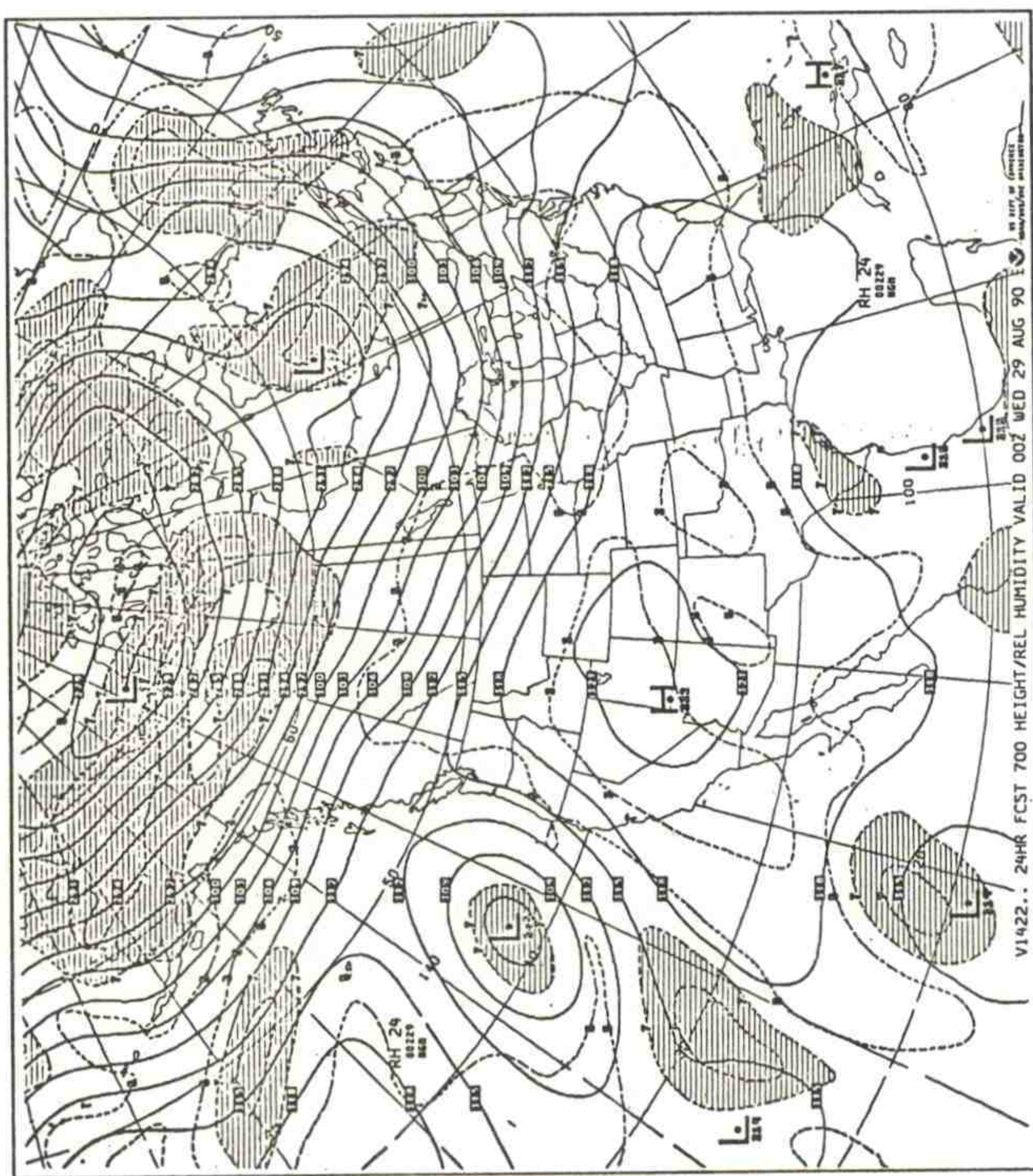
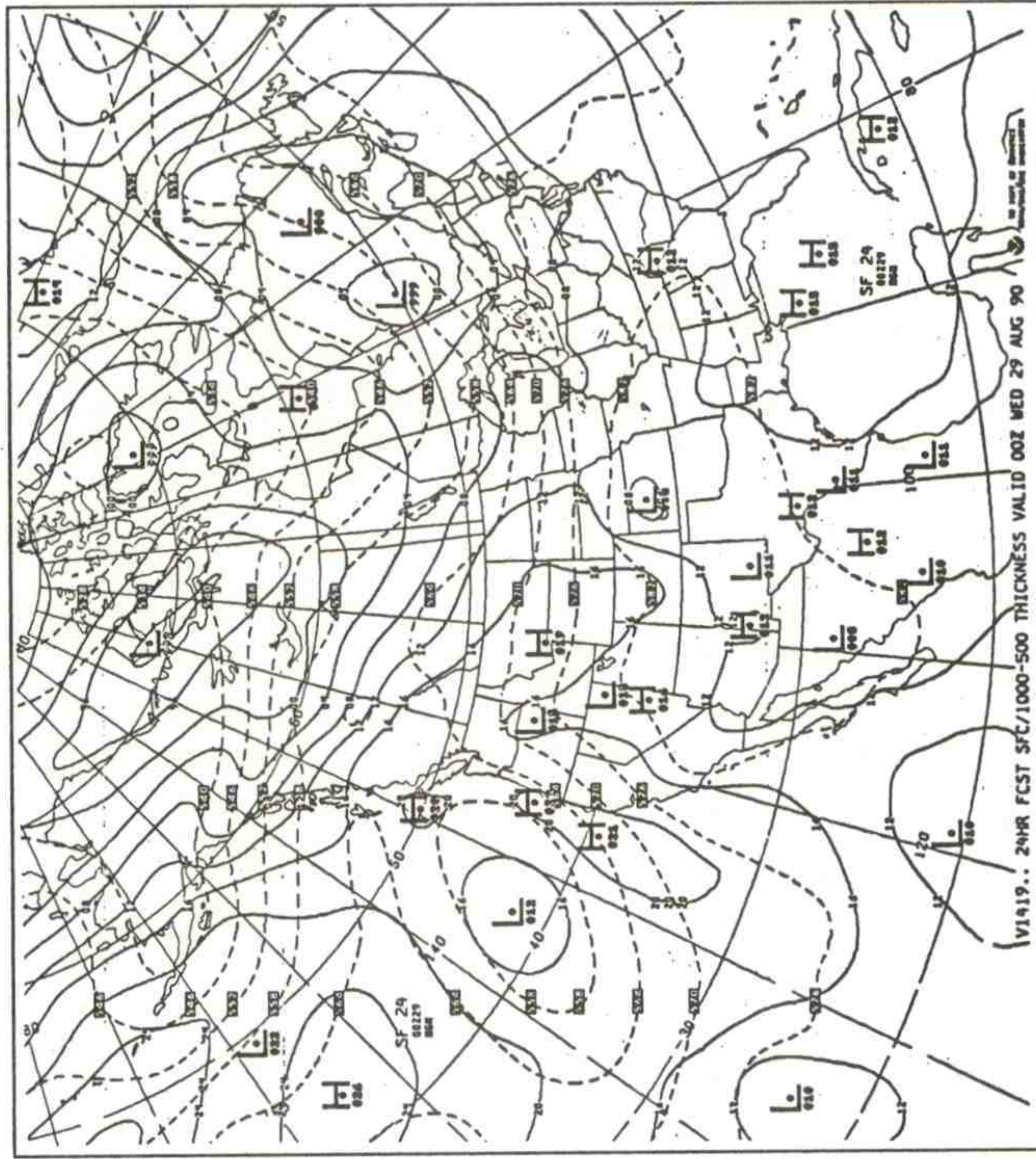
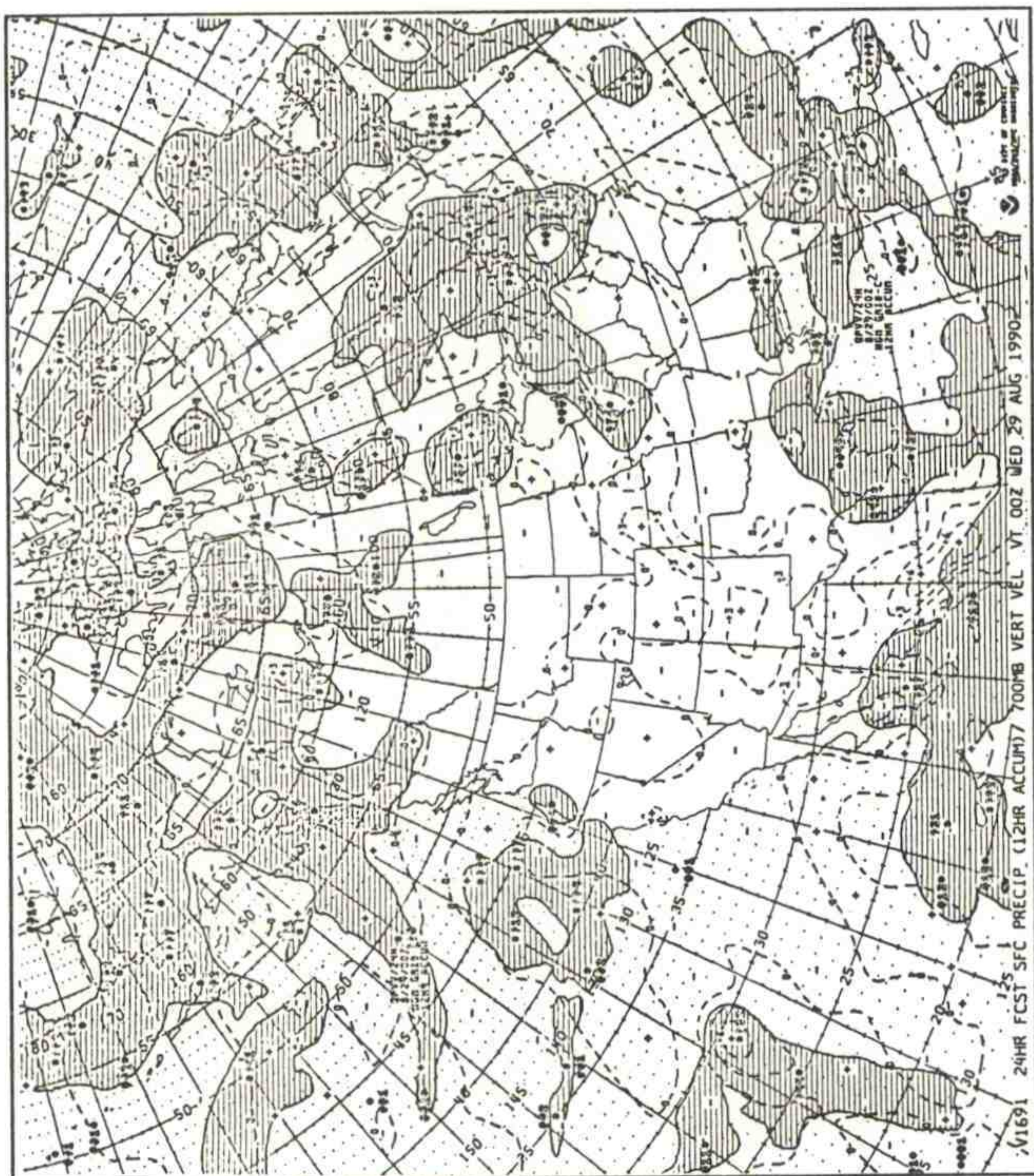


Figure 2.1 The NGM 24-hour forecast panels valid for 0000 UTC on August 29, 1990 (7:00 p.m., CDT, on August 28).

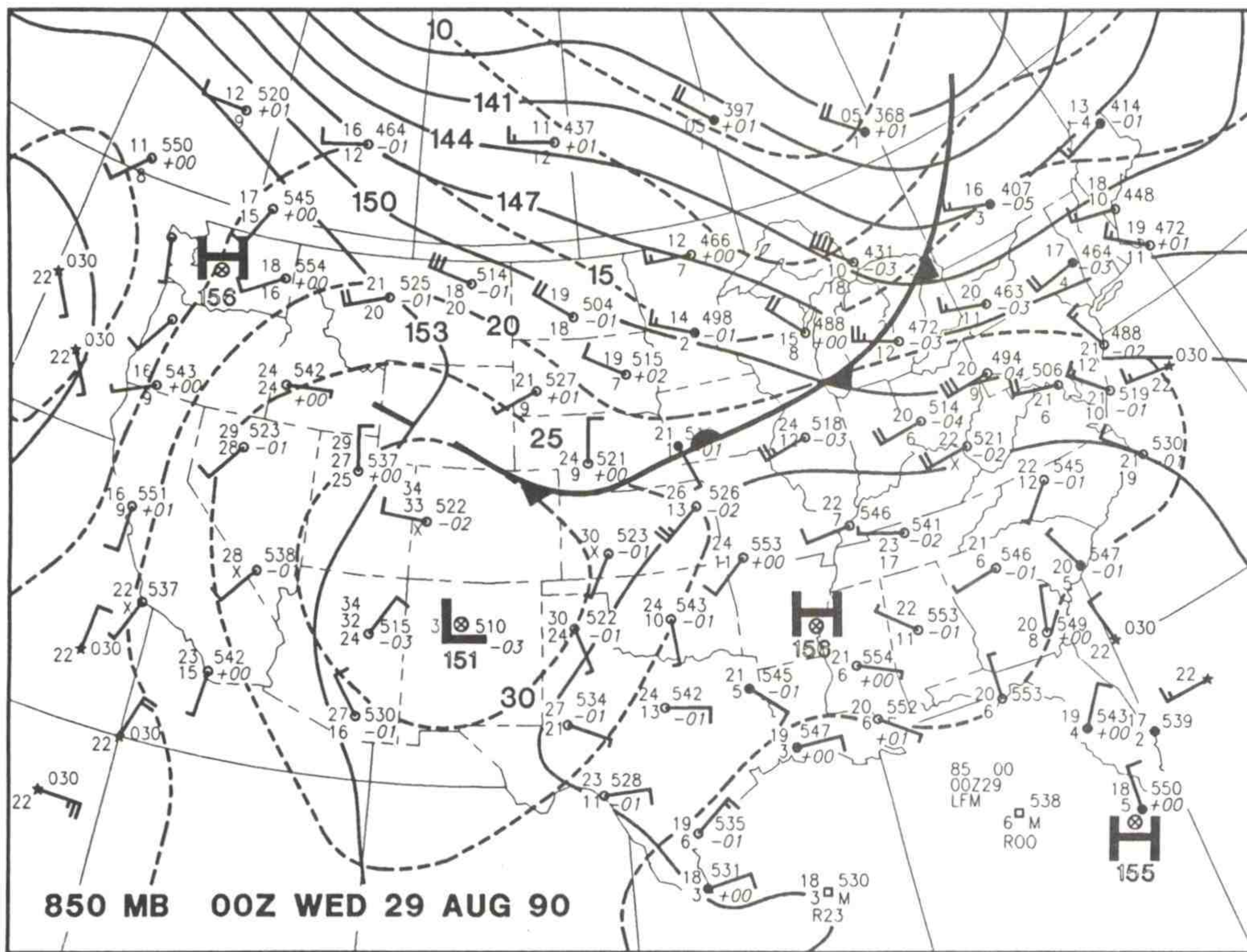


Figure 2.2a AFOS 850 mb analysis for 0000 UTC on August 29, 1990 (7:00 p.m., CDT, on August 28). The position of the large-scale frontal zone at 850 mb has been added.

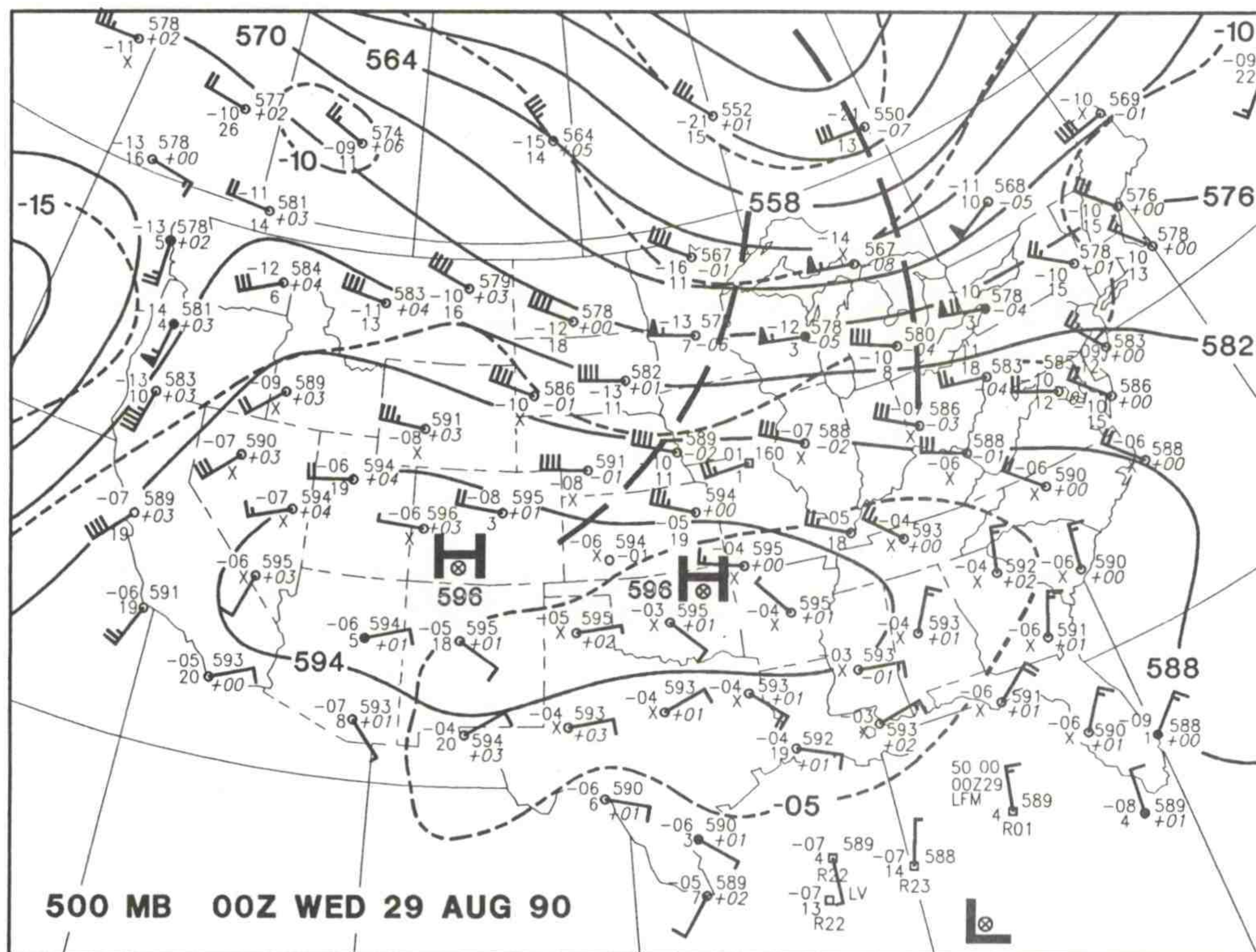


Figure 2.2b AFOS 500 mb analysis for 0000 UTC on August 29, 1990 (7:00 p.m., CDT, on August 28). Heavy dashed lines indicate the position of two short-wave troughs over southern Canada and the northern United States.

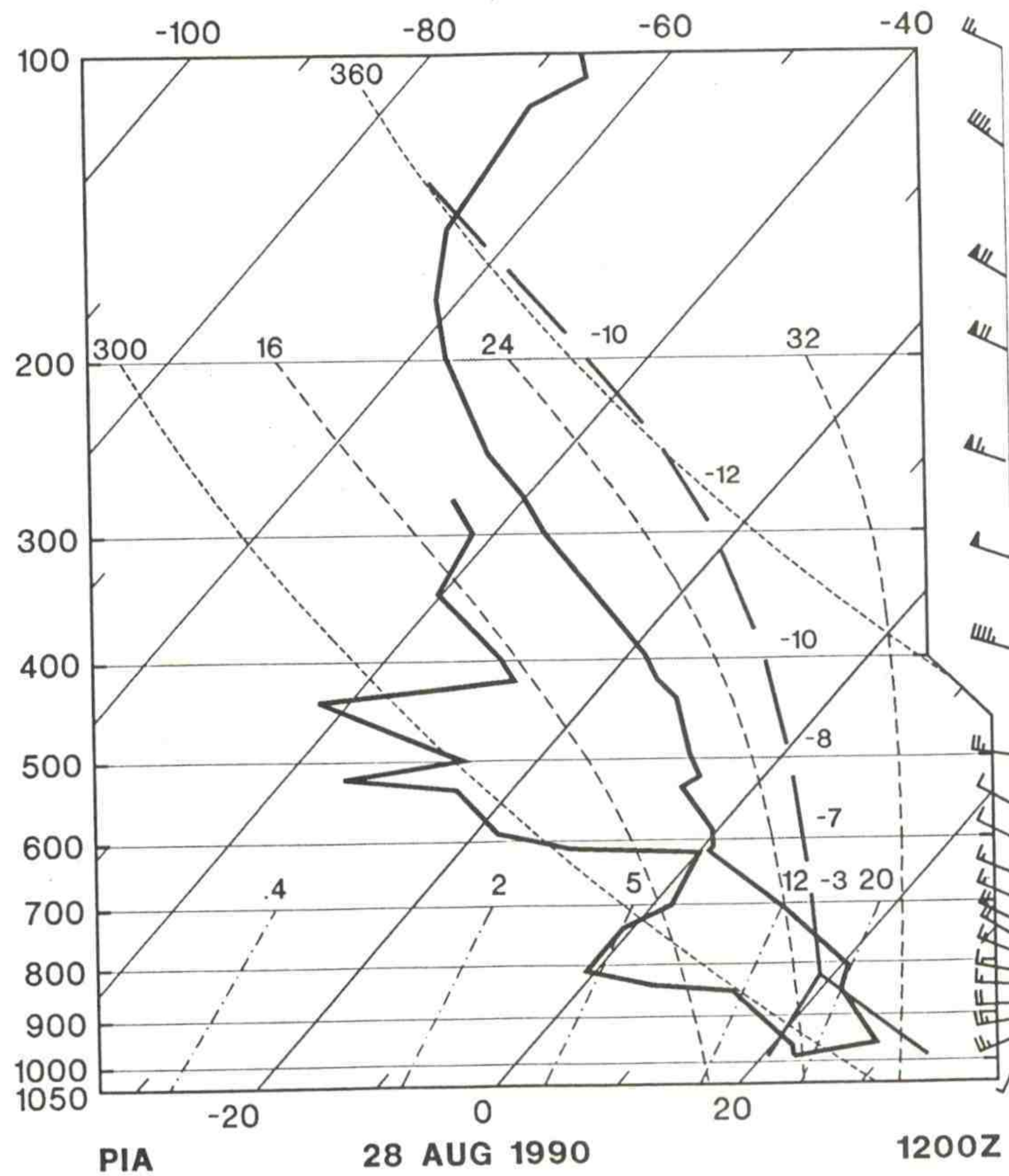


Figure 2.3a Skew T/log P plot of Peoria, Illinois, upper-air sounding for 1200 UTC (5:00 a.m., CDT) on August 28, 1990. The shaded area shows the positive buoyancy area for a representative afternoon mixed layer parcel; lifted indices at various levels are also shown for this parcel.

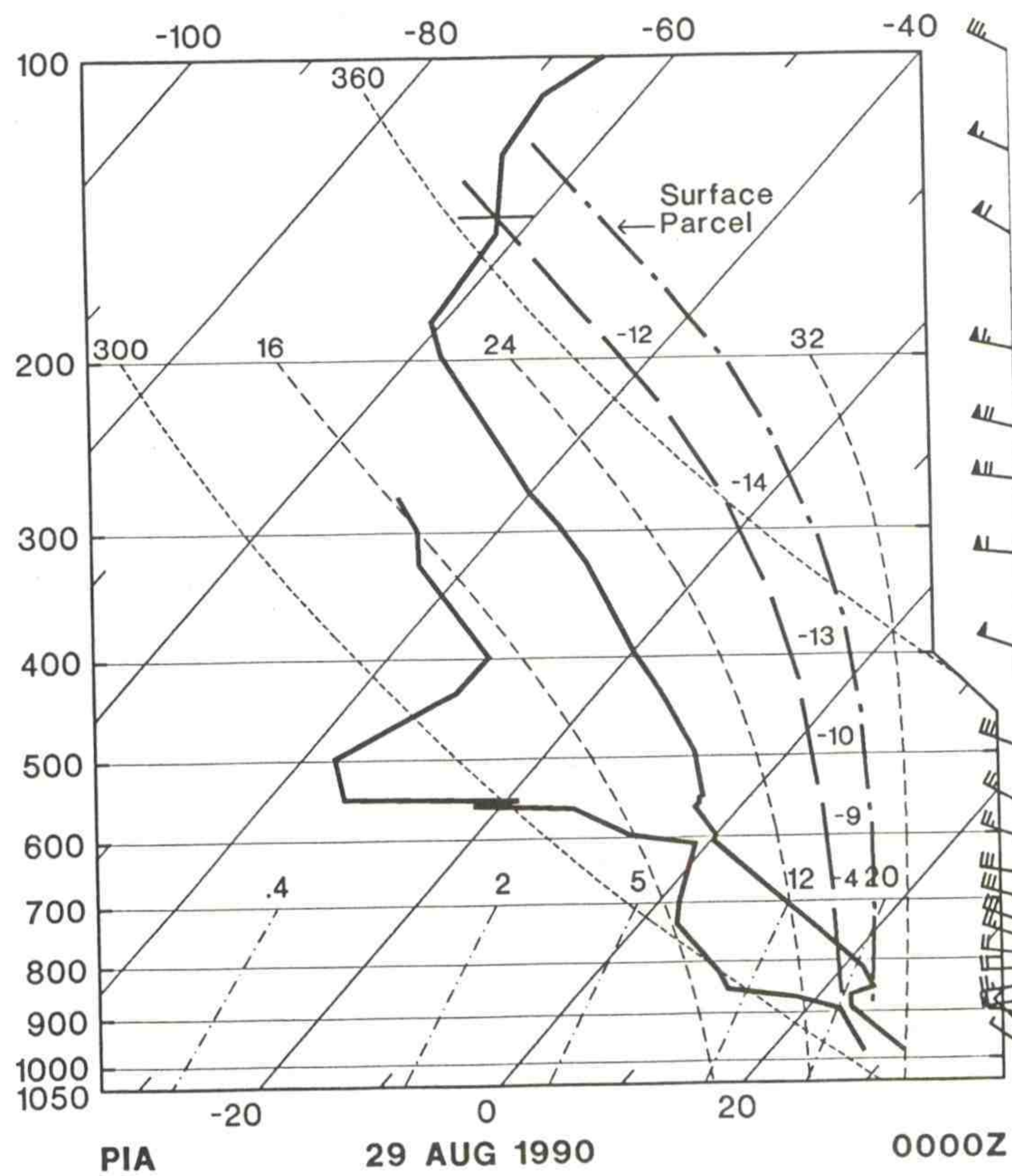


Figure 2.3b Similar chart for Peoria's 0000 UTC sounding on August 29, 1990 (7:00 p.m., CDT, on August 28). The shaded area shows the positive buoyancy area for the mixed layer parcel along with lifted indices at a number of levels. The moist adiabat for the surface lifted index is also indicated.

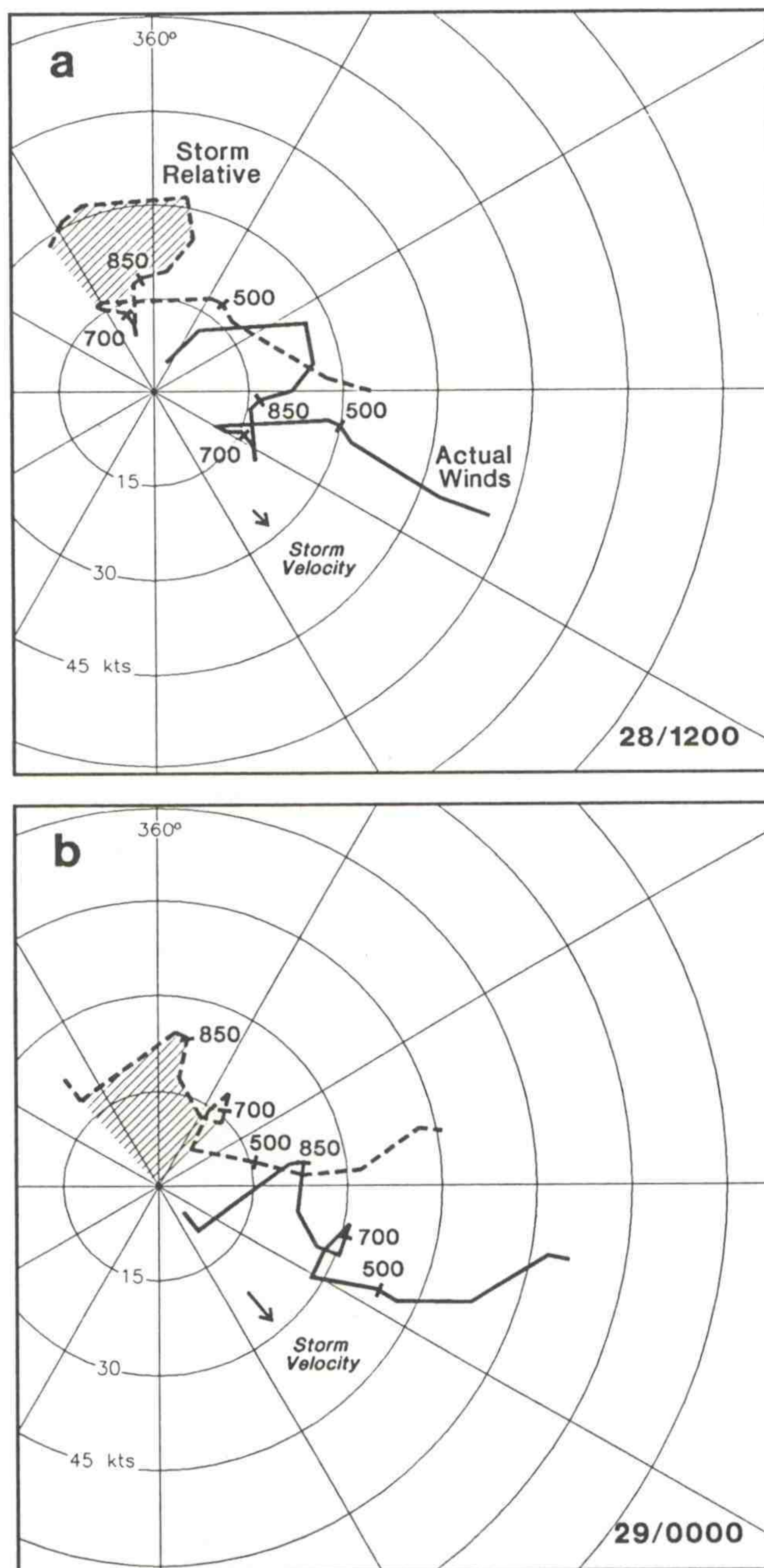


Figure 2.4 Hodographs for observed winds in lower half of troposphere at Peoria, Illinois, at (a) 1200 UTC (5:00 a.m., CDT) on August 28, 1990 and at (b) 0000 UTC on August 29, 1990 (7:00 p.m., CDT, on August 28). Wind speeds are indicated in kts, and velocity vector of the supercell thunderstorm is indicated. The actual hodographs are shown by the solid line and the storm-relative hodographs by the dashed lines. Winds at 850, 700, and 500 mb levels are indicated. Cross-hatched areas are proportional to positive, storm-relative helicity for layer from the surface to 3 km.

