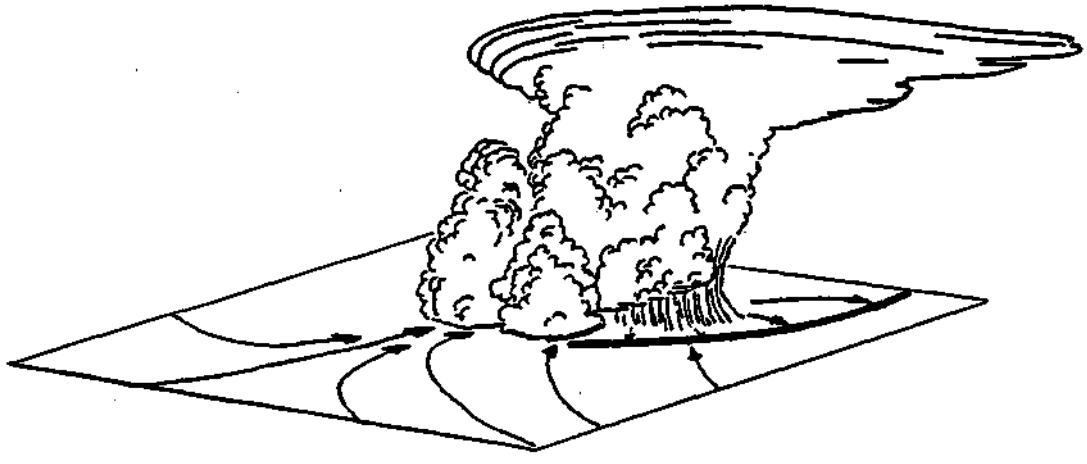
State Water Survey Division
METEOROLOGY SECTION
AT THE
UNIVERSITY OF ILLINOIS

Illinois Department of
Energy and Natural Resources

SWS Contract Report 323

SUMMARY OF THE VIN FIELD PROGRAM: SUMMER 1979

B. Ackerman, R. W. Scott, and N. E. Westcott
Illinois State Water Survey



Technical Report 1
NSF Grant ATM 78-08865
Low Level Convergence and the
Prediction of Convective Precipitation

Champaign, Illinois
February 1983

The project "Low-level Convergence and the Prediction of Convective Precipitation" is a coordinated research effort by the State Water Survey Division of the Department of Energy and Natural Resources, the Office of Weather Research and Modification in the National Oceanic and Atmospheric Administration, and the Department of Environmental Sciences of the University of Virginia. Support of this research has been provided to the State Water Survey by the Division of Atmospheric Sciences, National Science Foundation, through grant ATM-78-08865. This award includes funds from the Army Research Office and the Air Force Office of Scientific Research of the Department of Defense.

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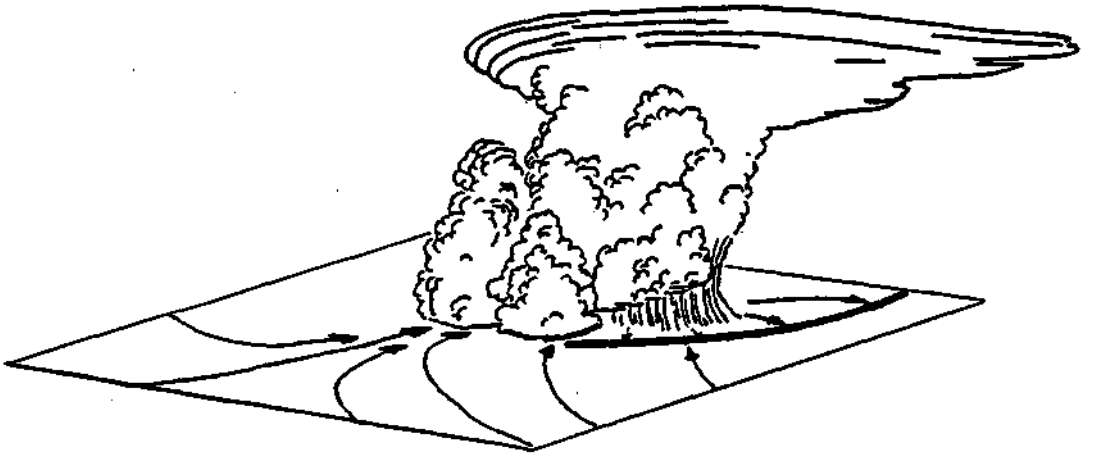