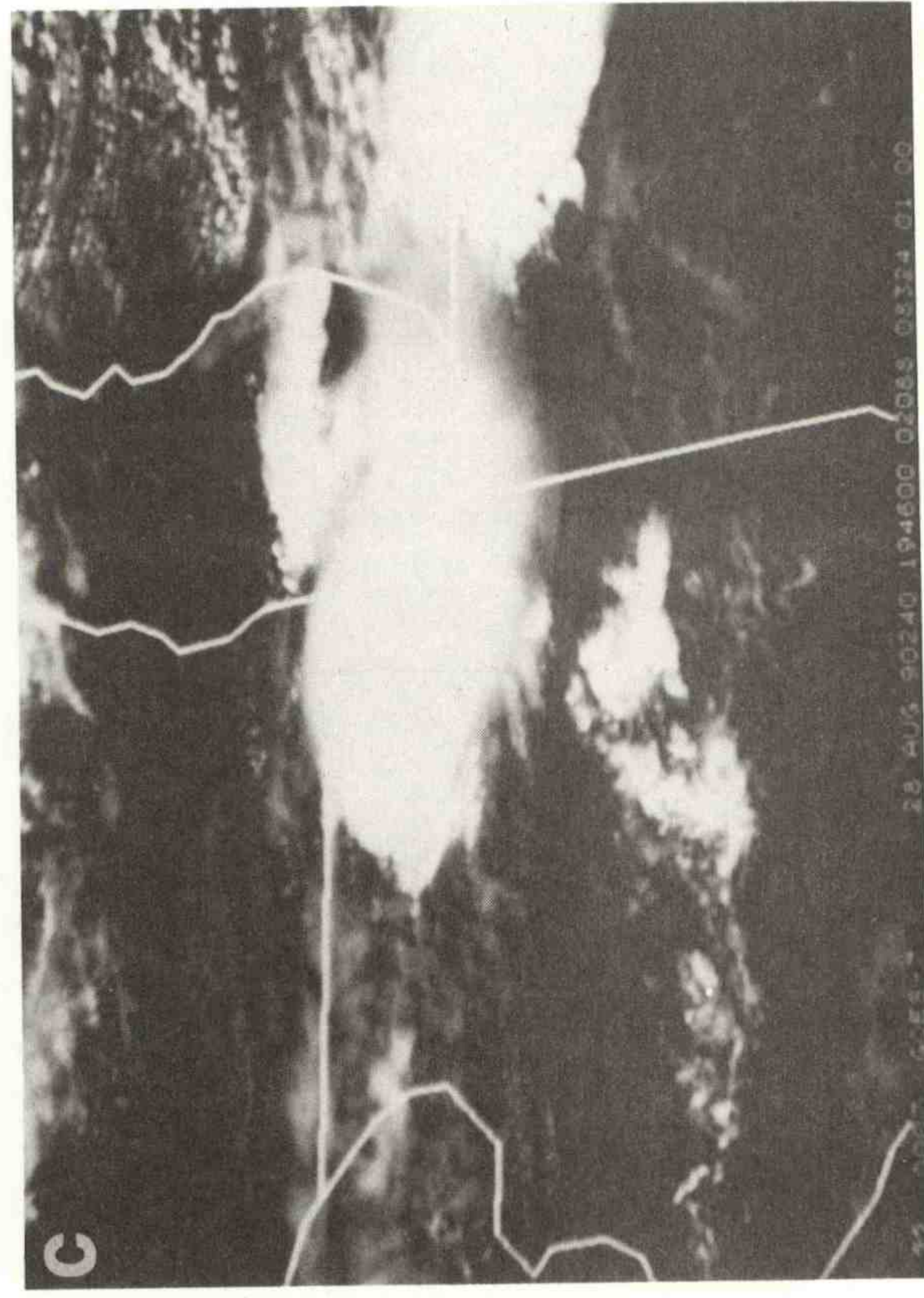
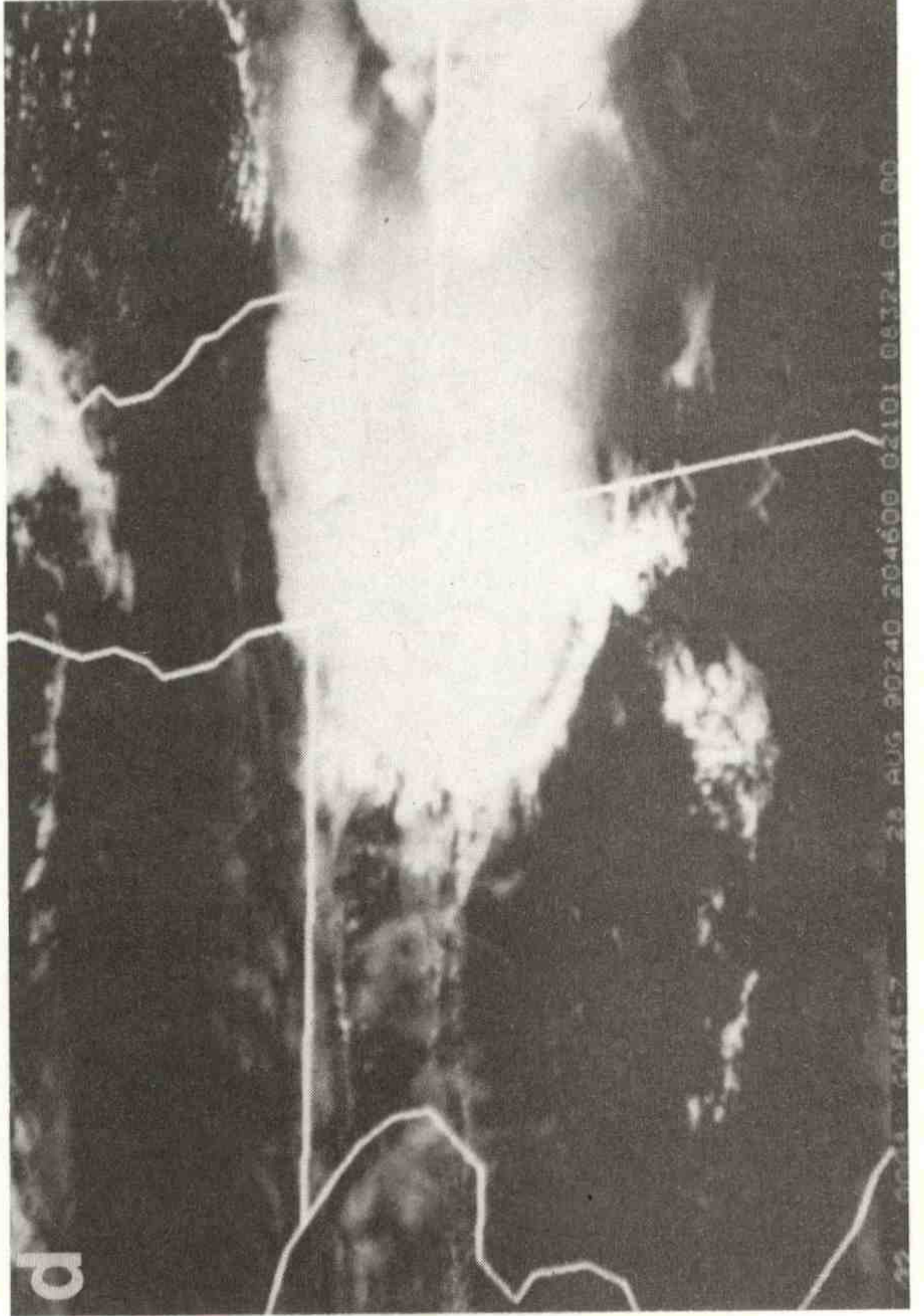
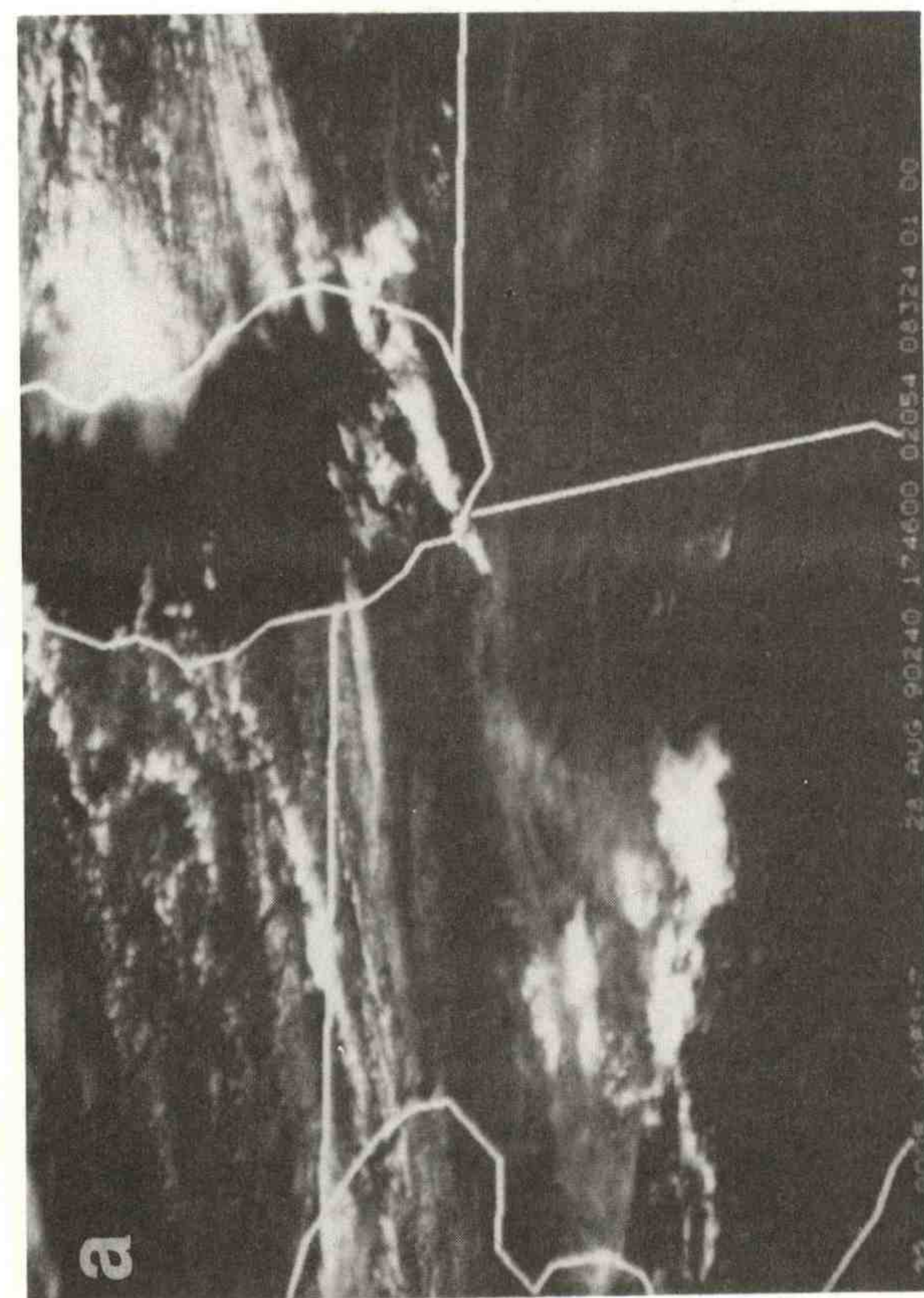
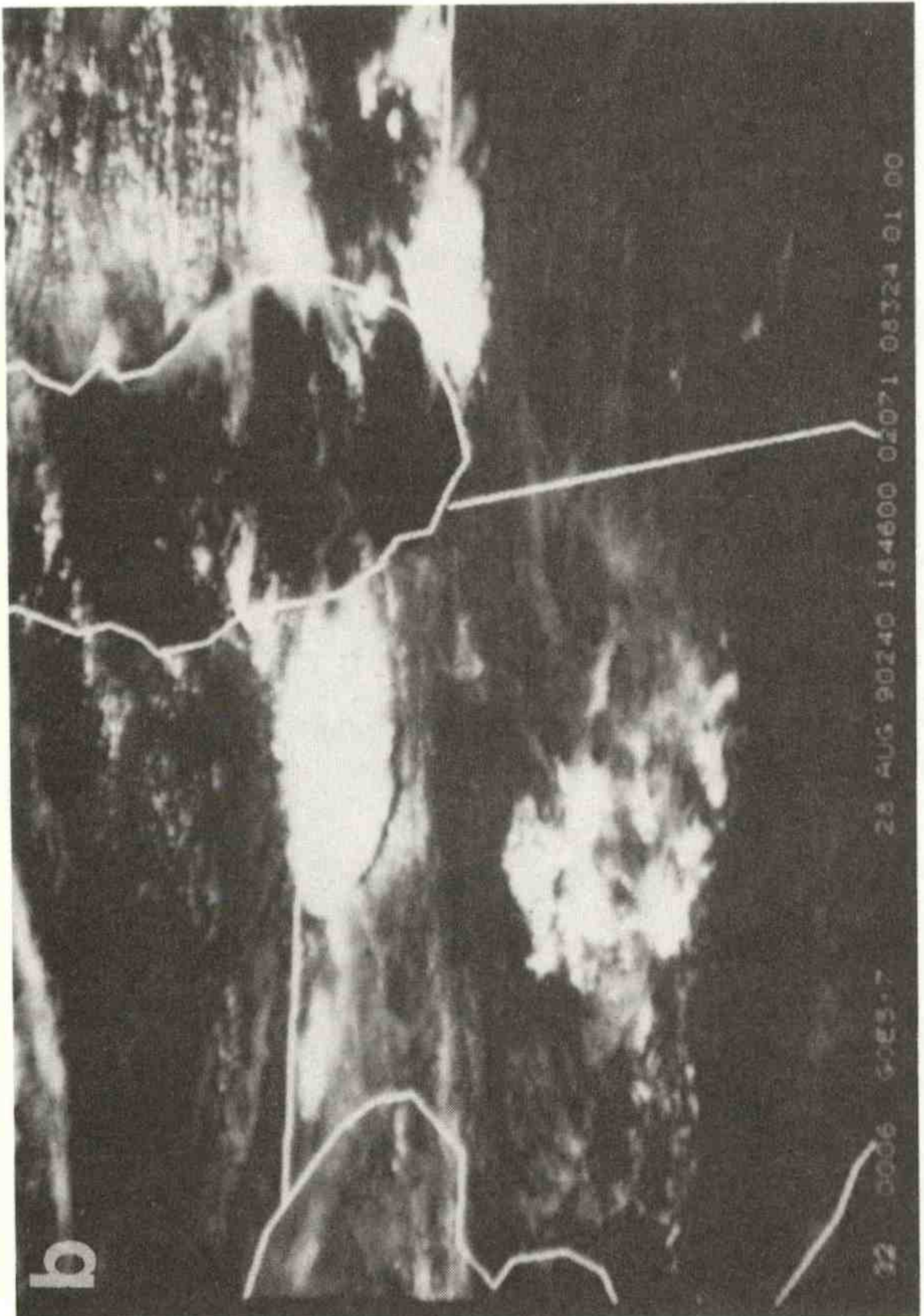


Figure 2.5 Visible GOES images showing the development and progression of the tornadic thunderstorm across northern Illinois at: (a) 12:46 p.m., CDT; (b) 1:46 p.m., CDT; (c) 1:46 p.m., CDT; (d) 2:46 p.m., CDT; (e) 3:46 p.m., CDT; and (f) 3:46 p.m., CDT on the afternoon of August 28.

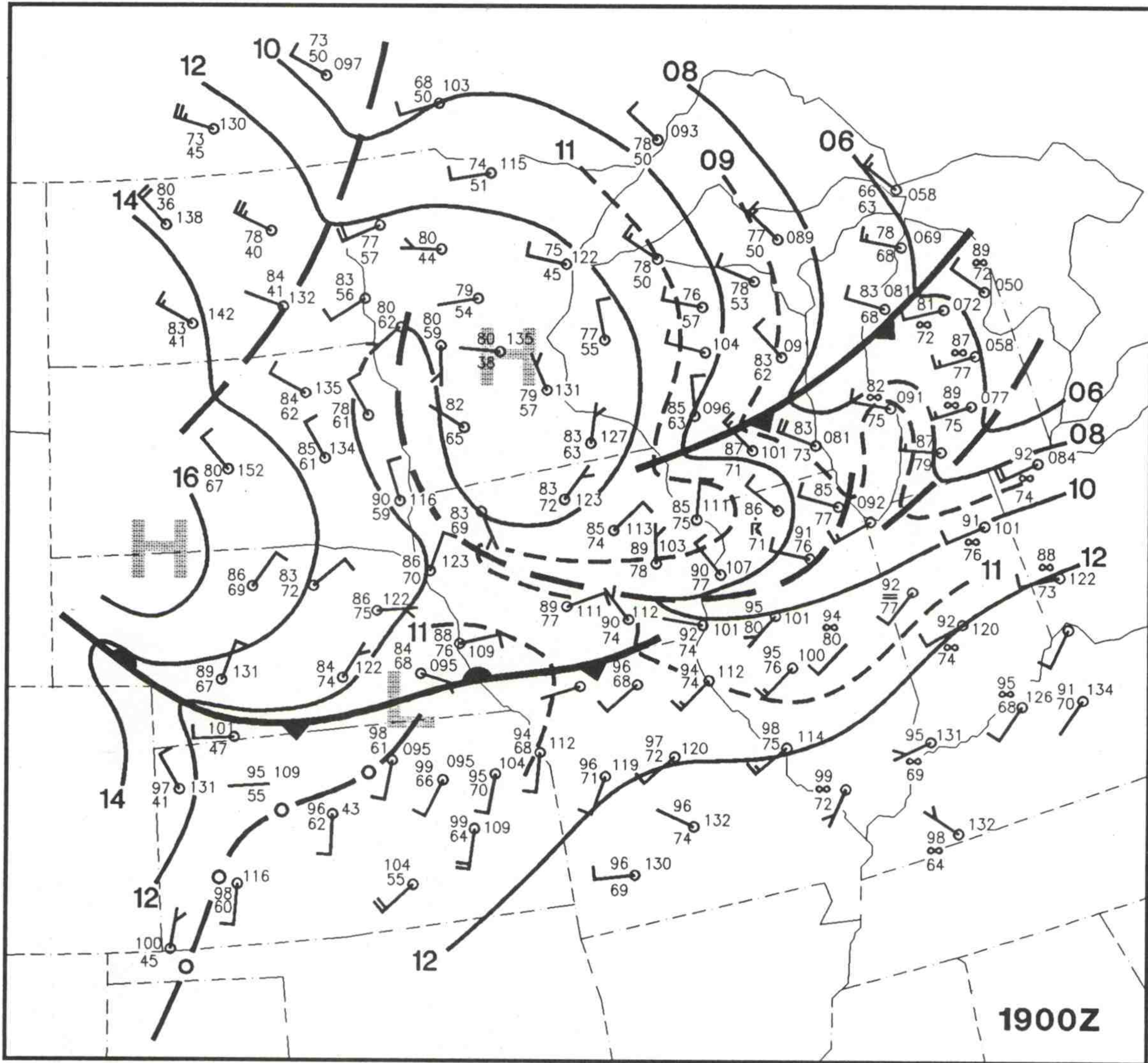


Figure 2.6 AFOS surface data plotted for 1900 UTC (2:00 p.m., CDT) on August 28, 1990. A subjective analysis of surface features is overlain. Surface pressure is in mb.

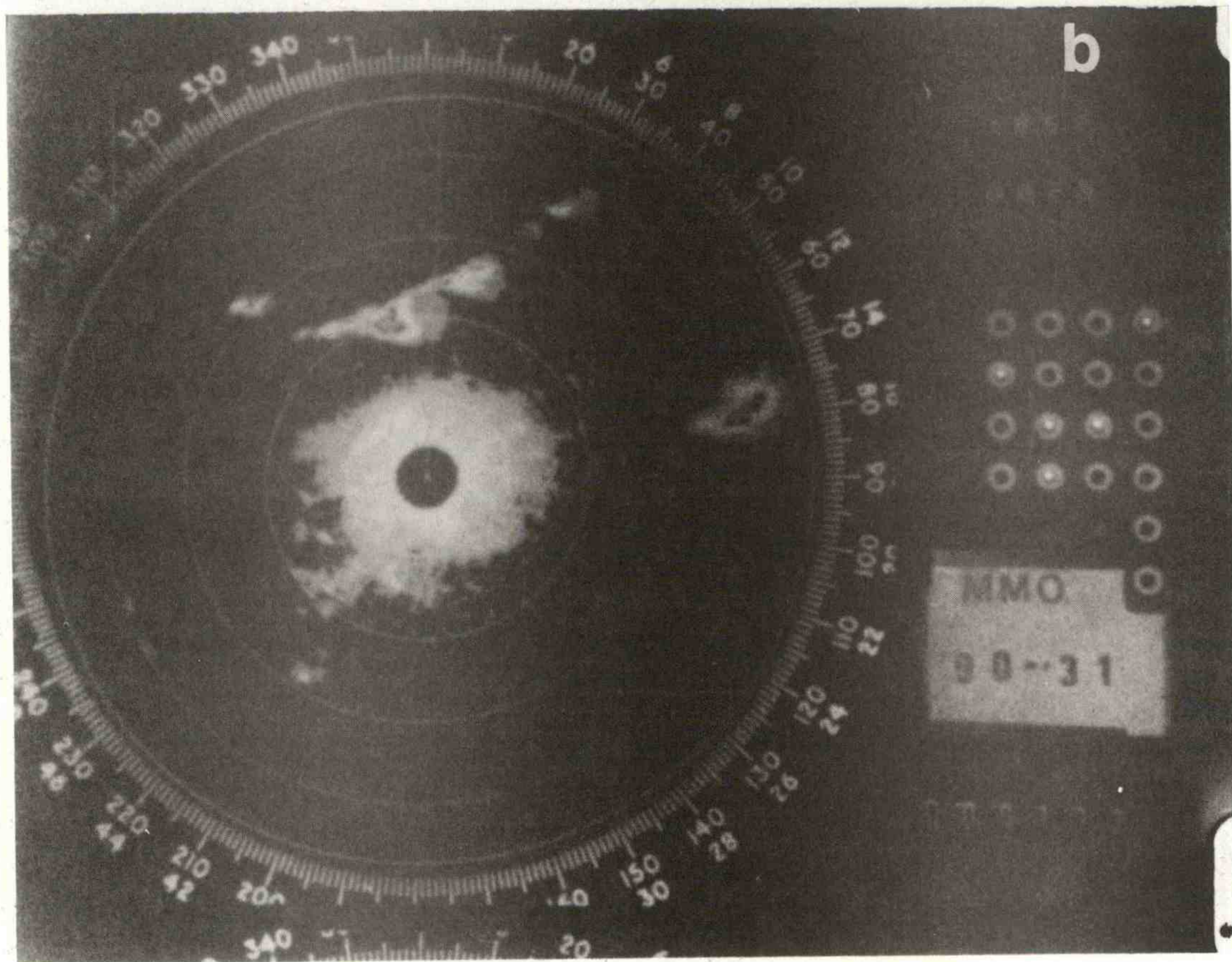
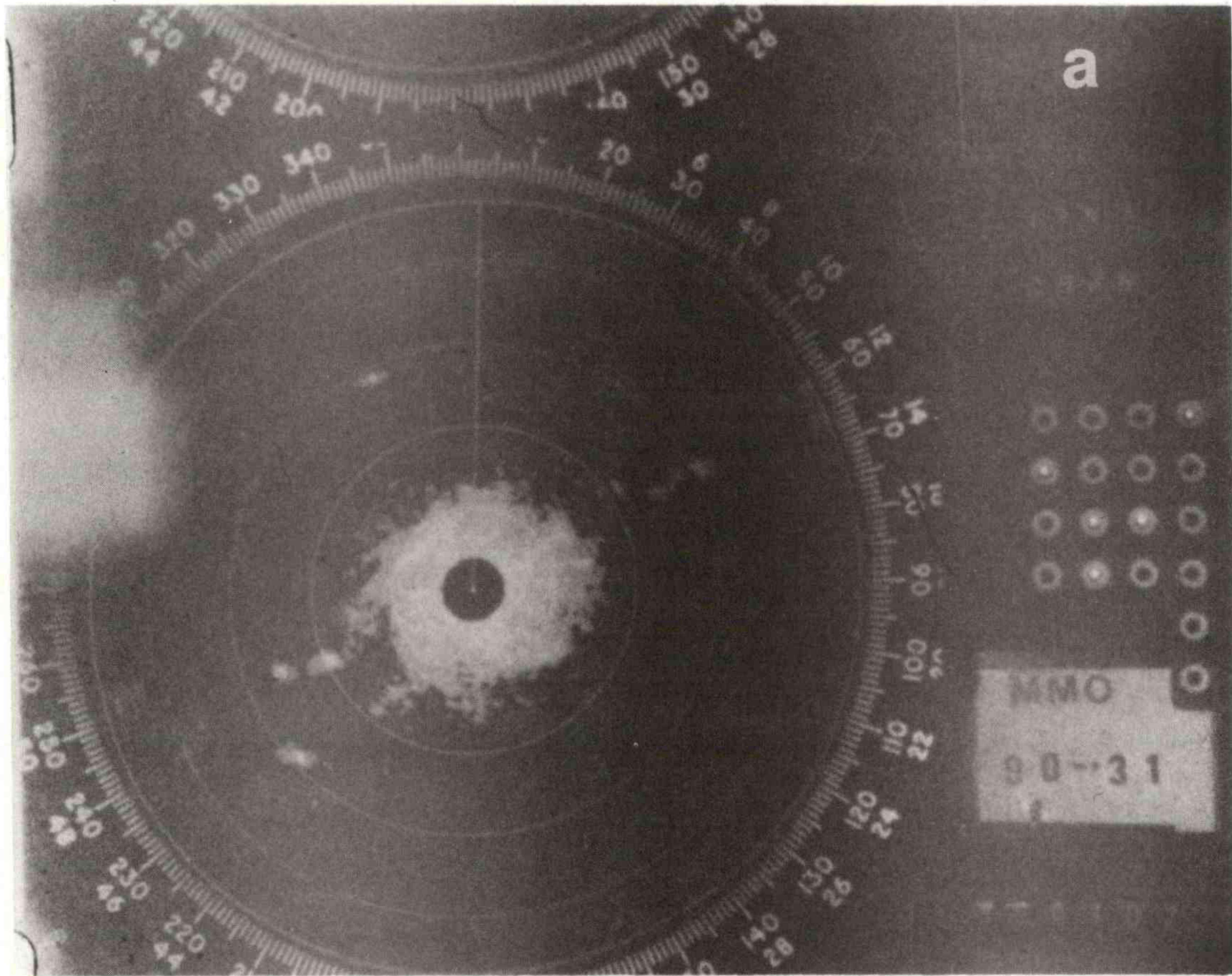


Figure 2.7 Photographs of the Marseilles, Illinois, WSR-74S radar PPI scope at: (a) 1746 UTC (2:46 p.m., CDT) and (b) 1846 UTC (1:46 p.m., CDT).

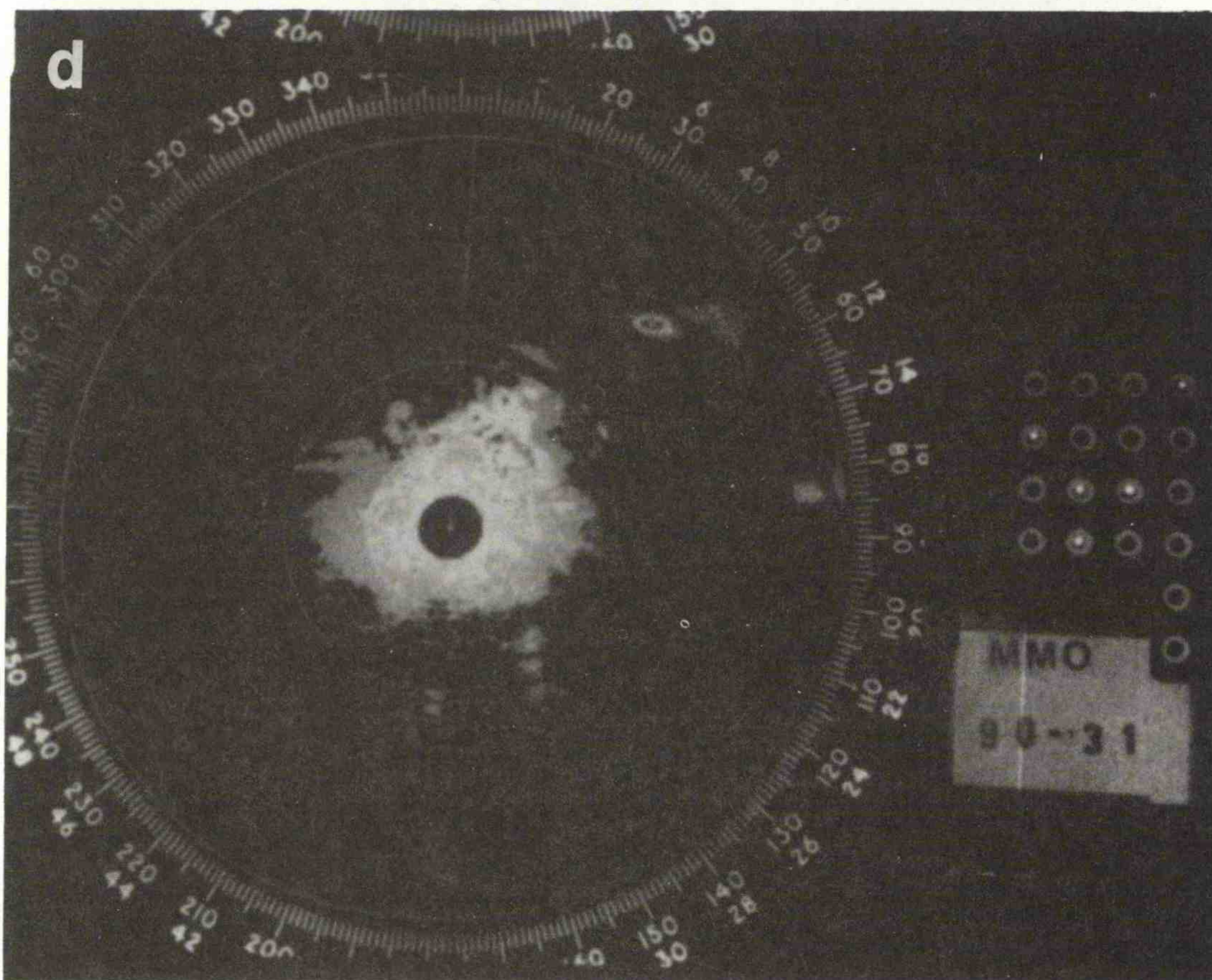
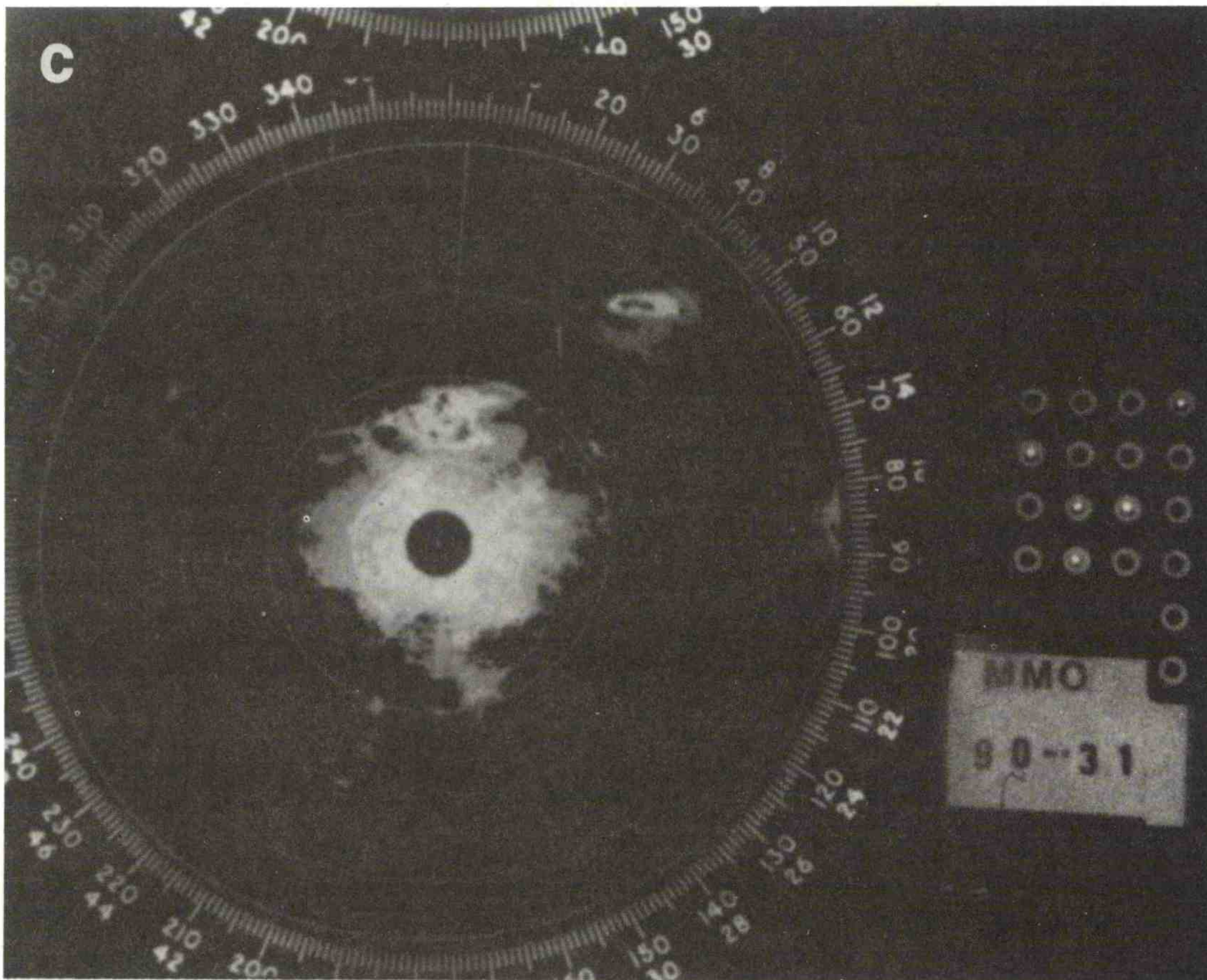


Figure 2.7 (cont'd) Photographs of the Marseilles, Illinois, WSR-74S radar PPI scope at: (c) 1946 UTC (2:46 p.m., CDT) and (d) 2021 UTC (3:21 p.m., CDT) on August 28, 1990.

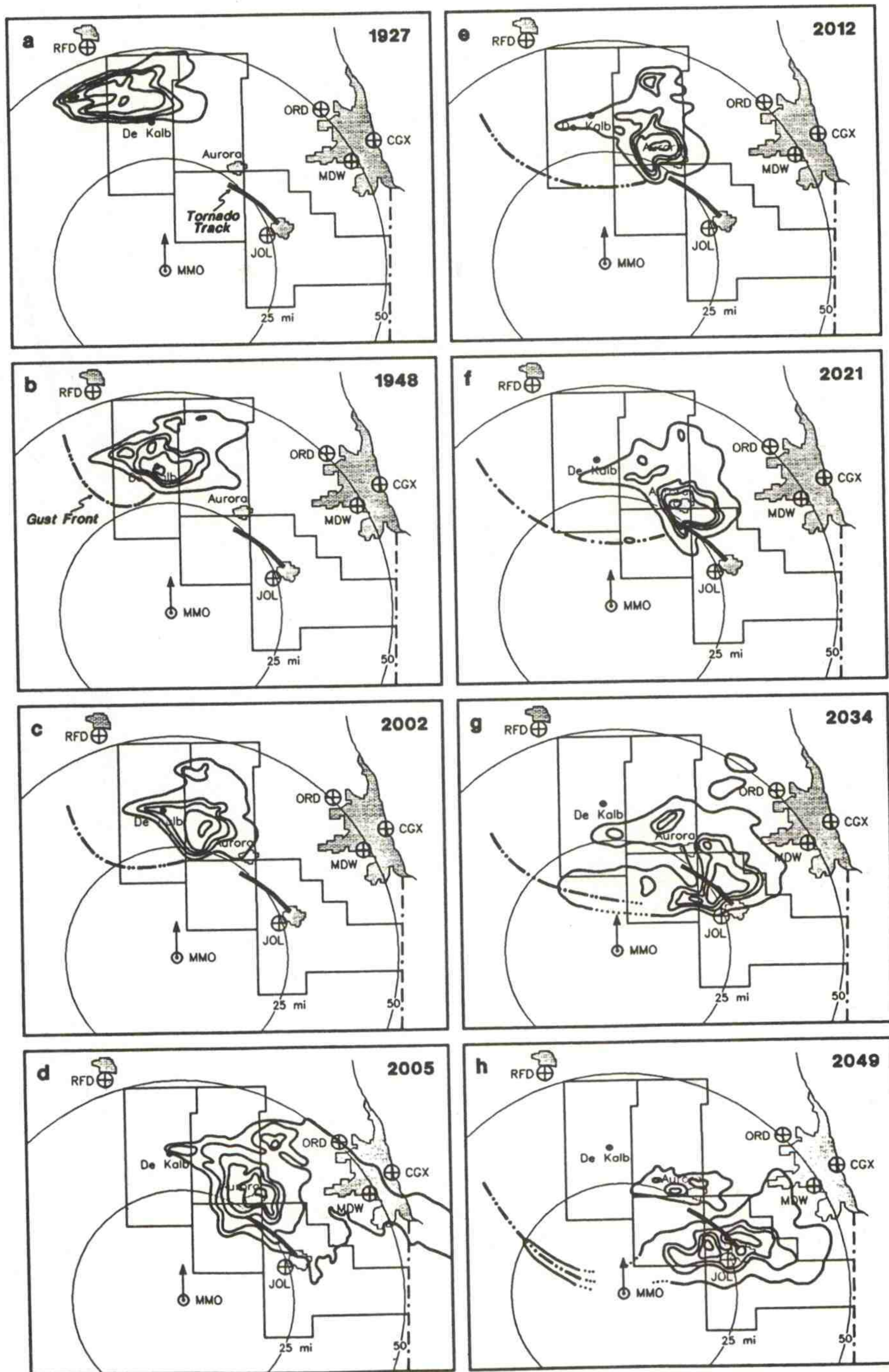


Figure 2.8 Tracings of the reflectivity patterns from the MMO PPI scope film for: (a) 1927 UTC (2:27 p.m., CDT); (b) 1948 UTC (2:48 p.m., CDT); (c) 2002 UTC (3:02 p.m., CDT); (d) 2005 UTC (3:05 p.m., CDT); (e) 2012 UTC (3:12 p.m., CDT); (f) 2021 UTC (3:21 p.m., CDT); (g) 2034 UTC (3:34 p.m., CDT); and (h) 2049 UTC (3:49 p.m., CDT). Reflectivity contours for VIP levels 2 through 6 are traced. All panels are at 0.5 degrees elevation, except for panel "d." Panel "d" is for an elevation angle of 11 degrees with all VIP levels 1 through 6 contoured.

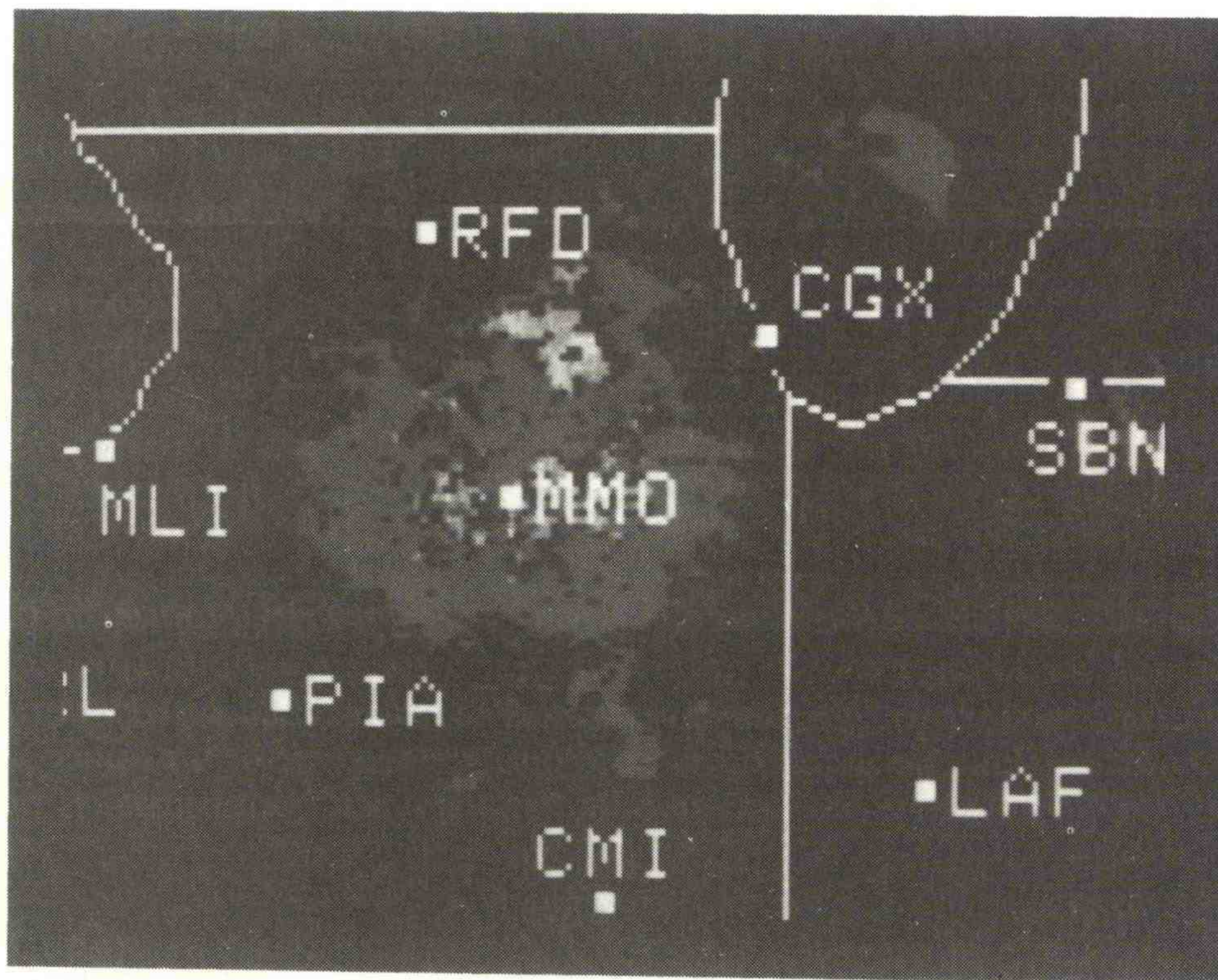


Figure 2.9 Kavouras monitor PPI reflectivity from MMO at 2011 UTC (3:11 p.m., CDT) as it appeared on a Kavouras remote display at NSSFC, where the data were digitally recorded. Original color photograph of this display was provided to the DST by Professor Fujita.

CHAPTER 3

WARNINGS AND FORECASTS

The potential for severe thunderstorm activity over the Great Lakes region had been monitored closely by NSSFC during the 2 days preceding August 28. The NSSFC Convective Outlook issued at 2:00 a.m., CDT, on August 28 (see figure 3.1) indicated a slight risk for severe thunderstorms over a large portion of the northeastern United States, including northern portions of Illinois. The zone forecasts for Illinois that were issued at 4:00 a.m. and updated at 10:00 a.m., CDT, focused on the cooling and drying that would follow the passage of the cold front and upon the increased chances for thunderstorms accompanying the front during the afternoon and evening. For example, the 4:00 a.m., CDT, WSFO Chicago zone forecast had increased the probabilities for thunderstorms and measurable precipitation to 40 percent (while MOS (model output statistics) guidance continued to indicate 20 percent levels of probability).

The NSSFC Convective Outlook was updated at 10:00 a.m., CDT (1500 UTC) to indicate a substantially increased severe thunderstorm threat from western New York to northern Illinois, i.e., a "moderate risk" for severe thunderstorms. The discussion accompanying the outlook map (see appendix A and figure 3.1) emphasized the extreme instability present in the moderate risk area and noted the weakening of the mid-level cap that would allow easier development of storms.

Although northern Illinois was now in a moderate risk situation, the WSFO Chicago staff choose not to issue a special "State Severe Storm Outlook." The decision not to issue a "State Severe Storm Outlook" after the mid-morning NSSFC upgrade to moderate risk for northern Illinois reflected the fact that the new morning zone forecasts had just been released. These zone forecasts, however, did not mention any risk of severe thunderstorms for northern Illinois.

Because of the perceived strong likelihood of widespread severe thunderstorm activity, the NSSFC requested special rapid interval scan operations (RISOP) GOES (Geostationary Operational Environmental Satellite) imagery beginning at 11:30 a.m., CDT. The high-frequency RISOP imagery is not accessible to field WSFOs.

Between 12:40 and 1:28 p.m., CDT, the MMO radar indicated rapidly intensifying storms over extreme northern Illinois. The staff at WSO Rockford responded quickly, indicating a local sensitivity to the significant nature of the severe storm threat highlighted in the NSSFC morning update. Rockford issued special weather statements at 1:12 p.m. and 1:26 p.m., CDT, noting the strong nature of the developing storms. These statements keyed on the immediate possibility of heavy rains, small hail, and strong gusty winds, particularly in Boone County and the city of Rockford.

The NSSFC issued Severe Thunderstorm Watch #691 at 1:28 p.m., CDT (1828 UTC) for portions of northern Illinois, southern Lake Michigan, and northwest Indiana. The watch was valid from when issued until 8:00 p.m., CDT (0100 UTC) and the descriptive text emphasized that extreme instability was present, that a strong upper-tropospheric jet was over the area, and that rapid development of severe thunderstorms was expected in northern Illinois and northwestern Indiana.

Very shortly after the watch was issued (1:32 p.m., CDT) the MMO radar site called WSO Rockford to report that the radar indicated a BWER just north of Rockford. Only 3 minutes later, a funnel cloud occurrence (1:35 p.m., CDT) followed by a tornado touchdown (1:37 p.m., CDT) just south of Pecatonica (about 15 miles west of Rockford) were both reported to WSO Rockford by the ISP. In response, WSO Rockford issued a tornado warning (1:39 p.m., CDT) for southern Winnebago, southern Boone, and northern DeKalb Counties. The storm was identified as moving to the southeast. The warning contained specific community names that might be affected and excellent "call-to-action" statements. The final sentence emphasized that "This is a serious situation...your life may depend on how quickly you respond to this tornado warning!"

Two more reports were received from District 16 State Police Headquarters at 1:40 and 1:42 p.m., CDT, that a tornado was on the ground at Seward, Winnebago County. Seward was within the specified tornado warning area. Within minutes, the State Police also reported that there was confirmed damage with this storm. Because there was no post-storm survey, it is not clear whether there were actually two separate tornado occurrences west of Rockford. The WSO Rockford issued another tornado warning; this time for Ogle County. Excellent call-to-action statements were again included; however, the relationship of this new warning to the previous one, which remained in effect, was not made clear.

Information provided to the DST by NSSFC indicates that special SELS analyses and RISOP imagery led their staff to be concerned that the northern Illinois thunderstorm was a right-moving, supercell storm with tornadic potential. Rather than reissuing the severe thunderstorm watch, SELS decided that the local offices had the situation well in hand, i.e., the rapid response of WSO Rockford and the

issuance of the tornado warnings. However, SELS did not discuss the reasons for this decision directly with WSFO Chicago.

The WSFO Chicago issued a special weather statement at 2:00 p.m., CDT, providing further geographic refinements to the area affected by WW#691. This statement carried day, date, and time information in the header but was missing the month (AFOS alphanumeric display module--ADM) problems may have contributed to header problems on all of the severe weather statements issued at Chicago during the remainder of the afternoon). The statement described a line of thunderstorms moving into and through northeastern Illinois. The storms were anticipated in the metropolitan Chicago area between 2:00 and 6:00 p.m., CDT. The statement did not refer to any of the warnings or reports that had been issued by WSO Rockford.

During the next hour, WSO Rockford continued to issue multiple severe thunderstorm warnings and statements as the storm moved southeastward (see appendices A and B). The WSO continued to receive reports of marble to golf ball-size hail and storm damage from Winnebago and DeKalb Counties. At 2:55 p.m., CDT, WSO Rockford received a report of numerous instances of wind and crop damage from the DeKalb County Sheriff that also noted that golf ball-size hail and a funnel cloud had been observed 1-1/2 miles north of DeKalb, moving to the southeast. The information concerning the funnel cloud sighting was not included on any products issued by WSO Rockford and was apparently not relayed to WSFO Chicago.

The WSFO Chicago updated the local forecast at 2:17 p.m. and the zone forecasts at 2:27 p.m., CDT, in response to the watch. These new forecasts highlighted the possibility that some thunderstorms might produce large hail and damaging winds. At 2:20 p.m., CDT, Indianapolis issued a special weather statement that included some discussion of the severe storm reports that had been mentioned in the severe weather statements issued by WSO Rockford.

The Chicago WSFO issued a severe thunderstorm warning at 2:32 p.m., CDT (1932 UTC) for northern Kane County that would be valid until 3:30 p.m., CDT. The warning included names of specific communities that could be affected by the storm along with the prophetic reminder to "Remember...severe thunderstorms can and occasionally do produce a tornado with little or no advance warning...so be on the lookout." Although no mention was made of the earlier reports of tornadoes with this storm, the fact that it had produced 1-1/2-inch hail as it passed through Rockford was highlighted. The storm was noted as being located 25 miles southeast of Rockford; however, it was stated that "This storm is moving to the east at 25 miles an hour." The severe thunderstorm was actually moving to the southeast (as had been correctly noted in previously issued WSO Rockford severe weather products and the 2:30 p.m., CDT, MMO radar report) and at about 2:45 p.m., CDT, it moved into southwestern Kane County. No warnings were issued for this part of Kane County until 3:37 p.m., CDT.

The Marseilles office initiated a call (at 2:34 p.m., CDT) to the Chicago WSFO to alert them that the storm near Genoa in DeKalb County was a VIP level 6 and had tops indicated to 55,000 ft. The WSFO then contacted ISP District 2 to solicit possible severe weather and damage reports. At 2:50 p.m., CDT, the WSFO issued a severe weather statement noting that 1-inch hail had just been reported in extreme western Kane County. This statement correctly noted that the storm was moving to the southeast.

The 2:50 p.m., CDT, severe weather statement carried a header indicating that it was issued on "Sat Jun 30 1990." All additional severe weather statements issued by WSFO Chicago for the storm carried this same erroneous header; however, this problem appears not to have created any confusion as users were likely focusing on the content of the messages.

The Marseilles office initiated another call to the WSFO Chicago lead forecaster at 2:54 p.m., CDT (1954 UTC) to alert them that storm tops were 60,000 ft., 4-5 miles east of DeKalb, and that the VIP 6 level echo extended upward to 40,000 ft. At 3:15 p.m., CDT, the WSFO Chicago lead forecaster called MMO to ask for the exact location of the center of the VIP 6 echo. Staff at WSMO Marseilles responded that the storm top was now 65,000 ft., and the VIP 6 was located near Aurora (see appendix B). There were no further communication interchanges between the staffs at MMO and at WSFO Chicago for the next hour and twenty-six minutes.

The MIC of the CWSU called WSFO Chicago at 3:20 p.m., CDT (2020 UTC) and reported 1-1/4-inch hail at the CWSU in Aurora. He was apparently not aware of the possible wall cloud observed at the airport, nor of the very strong measured wind gusts, nor of the fact that the control tower had been abandoned.

The WSFO Chicago issued its second severe thunderstorm warning at 3:23 p.m., CDT, for southern Du Page County valid until 4:30 p.m., CDT (2130 UTC). This warning was similar to the first in that it again reminded users that severe thunderstorms can produce tornadoes with little warning. The warning highlighted tree damage that had occurred west of Aurora and that the storm had produced 1-1/2-inch hail at Rockford and 3/4-inch hail at Aurora. The warning also noted that the severe thunderstorm was located near Aurora and moving toward the southeast at 25 mph. Naperville and Lisle were identified as towns that should be affected by this storm. This warning was internally inconsistent since these towns are directly east of Aurora. Southern Du Page County is located northeast to east-southeast of Aurora.

The WSO Rockford issued a severe weather statement at 3:35 p.m., CDT, noting that **all** the severe thunderstorm warnings for north-central Illinois had expired and were no longer in effect. At this same time, WSFO Chicago was issuing new

warnings for counties in northeastern Illinois and Severe Thunderstorm Watch #691 remained in effect. Thus, information that was possibly confusing and contradictory was being broadcast across the general area, e.g., messages from both Chicago and Rockford go to some of the same ISP District Headquarters in northern Illinois.

The WSFO Chicago issued a new severe thunderstorm warning at 3:37 p.m., CDT (2037 UTC). This warning (issued 14 minutes after the warning for southern Du Page County) was for northeast Kendall, southern Kane, northern Will, and southern Du Page Counties valid until 4:45 p.m., CDT. Thus, at this time there were two warnings in effect simultaneously for southern Du Page County; there was no clarifying language regarding this situation. This warning stated that another severe storm had developed to the west of Aurora and that it had produced nearly 2-inch hail in Aurora. Communities identified as possibly in the path of this storm were Bolingbrook, Lockport, Naperville, Oswego, and Aurora. This warning also carried the reminder that severe thunderstorms occasionally produce tornadoes.

At 3:37 p.m., CDT, the tornado was approaching northwest Joliet in Will County. Thus, the severe weather events and tornadoes over southwest Kane, northeast Kendall, and much of western Will Counties had occurred in a region not covered by any type of warnings. These events were within the severe thunderstorm watch area. The last several minutes of the tornado track and the wind damage east of Joliet were covered by the 3:37 p.m., CDT, severe thunderstorm warning.

At 3:40 p.m., CDT (2040 UTC) the WSFO issued a severe weather statement alerting users that winds had overturned a trailer near Oswego at 3:38 p.m., CDT (note that the damage had in reality occurred earlier than indicated by a radio station's report) and that golf ball-size hail had been reported near Joliet at 3:40 p.m., CDT. Between 3:40 and 3:45 p.m., CDT, the WSFO MIC called the Will County Sheriff's Office twice seeking severe storm reports. Even though the MIC identified himself as an NWS employee, the sheriff's office responded that they didn't have time to talk to the "media" and hung up.

At 3:45 p.m., CDT, the ISP reported that a tornado had occurred in the Crest Hill area. In response to this confirmation, the WSFO issued a tornado warning for west-central Will County at 3:51 p.m. that was valid until 5:00 p.m., CDT (2200 UTC). This warning carried excellent call-to-action statements and identified the town of New Lenox as possibly being in the path of the tornado. The tornado had dissipated by the time this warning was issued; however, the storm continued to produce substantial wind damage as it moved to the southeast of Joliet.

A severe weather statement was issued at 3:55 p.m., CDT, emphasizing the reported tornado at Crest Hill and identifying east Joliet and New Lenox as being

in the storm path. The radar echo was continuing to move southeastward toward Indiana, and at 4:23 p.m., CDT, WSFO Indianapolis issued their first severe thunderstorm warning for this storm, specifically for Newton and Jasper Counties.

As damage reports continued being received and as the storm continued southeastward, WSFO Chicago issued a new severe thunderstorm warning at 4:31 p.m., CDT, for eastern Kankakee County. This warning provided substantial information about the severe weather history of the storm (2-inch hail, damaging winds, tornado at Crest Hill, and a funnel cloud near Bourbonnais) and alerted the communities of Kankakee, Manteno, Momence, and St. Anne that they were likely to be affected. Also at this time (4:35 p.m., CDT) a severe weather statement canceled the tornado warning for west-central Will County. This severe weather statement included the somewhat contradictory sentences: "The storm producing the tornado has moved to the southeast and is now located over east Kankakee County. A Severe Thunderstorm Warning is in effect until 5:30 p.m. for east Kankakee County."

At 4:41 p.m., CDT, WSFO Chicago called the MMO radar operator to ask if there was a hook on the VIP 6 storm. The operator replied that there had not appeared to be any through the past hour, but he would watch the storm closely. He also reported that the storm was located in northeast Kankakee County. However, 3 minutes later the MMO operator called the WSFO to report a hook echo south of Beecher along the Will and Kankakee County line. In response to this, a new tornado warning was issued at 4:50 p.m., CDT, for southwest Lake County, Indiana, by WSFO Chicago. Although there were no call-to-action statements in this message, it did identify several towns in the path of the storm. At 5:15 p.m., CDT, WSFO Chicago canceled both the severe thunderstorm warning for eastern Kankakee County and the tornado warning for southwestern Lake County since the storm had moved into Indianapolis' area of responsibility.

The WSFO Indianapolis issued a tornado warning for northern Newton County at 4:51 p.m., CDT, referencing the MMO hook echo observation. All further actions regarding this storm occurred within the area of responsibility of WSFO Indianapolis.

3.1 Discussion of Services

The NSSFC in Kansas City correctly identified the increasing severe thunderstorm threat that was developing over the Great Lakes Region and noted the extreme instability present. The 1500 UTC updated outlook was particularly accurate in its identification of the region where the threat had reached moderate levels. During the afternoon of August 28, severe storms affected an area that stretched all the way from Illinois eastward to the Atlantic Seaboard. NSSFC issued three tornado watches and eleven severe thunderstorm watches during the

day. The center received 255 reports of severe weather events, only 10 of which were reported as tornadoes. Thus, August 28 proved to be an unusually active late summer severe weather day.

Watch #691 was issued as a "Severe Thunderstorm" watch primarily because of the low-level wind shear characteristics of the large-scale environment over northern Illinois. The thunderstorm situation appeared to favor the occurrence of damaging wind storms and hail rather than tornadoes. When the storm over northern Illinois was identified as dangerous and potentially tornadic, NSSFC decided not to reissue #691 as a tornado watch. The staff at NSSFC felt that the situation was being handled well locally. The DST feels that this information, if it had been discussed with the severe weather desk forecaster at Chicago, might have affected the decision-making process for the next several critical hours.

The storm posed particularly serious problems for WSO Rockford during the early afternoon since it developed explosively within Rockford's area of responsibility. The WSO Rockford responded rapidly and very effectively. There appeared to have been useful interaction between the MMO radar site and WSO Rockford, particularly from 12:56 to 1:43 p.m., CDT. However, there was apparently little communication between the Chicago and Rockford offices. (Note that staffing levels at the Illinois offices followed NWS standard practices, and actual duty hours worked on August 28 are shown in appendix G.) The WSFO Chicago AFOS Alarm and Alert program was not set to display severe weather products issued by its WSOs, and this may have contributed to delayed recognition at the WSFO of how rapidly the severe storm threat was evolving.

The storm also posed interpretation problems for the radar operators at Marseilles and the forecasters at Chicago since it spent a large portion of its life within the extended ground clutter pattern of the radar. The storm was apparently examined carefully in the vertical when it was at long ranges, i.e., the timely identification of the BWER and the interaction with Rockford helping the WSO respond very quickly and appropriately. As the storm approached the Chicago warning area and the ground clutter, the situation became much more complex. The major storm developed rapidly southeastward, while two intense but much smaller cells lagged behind to the north and northwest. However, a number of special scans and RHIs were taken during this critical period (see appendix B-4).

There were several important radar indicators of the dangerous character of the primary storm, discussed earlier in chapter 2, as it moved across portions of Kane and Kendall Counties. (Both Chicago and Marseilles have static monitors as well as animated RADID displays.) These radar signatures were not identified in real-time at either Marseilles or Chicago. Frame-by-frame review of the MMO film indicates that two elevated scans and a number of RHI scans were made before and during the principal tornado (again, refer to appendix B-4 for details).

The DST feels that the full capabilities of the WSR-74S radar were not utilized during this critical period, i.e., while the storm was moving through Kane and Kendall Counties. Although the PPI character of the storm was viewed occasionally at elevations above the clutter, systematic scanning of the echo at elevations above 0.5 degrees was apparently not done. Similarly, there are no clear indications that the weather radar identification of severe thunderstorms (WRIST) procedures were employed. The WSFO did not request any special scanning of the principal storm cell. These facts may reflect local operating approaches to minimize impacts on external, dial-up users of the Marseilles radar data. The physical separation of the radar and its operators from the WSFO exacerbates any communication, radar control, and interpretation problems.

Although several calls were made from MMO to WSFO Chicago as the severe thunderstorm was moving into its area of responsibility, no further phone calls were initiated to the WSFO during an extended period from 2:54 p.m. until 4:44 p.m., CDT. The reasons for this lack of communication and interaction between Marseilles staff and their WSFO are not clear. Nearby surveillance radar sites observed the very severe character of the radar echo of the principal storm (e.g., Moline, Illinois, and South Bend, Indiana) but also did not communicate their observations to WSMO Marseilles or WSFO Chicago.

Finally, the Marseilles WSR-74S radar was fitted with an experimental Doppler capability in 1983. On the afternoon of August 28, the high resolution fast fourier transform processor was inoperative, having been returned to the manufacturer for repairs (note that this processor is virtually a one-of-a-kind unit with no spares available). The lower resolution pulse pair processor was operating; however, even though the major gust front was progressing almost directly toward MMO, no velocities of any significance were detected. In discussing this particular Doppler upgrade with NOAA staff involved in its initial installation and evaluation, the DST concluded that the pulse pair processor at MMO has probably never functioned properly. The Doppler capabilities available at MMO on August 28 were very crude and operating in a degraded mode; comparisons with the WSR-88D radar are inappropriate.

The Chicago office, while not having to react to a rapid thunderstorm development directly in its responsibility area, did have problems in responding to the severe weather in a timely fashion. We have already noted that there was a low level of communication and direct interaction between key NWS offices. There was also very little timely spotter or damage information available to WSFO Chicago as the storm moved through its warning area. These are important aspects of the event, and they impacted the decision-making process at WSFO Chicago.

During severe weather episodes, the most senior forecaster, termed the "supervising forecaster," on duty is responsible for determining the staffing of

the severe weather desk. This forecaster is also responsible for overseeing and coordinating all warning and forecast activities during the shift. The DST interviews with WSFO Chicago staff indicate that these procedures were not fully implemented on August 28. The supervising forecaster, the DMIC, assumed responsibility for the severe weather desk--with assistance from an aviation meteorologist and the MIC. Because of the presence and direct involvement of senior station management, the forecaster at the public service desk did not become closely involved in the activities, products, and decision-making processes occurring at the severe weather desk. The DST feels that effective coordination among all the meteorologists at work at the WSFO did not occur during the critical period from 1:30 to 4:00 p.m., CDT.

The first two warnings issued by the WSFO were for areas located to the north and east of the actual storm track. A long period of time elapsed between the issuance of the warning for northern Kane County and the warning 51 minutes later for southern Du Page County. During this period, the principal thunderstorm echo was moving rapidly through southwestern Kane County, northeastern Kendall County, and into western Will County (refer to chapter 2). Some of the products issued, while correctly noting where the storm was located, gave incorrect storm movements or highlighted locations threatened that were not consistent with the stated storm movement. There were equipment factors that may have contributed to the apparent confusion concerning where the storm was and where it was moving. Several hardware and systems problems had to be dealt with by the WSFO staff during the period of intense thunderstorms. These are described below.

The WSFO had been experiencing database storage problems with AFOS and was running "modify" to correct them. This procedure requires AFOS to operate in data communications module (DCM)-degrade mode. The office returned to dual computer operation prior to issuing the watch redefining statement (i.e., before 2:00 p.m., CDT).

Prior to 3:00 p.m., CDT, the bell pager on the telephone "hotline" to MMO was not functioning. Commercial lines were used for communicating with MMO. The bell pager began to function again after 3:00 p.m., CDT.

After issuance of the 3:37 p.m., CDT, severe thunderstorm warning, the ADM, being used for message composition, became "flaky"--primarily dropping lines of text in product display and in message-composition preformat. During preparation of the 3:51 p.m., CDT, tornado warning message, the console became unusable, and another ADM was used for generic warning system (GWARN) preparation.

There are three different radar monitors available in the forecast operations area. The Kavouras display was working normally and displayed the low-level radar echoes accurately. However, the direct monitor display of the Marseilles radar PPI scope had a systematic northeastward displacement (5 to 7 miles) of the echoes relative to their true location. This is apparently a software problem that has been present since the equipment was installed in 1983. The staff of the WSFO is aware of this problem, and it has been dealt with via subjective, visual adjustments. This MMO monitor is the one most accessible to the severe weather desk and, in the midst of the hectic activities of the afternoon of August 28, may have contributed to the warning problems already discussed.

Finally, the public service desk forecaster stated that the RADID monitor was randomly picking up "out-of-sequence" PPIs, making it very difficult to follow the storm's movement.

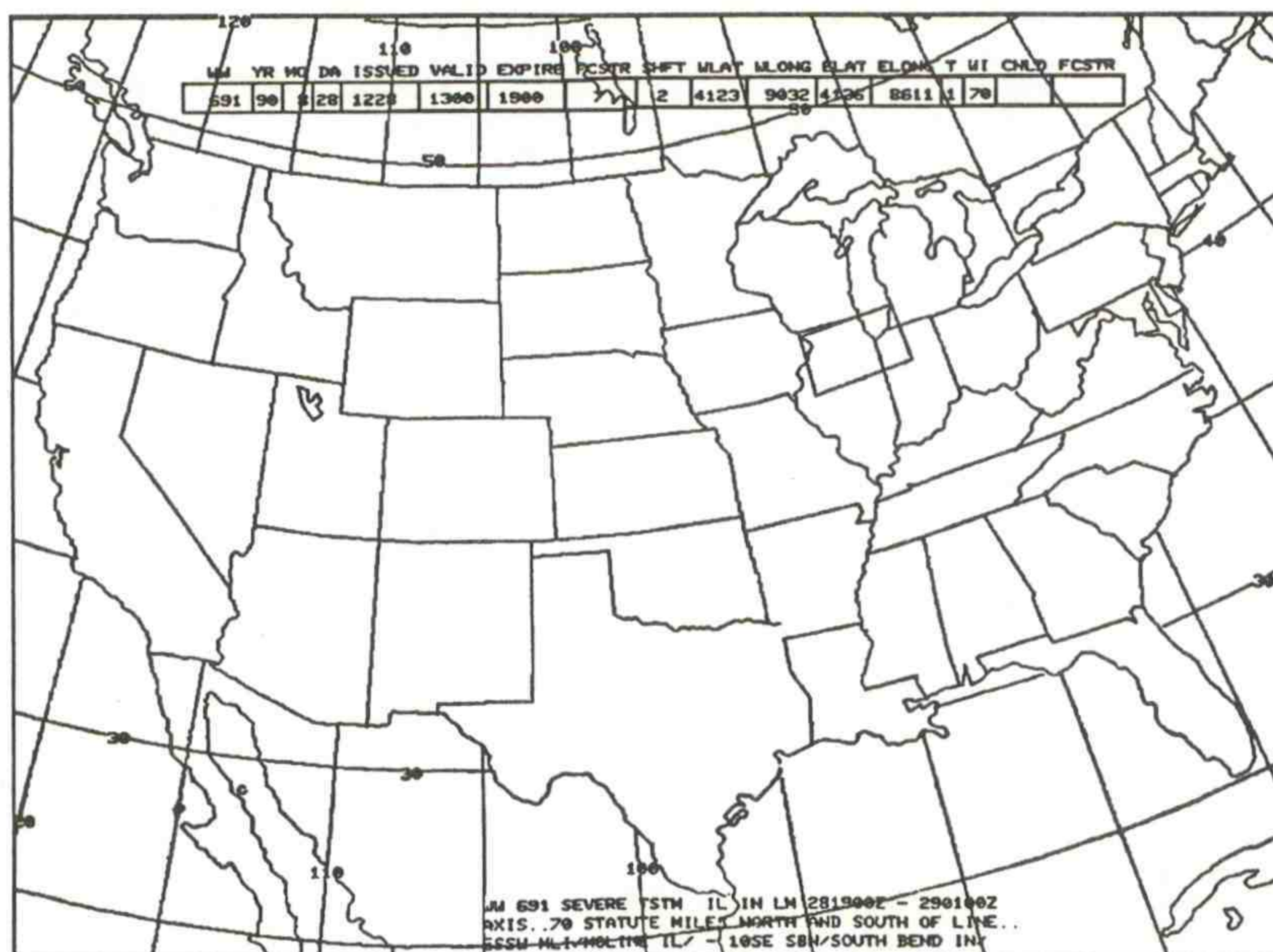
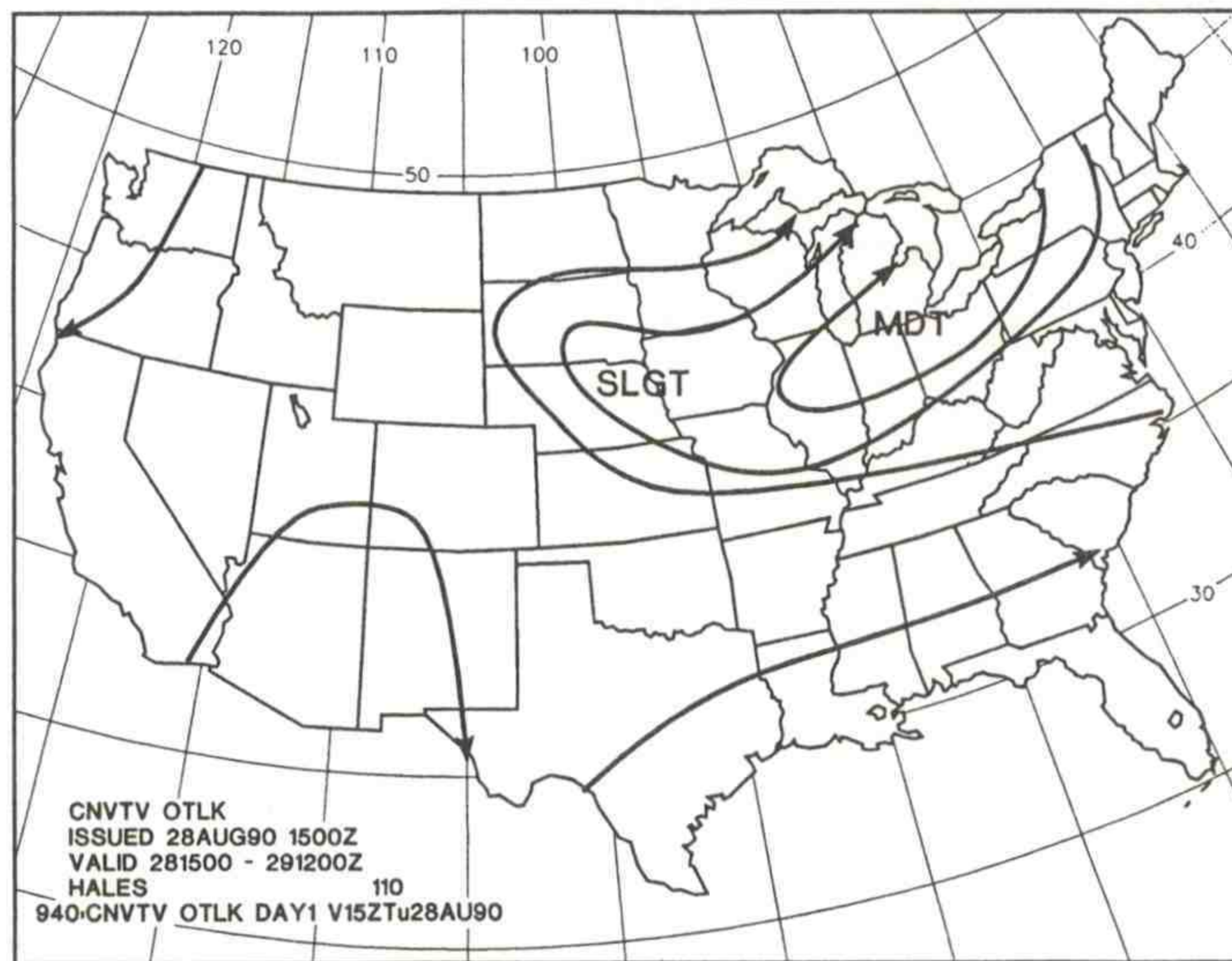
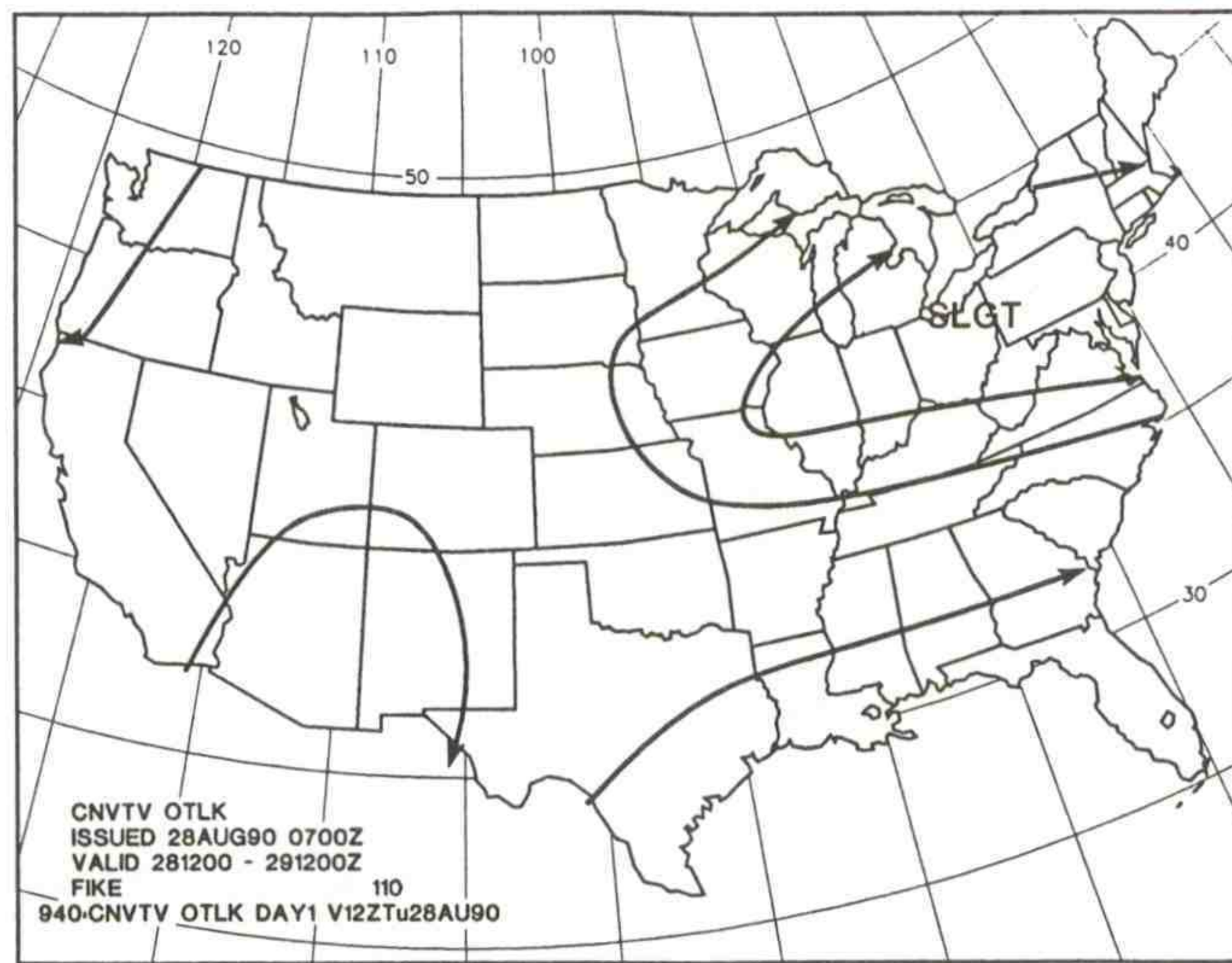


Figure 3.1 Map plots of the NSSFC convective outlooks issued at 0700 UTC (2:00 a.m., CDT) in the upper panel, issued at 1500 UTC (10:00 a.m., CDT) in middle panel and of the area covered by Severe Thunderstorm Watch #691 in bottom panel.

CHAPTER 4

PREPAREDNESS, DISSEMINATION, AND RESPONSE

The Chicago WSFO is directly responsible for severe weather warnings, weather preparedness, and warning coordination for 13 counties in northeastern Illinois and 2 counties in northwestern Indiana. The population of this area exceeds 7 million, making this one of the largest severe weather responsibilities in the NWS. Preparedness efforts at the Chicago office generally are directed at active user and emergency preparedness/disaster response group meetings to foster severe weather awareness and to accomplish training of severe thunderstorm spotters.

4.1 Preparedness--WSFO Chicago

Prior to 1990, WSFO Chicago local station severe weather drill procedures were handled very informally; a new and more formal drill approach has been initiated during the past year. There was a Spring 1990 severe weather program drill conducted at the office during March of 1990. The NWS requires at least an annual severe weather program drill at every WSFO. Also, there were June 1990 drills on using GWARN and July 1990 drills on GWARN and the Southern Region Warning System (SRWARN). There were no August drills. Reviews of the station duty manual (SDM) by forecaster staff had not occurred systematically during either 1989 or 1990.

Preparedness activities within the NWS, in general, are designed to focus on three primary activities: hazard awareness, severe weather spotter training, and warning coordination with emergency service agencies and the media. These activities are discussed for WSFO Chicago and northeastern Illinois in the following subsections and in section 4.2.

4.1a Hazard Awareness

The NWS has produced a number of slide presentations for use by local offices in presentations on the hazards posed by severe thunderstorms, tornadoes, flash floods, winter storms, etc. These presentations are designed for general audiences, i.e., civic groups, neighborhood associations, schools, etc. These presentations are

not technical and are given to increase public awareness of weather hazards and of protective actions which can be taken to prevent deaths and injuries.

The WSFO Chicago assigns these activities to the Port Meteorological Officer (PMO) and the WPM focal point forecaster. Because of lack of available time and the higher priority of spotter training and warning coordination activities, many NWS offices have essentially handed much of this responsibility over to other groups, e.g., local emergency management officials or local media meteorologists.

4.1b Severe Weather Spotter Training

Given the limited ability of existing NWS technology to detect and monitor the presence and intensity of severe weather phenomena, e.g., the inability of existing radars to detect directly the existence of a tornado, it is essential that remote-sensing observations be supplemented with ground truth observations of trained personnel. Thus, an important preparedness activity for NWS offices is conducting severe weather spotter training for a variety of groups.

The WSFO Chicago has been very active in conducting such training sessions--refer to appendix D for details. The sessions given have been typically to law enforcement, civil defense, and fire departments and to amateur radio groups. These presentations do reflect principally responses to requests for talks. Since the office does not have a staff position dedicated to preparedness activities, it was not able to develop an aggressive and proactive spotter and warning coordination program. The severe storm spotter network in the Chicago area, the Chicagoland Skywarn Association, is coordinated, and essentially maintained, by a single ham operators' radio club. Inquiries from potential storm spotters are routinely referred to the radio operators group.

While the DST was visiting WSFO Chicago, several members examined a storm spotter notebook maintained at the severe weather desk. They found that some of the numbers listed were no longer in service and that, generally, the spotter information was not current. It appears that the last substantial update of the spotter notebook had been made in 1979. Thus, the entire storm spotter program at WSFO Chicago relies heavily upon the efforts of the ham network. This aspect of the severe weather program may be reflected by the fact that most of the calls regarding severe weather on August 28 were actually initiated by off-duty employees of the NWS.

However, as will be noted in the next section, the training of groups on how to recognize severe weather phenomena is only one component of an effective spotter program. Equally important is the development of an integrated system to ensure that spotters are activated prior to the onset of severe storms and that reliable means exist to relay their observations to the NWS. The DST found no evidence

of the existence of such an integrated system in the counties impacted by the tornado. In the three counties in which interviews were conducted, no spotters had been activated and no reports of severe weather were relayed to WSFO Chicago. Despite the fact that 11 severe weather awareness talks and/or spotter training sessions were held in Kane and Will Counties during 1989 and 1990, an effective severe weather spotter system did not result.

4.1c Warning Coordination and Dissemination

The most important preparedness activity of the NWS is warning coordination with local emergency service agencies and the media. Evidence of this importance is the fact that in the modernized and restructured Weather Service each office will have a position dedicated to these activities. While the activities discussed in the two preceding sections essentially involve giving prepared presentations and fielding related questions, warning coordination requires much more interaction and discussion.

The purpose of warning coordination activities is to ensure that there is full understanding between NWS and local officials and media of how severe weather events will be handled. This activity should consist of regular discussions concerning how the NWS forecasts and detects severe weather, what products the NWS issues to indicate the potential or occurrence of severe weather, how these products are disseminated from the NWS, how these products are further disseminated by users who receive them, how local officials and the media should use these products, what types of "ground truth" events are important to the NWS, how reports of these severe weather events are relayed to the NWS, etc. In contrast to the two previous activities, the DST found no evidence that WSFO Chicago had engaged in warning coordination activities with officials in the area impacted by the tornado.

The ISP plays a pivotal role in the dissemination of severe weather warnings to county and municipal law enforcement agencies. The ISP is thus in an ideal position to collect and relay severe weather reports from the numerous law enforcement agencies in northeastern Illinois. Both ISP district offices visited by members of the DST indicated that they had never been visited by, nor discussed warning coordination issues with, anyone from WSFO Chicago. Likewise, county officials in Kane, Kendall, and Will Counties stated to the DST that they had not had any direct contact with NWS personnel for the past year or two. These officials did not know what procedures they should use to relay severe weather reports to WSFO Chicago. One official did not know how to call WSFO Chicago and another indicated that he was not aware of any need to relay such reports on to the Chicago WSFO.

4.2 Preparedness--External User Groups

The general response given to various members of the DST by external groups was that responses taken after the issuance of severe thunderstorm watches are minimal. Local emergency response groups and officials agreed that tornado watches and tornado warnings are the NWS products that are likely to evoke preparedness activities. None of the three counties in the Chicago area of responsibility that were seriously affected by the storm (i.e., Kane, Kendall, and Will) appear to have organized storm spotter groups. Officials in these counties depend heavily upon information from law enforcement units. Some specific details of local preparedness activities follow.

The ham radio spotter group, "Chicagoland Skywarn Association," activates whenever watches and warnings are issued by the NWS. The group monitors daily weather conditions and sometimes anticipates being needed so that they are ready to activate immediately. The group has a radio located at the WSFO and will man this station if requested by the WSFO staff. This position was not manned on August 28. The group maintains telephone contact with the WSFO if the radio is not manned. Members of the group appear to be well trained and motivated; however, they are clearly most easily available outside of normal working hours. Although the group has a substantial membership, most members live in Chicago or the near suburbs. Few Chicagoland Skywarn Association members live in the far western suburbs or in the counties affected by the storm on August 28.

Kane County relies upon road crews and building inspectors for storm reports during normal working hours and has about 26 volunteer employees for reporting at other times. The sheriff's deputies and local police are expected to alert the dispatchers if they experience or observe severe weather. The county has no plan for strategically deploying storm spotters. The Chicago WPM focal point forecaster spoke to three groups in Kane County during 1990. The annual program at the Fermilab is the largest severe weather awareness meeting of the year in the Chicago area.

Kane County subscribes to a private meteorological service to obtain weather information. Through this service, the Emergency Services and Disaster Agency (ESDA) director monitors images from the NWS MMO radar. The director also monitors NWR reports and spotter reports and makes telephone calls to WSO Rockford to keep current on threatening weather conditions. Each municipal government within the county appears to act somewhat autonomously with regard to severe weather.

Kendall County also has no formal, active storm spotter program; spotter training does not seem to have a high priority in the county. Several ham operators in the

county occasionally provide storm reports. There is an active spotter group in Sandwich, Illinois (DeKalb County) and their reports are monitored by the Kendall County ESDA director. County and local law enforcement officials are expected to be more alert to weather conditions during watches and warnings, but the county has no procedures for positioning units strategically. The ESDA director is a part-time position; however, the incumbent is a member of the county sheriff's department. Most sirens in Kendall County can be sounded either locally or by the ESDA director. There were no severe weather awareness interactions between the NWS and groups in Kendall County during 1990.

Will County has no organized storm spotter effort and relies upon law enforcement agencies, similar to the other two counties. The sounding of sirens is a local responsibility in Will County. Unfortunately, the Will County Sheriff's Office, perhaps because of lack of past interactions, confused the NWS with the media and refused to talk to the MIC immediately following the tornado.

All of the above information indicates an overall lack of coordinated, comprehensive, or integrated county-wide procedures or structures for preparing for or dealing with possible severe weather situations. The emphasis has clearly been upon emergency and disaster **response** functions, rather than preparedness, in the counties affected by the tornado.

4.3 Media Dissemination

The severe weather watch and warning information messages generated by the Chicago and Rockford NWS Offices appear to have been well disseminated during the afternoon of August 28. However, representatives from most media outlets in the Chicago area stated that they give less emphasis to severe thunderstorm products than they do to tornado watches and warnings.

Those media outlets relying on NWR and NWWS appear to have used them effectively (refer to appendices C-2 and C-3). Three of the five 50,000 watt Chicago radio stations subscribe to the NWWS. Similarly, two Rockford TV stations and three Chicago TV stations subscribe to the service. Because of the cost of NWWS, it is often not used by smaller media outlets, e.g., none of the radio stations in Joliet subscribe. Except for WIFR-TV in Rockford, there were no complaints about NWWS service on August 28. This station complained that information flows much too slowly over the Contel system of distribution for NWWS.

The severe storms of August 28 occurred within the service area of two NWR stations operated in northern Illinois by the NWS. The transmitter for the station programmed by WSO Rockford is located 25 miles southwest of Rockford, near Oregon, Illinois. The transmitter for the station programmed by WSFO Chicago is

located on the Sears Tower in downtown Chicago. Of all the media outlets contacted, only two Joliet radio stations used NWR as a primary source of severe weather information. Several other stations do use NWR as a backup.

Media representatives were contacted at nine TV stations (five in Chicago, three in Rockford, and one in Joliet). The television stations generally broadcast the NWS severe weather watches and warnings promptly. All of the TV stations responded by at least airing crawlers, and some said that they had cut in with live reports. Most of the stations felt that they had a good working relationship with the NWS and that NWS personnel were cooperative when contacted for information and interviews. Additional details are provided in appendix C.

The DST contacted nine radio stations. Four of these were in Joliet and the other five were 50,000 watt outlets in Chicago. All stations except for two Joliet outlets broadcast Severe Thunderstorm Watch #691. All stations but one broadcast the warnings that were issued. However, three of the Joliet stations lost power shortly after they broadcast the 3:37 p.m., CDT, severe thunderstorm warning; the other station in Joliet lost power before this warning could be broadcast. Again, see appendix C for additional details.

4.4 User Response

Because the county ESDAs take little action in response to a severe thunderstorm watch and because there were no severe thunderstorm or tornado warnings issued for the affected counties prior to the tornado, there is little to report regarding user response. Most officials with whom we talked felt that the storm had "struck without warning" and emphasized that their groups would have responded in some way to a tornado watch or warning. The ESDA directors of the three affected counties were generally unaware of the critical need for storm information to flow from their counties to the NWS. Thus, most of the actual storm reports received at the WSFO came from off-duty employees or from the ISP.

Public education on storm awareness and personal protective actions to be taken if a tornado occurs appear to have been quite successful. Tornado safety week activities and Plainfield High School's extensive safety drills proved lifesaving in a number of instances. This is likely the reason for a relatively low death toll from a large area of very great destruction. Several people saved lives by having family members and children take refuge in interior bathrooms. A teacher at Plainfield High instinctively fell into the protective position practiced in the safety drills and received only cuts and bruises.

APPENDIX A

CHRONOLOGY OF RELEASES RELATED TO THE PLAINFIELD/CREST HILL TORNADO

The following are the products issued by several Illinois National Weather Service offices and the National Severe Storms Forecast Center on the August 28, 1990. Each release is reproduced **exactly** as it was disseminated. Releases from the Indianapolis WSFO which discussed the severe weather in Illinois are also reproduced here.

A-1: Releases of the National Severe Storms Forecast Center

A-1.1: Convective Outlook

CHISWODY1:

ACUS1 KMKC 280614
MKC AC 280700

CONVECTIVE OUTLOOK...REF AFOS
NMC GPH940

VALID 281200 - 291200Z

REF WW 687 TIL 08Z AND WW 688 TIL
09Z.

THERE IS A SLGT RISK OF SVR TSTMS
MAINLY THIS AFTN AND EVE TO THE
RGT OF A LN FM ORF 50 S EKN CVG
BMG 50 S UIN IRK OTM MSN
OSC...CONT..ART GFL 20 N BOS.

GEN TSTMS FCST TO THE RGT OF A LN
FM 40 N 40M DLS MFR CEC...CONT...20 S
IPL IPL SGU 4HV MTJ ALS ROW 80 W
MRF...CONT...20 SSE DRT ACT SHV MEI
MGM SAV...CONT...HAT TRI CKV SGF
EMP GRI HON MSP MQT 20 NE MQT.

UPR LVL FLOW FCST TO BCM WNWLY
ACRS THE GRTLKS AND THE NRN AND
MID ATLC STATES AS UPR RIDGE
BUILDS WWD INTO THE ROCKIES. STG
BAND OF MID LVL WINDS FCST ACRS
THE LWR GRTLKS WITH 500 MB WINDS
BTWN 40 AND 50 KTS. AMS WL BE
MOIST AND VRY UNSTBL FM WRN SXNS

OF PA/NY EWD ACRS THE SRN
GRTLKS INTO THE MID MS VLY. SFC
DEWPNTS IN THE 70S AND LIFTED
INDICES BTWN MINUS 8 AND MINUS 10
ARE LKLY ACRS THIS RGN. EXPC SVR
TSTMS TO DVLP ALG AND AHD OF
CDFNT FM MI SWWD ACRS SRN W/WRN
IL/NWRN IND DURG THE AFTN HRS
WITH ACTVTY MOVG RAPIDLY ESEWD
INTO OH/WRN PA/WRN NY UNDER STG
WNWLY FLOW ALF. ISOLD SVR TSTMS
MAY DVLP AS FAR W AS ERN IA/NERN
MO...HOWEVER EXPC WRM MID LVL
TEMPS TO LIMIT SVR TSTM POTENTIAL
FURTHER W ALG CDFNT OVR
MO/IA/SERN NEB/NERN KS.

MCC CURRENTLY OVR SERN
MI/ONTARIO/WRN NY XPCD TO SLOLY
WKN. OUTFLOW BNDRY LEFT BHND BY
MCC MAY SERVE TO FOCUS LOW LVL
CNVGNC FM NY/PA/WV EWD TO SRN
NEW ENG AND THE MID ATLC STATES.
DIFFLUENT UPR FLOW WL ENHANCE
UVV ACRS THIS AREA. ISOLD SVR
TSTMS FCST TO DVLP INVOF BNDRYS
OVR NY/PA/NRN WV AND MOVE ESEWD
TWD THE ATLC CST. CIRRUS SHIELD
FM MCC MAY LMT DEGREE OF INSTBY
ACRS NY/SRN NEW ENG...HOWEVER
EXPC SUF INSTBY FOR ISOLD SVR TSTM
DVLPMNT.

..FIKE.. 08/28/90

MKC AC 281500

CONVECTIVE OUTLOOK...REF AFOS
NMC GPH940

VALID 281500 - 291200Z

THERE IS A MDT RISK OF SVR TSTMS
THIS AFTN AND TNGT OVR PTNS OF
NRN IL...SRN MI...NRN IN...NRN OH...N
AND W PA...AND WRN NY. THIS
INCLUDES AREA TO RT OF LN FM ART
ELM PIT CMH IND SPI BRL MLI RFD 30
NE MBS.

THERE IS A SLGT RISK OF SVR TSTMS
SURROUNDING THE MDT AREA TO RT
OF LN FM BTV POU CXY MGW EVV VIH
GVW GRI VTN PIR HON ALO GRB PLN.

GNL TSTMS TO RT OF LN FM HAT TRI
SGF RSL LBF 4MC BIS STC RHI
MQT...CONT...DRT ACT SHV MGM
NBC...CONT...IPL EED CDC 4HV MTJ ALS
50 W MRF...CONT...40 N 40M YKM RDM
CEC.

SIG CHGS UNDERWAY IN LRG SCALE
FLOW OVR CNTR/ERN U.S. WITH STG
WLYS ACRS TOP OF PLAINS HI TO TURN
MORE NWLY BRINGING HGT FALLS AND
MID LVL CD ADVCN WITH IT. THIS
WILL MAKE FOR MORE EFFECTIVE
RELEASE OF VERY UNSTBL AMS STILL
POSITIONED AHD OF WK CD FNT FM
NRN MI TO NEB. SNDGS THIS AM HV
VERY IMPRESSIVE POS AREAS WITH
FNT MOST UNSTBL WITH A MINUS 14 LI.
WITH LWR LVL FLOW BCMG WLY AND
RATHER WK...FOCUSING OF INITIAL
DVLPMNT STILL SOMEWHAT IN DOUBT.
A FAST MVG S/WV TRF IS EVIDENT OVR
UPR MS VLY AND SHLD PROVIDE SM
UVV IN WEAKLY CNVGNT FNTL ZN. SVR
TSTMS SHLD DVLP DURG AFTN NR AND
AHD OF FNT OVR LWR GRT LAKES AND
MV RPDLY ESEWD THRU NRN OH VLY
AND ERN GRT LAKES WITH AN MCC
LIKELY. OTR DVLPMNT EXPCD IN
INCRGLY NWLY FLOW OVR PLAINS ALG
AND N OF FNT WHERE POOLING OF
VERY HI DPTS AND UPSLOPE WILL AID
SVR TSTM DVLPMNT. MINUS 8 LI AT
RAP AT 12Z REFELCTS THIS PNTL
INSTBLTY. STMS COULD CONT MUCH

OF NGT SEWD INTO LWR MO VLY
WHERE STG MID LVL COOLING AND
INCRG MID LVL NWLY FLOW WILL BE
OCCURRING. QUICK LOOK AT NEW LFM
HAS VORT MAX DROPPING SEWD THRU
PLAINS THIS AFTN AND TNGT WHICH
COULD RESULT IN MORE ACTIVE SVR
THAN FCSTD THRU PLAINS BUT WILL
WAIT FOR NEW NGM BEFORE
UPGRADING.

..HALES.. 08/28/90

CHISWODY1:
ACUS1 KMKC 281836
MKC AC 281900

CONVECTIVE OUTLOOK...REF AFOX
NMC GPH940

VALID 281900 - 291200Z

REF WW 689 TIL 00Z..WW 690/691 TIL
01Z...AND WW 692 TIL 02Z.

THERE IS A MDT RISK OF SVR TSTMS
THIS AFTN AND TNGT OVR PTNS OF
NRN/CNTRL IL...SRN MI...NRN/CNTRL
IND...NRN/CNTRL OH...N AND W PA
...MUCH OF NRN MO..SRN HLF IA..AND
ERN NEB. THIS INCLUDES THE AREA
TO THE RT OF A LN FM 10 N PBG ALB
AVP AOO ZZV HUF STJ LNK OLU OFK
SUX CID RFD 20 NE MBS.

THERE IS A SLGT RISK OF SVR TSTMS
SURROUNDING THE MDT AREA TO RT
OF LN FM 60 NNE MPV HVN NEL HGR
EVV VIH TOP BBW 10 SW RAP 10 NW RAP
ABR 20 N RWF LNR MTW PLN.

GNL TSTMS TO RT OF LN FM HAT TRI
SGFRSL LBF 4MC BIS STC RHI
MQT...CONT...DRT ACT SHV MGM
NBC...CONT...IPL EED CDC 4HV MTJ ALS
50 W MRF...CONT...40 N 40M YKM RDM
CEC.

SVR TSTMS HV RPDLY FORMED IN SVRL
AREAS FM WRN SD THRU NRN IL. AMS
IS EXTRMLY UNSTBL FM CNTRL IA
THRU LWR MI AS SFC DWPTS RMN IN
THE LOW/MID 70S AND MID LVL TEMPS
BGN TO COOL IN RESP TO SHRTWV

TROFS DROPPING SEWD INTO THE RGN. SVR CELL NR RFD IS RPDLY INCRG IN SIZE ALG FNTL BNDRY WITH STG TSTMS ALSO DVLPG OVR NRN IND. EXPC ORGANIZED BAND OF SVR TSTMS TO EVENTUALLY DVLPG..PSBLY INTO A DERECHO..AND CONT MOVG RPDLY ESEWD ACRS NRN IL/NRN IND AND NRN OH THIS AFTN.

SHRTWV TROF MOVG ESEWD ACRS GRTLKS THIS AFTN/EVE IS EXPCD TO ENHNC UVV OVR EXTRMLY UNSTBL AMS OVR MI AND RESULT IN RPD SVR TSTM DVLPM. STRENGTH OF MID LVL WIND FIELD AND DEGREE OF INSTBY SUGS ISOLD TORNADOES ARE PSBL OVR THIS AREA.

ANOTHER SHRTWV TROF MOVG RPDLY SEWD ACRS THE NRN PLAINS THIS AFTN IS BEST DEPICTED BY 12HR NGM. SVR TSTMS ALREADY DVLPG IN RESP TO THIS SYS OVR SD WHERE STG MID/UPR LVL FLOW IS RPDLY SHEARING TOPS OFF CNVTN. EXPC THIS ACTVTY TO CONT SVR AND DVLPG ESEWD INTO E-W MOIST AXIS WHICH EXTDS FM CNTRL NEB THRU CNTRL IA. ALTHOUGH AMS IS VERY UNSTBL IT IS CURRENTLY CAPPED OVR THIS AREA BUT PROGS FCST STG COOLING ALOFT MOVG INTO THIS RGN WHICH WILL ALLOW FOR RPD DVLPM OF SVR STORMS BY EVE.

RPD TSTM DVLPM FM LK HURON EWD ACRS SE ONTARIO IS EXPCD TO CONT AND RCH SVR LIMITS BEFORE RCHG NRN LK ERIE..LK ONTARIO..AND WRN NY. AMS HAS RPDLY DSTBLZD OVR PA/NY THIS AFTN AND CONDITONS ARE NOW FVRBL FOR DVLPM OF AN MCS OR DERECHO OF MOV ACRS MUCH OF NY AND PA LT THIS AFTN AND EVE.

...July.. 08/28/90

A-1.2: Mesoscale Discussion

..JULY.. 08/28/90

:419,0849 424,0904 404,0905
400,0854:ACUS3 KMKC 28180
MKC MCD 281810

SELS MESOSCALE DISCUSSION FOR ...SE WI/NRN IL/NW IN... CONCERNING... SEVERE THUNDERSTORM POTENTIAL TSTMS ARE DVLPG RPDLY ALG SFC CDFNT NR THE IL/WI BDR N/NW OF RFD. AMS IS XTRMLY UNSTBL AHD FNT AND INCRG MID LVL WIND FIELD WILL ENHANCE VERT SHEAR PROFILE AND INCR SVR POTENTIAL. XPC TSTM TO CONT INTSFYG AND BECOME SVR DURG THE NEXT HR...WITH GREATEST THREAT ACRS NRN IL/NW IN THRU 21Z. ISOLD CELLS MAY REACH SVR LVLS ALG/SE OF A JVL/MKE LN ALTHO THESE STMS WILL MOVE OUT OF WI BTWN 19-1930Z. PRIND WW WILL BE NEEDED SHORTLY ACRS NRN IL/NW IN.
..SAMMLER.. 08/28/90

A-1.3: Watch

Note: NSSFC issued many other watches for the central and eastern United States that are not reproduced here. Severe Thunderstorm Watch #691 was the only watch that affected northern Illinois during the afternoon of August 28, 1990.

MKCSEL1

WWUS9 KMKC 281828
MKC WW 281828
ILZ000-INZ000-LMZ000-290100-

BULLETIN - IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WATCH
NUMBER 691
NATIONAL WEATHER SERVICE KANSAS
CITY MO
128 PM CDT TUE AUG 28 1990

.A..THE NATIONAL SEVERE STORMS
FORECAST CENTER HAS ISSUED A
SEVERE THUNDERSTORM WATCH FOR

NORTHERN AND PARTS OF
CENTRAL ILLINOIS
PORTIONS OF NORTHWEST
INDIANA
AND PARTS OF SOUTHERN LAKE
MICHIGAN

EFFECTIVE THIS TUESDAY AFTERNOON
AND EVENING UNTIL 800 PM CDT.

LARGE HAIL...DANGEROUS LIGHTNING
AND DAMAGING THUNDERSTORM
WINDS ARE POSSIBLE IN THESE AREAS.

REMEMBER...A SEVERE
THUNDERSTORM WATCH MEANS
CONDITIONS ARE FAVORABLE FOR
SEVERE THUNDERSTORMS IN AND
CLOSE TO THE WATCH AREA. PERSONS
IN THESE AREA SHOULD BE ON THE
LOOKOUT FOR THREATENING
WEATHER CONDITIONS AND LISTEN
FOR LATER STATEMENTS AND
POSSIBLE WARNINGS.

\$\$

C.. A FEW SVR TSTMS WITH HAIL SFC
AND ALF TO 3 IN. EXTRM TURBC AND
SFC WND GUSTS TO 70 KNOTS. A FEW
CBS WITH MAX TOPS TO 550. MEAN
WIND VECTOR 28035.

D... TSTMS DVLPG RPDLY ALG CD FNT
N/IL BDR. WITH AMS XTRNY UNSTBL
AND STG JET ACRS AREA...STMS SHLD
BCM RPDLY SVR AS THEY MV/DVLP
ESEWD INTO NRN IL/NWRN IN.

E....OTR TSTMS.. CONT WW 689 690.

...HALES

A-1.4: Tornado and Severe Thunderstorm Reports

WWU560 KMKC 291038

NSSF C TORNADO AND SEVERE THUNDERSTORM REPORTS
PRELIMINARY LIST-INTERNAL DISSEMINATION ONLY
FOR 06CST TUE AUG 28 1990 THRU 06CST WED AUG 29 1990

EVENT	LOCATION	REMARKS	(CST)TIME
2	*TORN NR PECATONICA IL (14 WNW RFD)	(---)	28/1240
	TREES DOWN...CARS LIFTED OFF GROUND.	RFD/TOR	4230 8935
31	*TORN PLAINFIELD IL (29 ENE MMO)	(WS# 691)	28/1430
	15 DEAD 350 INJ HIGH SCHOOL AND MANY HOMES	DSTDCHI/LSR	4160 8820
15	*TORN CREST HILL IL (30 ENE MMO)	(WS# 691)	28/1445
	11 DEAD APT COMPLEX HIT.....MANY INJURIES...CHI/TOR		4156 8815
67	*TORN 43 WSW DETROIT MI (15 SW ARB)	(WT# 689)	28/1605
	BRIEF TORND AO TOUCHDOWN.	DTW/LSR	4206 8396
68	*TORN DUNDEE MI (19 SSE ARB)	(WTN 689)	28/1610
		DTW/LSR	4195 8365
9	A175 13 SW SAULT STE MARIE MI (11 SW SSM)	(---)	28/1045
		SSM/LSR	4635 8455
10	WNDG 13 SW SAULT STE MARIE MI (11 SW SSM)	(---)	28/1045
		SSM/LSR	4635 8455
8	A100 12 SSE SAULT STE MARIE MI (12 SE SSM)	(---)	28/1055
		SSM/LSR	4631 8421
4	A250 (RFD) GTR ROCKFORD ARPT IL	(WS# 691)	28/1310
	ALSO...GOLFBALL HAIL IN SOUTHEAST ROCKFORD.	RFD/LSR	4220 8910
5	WBDG SRN SOUTH BEND IN (4 ESE SBN)	(WS# 691)	28/1315
	BLDG DMGD...POWER LINES DOWN	\$SBN/SVS	4166 8625
53	WNDG 5 S SOUTH BEND IN (8 SSE SBN)	(WS# 691)	28/1318
	1 DEAD 1 INJ HOUSE UNDER CONSTR. COLLAPSED.	SBN/LSR	4158 8625
7	WNDG NAPPANEE IN (23 SE SBN)	(WS# 692)	28/1340
	LRG TREES DOWN	SBN/SVR	4145 8600
55	G 50 GOSHEN IN (26 ESE SBN)	(WS# 692)	28/1345
	ALSO.;LARGE TREE DOWN ON HOUSE 8 SE GOSHEN.	SBN/LSR	4158 8583
6	A100 NR SYCAMORE IL (26 SE RFD)	(WS# 691)	281350
		CHI/SVS	4198 8868
20	A175 1 N DEKALB IL (24 SE RFD)	(WS# 691)	28/1354
		RFD/LSR	4195 8875
12	A 75 AURORA IL (33 NE MMO)	(WS# 691)	28/1400
		\$CHI/SVR	4176 8831
56	WNDG 10 SSW SOUTH BEND IN (12 S SBN)	(WS# 691)	28/1407
	TREES AND POWER LINES DOWN.	SBN/LSR	4151 8633
57	WNDG 5 5 NAPPANEE IN (28 SE SBN)	(WS# 692)	281411
	TREES AND POWER LINES DOWN.	SBN/LSR	4136 8600
11	WNDG DEKALB IL (25 SE RFD)	(WS# 691)	28/1420
	TREES/POWER LINES DOWN	RFD/SVS	4193 8875
28	A125 AURORA IL (33 NE MMO)	(WS# 691)	28/1427
		CHI/LSR	4176 8831
29	WNDG AURORA IL (33 NE MMO)	(WS# 691)	28/1427
	LARGE TREE LIMBS DOWN.	CHI/LSR	4176 8831
13	WNDG NR OSWEGO IL (27 NE MMO)	(WS# 691)	28/1438
	TRAILER FLIPPED OVR	CHI/SVS	4168 8835
30	WNDG SYCAMORE IL (26 SE RFD)	(WS# 691)	28/1440
	TREES DOWN.	CHI/LSR	4198 8868
14	A250 NR JOLIET IL (32 ENE MMO)	(WS# 691)	28/1445
		CHI/LSR	4153 8810
58	A100 3 SE GOSBEN IN (29 ESE SBN)	(WS# 692)	28/1448
		SBN/LSR	4155 8578
19	A175 5 5 DEMOTTE IN (50 NNW LAF)	(WS# 691)	28/1527
		IND/SVS	4111 8720
16	A200 AURORA IL (33 NE MMO)	(W54 691)	28/1530
	RPTS OF MANY CARS DMGD		
41	WNDG AURORA IL (33 NE MMO)	(WS# 691)	28/1530
	APRXLY 14 AIRCRAFT OVERTURNED OR DMGD...HANGARS DSTRYD.	CHI/LSR	4176 8831
18	A 75 NR ADRIAN MI (25 NNW TOL)	(WT# 689)	28/1535
		DTW/SVR	4190 8403
66	WNDG LENA WEE CO MI (26 NNW TOL)	(WT# 689)	28/1545
	LRG TREES UPROOTED AND PWR LNS DWN.	DTW/LSR	4190 8406

93	WNDG	FULTON CO OH	(17 W TOL)	(WS# 692)	28/1605
		TREES DWN.		CLE/SVS	4161 8413
21	A 88	JASPER CO IN	(42 NNW LAF)	(WS# 691)	28/1610
		RPTD NR JELLYSTONE PARK.....NRN JASPER CO.		IND/SVR	4101 8710
69	A 75	MONROE CO MI	(22 SSW DTW)	(WT# 689)	28/1615
				DTW/LSR	4190 8345
70	G 52	MONROE CO MI	(22 SSW DTW)	(WT# 689)	28/1615
				DTW/LSR	4190 8345
71	A 75	LENAWEE CO MI	(26 NNW TOL)	(WT# 689)	28/1615
				DTW/LSR	4190 8406
72	G 52	LENAWEE CO MI	(26 NNW TOL)	(WT# 689)	28/1615
				DTW/LSR	4190 8406
54	A150	BRIDGMAN MI	(14 SSW BEH)	(WS# 691)	28/1623
				SBN/LSR	4193 8655
17	A100	6 NE COLUMBIA CITY IN	(20 NNW FWA)	(WS# 692)	28/1630
				FWA/SVS	4123 8538
23	WNDG	MONON IN	(30 N LAF)	(WS# 691)	28/1633
		TREES DOWN.		IND/SVS	4086 8686
74	A100	REDFORD MI	(13 NNE DTW)	(WT# 689)	28/1645
				DTW/LSR	4241 8328
24	WNDG	ROYAL CENTER IN	(38 NE LAF)	(WS# 691)	28/1652
		TREES AND POWER LINES DOWN.		IND/SVS	4086 8650
25	WNDG	LOGANSPOUT IN	(37 NE LAF)	(WS# 691)	28/1652
				IND/SVS	4075 8635
26	A 88	1 E CAMDEN IN	(25 ENE LAF)	(WS# 691)	28/1703
				IND/SVS	4061 8651
73	WNDG	25 SW DETROIT MI	(14 SSW DTW)	(WT# 689)	28/1738
		LRG TREES UPROOTED.		DTW/LSR	4203 8346
92	G 52	ANSONIA OH	(30 NW DAY)	(WS# 692)	28/1820
				DAY/SVR	4021 8463
63	G 83	DARKE CO OH	(26 NW DAY)	(WS# 692)	28/1830
				CLE/SVS	4014 8460
81	A150	1 N SUMMITVILLE IN	(14 WNW MIE)	(WS# 692)	28/1900
				ND/SVR	4035 8563
64	A 88	KOKOMO IN	(41 WNW MIE)	(WS# 692)	28/1910
				IND/SVR	4048 8613
62	WNDG	SPRINGFIELD ARPT OH	(20 ESE DAY)	(WS# 698)	28/1916
		TWO-FOOT TREES SNAPPED IN HALF.		CLE/SVS	3983 8383
61	A 75	NR CONNERSVILLE IN	(43 SSE MIE)	(WS# 696)	28/1947
				IND/SVS	3964 8513
40	A175	ANDERSON IN	(18 SW MIE)	(WS# 696)	28/2012
				IND/SVS	4010 8568
33	A 75	MIDDLETOWN IN	(15 SSW MIE)	(WS# 696)	28/2013
				IND/SVS	4005 8553
34	WNDG	MIDDLETOWN IN	(15 SSW MIE)	(WS# 696)	28/2020
		TREES DOWN.		IND/SVS	4005 8553
79	WNDG	ERN HAMILTON CO IN	(26 NNE IND)	(WS# 696)	28/2037
		NMRS TREES DWN.		IND/SVR	4006 8605
80	WNDG	RUSHVILLE IN	(43 S MIE)	(WS# 696)	28/2100
		NMRS TREES DWN. TREE DWN ON POLICE CAR.		IND/SVS	3961 8545
77	WNDG	NRN HANCOCK CO IN	(28 ENE IND)	(WS# 696)	28/2128
		TREES DWN.		IND/SVS	3981 8576
78	WNDG	SRN FAYETTE CO IN	(43 SSE MIE)	(WS# 696)	28/2133
		SVRL TREES UPROOTED.		IND/SVS	3964 8516
76	A 75	NR FISHERS IN	(22 NE IND)	(WS# 696)	28/2145
				IND/SVS	3996 8601
75	A 75	SE HENRY CO IN	(21 5 MIE)	(WS# 696)	28/2220
				IND/SVS	3993 8536

A-2: Releases of WSO Rockford

A-2.1: Warnings and Statements

NNNNZCZC CHISPSRFD

ETTAA00 KRFD 281812 COR
ILZ001-002-281900-

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
105 PM CDT TUE AUG 28 1990

...TUNDERSTORMS DEVELOP OVER
EXTREME NORTHERN ILLINOIS...

AT 1 PM A CLUSTER OF STRONG
THUNDERSTORMS HAVE DEVELOPED
RAPIDLY OVER EXTREME NORTHERN
ILLINOIS. THE STORMS WERE LOCATED
NORTH OF A LINE FORM ORANGEVILLE
TO DURAND TO ROCKTON NEAR THE
ILLINOIS WISCONSIN BORDERS THEY
WERE WERE MOVING TO THE EAST
SOUTHEAST AT 30 MPH.

BREIF HEAVY RAINFALL STRONG
GUSTY WINDS AND SMALL HAIL CAN BE
EXPECTED WITH THESE STORMS.
PERSONS NEAR THOSE AREAS SHOULD
BE ON ALERRT FOR RAPIDLY
CHANGING CONDITIONS.

LIBRIZZI
ATT:ISP...1..16..2

NNNNZCZC CHISPSRFD
ETTAA00 KRFD 281826
ILZ001-002-281900-

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
125 PM CDT TUE AUG 28 1990

...STRONG THUNDERSTORM OVER
EXTREME NORTHERN ILLINOIS...

AT 120 PM RADAR INDICATED A STRONG
THUNDERSTORM JUST SOUTH OF
DURAND ABOUT 20 MILES NORTHWEST

OF THE CITY OF ROCKFORD MOVING
TOWARDS THE EAST AT 30 MPH. THIS
STORM WILL BRING BRIEF HEAVY
RAINFALL ALONG WITH STRONG GUSTY
WINDS AND SMALL HAIL. THE STORM
WILL MOVE THROUGH THE
NORHTERRN PORTIONS OF THE CITY OF
ROCKFORD INTO BOONE COUNTY BY 2
PM.

PERSONS IN OR NEAR NEAR THOSE
AREAS SHOULD BE ON ALERT RAPIDLY
CHANGING CONDITIONS.

LIBRIZZI
ATT:ISP...1..16..2

NNNNZCZC CHITORRFD
E:IL,MI:TTAA00 KRFD 281839
ILC201-007-037-281930-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED/EBS ACTIVATION
REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE
ROCKFORD IL
139 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A TORNADO WARNING
EFFECTIVE UNTIL 230 PM CDT FOR
PEOPLE IN THE FOLLOWING COUNTIES

IN THE NORTH CENTRAL PART OF
ILLINOIS SOUTHERN WINNEBAGO
...SOUTHERN BOONE...NORTHERN
DEKALB

AT 140 CDT THIS AFTERNOON A
TORNADO WAS REPORTED ON THE
GROUND NEAR PECATONICA ILLINOIS
IN WEST WINNEBAGO COUNTY...ABOUT
15 MILES WEST OF ROCKFORD. IT WAS
MOVING SOUTHEAST.

SOME COMMUNITIES THAT WILL BE
AFFECTED BY THIS TORNADO...
ROCKFORD...LOVES PARK...MACHESNEY
PARK...BELLEVIDERE...AND DEKALB

PERSONS IN THE PATH OF THIS DANGEROUS STORM TAKE COVER IMMEDIATELY IN A BASEMENT OR SMALL CENTRAL INTERIOR ROOM ON THE LOWEST FLOOR. ABANDON CARS... FARM MACHINERY AND MOBILE HOMES FOR REINFORCED BUILDING. IF OUT-OF-DOORS GO TO A REINFORCED SHELTER OR DITCH... CULVERT OR RAVINE. THIS IS A SERIOUS SITUATION... YOUR LIFE MAY DEPEND ON HOW QUICKLY YOU RESPOND TO THIS TORNADO WARNING!

ATTN: ISP DIST 1..2..16 FIELDS

NNNNZCZC CHITORRFD
ETTAA00 KRFD 281902 COR
ILC141-281930-

BULLETIN -- IMMEDIATE BROADCAST REQUESTED/EBS ACTIVATION REQUESTED TORNADO WARNING ...CORRECTED FOR TIME... NATIONAL WEATHER SERVICE ROCKFORD IL
157 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS ISSUED A TORNADO WARNING EFFECTIVE UNTIL 230 PM CDT FOR PEOPLE IN THE FOLLOWING COUNTY

IN THE NORTH CENTRAL PART OF ILLINOIS
OGLE

AT 158 PM CDT A FUNNEL CLOUD WAS REPORTED HEADED TOWARD BYRON IN OGLE COUNTY ILLINOIS...ABOUT 15 MILES SOUTHWEST OF ROCKFORD ILLINOIS.

SOME COMMUNITIES THAT WILL BE AFFECTED BY THIS TORNADO... BYRON...AND OREGON.

PERSONS IN THE PATH OF THIS DANGEROUS STORM TAKE COVER IMMEDIATELY IN A BASEMENT OR SMALL CENTRAL INTERIOR ROOM ON THE LOWEST FLOOR. ABANDON CARS...

FARM MACHINERY AND MOBILE HOMES FOR REINFORCED BUILDING. IF OUT-OF-DOORS GO TO A REINFORCED SHELTER OR DITCH... CULVERT OR RAVINE. THIS IS A SERIOUS SITUATION... YOUR LIFE MAY DEPEND ON HOW QUICKLY YOU RESPOND TO THIS TORNADO WARNING!

ATTN: ISP DIST 1..2..16 FIELDS

NNNNZCZC CHISVSRFD
ETTAA00 KRFD 281919
ILZALL-281945-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
215 PM CDT TUE AUG 28 1990

...A TORNADO WARNING REMAINS IN EFFECT TILL 230 CDT FOR THE FOLLOWING ILLINOIS COUNTIES... EASTERN OGLE...SOUTHERN BOONE... AND NORTHERN DEKALB...

...THE TORNADO WARNING HAS BEEN CANCELED FOR WINNEBAGO AND WESTERN OGLE COUNTIES AS OF 215 CDT THIS AFTERNOON...

AT 215 CDT THIS AFTERNOON A POSSIBLE TORNADO WAS LOCATED ALONG THE NORTHEAST OGLE/ NORTHWEST DEKALB COUNTY LINE MOVING TOWARD THE SOUTHEAST. THIS IS ABOUT 15 MILES SOUTHEAST OF ROCKFORD ILLINOIS.

BETWEEN 130 AND 215 CDT THIS AFTERNOON NUMEROUS REPORTS OF DAMAGE DUE TO A TORNADO WAS REPORTED IN WINNEBAGO COUNTY...MAINLY WEST OF ROCKFORD. IN ADDITION... LARGE HAIL...IN EXCESS OF ONE INCH IN DIAMETER WAS REPORTED THROUGHOUT SOUTHERN WINNEBAGO...NORTHERN OGLE...SOUTHERN BOONE...AND NORTHERN DEKALB COUNTY.

PERSONS STILL IN THE WARNED
COUNTIES SHOULD REMAIN IN
SHELTER.

ATTN: ISP 1..2..16 FIELDS

E:IL,MI:TTAA00 KRFD 281929
ILCO37-282000-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE
ROCKFORD IL
229 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 300 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNTY

IN THE NORTH CENTRAL PART OF
ILLINOIS
NORTHERN DEKALB

THIS AFTERNOON AT 230 CDT A SEVERE
THUNDERSTORM WAS LOCATED IN
NORTHWEST DEKALB COUNTY NEAR
KIRKLAND...ABOUT 20 MILES
SOUTHEAST OF ROCKFORD ILLINOIS.
IT WAS MOVING EAST SOUTHEAST AT 25
MPH AND WAS PRODUCING HAIL IN
EXCESS OF ONE INCH IN DIAMETER.

SOME COMMUNITIES THAT WILL BE
AFFECTED BY THIS SEVERE
THUNDERSTORM...GENOA...AND
DEKALB.

IF YOU ARE IN AN AREA THREATENED
BY THE STORM.. GO TO A REINFORCED
SHELTER. SEVERE THUNDERSTORMS
CAN PRODUCE WINDS OF 60 MPH OR
GREATER... LARGE HAIL... DANGEROUS
LIGHTNING AND HEAVY RAIN THAT
CAN QUICKLY FLOOD A LOW LYING
AREA.

REMEMBER... SEVERE
THUNDERSTORMS CAN AND
OCCASIONALLY DO PRODUCE A

TORNADO WITH LITTLE OR NO
ADVANCE WARNING SO BE ALERT!

ATTN: ISP DIST 1..2..16 FIELDS

NNNNZCZC CHISVSRFD
ETTAA000 KRFD 281946
ILZALL-282015-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
245 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WARNING
REMAINS IN EFFECT FOR NORTHERN
DEKALB COUNTY ILLINOIS TILL 3 CDT
THIS AFTERNOON...

AT 245 CDT THIS AFTERNOON A SEVERE
THUNDERSTORM...PRODUCING HAIL IN
EXCESS OF ONE INCH IN DIAMETER
...COVERED ALL OF THE NORTHERN
HALF OF DEKALB COUNTY. THIS
WOULD BE FROM 20 TO 35 MILES
SOUTHEAST OF ROCKDFORD ILLINOIS.
IT WAS MOVING EAST SOUTHEAST AT 25
MPH.

ELSEWHERE...THIS SAME
THUNDERSTORM COMPLEX EXTENDED
BACK WEST INTO EXTREME EASTERN
OGLE COUNTY JUST NORTH OF
ROCKHELLE ILLINOIS. THE STORMS
LOCATED IN OGLE COUNTY WILL
PRODUCE SMALLER HAIL WITH BRIEF
VERY HEAVY RAINS AND STRONG
GUSTY WINDS.

PERSONS IN DEKALB COUNTY SHOULD
REMAIN IN SHELTER TILL THESE
STORMS PASS OR LATER STATEMENTS
OR POSSIBLY NEW WARNINGS ARE
ISSUED.

ATTN: ISP 1..2..16 FIELDS

NNNNZCZC CHISVRRFD
E:IL,MI:TTAA00 KRFD 281958
ILCO37-282030-

BULLETIN - IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE
ROCKFORD IL
258 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 330 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNT
IN THE NORTH CENTRAL PART OF
ILLINOIS
SOUTHERN DEKALB

THIS AFTERNOON AT 300 CDT A SEVERE
THUNDERSTORM...PRODUCING HAIL IN
EXCESS OF ONE INCH IN
DIAMETER...WAS LOCATED OVER THE
CITY OF DEKALB ...DEKALB COUNTY...
ILLINOIS. IT WAS MOVING TO THE
SOUTHEAST AT 20 TO 25 MPH. THIS
WARNING IS FROM THE CITY OF
DEKALB ON THROUGH THE SOUTH END
OF THE COUNTY.

SOME COMMUNITIES THAT WILL BE
AFFECTED BY THIS SEVERE
THUNDERSTORM...DEKALB...
HINCKLEY...AND SANDWICH.

IF YOU ARE IN AN AREA THREATENED
BY THE STORM... GO TO A
REINFORCED SHELTER. SEVERE
THUNDERSTORMS CAN PRODUCE
WINDS OF 60 MPH OR GREATER...
LARGE HAIL... DANGEROUS LIGHTNING
AND HEAVY RAIN THAT CAN QUICKLY
FLOOD A LOW LYING AREA.

REMEMBER... SEVERE
THUNDERSTORMS CAN AND
OCCASIONALLY DO PRODUCE A
TORNADO WITH LITTLE OR NO
ADVANCE WARNING SO BE ALERT!

ATTN: ISP 1..2..16 FIELDS

NNNN>##<A<
<ZCZC CHISVSRFD
ETTAA00 KRFD 282002
ILZALL-282045-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
320 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WARNING
REMAINS IN EFFECT FOR THE SOUTH
HALF OF DEKALB COUNTY ILLINOIS
TILL 330 CDT THIS AFTERNOON...

A THUNDERSTORM WITH LARGE HAIL
WAS STILL LOCATED OVER THE
CENTRAL PORTION OF DEKALB COUNTY
AT 320 CDT THIS AFTERNOON. THE
SHERIFFS OFFICE IN DEKALB
REPORTED POWER LINES AND TREES
DOWN AT 315 CDT THIS AFTERNOON.
THE STORM WAS MOVING ALMOST DUE
EAST AT 25 MPH.

THIS MOVEMENT MEANS THE AREA
MOST LIKELY TO BE EFFECTED BY THE
STORM WOULD BE THE EXTREME
EASTERN PORTIONS OF THE SOUTH
HALF OF DEKALB COUNTY...NEAR THE
KANE AND KENDALL COUNTY LINES.

PERSONS IN DEKALB COUNTY...
ESPECIALLY DEKALB AND HINCKLEY...
SHOULD REMAIN IN SHELTER TILL
THIS STORM PASSES ON EAST OF THE
COUNTY.

ATTN: ISP 1..2..16 FIELDS

NNNN>A##<A<
<ZCZC CHISVSRFD
ETTAA00 KRFD 282038
ILZALL-282100-
SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
ROCKFORD IL
335 PM CDT TUE AUG 28 1990

...ALL SEVERE THUNDERSTORM
WARNINGS HAVE EXPIRED IN NORTH
CENTRAL ILLINOIS THIS AFTERNOON
AT 335 CDT...

RADAR AT 335 CDT THIS AFTERNOON
WAS SHOWING ALL SEVERE STORM
ACTIVITY EAST OF THE NORTH
CENTRAL PORTIONS OF ILLINOIS. AS A
RESULT ALL WARNINGS HAVE EITHER
BEEN CANCELED OR EXPIRED.

THE STORMS OVER NORTHEAST
ILLINOIS WERE STILL MOVING TO THE
SOUTHEAST AT 25 MPH AWAY FROM
NORTH CENTRAL ILLINOIS.

HOWEVER...A SEVERE THUNDERSTORM
WATCH WILL REMAIN IN EFFECT TILL 8
CDT THIS EVENING FOR ALL OF
NORTHERN ILLINOIS. THIS IS DUE TO A
COLD FRONT STILL LOCATED THROUGH
SOUTHERN WISCONSIN. THIS FRONT
MAY VERY WELL PRODUCE ADDITIONAL
SEVERE THUNDERSTORMS LATER THIS
EVENING.

REPEATING.. ALL SEVERE
THUNDERSTORM WARNINGS FOR
NORTH CENTRAL ILLINOIS HAVE
EITHER EXPIRED OR BEEN CANCELED.

ATTN: ISP 1..2..16 FIELDS

NNNN>##<A<
<ZCZC CHISPSRFD
ETTAA00 KRFD 290138 COR
ILZ001-002-290200-

SPECIAL WEATHER STATEMENT
...CORRECTED...
NATIONAL WEATHER SERVICE
ROCKFORD IL
830 CDT TUE AUG 28 1990

...SEVERE THUNDERSTORM WATCH FOR
NORTHERN ILLINOIS CANCELLED...

THE SEVERE THUNDERSTORM WATCH
FOR NORTHERN ILLINOIS WAS
CANCELLED THIS EVENING.
THUNDERSTORMS HAD MOVED INTO
CENTRAL ILLINOIS.

THE STORMS WERE IN ADVANCE OF A
SOUTHWARD MOVING COLD FRONT
WHICH HAD MOVED THROUGH THE
STATELINE AREA AT 700 PM CDT.

PETROVICH

A-2.2: Storm Report

<ZCZC CHILSRRFD

ETTAA00 KRFD 282155

STORM REPORT ...DATA FROM WW 691...
NATIONAL WEATHER SERVICE ROCKFORD IL
455 PM CDT TUE AUG 28 1990

TIME CDT	EVENT
135 PM CDT...	FUNNEL CLOUD REPORTED BY THE ILLINOIS STATE POLICE AT THE STATE POLICE HEADQUARTERS SOUTH OF PECATONICA ILLINOIS. (15 W RFD) WINNEBAGO COUNTY
142 PM ...	TORNADO ON THE GROUND NEAR STATE POLICE HEADQUARTERS. MOVEMENT TO THE SOUTH. (15 W RFD) ALSO TORNADO REPORTED AT SEWARD. WINNEBAGO CO. (15 W RFD)
145 PM...	STATE POLICE REPORTED CARS RAISED OFF THE GROUND.. TREES DOWN AND CEMETARY STONES LIFTED OFF THE GROUND NEAR POLICE HEADQUARTERS. (15 W RFD) WINNEBAGO COUNTY.
205 PM...	FUNNEL CLOUD REPORTEED BY STATE POLICE IN WEST ROCKFORD ILLINOIS AT MONTAGUE ROAD. WINNEBAGO COUNTY.
208 PM...	GOLF BALL SIZE HAIL IN SOUTHEAST ROCKFORD ILLINOIS ON SANDY HOLLOW ROAD. WINNEBAGO COUNTY.
210 PM...	2 1/2 INCH IN DIAMETER HAIL ON THE EASTERN PART OF THE GREATER ROCKFORD AIRPORT. REPORTED BY AIRPORT EMPLOYEES. WINNEBAGO COUNTY.
230 PM...	MARBLE SIZE HAIL IN NORTHWEST DEKALB COUNTY. REPORTED BY DEKALB COUNTY SHERIFF. (15 SE RFD)
254 PM...	JUST NORTH OF THE CITY OF DEKALB ILLINOIS IN DEKALB COUNTY. GOLF BALL SIZE HAIL. TREE DAMAGE AND CROP DAMAGE. SAME DAMAGE AT 1 1/2 MILES NORTH OF DEKALB. REPORTED BY DEKALB COUNTY SHERIFF. (25 SE RFD)
308 PM...	3/4 INCH IN DIAMETER HAIL REPORTED AT NORTHERN ILLINOIS UNIVERSITY IN DEKALB. REPORTED BY RADIO STATION. DEKALB COUNTY. (25 SE RFD)

HELGERSON/FIELDS/LIBRIZZI

A-3: Releases of WSMO Marseilles

A-3.1: Radar Summary

CHIRNSMMO:

TTAA00 KMMO 281940

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
230 CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS IN EFFECT FOR NORTHERN AND PARTS OF CENTRAL ILLINOIS... PORTIONS OF NORTHWEST INDIANA... AND PARTS OF SOUTHERN LAKE MICHIGAN...THIS TUESDAY AFTERNOON AND EVENING UNTIL 800 PM CDT...

AT 230 PM CDT...A SEVERE THUNDER-STORM WAS DETECTED OVER NORTH CENTRAL ILLINOIS...18 MILES EAST SOUTHEAST OF ROCKFORD.

MOVEMENT WAS SOUTHEAST AT 25 MILES AN HOUR.

THIS STORM WAS PART OF A 20 MILE WIDE BAND OF NUMEROUS THUNDER-STORMS...MANY WITH HEAVY RAIN AND HAIL...THAT WAS OCCURRING ACROSS NORTH CENTRAL AND NORTHEAST ILLINOIS...ALSO...THE EXTREME SOUTH-EAST CORNER OF WISCONSIN... CENTERED ALONG A LINE FROM 15 MILES WEST OF ROCKFORD... TO WOODSTOCK... TO KENOSHA.

MOVEMENT WAS SOUTHEAST AT 30 MILES AN HOUR.

ELSEWHERE...AN AREA OF NUMEROUS THUNDERSTORMS...A FEW WITH VERY HEAVY RAIN...WAS LOCATED OVER NORH CENTRAL INDIANA...IN THE SOUTH BEND AREA.

MOVEMENT WAS SOUTHEAST AT 30MILES AN HOUR.
BAALKE

CHIRNSMMO:
TTAA00 KMMO 282037

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
330 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS IN EFFECT FOR NORTHERN AND PARTS OF CENTRAL ILLINOIS... PORTIONS OF NORTHWEST INDIANA... AND PARTS OF SOUTHERN LAKE MICHIGAN...THIS TUESDAY AFTERNOON AND EVENING UNTIL 800 PM CDT...

AT 330 PM CDT...AN AREA OF NUMEROUS THUNDERSTORMS...SOME SEVERE...WAS DETECTED OVER NORTH CENTRAL AND NORTHEAST ILLINOIS... SOUTH OF A LINE FROM 10 MILES WEST OF DEKALB...TO OHARE...AND EAST OF A LINE FROM 10 MILES WEST OF DEKALB...TO 20 MILES NORTHEAST OF MARSEILLES.

THE STRONGEST STORMS WERE LOCATED NEAR YORKVILLE.

MOVEMENT WAS SOUTHEAST AT 40 MILES AN HOUR.

ALSO...THUNDERSTORMS WERE SCATTERED OVER PARTS OF SOUTHERN LAKE MICHIGAN...25 TO 35 MILES EAST OF RACINE.

MOVEMENT WAS SOUTHEAST AT 35 MILES AN HOUR.

ISOLATED THUNDERSTORMS HAD DEVELOPED OVER CENTRAL ILLINOIS...BETWEEN BLOOMINGTON AND 40 MILES EAST OF BLOOMINGTON.

MOVEMENT WAS SOUTHEAST AT 35 MILES AN HOUR.
BAALKE

CHIRNSMMO:
TTAA00 KMMO 282140

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
430 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS IN EFFECT FOR NORTHERN AND PARTS OF CENTRAL ILLINOIS... PORTIONS OF NORTHWEST INDIANA... AND PARTS OF SOUTHERN LAKE MICHIGAN... THIS TUESDAY AFTERNOON AND EVENING UNTIL 800 PM CDT...

AT 430 CDT...AN AREA OF NUMEROUS THUNDERSTORMS...SOME SEVERE...WAS DETECTED OVER NORTHEAST...AND EAST CENTRAL ILLINOIS...EXTREME NORTHWEST INDIANA...AND SOUTH LAKE MICHIGAN...EAST OF A LINE FROM NEAR DUPAGE AIRPORT...NEAR AURORA...30 MILES WEST OF KANKAKEE...TO 20 MILES NORTH OF DANVILLE.

THE STRONGEST STORMS WERE LOCATED 10 MILES SOUTHWEST OF CHICAGO HEIGHTS.

MOVEMENT WAS SOUTHEAST AT 40 MILES AN HOUR.
JENSEN

CHIRNSMMO:
TTAA00 KMMO 282236

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
530 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS IN EFFECT FOR NORTHERN AND PARTS OF CENTRAL ILLINOIS...PORTIONS OF NORTHWEST INDIANA...AND PARTS OF SOUTHERN LAKE MICHIGAN...THIS TUESDAY AFTERNOON AND EVENING UNTIL 800 PM CDT...

AT 530 PM CDT...SCATTERED THUNDERSTORMS...WITH VERY HEAVY

RAIN..WERE DETECTED OVER NORTHEAST...AND EAST CENTRAL ILLINOIS...NORTHWEST...AND NORTH CENTRAL INDIANA...SOUTH LAKE MICHIGAN...AND SOUTHWEST LOWER MICHIGAN...EAST OF A LINE FROM 10 MILES WEST OF OHARE AIRPORT...TO 10 MILES EAST OF MARSEILLES...TO 25 MILES SOUTHWEST OF KANKAKEE.

THE STRONGEST STORMS WERE LOCATED 35 MILES NORTH OF LAFAYETTE.

MOVEMENT WAS SOUTHEAST AT 40 MILES AN HOUR.
JENSEN

CHIRNSMMO:
TTAA00 KMMO 282339

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
630 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS IN EFFECT FOR NORTHERN AND PARTS OF CENTRAL ILLINOIS...PORTIONS OF NORTHWEST INDIANA...AND PARTS OF SOUTHERN LAKE MICHIGAN...THIS TUESDAY AFTERNOON AND EVENING UNTIL 800 PM CDT...

AT 630 PM CDT...SCATTERED THUNDERSTORMS...WITH VERY HEAVY RAIN...WERE DETECTED OVER NORTHEAST ILLINOIS... NORTHWEST ...NORTH CENTRAL...AND WEST CENTRAL INDIANA...SOUTH LAKE MICHIGAN... AND SOUTHWEST LOWER MICHIGAN...EAST OF A LINE FROM NEAR MIDWAY AIRPORT...TO 20 MILES SOUTHWEST OF LAFAYETTE.

ALSO...AN ISOLATED THUNDERSTORM... WITH VERY HEAVY RAIN...WAS DETECTED OVER NORTH CENTRAL ILLINOIS...15 MILES SOUTHWEST OF MARSEILLES.

MOVEMENT WAS SOUTHEAST AT 30
MILES AN HOUR.
JENSEN

CHIRNSMMO:
TTAA00 KMMO 290038

RADAR SUMMARY
NATIONAL WEATHER SERVICE
MARSEILLES IL
730 PM CDT TUE AUG 28 1990

...A SEVERE THUNDERSTORM WATCH IS
IN EFFECT FOR PORTIONS OF CENTRAL
AND EASTERN ILLINOIS...AND PARTS OF
CENTRAL AND SOUTHERN INDIANA...
THIS TUESDAY NIGHT AND WEDNESDAY
MORNING UNTIL 100 AM CDT...

AT 730 PM CDT...WIDELY SCATTERED
THUNDERSTORMS...VERY HEAVY
RAIN...WERE DETECTED OVER PARTS OF
NORTH CENTRAL...AND EAST CENTRAL
ILLINOIS...NEAR MARSEILLES...AND 30
MILES NORTHEAST OF BLOOMINGTON.

ALSO...ISOLATED
THUNDERSTORMS...AND LIGHT RAIN
SHOWERS...WERE DETECTED OVER
NORTHWEST...AND WEST CENTRAL
INDIANA...EAST OF A LINE FROM 10
MILES SOUTHWEST OF MICHIGAN
CITY...TO 20 MILES SOUTH OF
LAFAYETTE.

MOVEMENT WAS SOUTHEAST AT 35
MILES AN HOUR.
JENSEN

A-3.2: Radar Coded Message

CHIROBMMO:

TTAA00 KMMO 280427
IMMO 0425 AREA 5TRWU 43/200 60/250
20W AO110 C3225
^EQ9988=

CHIROBMMO:

TTAA00 KMMO 280526
IMMO 0525 CELL TRWU 61/240 D13 C3220
^ET98=

CHIROBMMO:

TTAA00 KMMO 280626
IMMO 0625 CELLS TRWU 50/185 D14 54/199
D6 MOVMT C2920
^FQ999=

CHIROBMMO:

TTAA00 KMMO 280726
IMMO 0725 PPINE=

CHIROBMMO:

TTAA00 KMMO 280826
IMMO 0825 PPINE=

CHIROBMMO:

TTAA00 KMMO 280927
IMMO 0925 CELL TRWU/NEW 301/240 D5
^JC9=

CHIROBMMO

TTAA00 KMMO 281026
IMMO 1025 PPINE=

CHIROBMMO:

TTAA00 KMMO 281126
IMMO 1125 PPINE=

CHIROBMMO:

TTAA00 KMMO 281227
IMMO 1225 PPINE=

CHIROBMMO:

TTAA00 KMMO 281326
IMMO 13255 PPINE=

CHIROBMMO:
TTAA00 KMMO 281426
IMMO 1425 PPINE=

CHIROBMMO:
TTAA00 KMMO 281526
IMMO 1525 AREA 4RW/NEW 263/125 234/80
30W C2720 MT 250 AT 261/114
^OI222 PJ2=

CHIROBMMO:
TTAA00 KMMO 281626
IMMO 1625 AREA 4RW/NC 268/100 218/65
33W C2725 MT 270 AT 228/57
^NK2 OK12=

CHIROBMMO:
TTAA00 KMMO 281726
IMMO 1725 AREA 1RW/NC 58/170 213/130
262/150 C2720 MT 260 AT 61/110
^IQ2 NK2 OI22 PI101 RK2=

CHIROBMMO:
TTAA00 KMMO 281828
IMMO 1825 SPL CELL TRWX/NEW 338/65
D12 MT 500 PIA TROP 446
AREA 3TRW++/+ 314/140 68/170 215/100
C2820 MT 400 AT 359/68
^JL330012 KI23250003 NL2 OL2 PL2=

CHIROBMMO:
TTAA00 KMMO 281930
IMMO 1925 SPL CELL TRWXX/+ 349/45 D12
C3120 MT 520 PIA TROP 446 TORNADO
RPRTD 15 W RFD 281902
LN 7TRW++/NEW 33/105 322/55 20W C3125
MT 450 AT 31/94
AREA 2TRW++/NC 32/120 92/200 202/90
294/145 C2925 MT 500 AT 84/113
^IN42 IT9 JM34000309 KK16300034 LH1
NN2 PM1=

CHIROBMMO:
TTAA00 KMMO 282028
IMMO 2025 SPL CELL TRWXX/NC 27/29 D8
C3135 MT 650 AT 27/29 PIA TROP 446

AREA 3TRW+/- 53/190 89/210 196/95 335/60
C3030 MT 430 AT 45/90
^IO21 JS999 KM52000199 LM46 LS9 NO1
ON21=

CHIROBMMO:
TTAA00 KMMO 282133
IMMO 2130 SPL CELL TRWXX/NC 94/40 D9
C3135 MT 600 PIA TROP 446 TORNADO
RPRTD 3N JOLIET 282045
AREA 3TRWX/+ 352/65 75/230 93/205 158/70
C3125 MT 550 AT 59/93 AREA 3TRWX/+
352/65 75/230 93/205 158/70 C3125 MT 550
AT 59/93
^JP5 JU9 KO2115999 LN562 MN333 NP3=

CHIROBMMO:
TTAA00 KMMO 282144
IMMO 2143 SPL HOOK 93/50=

CHIROBMMO:
TTAA00 KMMO 282230
IMMO 2228 SPL AREA 4TRWX/NC 11/50
77/215 100/200 172/35 C3230 MT 570 AT
105/84 TOP 470 AT 92/30 PIA TROP 446
^JP440009 KO3321999 LO5214 MN2435=

CHIROBMMO:
TTAA00 KMMO 282333
IMMO 2330 SPL CELL TRWXX/+ 233/15 D11
C3225 MT 570 PSBL A VIP 6 TO 300 VIP
5 TO 400 PIA TROP 446
AREA 3TRWX/NC 52/50 69/130 100/160
136/100 C3230 MT 550 AT 120/119 CVRG
DCRG
^KO212 LQ109 MM6002009 NQ45=

CHIROBMMO:
TTAA00 KMMO 290028
IMMO 0025 SPL AREA 1TRWX/NC 351/35
93/210 116/210 189/70 C3230 MT 410 AT
173/30 PIA TROP 483 PTLY TRWU
^KQ1 MM35 MS999 NN4 NS89 OP1=

CHIROBMMO:
TTAA00 KMMO 290131
IMMO 0129 SPL AREA 2TRW+/- 295/90
100/190 133/210 260/115 C3125 MT 460 AT
268/71 PIA TROP 483 APRNT TRWX AT
114/135
^MM302012899 NJ33 NT9 OT99 PR9=

CHIROBMMO:

TTAA00 KMMO 290235
IMMO 0230 SPL CELL TRWX/NC 250/50 D13
C3125 MT 540 PIA TROP 483 VIP 5 TO 260
AREA 1TRW+/NC 309/140 100/200 130/220
265/100 C3125 MT 380 AT 119/109 APRNT
TRWX AT 120/145
^KH102 LS9 MT99 NK45 NR398 OV9=

CHIROBMMO:

TTAA00 KMMO 290334
IMMO 0330 AREA 4THRW+/NEW 304/120
36/70 63W C2930 MT 390 AT 345/57 CELL
TRW+/- 221/58 D18 C3125 MT 310
AREA 2TRWU 112/130 125/205 60W C3230
^JL12 KI2323 NS999 OL3 OT999=

CHIROBMMO:

TTAA00 KMMO 290434
IMMO 0429 SPL AREA 6TRWX/NEW 272/160
275/70 28W C2925 MT 580 AT 272/114 PIA
TROP 483 VIP 5 TO 300
AREA 2TRW+/NC 309/160 42/110 122/220
169/120 C2925 MT 340 AT 38/56
MOST TOPS BLO 270 TRWU SE PTN
^JI1220212 KJ23123 MK1 NG9354 NT99 002
OU9=

A-4: Releases of WSFO Chicago

A-4.1: State Forecast Discussions

TTAA00 KCH1 280918

APRCHG CDFNT PROGGD TO ABT A CHI/BRL LINE BY 00Z, THEN CONTD SLOLY SEWRD TO SRN TIP OF STA WED AFTN. SIGNIFICANTLY COOLER AND DRIER AIR SEVERAL HRS BHND FNT, HWVR.

UPR WV AND PVA ALSO LAG 6-12 HRS BHND FNT, WHICH SGGSTS DVLPMNT OF SECONDARY CDFNT AND/OR POST FNTL TSTMS. WIL THFRFR RETAIN TSTM THREAT AFT FROPA AT ANY GIVEN POINT.

HV RAISED TDA/S XPCTD MAX TEMPS A LTL ABV GUIDANCE IN LITE OF YTDA/S UPSTREAM HIGHS.

.IL...NONE

KOENEMAN

TTAA00 KCH1 281440

XTRAPLTN PUTS CD FNT CHI-MLI LN JUST BFR 00Z. FNT CONTINUES SWD THRU EVENING. WND SHFTS WIT FNT BUT COOLR DRIER AIR ABT 6-8 HRS BHND FNT.

AMS AHD OF FNT VRY JUCY >70 DWPTS AND UNSTBL WITH CLDR AIR TDA AT H5 AND K INDX INTO 30S. SUM SHWRS HV BRKN OUT OVR W CTNRL IL THS AM AND ON SWIS SHOW TO BE PART OF A BRDR PCPN AREA XTNDG WWD INTO CNTR IA. ADJSMTS TO ZNS FOR FNT PSN AND RW.

.IL...NONE

SOMREK

TTAA00 KCH1 282002

SCT TSTMS NR AND AHD OF CDFNT. SHD TRICKL DWN THE ST WITH THE

FNT. CANT SAY FOR SURE HOW FAST CDFNT WILL MOV ACRS ST BUT TMP FCSTS HV GRDL COOLNG OVR NXT TWO DAYS AS A 2NDRY FNT MOVS INTO THE ST.

.IL...NONE

WILLIAMS

A-4.2: Zone Forecasts

TTAA00 KCHI 280912

ILLINOIS ZONE FORECASTS
NATIONAL WEATHER SERVICE CHICAGO
IL

ILZ003-281500-

ILLINOIS ZONE 3

4 00 AM CDT TUE AUG 28 1990

.TODAY... PARTLY SUNNY...HOT AND HUMID. A 40 PERCENT CHANCE OF THUNDERSTORMS BY EVENING. HIGH IN THE LOWER OR MIDDLE 90S. SOUTHWEST WINDS 10 TO 20 MPH BECOMING NORTHWEST TOWARD EVENING.

.TONIGHT... A 40 PERCENT CHANCE OF EVENING THUNDERSTORMS. THEN PARTLY CLOUDY...TURNING COOLER AND LESS HUMID. LOW IN THE MIDDLE 60S. NORTHWEST WINDS ABOUT 10 MPH.

.WEDNESDAY... MOSTLY SUNNY. COOLER AND LESS HUMID. HIGH IN THE LOWER OR MIDDLE 80S.

\$\$

KOENEMAN

TTAA00 KCHI 281500

ILLINOIS ZONE FORECASTS
NATIONAL WEATHER SERVICE CHICAGO
IL

ILZ003-282100-

ILLINOIS ZONE 3

10 00 AM CDT TUE AUG 28 1990

.THIS AFTERNOON... HOT AND HUMID. MOSTLY SUNNY WITH A 40 PERCENT CHANCE OF THUNDERSTORMS. HIGH IN THE LOWER OR MIDDLE 90S. SOUTHWEST WINDS 10 TO 20 MPH

BECOMING NORTHWEST BY LATE
AFTERNOON.
.TONIGHT... A 40 PERCENT CHANCE OF
EVENING THUNDERSTORMS. THEN
PARTLY CLOUDY...TURNING COOLER
AND LESS HUMID. LOW IN THE MIDDLE
60S. NORTHWEST WINDS ABOUT 10
MPH.
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S.
\$\$
SOMREK

TTAA00 KCHI 281927 AMD
ILLINOIS ZONE FORECASTS UPDATED
NATIONAL WEATHER SERVICE CHICAGO
IL
ILZ003-282100-
ILLINOIS ZONE 3 UPDATED
2 30 PM CDT TUE AUG 28 1990
...SEVERE THUNDERSTORM WATCH
THIS AFTERNOON AND EARLY
EVENING...THIS AFTERNOON... HOT
AND HUMID WITH SCATTERED
SHOWERS AND THUNDERSTORMS.
SOME THUNDERSTORMS MAY PRODUCE
LARGE HAIL AND DAMAGING WINDS.
HIGH IN THE LOWER OR MIDDLE 90S.
SOUTHWEST WINDS 10 TO 20 MPH
BECOMING NORTHWEST.
.TONIGHT... SHOWERS AND
THUNDERSTORMS ENDING THEN
PARTLY CLOUDY.U TURNING COOLER
AND LESS HUMID. LOW IN THE MIDDLE
60S. NORTHWEST WINDS ABOUT 10
MPH.
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S.
\$\$
SOMREK

TTAA00 KCHI 282104
ILLINOIS ZONE FORECASTS
NATIONAL WEATHER SERVICE CHICAGO
IL
ILZ003-290200-
ILLINOIS ZONE 3
4 00 PM CDT TUE AUG 28 1990
...SEVERE THUNDERSTORM WATCH
THROUGH THIS EVENING...

.THIS EVENING... HOT AND HUMID WITH
SCATTERED SHOWERS AND
THUNDERSTORMS. SOME
THUNDERSTORMS MAY PRODUCE
HEAVY RAINFALL...LARGE HAIL AND
WIND GUSTS ABOVE 40 MPH. HIGH IN
THE LOWER OR MIDDLE 90S.
.TONIGHT... PARTLY CLOUDY. TURNING
COOLER AND LESS HUMID. LOW IN
THE MIDDLE 60S. NORTHWEST WINDS
10 TO 15 MPH
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S. WINDS
BECOMING LIGHT AND VARIABLE.
.WEDNESDAY NIGHT... FAIR. COOLER.
LOW AROUND 60.
.THURSDAY... MOSTLY SUNNY. HIGH IN
THE LOWER OR MIDDLE 80S.
\$\$
WILLIAMS

TTAA00 KCHI 282105
ILLINOIS ZONE FORECASTS
NATIONAL WEATHER SERVICE CHICAGO
IL
ILZ003-290200-
ILLINOIS ZONE 3
4 00 PM CDT TUE AUG 28 1990
...SEVERE THUNDERSTORM WATCH
THROUGH THIS EVENING...
.THIS EVENING... HOT AND HUMID WITH
SCATTERED SHOWERS AND
THUNDERSTORMS. SOME
THUNDERSTORMS MAY PRODUCE
HEAVY RAINFALL.. LARGE HAIL AND
WIND GUSTS ABOVE 40 MPH. HIGH IN
THE LOWER OR MIDDLE 90S.
.TONIGHT... PARTLY CLOUDY. TURNING
COOLER AND LESS HUMID. LOW IN
THE MIDDLE 60S. NORTHWEST WINDS
10 TO 15 MPH.
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S. WINDS
BECOMING LIGHT AND VARIABLE.
.WEDNESDAY NIGHT... FAIR. COOLER.
LOW AROUND 60.
.THURSDAY... MOSTLY SUNNY. HIGH IN
THE LOWER OR MIDDLE 80S.
\$\$
WILLIAMS

ILZ003-290200-
ILLINOIS ZONE 3
4 PM CDT TUE AUG 28 1990
...SEVERE THUNDERSTORM WATCH
THROUGH THIS EVENING..
.THIS EVENING... HOT AND HUMID WITH
SCATTERED SHOWERS AND
THUNDERSTORMS. SOME
THUNDERSTORMS MAY PRODUCE
HEAVY RAINFALL...LARGE HAIL AND
WIND GUSTS ABOVE 40 MPH. HIGH IN
THE LOWER OR MIDDLE 90S.
.TONIGHT... PARTLY CLOUDY. TURNING
COOLER AND LESS HUMID. LOW IN
THE MIDDLE 60S. NORTHWEST WINDS
10 TO 15 MPH.
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S. WINDS
BECOMING LIGHT AND VARIABLE.
.WEDNESDAY NIGHT... FAIR. COOLER.
LOW AROUND 60.
.THURSDAY... MOSTLY SUNNY. HIGH IN
THE LOWER OR MIDDLE 80S.
\$\$
WILLIAMS

TTAA00 KCHI 282116 COR
ILLINOIS ZONE FORECASTS
NATIONAL WEATHER SERVICE CHICAGO
IL
4 00 PM CDT TUE AUG 28 1990
ILZ003-290200-
ILLINOIS ZONE 3 CORRECTION TO THIS
EVENING...
4 00 PM CDT TUE AUG 28 1990
...SEVERE THUNDERSTORM WATCH
THROUGH THIS EVENING..
.THIS EVENING... HOT AND HUMID WITH
SCATTERED SHOWERS AND
THUNDERSTORMS. SOME
THUNDERSTORMS MAY PRODUCE
HEAVY RAINFALL..LARGE HAIL AND
WIND GUSTS ABOVE 40 MPH.
.TONIGHT... PARTLY CLOUDY. TURNING
COOLER AND LESS HUMID. LOW IN
THE MIDDLE 60S. NORTHWEST WINDS
10 TO 15 MPH.
.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S. WINDS
BECOMING LIGHT AND VARIABLE.

.THURSDAY... MOSTLY SUNNY. HIGH IN
THE LOWER OR MIDDLE 80S.
WILLIAMS

A-4.3: Warnings and Statements

<ZCZC CHISPSCHI
ETTAA00 KCHI 281901
ILZ003-201200-

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
IL
2 00 PM CDT TUE 28 1990

A SEVERE THUNDERSTORM WATCH HAS
BEEN POSTED FOR NORTHERN ILLINOIS
INCLUDING THE CHICAGO AREA FOR
THIS AFTERNOON AND EARLY
EVENING.

A COLD FRONT MOVING SOUTH FROM
WISCONSIN HAS FORCED
THUNDERSTORMS TO DEVELOP IN
SOUTHERN WISCONSIN AND NORTHERN
ILLINOIS. AT 2 PM THE
THUNDERSTORMS WERE LOCATED IN A
LINE FROM JUST SOUTH OF
MILWAUKEE TO JUST WEST OF
ROCKFORD AND HAD ENTERED THE
EXTREME NORTH AND NORTHEAST
PORTIONS OF THE CHICAGO SUBURBAN
AREAS.

THE LINE OF THUNDERSTORMS ARE
SLIPPING SOUTHEAST AND WILL MOVE
ACROSS THE CHICAGO AREA BETWEEN
2 AND 6 PM. SOME OF THE
THUNDERSTORMS MAY BE SEVERE AND
PRODUCE STRONG WINDS AND LARGE
HAIL.

BE ALERT FOR RAPIDLY CHANGING
AND THREATENING WEATHER AND BE
PREPARED TO SEEK SHELTER AS
NECESSARY.

SOMREK

<ZCZC CHILFPCHI
ETTAA00 KCHI 281917 AMD
ILZ003-282100-

CHICAGO METROPOLITAN FORECAST
UPDATED
NATIONAL WEATHER SERVICE CHICAGO
IL
2 10 PM CDT TUE AUG 28 1990

...SEVERE THUNDERSTORM WATCH
THIS AFTERNOON AND EARLY
EVENING...

.THIS AFTERNOON... HOT AND HUMID
WITH SCATTERED SHOWERS AND
THUNDERSTORMS. SOME
THUNDERSTORMS MAY PRODUCE
LARGE HAIL AND DAMAGING WINDS.
HIGH IN THE LOWER OR MIDDLE 90S.
SOUTHWEST WINDS 10 TO 20 MPH
BECOMING NORTHWEST BY LATE
AFTERNOON.

.TONIGHT... SHOWERS AND
THUNDERSTORMS ENDING THEN
PARTLY CLOUDY. TURNING COOLER
AND LESS HUMID. LOW IN THE MIDDLE
60S. NORTHWEST WINDS ABOUT 10
MPH.

.WEDNESDAY... MOSTLY SUNNY.
COOLER AND LESS HUMID. HIGH IN
THE LOWER OR MIDDLE 80S.

\$\$
SOMREK

ZCZC CHISVRCHI
ETTAA00 KCHI 281932
ILC089-282030-

BULLETIN - IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
232 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 330 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNTY

IN THE NORTHEAST PART OF
ILLINOIS
NORTHERN KANE

AT 2 25PM CDT A SEVERE
THUNDERSTORM WAS LOCATED IN THE
NORTHWEST CORNER OF DEKALB
COUNTY OR 25 MILES SOUTHEAST OF
ROCKFORD. THIS STORM IS MOVING TO
THE EAST AT 25 MILES AN HOUR. THE
STORM SHOULD MOVE INTO NORTHERN
KANE COUNTY IN THE NEXT HOUR
POSSIBLY PRODUCING STRONG WINDS
AND LARGE HAIL.

AS THIS STORM PASSED THROUGH
ROCKFORD...ONE AND ONE-HALF INCH
HAIL FELL. RESIDENTS OF KANE
COUNTY SHOULD PREPARE FOR THIS
STORM IMMEDIATELY. SOME CITIES IN
KANE COUNTY AFFECTED BY THE
STORM INCLUDE
GENEVA...BURLINGTON...ELGIN...ST
CHARLES...AND MAPLE PARK.

REMEMBER...SEVERE THUNDERSTORMS
CAN AND OCCASIONALLY DO PRODUCE
A TORNADO WITH LITTLE OR NO
ADVANCE WARNING...SO BE ON THE
LOOKOUT.

BRUMER
2 15

CHISVSCHI
TTAA00 KCHI 281952
ILZ003-282030-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
IL
2 50 PM CDT SAT JUN 30 1990

AT 2 50 PM ONE INCH HAIL HAS BEEN
REPORTED EAST OF SYCAMORE IN
EXTREME WESTERN KANE COUNTY.
THE HAIL IS ASSOCIATED WITH A
THUNDERSTORM MOVING SOUTHEAST
ACROSS KANE COUNTY. THE STORM
WILL AFFECT THE AREAS AROUND ST.
CHARLES AND GENEVA.

BE ALERT FOR THREATENING
WEATHER AND BE PREPARED TO TAKE
SHELTER IF NECESSARY.

ZCZC CHISVRCHI
ETTAA00 KCHI 282023
ILC043-282130-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
323 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 430 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNTY

IN THE NORTHEAST PART OF
ILLINOIS
SOUTHERN DU-PAGE

AT 3 20 PM CDT A SEVERE
THUNDERSTORM WAS LOCATED IN
SOUTHERN KANE COUNTY NEAR
AURORA. THIS STORM WAS MOVING TO
THE SOUTHEAST AT 25 MILES AN HOUR
AND SHOULD ENTER SOUTHERN
DUPAGE COUNTY WITHIN THE HOUR.
NAPERVILLE AND LISLE ARE SOME
CITIES THAT SHOULD BE AFFECTED.

TREE DAMAGE WAS REPORTED ABOUT
15 MILES WEST OF AURORA AS THE
STORM PASSED THROUGH KANE
COUNTY. THIS SAME STORM
PRODUCED ONE AND ONE HALF INCH
HAIL AT ROCKFORD AND 3/4 INCH HAIL
AT AURORA.

RESIDENTS OF SOUTH DUPAGE COUNTY
SHOULD ALSO BE PREPARED FOR
STRONG GUSTY WINDS AND LARGE
HAIL AS THIS STORM APPROACHES.

REMEMBER...SEVERE THUNDERSTORMS
CAN AND OCCASIONALLY DO PRODUCE
A TORNADO WITH LITTLE OR NO
ADVANCE WARNING...SO BE ON THE
LOOKOUT.

BRUMER
2 15

ZCZC CHISVRCHI
ETTAA00 KCHI 282037
ILC093-089-197-043-282145-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
337 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 445 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNTIES

IN THE NORTHEAST PART OF
ILLINOIS
NORTHEAST KENDALL...
SOUTHERN KANE...NORTHERN
WILL...SOUTHERN DU-PAGE

AT 3 30 PM ANOTHER SEVERE STORM
HAS DEVELOPED TO THE WEST OF
AURORA PRODUCING NEARLY 2 INCH
HAIL OVER AURORA. THIS STORM WAS
MOVING TO THE SOUTHEAST AT 25
MILES AN HOUR AND SHOULD AFFECT
SOUTHERN KANE...SOUTHERN
DUPAGE...NORTHEAST KENDALL..AND
NORTH WILL COUNTIES AFFECTING
COMMUNITIES SUCH AS BOLINGBROOK
...LOCKPORT...NAPERVILLE...OSWEGO...A
ND AURORA.

RESIDENTS OF THESE COMMUNITIES
SHOULD BE ALERT FOR THE APPROACH
OF THIS STORM THAT MAY POSSIBLY
BRING VERY STRONG WINDS AND
LARGE HAIL.

REMEMBER...SEVERE THUNDERSTORMS
CAN AND OCCASIONALLY DO PRODUCE
A TORNADO WITH LITTLE OR NO
ADVANCE WARNING...SO BE ON THE
LOOKOUT.

BRUMER
2 5 15

CHISVSCHI
TTAA00 KCHI 282044
ILZ003-282130-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
IL
3 40 PM CDT SAT JUN 30 1990

AT 3 38 PM CDT THUNDERSTORM WINDS
HAD FLIPPED A TRAILER NEAR OSWEGO
IN NORTHEAST KENDALL
COUNTY...ABOUT 10 MILES SOUTH OF
AURORA.

GOLF BALL SIZE HAIL WAS REPORTED
AT 3 40 PM NEAR JOLIET IN WILL
COUNTY.

THE STORMS PRODUCING THE LARGE
HAIL AND STRONG WINDS WAS MOVING
SOUTHEAST AT 25 MPH.

ZCZC CHITORCHI
ETTAA00 KCHI 282051
ILC197-282200-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED/EBS ACTIVATION
REQUESTED TORNADO WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
351 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A TORNADO WARNING
EFFECTIVE UNTIL 500 PM CDT FOR
PEOPLE IN THE FOLLOWING COUNTY

IN THE NORTHEAST PART OF
ILLINOIS
WEST CENTRAL WILL

AT 3 45 PM CDT A TORNADO WAS
REPORTED AT CREST HILL...A
NORTHERN SUBURB OF JOLIET. THE
TORNADO WILL TRACK NORTH AND
EAST OF JOLIET TOWARD NEW LENOX
FOLLOWING ROUTE 30.

THIS IS A DANGEROUS STORM. ACT
QUICKLY. IF YOU ARE IN THE PATH OF
THIS TORNADO MOVE TO A SHELTER

BELOW GROUND IF POSSIBLE.
OTHERWISE GO TO A SMALL INTERIOR
ROOM ON THE LOWEST FLOOR
POSSIBLE. ABANDON CARS AND
MOBILE HOMES. TAKE COVER IN A
REINFORCED BUILDING OR GO TO A
DITCH OR CULVERT.

SOMREK
ATTN ISP 5

CHISVSCHI
TTAA00 KCHI 282100
ILZ003-282130-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
IL
3 55 PM CDT SAT JUN 30 1990

A TORNADO WAS REPORTED BY STATE
POLRICE AT 3 45PM CDT AT CREST
HILL...A NORTHERN SUBURB OF JOLIET.
FOLLOW-UP REPORTS INDICATE
INJURIES WITH THE TORNADO.

THE TORNADO MOVEMENT IS TO THE
SOUTHEAST TO THE EAST SIDE OF
JOLIET TOWARD NEW LENOX AND
ALONG ROUTE 30.

IF YOU ARE IN THE PATH OF THIS
STORM...TAKE SHELTER IMMEDIATELY.

SOMREK

ZCZC CHISVRCHI
ETTAA00 KCHI 282131
ILC091-282230-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
431 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A SEVERE THUNDERSTORM
WARNING EFFECTIVE UNTIL 530 PM
CDT FOR PEOPLE IN THE FOLLOWING
COUNTY

IN THE NORTHEAST PART OF
ILLINOIS
EASTERN KANKAKEE

AT 4 30 CDT A SEVERE THUNDERSTORM
WAS MOVING TO THE SOUTHEAST AT 25
MILES AN HOUR FROM EASTERN WILL
COUNTY INTO KANKAKEE COUNTY.

THE HISTORY OF THIS STORM
PRODUCED 2 INCH HAIL...DAMAGING
WINDS.....A TORNADO AT CREST
HILL...AND A FUNNEL CLOUD REPORT
NEAR BOURBONNAIS. RESIDENTS OF
KANKAKEE SHOULD PREPARE FOR THE
APPROACH OF THIS STORM AND BE ON
THE LOOK OUT FOR SEVERE WEATHER.

SOME OF THE COMMUNITIES AFFECTED
INCLUDE MANTENO...MOMENCE...AND
ST. ANNE.

REMEMBER...SEVERE THUNDERSTORMS
CAN AND OCCASIONALLY DO PRODUCE
A TORNADO WITH LITTLE OR NO
ADVANCE WARNING...SO BE ON THE
LOOKOUT.

BRUMER
21

CHISVSCHI
TTAA00 KCHI 282135
ILZ003-282230-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE CHICAGO
IL
4 30 PM CDT SAT JUN 30 1990

THE TORNADO WARNING FOR WEST
AND CENTRAL WILL COUNTY IS
CANCELLED. THE STORM PRODUCING
THE TORNADO HAS MOVED TO THE
SOUTHEAST AND IS NOW LOCATED
OVER EAST KANKAKEE COUNTY. A
SEVERE THUNDERSTORM WARNING IS
IN EFFECT UNTIL 5 30 PM FOR EAST
KANKAKEE COUNTY.

SOMREK

ZCZC CHITORCHI
ETTAA00 KCHI 282150
INC089-2822150-

BULLETIN -- IMMEDIATE BROADCAST
REQUESTED/EBS ACTIVATION
REQUESTED TORNADO WARNING
NATIONAL WEATHER SERVICE CHICAGO
IL
450 PM CDT TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE HAS
ISSUED A TORNADO WARNING
EFFECTIVE UNTIL 515 PM CDT FOR
PEOPLE IN THE FOLLOWING COUNTY

IN THE NORTHWEST PART OF
INDIANA
SOUTHWEST LAKE

AT 4 45PM CDT RADAR INDICATED A
POSSIBLE TORNADO NEAR
BEECHER...ABOUT 20 MILES
NORTHEAST OF KANKAKEE...JUST WEST
OF THE INDIANA BORDER.

THE STORM IS MOVING SOUTHEAST
AND WILL ENTER SOUTHWEST LAKE
COUNTY INDIANA NEAR
LOWELL...SHELBY AND SCHNEIDER.

SOMREK

<ZCZC CHISVSCHI
ETTAA00 KCHI 282211 COR
ILZ003-282300-

SEVERE WEATHER
STATEMENT...CORRECTION
NATIONAL WEATHER SERVICE CHICAGO
IL
5 15 PM CDT SAT JUN 30 1990

THE SEVERE THUNDERSTORM
WARNING FOR KANKAKEE COUNTY
AND THE TORNADO WARNING FOR
LAKE COUNTY INDIANA HAVE BOTH
BEEN CANCELLED. THE STORM
ASSOCIATED WITH THESE WEATHER
EVENTS HAS MOVED SOUTHEAST INTO
NEWTON COUNTY OF INDIANA.

A FEW FUNNEL CLOUDS WERE
REPORTED EARLIER IN KANKAKEE
COUNTY WITH THE STORM. HOWEVER
REPORTS OF SEVERE WEATHER ON THE
GROUND HAVE NOT MATERIALIZED.

BRUMER

A-4.4: Storm Report

TTAA00 KCHI 290011

STORM REPORT ...DATA FROM WW 691...
NATIONAL WEATHER SERVICE CHICAGO IL
600 PM CDT TUE AUG 28 1990

TIME CDT	EVENT
245 PM CDT...	HEAVY RAIN...ONE INCH HAIL...HIGH WINDS. REPORTED BY SPOTTER IN SYCAMORE IN EASTERN DEKALB COUNTY. (23 SE RFD)
252 PM ...	ONE HALF INCH HAIL...50 MPH GUST. REPORTED BY SPOTTER BETWEEN DEKALB IN DEKALB COUNTY AND I-88.
255 PM...	TREE DAMAGE AT BIG ROCK IN SOUTHWEST KANE COUNTY. REPORTED BY ARTCC AT AURORA.
317 PM...	35 MPH WIND AND 3/4 INCH HAIL AT ST CHARLES. REPORTED BY ARTCC AT AURORA.
321 PM...	LARGE HAIL AND STRONG WINDS AT SUGAR GROVE IN SOUTH KANE COUNTY. REPORTED BY STATE POLICE DISTRICT 2.
323 PM...	1 1/4 INCH HAIL AT AURORA REPORTED BY ARTCC. KANE COUNTY.
327 PM...	1 TO 1 1/4 INCH HAIL AT AURORA REPORTED BY WSFO EMPLOYEE. KANE COUNTY.
327 PM...	1/2 TO 3/4 INCH HAIL IN SOUTHWEST CORNER OF AURORA. ESTIMATED 40 TO 45 MPH WIND...LARGE TREE LIMBS DOWN. RELAYED REPORTS BY RADIO STATION. KANE COUNTY.
337 PM...	MOBILE HOME FLIPPED OVER NEAR OSWEGO (15 NW JOT) RELAYED REPORT BY RADIO STATION - WMSO. WILL COUNTY.
340 PM...	GOLF BALL SIZE HAIL AT JOLIET. REPORTED BY WSFO EMPLOYEE. WILL COUNTY
343 PM...	3/4 INCH HAIL AT LOCKPORT. REPORTED BY WSFO EMPLOYEE. WILL COUNTY.
340 PM...	1.25 INCHES OF RAIN IN 20 MINUTES. 3/4 INCH HAIL. TREES AND BRANCHES DOWN IN SYCAMORE (23 SE RFD). REPORTED BY SPOTTER. DEKALB COUNTY.
345 PM...	TENNIS BALL SIZE HAIL JUST WEST OF JOLIET. REPORTED BY WSFO EMPLOYEE.
425 PM...	TORNADO NEAR PLAINFIELD. TWENTY HOMES BADLY DAMAGED OR DESTROYED. ONE TO FOUR MILES NORTH OF PLAINFIELD. TORNADO STRUCK JOLIET JR COLLEGE...DAMAGE UNKNOWN. REPORTED BY SPOTTER AT MANHATTEN.
430 PM...	13 TO 14 AIRCRAFT OVERTURNED OR DAMAGED. POWER OUT. THREE HANGARS DESTROYED. WINDOWS BLOWN OUT OF CARS...ONE OVERTURNED. ALL AT AURORA AIRPORT. REPORTED BY FAA AT AURORA. OCCURRED AROUND 330 PM...RECEIVED LATER.

A-5: Releases of WSFO Indianapolis

Shown below are releases of the WSFO Indianapolis that were relevant to the severe weather events that occurred over northern Illinois.

A-5.1: Zone Forecasts

NNNN>##<A<
<ZCZC INDSWSIN
ETTAA00 KIND 281610

INDIANA WEATHER SUMMARY
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
1115 AM EST TUE AUG 28 1990

HIGH PRESSURE ALONG THE EAST COAST WILL GIVE INDIANA ONE MORE HOT AND UNCOMFORTABLE DAY. OVERNIGHT THE AIR CONDITIONERS DID NOT GET MUCH OF A BREAK AS LOW TEMPERATURES ONLY DROPPED INTO THE MIDDLE 60S TO LOWER 70S.

THE HEAT AND HUMIDITY WILL CONTINUE TO MOVE INTO INDIANA THIS AFTERNOON. BY LATE AFTERNOON TEMPERATURES WILL REACH THE LOWER TO MIDDLE 90S. RELATIVE HUMIDITIES WILL ONLY DECREASE TO THE 50 TO 60 PERCENT RANGE. THIS WILL MAKE IT VERY DANGEROUS TO DO ANY HARD WORK OUTDOORS. HEAT STROKE WOULD BE POSSIBLE IF FREQUENT BREAKS ARE NOT TAKEN AND IF YOU DO NOT DRINK AN ADEQUATE AMOUNT OF LIQUIDS.

A COLD FRONT WILL MOVE THROUGH INDIANA TONIGHT. THIS WILL BRING A CHANGE TO THE WEATHER. WITH THE AMOUNT OF MOISTURE IN THE AIR THUNDERSTORMS WILL DEVELOP ALONG THE FRONT. THESE THUNDERSTORMS WILL FIRST MOVE INTO NORTHERN INDIANA LATE THIS AFTERNOON. THEY SHOULD NOT MOVE INTO NORTHERN INDIANA LATE THIS AFTERNOON. THEY SHOULD NOT MOVE INTO CENTRAL INDIANA UNTIL LATER THIS EVENING. A FEW OF THESE THUNDERSTORMS MAY BE SEVERE.

SOME LOCATIONS MAY GET RAINFALL IN EXCESS OF TWO INCHES. THE COLD FRONT WILL MOVE SOUTH OF INDIANA ON WEDNESDAY. BEHIND THE FRONT COOLER AND LESS HUMID AIR WILL MOVE INTO INDIANA. ONLY IN THE EXTREME SOUTH WILL TEMPERATURES REACH ABOVE 90 DEGREES. THE NORTH WILL ONLY HAVE HIGHS AROUND 80.
HAINES

A-5.2: Warnings and Statements

NNNNZCZC INDSPSIND
ETTAA00 KIND 282027
INZ001>006-010-282200-

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE
INDIANAPOLIS INDIANA
320 PM EST TUE AUG 28 1990

TWO SEVERE THUNDERSTORM WATCHES ARE IN EFFECT FOR NORTHERN INDIANA THIS AFTERNOON AND EVENING. THE DIVIDING LINE BETWEEN THESE TWO WATCHES IS FROM SOUTH BEND TO 10 MILES SOUTH OF KOKOMO. THE WESTERN WATCH IS IN EFFECT UNTIL 800 PM EST...THE EASTERN WATCH IS IN EFFECT UNTIL 900 PM EST.

AT 315 PM EST RADAR SHOWED THUNDERSTORMS OVER EXTREME NORTHERN INDIANA BETWEEN SOUTH BEND AND FORT WAYNE

THE WEATHER SERVICE OFFICES AT BOTH SOUTH BEND AND FORT WAYNE HAVE ISSUED SEVERE THUNDERSTORM WARNINGS FOR SOME COUNTIES IN NORTH CENTRAL AND NORTHEAST INDIANA. THE WARNING FOR SOUTHERN ELKHART COUNTY IS IN

EFFECT UNTIL 330 PM. ANOTHER WARNING IS IN EFFECT UNTIL 330 PM FOR SOUTHERN LAGRANGE AND NOBLE COUNTIES.

THE THUNDERSTORMS WERE MOVING SOUTHEAST AT 30 TO 35 MILES AN HOUR.

ANOTHER THUNDERSTORM WHICH PRODUCED 1 1/2 HAIL IN ROCKFORD ILLINOIS WAS CONTINUING TO MOVE EAST SOUTHEAST AND IS EXPECTED TO MOVE INTO NORTHWEST INDIANA BETWEEN 4 AND 5 PM EST.

SOME CITIES INCLUDED ARE... KOKOMO... ELKHART...ANGOLA... WARSAW...FORT WAYNE...MARION... TIPTON...MUNCIE...WINCHESTER... SOUTH BEND... ROCHERSTER... LOGANSPORT...VALPARAISO...LAPORTE... MONTICELLO AND RENSSELAER.

REMEMBER...A WATCH MEANS THAT CONDITIONS ARE FAVORABLE FOR SEVERE WEATHER IN AND CLOSE TO THE WATCH AREA. PERSONS IN THESE AREAS SHOULD BE ON THE LOOKOUT FOR THREATENING WEATHER CONDITIONS AND LISTEN FOR LATER STATEMENTS AND POSSIBLE WARNINGS.

WJG

NNNNZCZC INDSPSIND
ETTAA00 KIND 282106
INZ001>006-010-282210-

SPECIAL WEATHER STATEMENT
NATIONAL WEATHER SERVICE
INDIANAPOLIS INDIANA
405 PM EST TUE AUG 28 1990

TWO SEVERE THUNDERSTORM WATCHES CONTINUE IN EFFECT FOR NORTHERN INDIANA FOR THIS AFTERNOON AND EVENING. THE DIVIDING LINE BETWEEN THESE TWO WATCHES IS FROM SOUTH BEND TO 10 MILES SOUTH OF KOKOMO. THE WESTERN WATCH IS IN EFFECT UNTIL

800 PM EST...THE EASTERN WATCH IS IN EFFECT UNTIL 900 PM EST.

SOME CITIES INCLUDED IN THE WATCH AREAS ARE SOUTH BEND...KOKOMO... ELKART...ANGOLA...WARSAW...FORT WAYNE...MUNCIE AND RENSSELAER.

AT 400 PM EST RADAR SHOWED DANGEROUS THUNDERSTORMS 30 MILES SOUTH OF DOWNTOWN CHICAGO AND OTHERS OVER NORTHEAST INDIANA BETWEEN SOUTH BEND AND TO THE NORTH OF FORT WAYNE.

THE STORMS WERE MOVING TO THE SOUTHEAST AT 30 MILES AN HOUR.

PEOPLE IN THE WATCH AREAS SHOULD KEEP ABREAST OF THE LATEST WEATHER DEVELOPMENTS AND LISTEN FOR POSSIBLE WARNINGS.
STEIGERWALDT

ETTAA00 KIND 282123
INC111-073-282200-

BULLETIN - IMMEDIATE BROADCAST REQUESTED
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
420 PM EST (420 PM CDT) TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE IN INDIANAPOLIS HAS ISSUED A SEVERE THUNDERSTORM WARNING EFFECTIVE UNTIL 500 PM EST (500 PM CDT) FOR PEOPLE IN THE FOLLOWING COUNTIES...

IN NORTHWEST INDIANA
...NEWTON
...JASPER

AT 418 PM EST A SEVERE THUNDERSTORM WAS NEARING THE ILLINOIS AND INDIANALINE 35 MILES SOUTH OF GARY. THIS STORM PRODUCED 2 INCH DIAMETER HAIL IN AURORA ILLINOIS WHICH IS WEST OF CHICAGO.

ANOTHER SEVERE THUNDERSTORM
WAS 30 MILES SOUTH OF GARY. GOLF
BALL SIZE HAIL WAS REPORTED WITH
THIS STORM AT I-65 AND INDIANA
STATE ROAD 10 BY THE PUBLIC AT 416
PM EST.

THE STORMS WERE MOVING TO THE
SOUTHEAST AT 35 MILES AN HOUR.

PEOPLE IN THE CITIES OF LAKE
VILLAGE...ENOS...KENTS...MOROCCO...
WHEATFIELD AND RENSSELAER
SHOULD REMAIN INDOORS AND AWAY
FROM WINDOWS. PEOPLE OUTDOORS
IN THESE CITIES SHOULD SEEK
SHELTER IN A STRONG BUILDING AS
QUICKLY AS POSSIBLE.

SEVERE THUNDERSTORMS PRODUCE
WINDS OF 58 MILES AN HOUR OR MORE
AND/OR LARGE HAIL 3/4THS INCH IN
DIAMETER OR GREATER.
STEIGERWALDT

NNNN
.BREAK

ZCZC INDSVRIND
ETTAA00 KIND 282135 COR
INC111-073-282200-

BULLETIN - IMMEDIATE BROADCAST
REQUESTED...CORRECTION
SEVERE THUNDERSTORM WARNING
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
420 PM EST (420 PM CDT) TUE AUG 28
1990

THE NATIONAL WEATHER SERVICE IN
INDIANAPOLIS HAS ISSUED A SEVERE
THUNDERSTORM WARNING EFFECTIVE
UNTIL 500 PM EST (500 PM CDT) FOR
PEOPLE IN THE FOLLOWING
COUNTIES...

IN NORTHWEST INDIANA
...NEWTON
...JASPER

AT 418 PM EST A SEVERE
THUNDERSTORM WAS NEARING THE

ILLINOIS AND INDIANA STATE LINE 35
MILES SOUTH OF GARY. THIS STORM
PRODUCED 2 INCH DIAMETER HAIL IN
AURORA ILLINOIS WHICH IS WEST OF
CHICAGO.

ANOTHER SEVERE THUNDERSTORM
WAS 30 MILES SOUTH OF GARY. GOLF
BALL SIZE HAIL WAS REPORTED WITH
THIS STORM AT I-65 AND INDIANA
STATE ROAD 10 BY THE PUBLIC AT 416
PM EST.

THE STORMS WERE MOVING TO THE
SOUTHEAST AT 35 MILES AN HOUR.

PEOPLE IN THE CITIES OF LAKE
VILLAGE...ENOS...KENTS...MOROCCO...
WHEATFIELD AND RENSSELAER
SHOULD REMAIN INDOORS AND AWAY
FROM WINDOWS. PEOPLE OUTDOORS
IN THESE CITIES SHOULD SEEK
SHELTER IN A STRONG BUILDING AS
QUICKLY AS POSSIBLE.

SEVERE THUNDERSTORMS PRODUCE
WINDS OF 58 MILES AN HOUR OR MORE
AND/OR LARGE HAIL 3/4 INCH IN
DIAMETER OR GREATER.

STEIGERWALDT
CORRECTION FOR LINE LENGTH

NNNNZCZC INDSVSIND
ETTAA00 KIND 282140
INZ001>006-282200-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
439 PM EST TUE AUG 28 1990
A SEVERE THUNDERSTORM WARNING
IS IN EFFECT FOR NEWTON AND
JASPER COUNTIES UNTIL 5 PM EST.

AT 430 PM EST...A SEVERE
THUNDERSTORM WAS 5 MILES WEST OF
MEDARYVILLE OR 35 MILES SOUTHEAST
OF GARY. AT 427 PM EST...GOLF BALL
SIZE HAIL WAS REPORTED WITH THIS
STORM BY THE JASPER COUNTY
SHERIFF 5 MILES SOUTH OF

DEMOTTE. DEMOTTE IS 30 MILES SOUTH OF GARY.

ANOTHER SEVERE THUNDERSTORM HAD JUST MOVED INTO NEWTON COUNTY BETWEEN LAKE VILLAGE AND ENOS...OR 30 MILES SOUTH OF GARY. THIS STORM EARLIER PRODUCED A TORNADO NEAR JOLIET ILLINOIS.

THESE STORMS WERE MOVING TO THE SOUTHEAST AT 35 MILES AN HOUR.
STEIGERWALDT

NNN
<BREAK

ZCZC INDTORIND
ETTAA00 KIND 282153
INC111-282230-

BULLETIN - EBS ACTIVATION REQUESTED
TORNADO WARNING
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
451 PM EST (451 PM CDT) TUE AUG 28 1990

THE NATIONAL WEATHER SERVICE IN INDIANAPOLIS HAS ISSUED A TORNADO WARNING EFFECTIVE UNTIL 530 PM EST (530 PM CDT) FOR PEOPLE IN THE FOLLOWING COUNTY...

IN NORTHWEST INDIANA
...NORTHERN NEWTON

AT 448 PM EST...WEATHER RADAR INDICATED A POSSIBLE TORNADO ON THE ILLINOIS AND INDIANA STATE LINE 5 MILES SOUTHWEST OF SCHNEIDER OR 30 MILES SOUTH OF GARY.

MOVEMENT WAS SOUTHEAST AT 35 MILES AN HOUR.

PEOPLE IN THE CITIES OF SUMAVA RESORTS...LAKE VILLAGE...THAYER AND ROSELAWN SHOULD MOVE TO AN INTERIOR ROOM OF THE HOME ON THE LOWEST FLOOR POSSIBLE. THIS STORM

PREVIOUSLY PRODUCED A TORNADO IN THE JOLIET AREA OF ILLINOIS.
STEIGERWALDT

NNNNZCZC INDSVSIND
ETTAA00 KIND 282206
INZOO1>006-282230-

SEVERE WEATHER STATEMENT
NATIONAL WEATHER SERVICE
INDIANAPOLIS IN
505 PM EST TUE AUG 28 1990

A TORNADO WARNING IS IN EFFECT FOR NORTHERN NEWTON COUNTY IN NORTHWEST INDIANA UNTIL 530 PM EST.

THE NATIONAL WEATHER SERVICE HAS NOT RECEIVED ANY REPORTS OF A TORNADO WITH THIS STORM IN INDIANA...BUT RADAR SHOWED A POSSIBLE TORNADO 8 MILES SOUTHEAST OF LAKE VILLAGE OR 35 MILES SOUTH OF GARY.

MOVEMENT WAS SOUTHEAST AT 35 MILES AN HOUR.

PEOPLE IN THE CITIES OF ROSELAWN...PEMBROKE AND KENTS SHOULD REMAIN INDOORS IN AN INTERIOR ROOM ON THE LOWEST FLOOR POSSIBLE UNTIL THIS STORM PASSES.
STEIGERWALDT

APPENDIX B

CHRONOLOGY OF ACTIONS/REPORTS

The following are the severe weather, telephone, and action logs that were maintained on August 28, 1990, at National Weather Service locations. The logs are reproduced fully here.

B-1: The Actions/Reports at WSO Rockford

The following is taken from hand written log from personnel at WSO Rockford August 28. Not all actions taken by the staff are noted in this log.

- 1:35 PM CDT Funnel cloud reported by State Police south of Pecatonica near State Police Headquarters.
- 1:37 PM CDT Tornado on the ground moving south...State Police.
- 1:39 PM CDT Tornado Warning issued for eastern Winnebago, southern Boone and northern DeKalb Counties. MMO reported cell movement of 29025.
- 1:40 PM CDT Tornado on the ground moving toward Seward...State Police.
- 1:42 PM CDT Tornado at Seward moving south...reported by State Police.
- 1:50 PM CDT State Police reports cars carried up to the air, trees down and cemetery stones carried aloft.
- 1:53 PM CDT Gene Boyt of Sjestron (sp) Construction--Funnel cloud west of Pecatonica--almost hit the ground--tail went back up into the cloud.
- 2:05 PM CDT Funnel Cloud reported west of Rockford...Montague RD. No touchdown.
- 2:08 PM CDT Golf ball hail--Sandy Hollow Road.
- 2:20 PM CDT 2-1/2" diameter hail east of Rockford airport.
- 2:30 PM CDT Marble size hail and rain in NW DeKalb reported by DeKalb County sheriff.
- 2:45 PM CDT North of city DeKalb--Damage to crops, tree damage, golf ball-size hail reported by DeKalb County sheriff.
- 2:54 PM CDT 3/4" hail at N.I.U. DeKalb.
- 2:55 PM CDT Golf ball-size hail, funnel cloud sighted moving southeast 1-1/2 miles north of DeKalb--reported by DeKalb Co. sheriff--numerous reports of crop and tree damage.

B-2: The Actions/Reports at WSFO Chicago

CHRONOLOGY OF SEVERE WEATHER EVENTS/ACTIONS AT WSFO CHICAGO AUGUST 28, 1990

(all times p.m., CDT)

- 2:00 Special Weather Statement issued as follow-up to Severe Thunderstorm Watch WW691 (NWR: 200-?)
- 2:10 Chicago Metropolitan Forecast updated to include possibility of severe thunderstorms (NWR: 222-407)
- 2:32 Severe Thunderstorm Warning issued until 3:30 for northern Kane County (NWR w/tones: 235-253)
- Illinois State Police, district 2, solicited for severe weather report
- 2:45 One-inch hail reported in western Kane County east of Sycamore (from ISP, district 2)
- 2:50 Severe Weather Statement issued as follow-up to 232 SVR (NWR: 253-305)
- 2:52 Half-inch hail and 50 mph winds reported between DeKalb and I-88 in DeKalb County (from spotter)
- 2:55 Tree damage reported in Big Rode in southwest Kane County (from CWSU ZAU)
- 3:17 Three-quarter inch hail reported at Aurora; 35 mph winds reported at St. Charles (from ESDA center at Melrose Park)
- 3:21 Pea-size hail and strong winds reported at Sugar Grove in Kane County (from ISP, district 2)
- 3:23 Severe Thunderstorm Warning issued until 4:30 for southern Du Page County (NWR w/tones: 325-338)
- 3:23 One and one-quarter-inch hail reported at ZAU (from CWSU ZAU)
- 3:27 One to one and one-quarter-inch hail reported at Aurora (from WSFO employee)
- 3:27 One-half to three-quarter-inch hail reported over southwest corner of Aurora; winds 40-45 mph; large tree limbs down (from ESDA center at Melrose Park)
- 3:37 Severe Thunderstorm Warning issued until 4:45 for northeast Kendall, southern Kane, northern Will and southern Du Page counties (NWR w/tones: 338-420)
- 3:37 Mobile home reported flipped near Oswego in Kendall County (from WMAQ radio)
- 3:40 Golf ball-size hail reported near Joliet in Will County (from WSFO employee)
- 3:40 Severe Weather Statement issued as follow-up to 337 SVR
- 3:43 Three-quarter-inch hail reported at Lockport in Will County (from WSFO employee)
- 3:45 Tennis ball-size hail reported west of Joliet in Will County (from WSFO employee)

- 3:45 Tornado reported at Crest Hill in Will County (from ISP, district 2)
- 3:51 Tornado warning issued until 5:00 for west-central Will County (NWR w/tone: 354-435)
- 3:55 Severe Weather Statement issued as follow-up to 351 TOR (NWR: 401-502)
- 4:31 Severe Thunderstorm Warning issued until 5:30 for eastern Kankakee County (NWR: 433-502)
- 4:35 Severe Weather Statement issued cancelling 351 TOR (NWR: 453-502)
- 4:50 Tornado Warning issued until 5:15 for southwest Lake (IN) County (NWR: 450-600)
- 5:11 Severe Weather Statement issued cancelling 431 SVR and 450 TOR (NWR: 511-604)

SEVERE WEATHER LOG FOR ILLINOIS

Month Aug 1990

Date	Time	Reporting Agency/Person	Type of Storm	Location	Remarks	Form Sent	WB614-2 Date	Date Recd
8/28	245	Spotter SP2	SVRTSTM		HVY RAIN 1 IN HAIL..HIGH WIND E.Sycamor RS			
9/28	2:52	Spotter DKB-188	TSTM	BTWN DKB-188	Y2"A 50 MPH more SE			
9/28	255	ARTCC	WND		BIG ROCK TREE DAMAGE			
	317p	Melroe			35 mph St. Charles 3/4A ARR			
9/28	321	State Police 2			LRG A/STRONG WINDS SUGAR GROVE PEA SIZE			
9/28	323	Fishes			1 1/4 A at ARTCC			
9/28	327	Collins			1 - 1 1/4 A AURORA-			
8/28	327pm CDT	Bill Smartz	HAIL, WIND DAMAGE		1/2 - 3/4 INCH HAIL OVER S.W. CORNER OF AURORA EST. 4045 MPH. WIND; LARGE TREE LIMBS DOWN.			
	337	WMDQ			MOBIL HOME FLIPPED IN OSWEGO			
	3:40	Paul Merzlock	SVR TSTM	JOT	GOLF BALL SIZED HAIL AT JOLIETS			
	3:43	Clint Simpson	" "	Lockport	3/4" HAIL			
8/28	3:40 pm	Dan Walts Dekalb		Dekalb	1.25" RAINFALL IN 20 MIN 3/4" HAIL TREES & BRANCHES DOWN IN SYSCAMORE			
8/28	RCVD 425 pm	Manhatton SD		Will CO	TORNADO -----PLAINFIELD HOMES BADLY DAMAGED OR DESTROYED 1-4 MI NORTH OF PLAINFIELD 127TH ST EAST OF HIGHWAY 59 20 HOUSES DAMAGED OR DESTROYED, U.S. 30 CLOSED SW			
					OF PLAINFIELD, TOR JOLIET JR COLLEGE. DAMAGE UNKN.			
8/28	RCVD 430	FAA 330 pm	TORNADO OR SVRTSTM	ARR AIR PORT	13-14 AFCT OVERTURNED OR DAMAGED POWER OUT 3 TRAILERS DESTROYED			
8/28					WINDOWS BLOWN OUT OF CARS 1 CAR OVERTURNED			
8/28	345	Paul MERF	SVR TSTM	W JOT	TENNIS BALL HAIL			
8/28	605	By MMO	SVRTSTM	PERU	DIME TO QUARTER SIZE HAIL			
	620	ARTCC	SVRTSTM	W.MMO	MARBLE SIZE HAIL			
	135	St Police	GOLF BALL HAIL	CULLON	FOLLOW UP BROKEN WINDOWS, VEHICLES DAMAGED BY HAIL			

B-3: The Communication Log at Marseilles WSMO

<u>August</u> <u>Month</u>	<u>1990</u> <u>Year</u>			
<u>DTG (Z)</u>	<u>TO</u>	<u>FROM</u>	<u>SUBJECT</u>	<u>INITIALS</u>
271812	CASC		Info for Ken	B
280000	TIME		Time Chk - Clocks ok	TD
281312	REGION JAMES		Furlough info (will call back)	B
281320		R.J.	Info on furlough	B
281756		RFD	Are those trw's nr us? Don't know for sure	VJ
281810	RFD		LVL 5 stm NNW of RFD top 47,000'	VJ
281816	CHI		Anything new with cell NW of RFD? Top 48,000'	VJ
281832	RFD		Bwer N of RFD 5 LVL	B
281843	RFD		LVL 6 stm top 56,000 ft mvg SE 20- 25 mph	W
281855		SBN	Cell nr us -- How is it doing? Top 46,000'--LVL 5	VJ
281902		CHI	RFD had tornado sighted 15 mi W of them	VJ
281928		RFD	LVL 6 stm nr Genoa in Dekalb. Cty, top 55,000'	VJ
281934	CHI		Told them same as RFD above	VJ
281954	CHI		60,000' stm LVL 6 4-5 mi E of DKB VIP 6 40,000	VJ
282015		CHI	Max top 65,000' VIP 6 nr Aurora	VJ
282039		HONEWOOD CC.	FAST Poss svr storms 4-7 pm	DR
282039		PIA	RNS says storms east of BMI, SPI radar shows nothing. Few weakening shwrs now.	DR
282125		NORWAY IL CITIZEN	FCST	DR
282126		LASALLE NUKE STA.	FCST	DR

282141	CHI	See any hook on VIP 6 storm? Not really thru past hour will keep close check. Storm now NE Kankakee Co.	DR
282142	BILL B.	In Oswego, major damage rptd	
282144	CHI	Hotline ok. Hook first time observed S of Beecher Kankakee/ Will co line	DR
282147	CHI	Our monitors shows it further S-E than Beecher? Storm nr Grant Park w/ Appendage extending to just SE of Beecher nr stateline. First appendage seen all day.	DR
282157	IND	Storm in N. Newton Co mvg SE top weakening to 50,000' VIP 5 to 15,000'	DR
282204	CHI	Storm is now out of S Lake Co. Another VIP 5 storm nr Joliet	DR
282340	CHI	The VIP 5 storm nr Joliet has weakened now to LVL 3. New VIP 5 strm 5 mi W of Peru dev rapidly since 5:30	DR
282303	PERU POLICE 223-2157	Radar shows poss hail spike over Peru. Any hail reports. Yes. Quarter size hail	DR
282305		LVL 6 storm LVL 6 to 20,000' over Peru called Peru Police said, dime to quarter size hail	DR
282308	MMO POLICE	Call Peru police back	DR
282310	PERU POLICE	Larger size hail than before very hvy rain.	DR
282338	CHI	LVL 6 storm over Streator picking up in speed now SE at 30-35 mph VIP 6 to ~300 will move thru Pontiac & Odell by 7 am	DR

B-4: Special Radar Scans of the Storm Taken at Marseilles WSMO

The time and scans taken were derived from the 8 mm film of the PPI scope at Marseilles WSMO. Numbers after the RHI denote azimuth angles along which the RHI was performed. Only for the 2005 elevated scan could the actual elevation tilt be determined.

<u>Time (CDT)</u>	<u>Procedure</u>
1809	RHI
1955-2000	RHIs and elevated scan
2002-2003	RHI
2005	Elevated scan
2013	RHI (37,43,45,49)
2017	Power dropout?
2029	RHI (8,13,17,28,49,80,81)
2045	RHI (54,56)
2046	RHI (31,38,52,54,64,70)
2053-2100	RHI (25,34,44,55,65,72,83) and elevated scans
2106	RHI (46,63,68,82,119)

B-5: The Communication Log at NSSFC

SELS DAY SHIFT

<u>LOG OF SIGNIFICANT Ph.</u>	<u>LLS</u>	
<u>TIME (CDT)</u>	<u>TO\FROM</u>	<u>SUBJECT</u>
1255	ARB/	#689
1310	FSD/	#690
1325	CHI IND	#691
1345	IND CLC	#692
1350	PIT/	NO ON WV
1530	BUF ALB/PIT	#693
1540	OMA	#694

SELS SWING SHIFT

<u>TIME</u>	<u>TO\FROM</u>	<u>SUBJECT</u>
1700 CDT	FM CHI	Radio rpts indc 5 dead, many injured NW & N of JOT (Talked to Paul Dailey)
1705 CDT	FM ARB	Discussed clrg in S LWR MI--prefer to keep in counties alg and south of bndry as indcd by Stlt (~BEH-FNT LN)
1730 CDT	FM CHI	Discussed psbl clrg of WW--real cdfnt still N of RFD-ORD with very unstbl ams contg. Prefer not to clr nrn ptn of WW atm as path of least regret.
1815 CDT	TO ALB	WW 695 wibis
1845 CDT	TO CHI, IND	WW 696 wibis
1915 CDT	TO ALB, PHL,PIT	WW 697 wibis
1920 CDT	FM FSD	Ok to clr W of Y26-P05 Ln

1925 CDT	FM CRW	Primary threat NRN WV pnhdl attm
1940 CDT	TO CRW, CLE,PIT	WW 698 wibis
2000 CDT	FM OMA	OK to clr wrn half of WW--we may cancel entire WW at zone time
2020 CDT	FM BUF	Discussed WW 693--Ok to clr nrn ptn
2120 CDT	TO BOS, PWM, ALB	WW 699 wibis
2135 CDT	TO PIT	Small area of W cntrl PA will not be in WW after 03Z expiration of WW 693. Agreed to have PIT Locally extend WW of svrl hrs in W cntrl PA as sqln sags swd.
2145 CDT	TO BOS, PHL,ALB, NYC	WW 700 wibis
2235 CDT	FM BOS	CHH radar indcs tstms rpdly wkng over wrn MA--our ltg confirms that trend--will cancel WW at 04Z
2250 CDT	TO ALB, PWM	Will cancel WWS 695 & 699

APPENDIX C

PRODUCT AND INFORMATION DISSEMINATION

C-1: Emergency Service Agencies

Watches, warnings, and severe weather statements are distributed to the various Illinois county and local emergency officials in several ways. The system is in place so that every affected official was notified of watches and warnings affecting his/her area of responsibility. These pathways include:

A: LEADS (Law Enforcement and Dissemination System)...This is the communication system of the Illinois State Troopers. Messages received over the NOAA Weather Wire System (NWS) drop at the state police headquarters in Springfield are evaluated by the duty technician, coded by that person as to counties affected, and forwarded to the trooper district offices having responsibility for those counties. communication drops on the LEADS also direct such messages to the various county sheriffs' offices, to some municipal police, and to other interested agencies.

B: NOAA Weather radio (NWR)...Only a few emergency offices have these installed. Most of the people involved have heard of NWR, however. In some counties, specifically Kane and Kendall, people feel reception deteriorates during bad weather.

C: NAWAS...Personnel at District 2 of the Illinois State Police seemed to do a lot more with this system than did those at District 5 although both offices have it. Warnings are not broadcast on NAWAS by District 5. They are broadcast and rebroadcast by District 2.

D: Local radios...Both District 2 and District 5 broadcast all watches and warnings received over LEADS on local radio frequency to their field people. Some of these frequencies are routinely monitored by local sheriffs and other groups.

E: Ham radios...A very aggressive group (CHICAGOLAND SKYWARN ASSOCIATION) collocated with the Melrose Park ESDA (Emergency Services and Disaster Agency) office has established a ham network through much of the NE Illinois area. The head of this group is also the head of the Melrose Park ESDA office. He pays for a NWS drop out of his own pocket. The SKYWARN people broadcast all watches, warnings, and statements dealing with systems affecting or that possibly could affect NE Illinois.

F: ISPERNS (Illinois State Police Emergency Radio Network System)...This is a statewide police network connecting all law enforcement agencies. Broadcasts of weather information on this are sometimes made. However, there seems to be no consistency or standardization as to its use for distributing weather information.

G: Will County has an agreement with Grundy County that Grundy County will fax copies of applicable weather messages received. Grundy County has leased a drop on the NWWS.

C-2: Radio Stations

WJCH (FM) - Joliet

News director John Rorik said they got the watch and warnings using NOAA Weather Radio (NWR). He did not broadcast the watch but indicated he probably would have if it was a tornado watch. He broadcasted the severe thunderstorm warning for Will County at 3:37 p.m. but not the tornado warning at 3:51 p.m., CDT, since he lost power.

WCCQ (FM) - Joliet

News director Bob Channick said his station received the watch and warnings from UPI, and he uses NWR as a backup. The watch was broadcast. He telephoned SELS directly for additional information and clarification. He cut into programming a number of times for warnings after 3:00 p.m. until he lost power at 3:40 p.m., CDT.

WJOL (AM) - Joliet

News director Randy Bunger said that the station got the watch and warnings from AP. NWR is available for backup. He was broadcasting warnings from the Rockford area all the way to Kane County. He couldn't recall the 3:37 p.m. and 3:51 p.m., CDT, warnings due to chaotic emergency conditions accompanying the tornado, in which he lost power.

WWHN (FM) - Joliet

Owner Ray Hawkins said he uses NWR. He did not get the watch. He attempted to broadcast the warning at 3:37 p.m., CDT, but lost power. He said he heard the sirens just before losing power. He indicated that severe thunderstorm watches do not raise as much concern as tornado watches.

WBBM (AM) - Chicago

According to Georgeann Herbert, the managing editor, they use Accu-weather for scheduled weather reports but also have access to AP (Associated Press), UPI (United Press International), and NOAA Weather Wire Service for NWS weather information. Accu-weather announced the watch over the station shortly after issuance but incorrectly called it a tornado watch. The station immediately corrected that. They were following the storm all the way from the Rockford area to Joliet and were broadcasting all the warnings. Around 2:00 p.m., CDT, they had a live report from state troopers and other eyewitnesses to the tornado sighting near Pecatonica. Shortly after the tornado, the station did a telephone interview with WSFO Chicago.

WGN-AM - Chicago

Staff meteorologist Roger Triemstra said they got all watch and warning information from NWS. They highlighted the severe weather outlook in the morning. The watch was broadcast at 1:30 p.m. and then they reported on severe weather activity in the Rockford area from 1:30 p.m. to 2:00 p.m., CDT. After 2:00 p.m., CDT, they broke into programming with warning and reports at least 30 times. The station was in contact with the WSMO in Marseilles as the storm progressed.

WLS-AM - Chicago

Wayne Messmer of the News Department indicated that they received all watch and warning information through AP. They announced the watch at 2:00 p.m., CDT, and cut in on all warnings affecting the Chicago area. Severe weather coverage become continuous after 3:30 p.m., CDT. The WSFO Chicago was interviewed by telephone shortly after the tornado struck.

WMAQ-AM - Chicago

News Director Jim Frank mentioned that sources of weather information are AP and the private meteorological firm of Murray and Trettel. All watch and warning information was broadcasted as soon as received. Even in routine weather situations they give forecasts and observations every few minutes along with expanded reports from Murray and Trettel 2 to 3 times an hour (and 4 to 5 times an hour during significant or severe weather). Weather coverage was continuous by 3:30 p.m., CDT. The station interviewed the WSFO by telephone.

WJJD-AM - Chicago

Reese Rickards is public service director. Their weather information source is NWWS and the private meteorological firm of OMNI (at Du Page Co. Airport). Although their news and weather reports are primarily a morning operation, their announcers broadcast severe weather reports as received.

C-3: Television Stations

ROCKFORD, ILLINOIS, TV STATIONS

WIFR-TV, Ch. 23, CBS affiliate, located in Freeport, IL

News Director said station received the Weather Service's severe thunderstorm watches and warnings and ran crawls at the bottom of the TV screen to inform the public even though their area was unaffected by the storm.

WREX-TV, Ch. 13, ABC affiliate

News Director Dennis Horton said he first heard about the stormy conditions from a state trooper's police radio. He received the NWS severe thunderstorm watch and warning later and ran crawls across the screen to inform the public.

WTVO-TV, Ch. 17, NBC affiliate

News Director said he received severe thunderstorm watch and warning from UPI wire at about 2 p.m. and ran a slide system and crawls with tone and chirp several times. He later heard the tornado warning from the sheriff's scanner in his office and ran an appropriate crawl.

CHICAGO TV STATIONS

WCIU-TV, Ch. 26, Univision, Spanish-speaking station

News Director received severe thunderstorm watches and warnings and ran crawls to inform public.

WFLD-TV, Ch. 32, Fox affiliate

News Director said station received severe thunderstorm watch and warning and ran several crawls throughout the afternoon. He later got word of the tornado warning from Rockford WSO through the AP wire and a radio system in the station's weather office. He commented that the information was updated so fast that as soon as the operator would type in one crawl, he'd get another message that would superseded it.

WGN-TV, Ch. 9, Trinity Broadcasting

Meteorologist Tom Skilling said his station heard about the severe thunderstorm watch and warning through the AP and Weather Wires. Crawls were aired non-stop throughout the afternoon at about 2:15 p.m., CDT. When he heard the tornado warning for southern Du Page, Kendall and Will Counties, he ran appropriate crawls at the bottom of the screen. He commented that the warning could've been "a little stronger."

WMAQ-TV, Ch. 5, NBC affiliate

Meteorologist John Coleman said he received the severe thunderstorm watches and warnings and ran continuous crawls including county warnings until 3:24 p.m., CDT. The station aired four to six constant updates, including a live cut in at 3:55 p.m., CDT, after the tornado had touched down. His comment was that "it is quite beyond the Weather Service's current capability to provide tornado warnings. It would be better if they issued severe thunderstorm watches and warnings and tell citizens that after that they're on their own."

APPENDIX D

PREPAREDNESS ACTIVITIES WSFO CHICAGO

D-1: 1989 Preparedness Talks

The list contains all talks related to severe weather and spotter training made in the counties of warning responsibility. However, nine other appearances not relating to convective severe weather also were made.

Feb	Larson Spotters	Will Co.
Feb	Cook County Sheriffs Police	Cook Co.
Feb	South Haven Civil Defense	Lake/Porter Cos. IN
Mar	Bolingbrook Amateur Radio Society	Will Co.
Mar	Lynwood ESDA	Cook Co.
Mar	Barrington Fire Dept & ESDA	Lake Co.
Mar	Crystal Lake Radio Amateurs/ESDA	McHenry Co.
Mar	Aurora ESDA	Kane Co.
Mar	Joliet Amateur Radio Society	Will Co.
Mar	Ford County ESDA	Ford Co.
	Iroquois & Livingston Cos. also represented	
Mar	Markham/Hometown ESDA	Cook Co.
Mar	Palos ESDA	Cook Co.
Mar	WAIT Radio (with McHenry Co. ESDA)	McHenry Co.
Mar	Naperville ESDA	Du Page Co.
Mar	York Radio Club	Du Page Co.
Apr	Palatine Fire Dept/ESDA	Cook Co.
Apr	Bolingbrook Amateur Radio Society (2nd)	Will Co.
Apr	Amateur Radio Emergency Service	Cook Co.
Apr	Fermilab/Batavia ESDA Severe Weather Seminar	Kane Co.
Apr	Lake Co. ESDA (3 separate appearances)	Lake Co.
Apr	Rolling Meadows Amateur Radio Club	Cook Co.
Apr	Argonne Amateur Radio Society	Du Page Co.
Apr	Des Plaines ESDA	Cook Co.
Apr	Melrose Park Skywarn & ESDA	Cook Co.
Apr	WGN Radio Severe Weather Seminar	Cook Co.
Apr	Grundy Co. ESDA	Grundy Co.
Apr	Wauconda Fire Dept/ESDA	Lake Co.
Apr	Palatine Fire Dept.	Cook Co.
May	Illinois Pilots Assn.	Du Page Co.
Jun	American Red Cross-Mid American Chptr.	Cook Co.
Jun	Columbia College	Cook Co.
Jun	Suburban Boating Assn.	Du Page Co.
Jun	Melrose Park Skywarn & ESDA (2nd)	Cook Co.
Jun	Morton Grove ESDA	Cook Co.
Jul	Moecherville/Aurora Fire Depts/ESDA	Kane Co.
Jul	Winnetka Public Library System	Cook Co.

D-2: 1990 WPM Appearances

Group	Approx Attendance	Place	Date	County
Morton Grove ESDA	(40)	Morton Grove	2/28	Cook Co.
Amateur Cross Link Repeater	(229)	Chicago	3/03	Cook Co.
6 Meter Club of Chicago	(41)	Brookfield	3/09	Cook Co.
*Buffalo Grove Condo Assn.	(175)	Buffalo Grove	3/13	Cook Co.
*South Shore Marine Assn.	(30)	Chicago	3/17	Cook Co.
WAFAR (amateur radio)	(30)	Chicago	3/21	Cook Co.
Des Plaines ESDA	(30)	Des Plaines	3/28	Cook Co.
Melrose Park ESDA/Skywarn	(109)	Melrose Park	4/04	Cook Co.
*WGN Radio Svr Wx Seminar	-----	Chicago	4/13	Cook Co.
*Electro Motive	(280)	LaGrange	4/25	Cook Co.
South Suburban Radio Amateurs	(90)	Crestwood	5/15	Cook Co.
Park Forest Fire Dept/ESDA	(23)	Park Forest	7/20	Cook Co.
Argonne Amateur Radio Club	(90)	Argonne Lab	3/07	Du Page Co.
York Radio Club	(65)	Elmhurst	3/16	Du Page Co.
Emergency Radio Service	(27)	Hanover Park	3/19	Du Page Co.
Argonne Amateur Radio Club	(31)	Argonne Lab	4/03	Du Page Co.
*Tellabs	(8)	Lisle	4/20	Du Page Co.
Ford Co. ESDA	(15)	Piper City	3/22	Ford Co.
also ESDA from Gilman				
also ESDA from Forrest				
Grundy Co. ESDA	(46)	Morris	3/23	Iroquois Co.
Iroquois Co. ESDA	...see Ford Co.			Grundy Co.
Aurora ESDA	(8)	Aurora	3/01	Kane Co.
Fermilab Svr Wx Seminar	(1400)	Batavia	4/14	Kane Co.
Aurora/Moecherville Fire Dept and ESDA	(55)	Moecherville	7/17	Kane Co.
*American Red Cross	(15)	Sugar Grove	8/10	Kane Co.
Lake Co. Emergency Svcs/ESDA	(25)	Mundelein	4/02	Lake Co.
Lake Co. ESDA	(25)	Libertyville	4/05	Lake Co.
Wauconda Fire Dept/ESDA	(41)	Wauconda	4/15	Lake Co.
Livingston Co. ESDA	...see Ford Co.			Livingston Co.
Crystal Lake Radio Amateurs	(35)	Crystal Lake	4/17	McHenry Co.
Joliet Amateur Radio society	(25)	Joliet	2/06	Will Co.
*Kiwanis of Joliet	(63)	Joliet	4/30	Will Co.

Note: All appearances were spotter oriented except those marked "*."

APPENDIX E

SUMMARY OF FATALITIES

E-1: List of Individuals

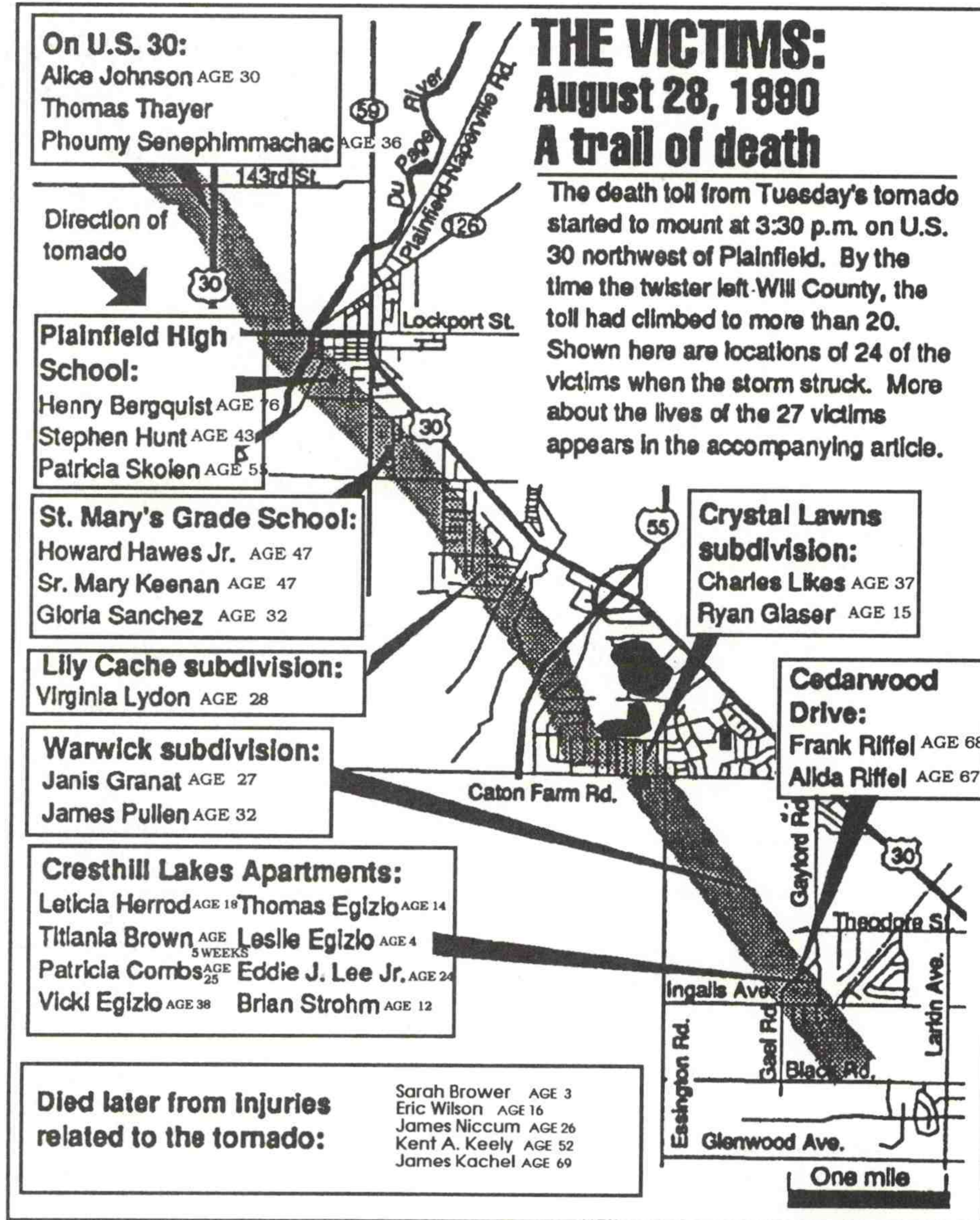
Summary of deaths in the Plainfield/Crest Hill tornado, including age, gender and location.

Age	Sex	Location	Age	Sex	Location
76	Male	High School	30	Female	Automobile
69	Male	Automobile	28	Female	Residential Area
68	Male	Automobile	27	Female	Residential Area
67	Female	Automobile	26	Male	Residential Area
55	Female	High School	25	Female	Apartment Complex
52	Male	Automobile	24	Male	Apartment Complex (Automobile)
47	Male	Grade School (Automobile)	18	Female	Apartment Complex
47	Female	Grade School	16	Male	Apartment Complex
43	Male	High School	15	Male	Residential Area (Outside)
41	Male	Automobile	14	Male	Apartment Complex
38	Female	Apartment Complex	12	Male	Apartment Complex
37	Male	Residential Area	4	Female	Apartment Complex
36	Female	Automobile	3	Female	Residential Area
32	Male	Residential Area	5 weeks	Female	Apartment Complex
32	Female	Grade School			

Summary of Totals:

Gender:	Males = 15	Females = 14
Locations:	Automobiles	9
	High School	3
	Grade School	2
	Apartment Complex	9
	Residential Area	6

E-2: Map Showing the Locations of the Fatalities
 (From Joliet "Herald News"
 Edited to reflect additional fatalities)



HERALD-NEWS/DENISE SMETANA-FRIANT

E-3: Map Showing Locations of Major Damage
(From Joliet "Herald News")

August 28, 1990

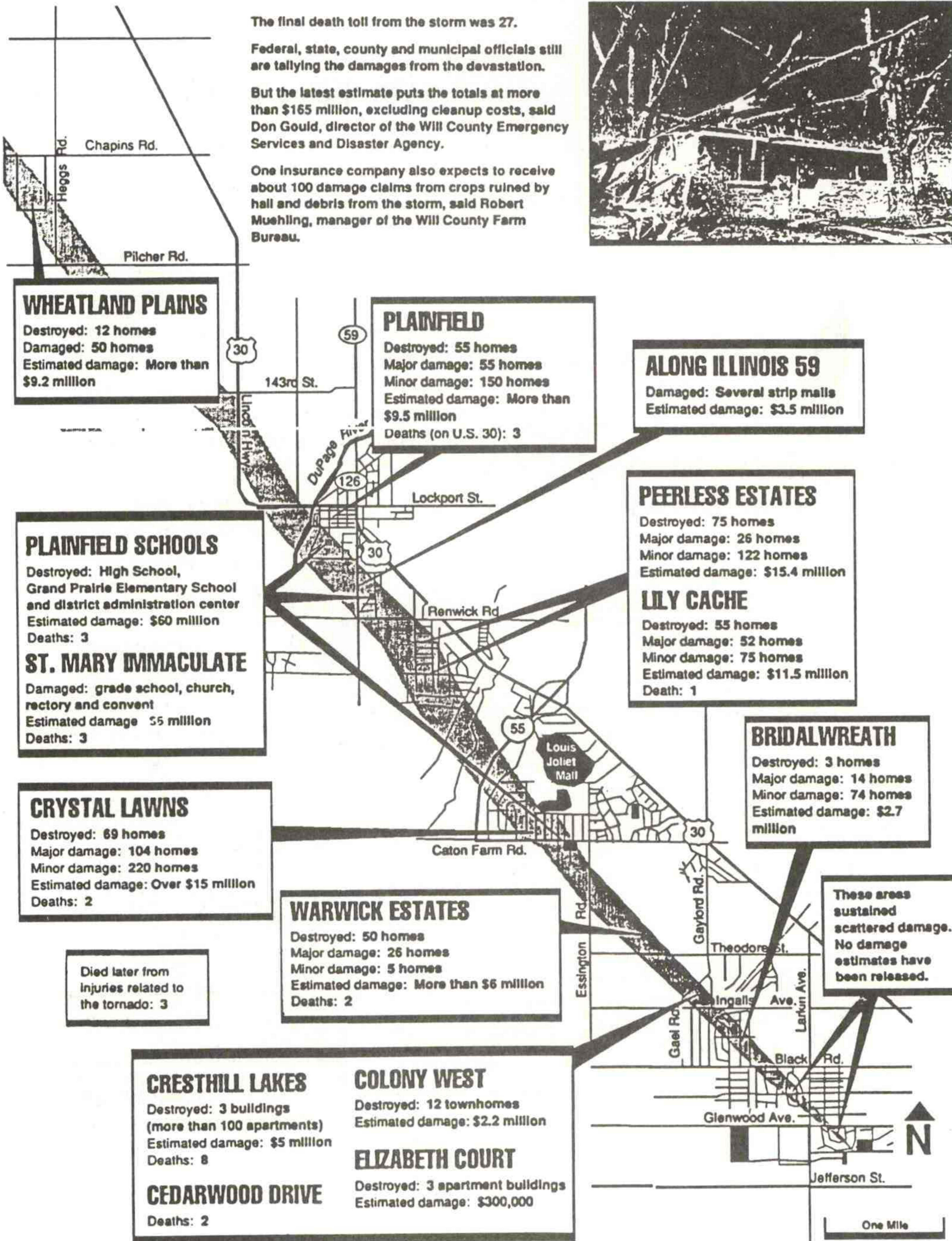
A trail of death and destruction

The final death toll from the storm was 27.

Federal, state, county and municipal officials still are tallying the damages from the devastation.

But the latest estimate puts the totals at more than \$165 million, excluding cleanup costs, said Don Gould, director of the Will County Emergency Services and Disaster Agency.

One insurance company also expects to receive about 100 damage claims from crops ruined by hail and debris from the storm, said Robert Muehling, manager of the Will County Farm Bureau.



APPENDIX F

PERSONS INTERVIEWED AND/OR CONTACTED BY THE DISASTER SURVEY TEAM

F-1: National Weather Service Employees

Name	Title	Location
Robert Somrek	DMIC	Chicago
Anthony Williams	Lead Forecaster	Chicago
Richard Koeneman	Lead Forecaster	Chicago
Richard Brumer	Aviation Forecaster	Chicago
Paul Dailey	MIC	Chicago (phone)
Gregory Dickey	Weather Service Specialist (WSS)	Chicago
Don Morrison	WSS	Chicago
John Jamison	Supervisory Meteorological Technician	Chicago
James Purpura	Forecaster	Chicago
Al Morrison	Lead Forecaster	Chicago
Joseph Baalke	Official in Charge (OIC)	Marseilles WSMO
Viggio Jensen	Intern	Marseilles WSMO
Daniel Riddle	Intern	Marseilles WSMO
Ron Fields	OIC	Rockford WSO
Allan Fischer	MIC	CWSU Aurora
Ron Przybylinski	Lead Forecaster	Indianapolis (phone)
Tim McClung	Intern	South Bend (phone)
Jim Meyer	MIC	Moline WSO (phone)

F-2: Other Agencies/Institutions

Name	Title	Location
Unknown	FAA Tower Controllers	Aurora
Ted Fujita	Professor of Meteorology	University of Chicago
Steve Gregory	Meteorologist	United Airlines
Carl Knable	Meteorologist	United Airlines
Mary Latta	President	Village of Plainfield
Don Gould	Director	Will County Emergency Services and Disaster Preparedness
Bill Diamond	Director	Kane County Emergency Services and Disaster Preparedness
John Taylor	Director	Kendall County Emergency Services
Pat Wilkenson	Communications Supervisor	District 2, Illinois State Police
Robert Hajak	Director	Melrose Park Emergency Services and Public Safety, Director Chicagoland Skywarn Association
Phillip Schwartz	Deputy Director	see above
Diane Larson	Teacher	Plainfield High School
Gene Anderson	Communications Supervisor	District 5, Illinois State Police
Peter Haas	Lt.	Will County Sheriff's Office
Ed Mayer	Sgt.	Will County Sheriff's Office
Wayne Perry	Publisher, "The Enterprise"	Plainfield
Marx Gibson	City Editor, "Herald News"	Joliet
Paul Sirvatka	Instructor	College of Du Page (phone)
Robert E. Gorsich	M.D.	Photographer
Chris Berry	WBBM News Director	Chicago (phone)
Georgeann Herbert	WBBM Managing Editor	Chicago (phone)
Jim Frank	WMAQ News Director	Chicago (phone)
Wayne Messmer	WLS News	Chicago (phone)
Roger Triemstra	WGN Staff Meteorologist	Chicago (phone)
Reese Rickards	WJJD Public Service Director	Chicago (phone)
John Rorik	WJCH-FM Station Manager	Joliet (phone)
Randy Bunger	WJOL-AM News Director	Joliet (phone)
Bob Channick	WCCQ-FM General Manager	Joliet (phone)
Prince Mayne	WCCQ-FM Program Director	Joliet (phone)
Ray Hawkins	WWHN Owner	Joliet (phone)
Jean Halevi	WGBO-TV PBS Director	Joliet (phone)
Dennis Horton	WREX-TV News Director	Rockford (phone)
Arles Hendershott	WIFR-TV News Director	Rockford (phone)
John Baumgartner	WTVO-TV News Director	Rockford (phone)
Tom Skilling	WGN-TV Staff Meteorologist	Chicago (phone)
John Coleman	WMAQ-TV Weathercaster	Chicago (phone)
Jim Tillman	WMAQ-TV Meteorologist	Chicago (phone)
Greg Caputo	WFLD-TV News Director	Chicago (phone)
Tom Bomilla	WLS-TV Meteorologist	Chicago (phone)
Ben Larson	WCIU-TV News Director	Chicago (phone)
Don Aguirre	WCIU-TV News Director	Chicago (phone)

APPENDIX G

NWS STAFFING FOR NORTHERN ILLINOIS

Three local NWS offices were directly involved in the warnings and forecasts provided to northern Illinois on the afternoon of August 28, 1990. The following is a list of the stations operational staff levels for that day.

Total Operational Staffing:

WSFO Chicago:

- 1 Area Manager/Meteorologist In Charge
- 1 Deputy Meteorologist In Charge
- 5 Lead/Public Forecasters
- 6 Journeymen Level Forecasters
- 5 Meteorological Technicians
- 1 Supervisory Meteorological Technician
- 1 Intern
- 1 Service Hydrologist

WSFO Rockford:

- 1 OIC
- 4 Meteorological Technicians
- 1 Intern

WSMO Marseilles:

- 1 OIC
- 3 Interns
- 1 Meteorological Technician

Staff on Duty August 28, 1990:

WSFO Chicago:

Paul Daily (MIC)	0700-1900	Admin/Svr Wx
Robert Somrek (DMIC)	0700-1000	Lead/Public
	1000-2000	Admin/Svr Wx
Anthony C. Williams	0900-1700	Lead/Public
Richard Brumer	1000-1400	Admin
	1400-1500	Aviation
	1500-1800	Svr Wx
Jane Hollingsworth	0600-1400	Aviation
Stephen Kahn	0900-1600	Admin/Hydro
	1600-2100	Svr Wx
Gregory Dickey	0600-1400	Observations
Allan Randal	1100-1900	Intern/Admin
James Vermoch	1500-2300	Aviation
Jim Lebda	1600-2400	Lead/Public
Don Morrison	1400-2200	Observations

WSO Rockford:

Ron Fields (OIC)	0800-1600
Joe Librizzi (WSS)	0800-1600
Dale Helgerson	1000-1800

WSMO Marseilles:

Joe Baalke (OIC)	0800-1600
Viggio Jensen (Intern)	0800-1600
Daniel Riddle (Intern)	~1500-2400

APPENDIX H

FUJITA TORNADO INTENSITY SCALE

<u>Category</u>	<u>Definition--Effective</u>
(F0)	<u>Gale tornado (40-72 MPH): Light damage.</u> Some damage to chimneys; break branches off trees; push over shallow-rooted trees; damage sign boards.
(F1)	<u>Moderate tornado (73-112 MPH): Moderate damage.</u> The lower limit is the beginning of hurricane wind speed; peel surface off roofs; mobile homes pushed off foundations or overturned; moving autos pushed off the roads.
(F2)	<u>Significant tornado (113-157 MPH): Considerable damage.</u> Roofs torn off frame houses; mobile homes demolished; boxcars pushed over; large trees snapped or uprooted; light-object missiles generated.
(F3)	<u>Severe tornado (158-206 MPH): Severe damage.</u> Roofs and some walls torn off well-constructed houses; trains overturned; most trees in forest uprooted; heavy cars lifted off ground and thrown.
(F4)	<u>Devastating tornado (207-260 MPH): Devastating damage.</u> Well-constructed houses leveled; structure with weak foundation blown off some distance; cars thrown and large missiles generated.
(F5)	<u>Incredible tornado (261-318 MPH): Incredible damage.</u> Strong frame houses lifted off foundations and carried considerable distance to disintegrate; automobile sized missiles fly through the air in excess of 100 yards; trees debarked; incredible phenomena will occur.