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Acknowledgements

The successful completion of a field experiment can only come about through the dedicated efforts of many people. We wish to express our appreciation to NCAR FOF for the use of a number of Climet wind systems as well as the PAM, and to thank Fred Brock, Paul Ahlstrom, Steve Semmer, and the other NCAR field personnel servicing the PAM, for their cooperation, ability and dedication. We also wish to recognize all those other unsung heroes who kept the network instruments operating: Irv Watson of NOAA/OWRM for caring so diligently for the analogue wind systems; Doug Jones, ISWS, and his trusty crew who kept the 240 raingages working and the stations neatly trimmed; Bob Scott, ISWS, and his student staff for hours of filling and tracking balloons in the upper air program, and the University of Virginia student staff, principally Harry Cooper and Rob Addis. We are particularly appreciative of the efforts of Gene Mueller, chief engineer of the CHILL radar and his technicians, for being ever on the ready and for continuing through very long hours when the need arose or the weather looked promising. Last but not least, the author of this Technical Note recognizes the contributions of the other Principal Investigators of the Project, Mike Garstang, U. Va, and Ron Holle, NOAA/OWRM, and Rob Sax and Bill Woddley, NOAA/NHEML and Joanne Simpson, U. Va. in developing and helping to implement the plans for the field measurement effort of the VIN project.

SECTION I.

INTRODUCTION

Background

Numerical and statistical modeling has now reached a point where the general pattern of synoptic-scale precipitation events can be predicted with fair reliability up to a day. in advance. However, our understanding of the manner in which precipitating clouds become organized on the mesoscale is still so inadequate that it is not possible to forecast accurately when, where, and how much precipitation is likely to occur, even a few hours in advance.

It has been known for many years that the occurrence of convective rainfall is likely to be preceded by convergent airflow in the lower troposphere. The low-level horizontal convergence is accompanied by vertical "stretching" which in turn tends to destabilize the atmosphere. Moreover, the inflow of air, replacing that which has risen due to the differential heating of unstable air masses, carries with it the heat and moisture of the surface layer, providing new sources of energy for convective development.

Documentation of the relationship between deep moist convection and mass convergence in the middle and lower troposphere was provided by measurements made during the Thunderstorm Project in the late 1940's (Byers and Braham, 1949). Data from this project also showed that local surface convergence often preceded the first appearance of a radar echo and/or the onset of convective precipitation. More recently the systematic study by Ulanski and Garstang (1977) quantified the relationship between surface convergence and rainfall. For summertime convection in south Florida, the time of onset and the intensity of point rainfall could be predicted up to an hour in advance from the surface convergence calculated from a high density wind network.

The VIN project, a coordinated research effort by the Department of Environmental Sciences of the University of Virginia (U.VA.), the Illinois State Water Survey (ISWS), and the Cumulus Group of NOAA (NOAA/NHEML and later NOAA/ OWRM) was developed to investigate the association between the low-level wind field and convective activity in the midwestern U.S. and to further explore the relationships found by Ulanski and Garstang in Florida. A key element of the project was a field program in central Illinois, designed specifically to collect measurements for a study of the role of low-level and surface convergence in the evolution of precipitating convective systems and for seeking methods which might be useful in the very short-range forecasting of convective rainfall.

This report provides a description of the field program conducted in central Illinois during the summer of 1979, the equipment deployed, and the data base which was generated. In addition, a daily summary of synoptic-scale and local weather and of availability of special observations is given in the Appendix for each day during the program.

Synopsis of Field Operations and Weather

Instrumented networks were located within a rectangular area of 5400 km^2 to the west of Champaign in central Illinois (Figure 1). The field program was fully operational from 28 June to 29 August but the raingage network was in place and operating by 1 June and continued for the three summer months. The field facilities were as follows:

- a high-density network (1/23 km) of 260 raingages with continuous analog recording
- the 27-station NCAR portable automated mesonet (PAM) with real-time telemetry
- a supplementary network of wind sensors with analog recording
- a supplementary network of hygrothermographs/thermographs/micro-barographs with analog recording
- a 3-station pilot-balloon network for wind measurement in the lower troposphere
- time-lapse photography from two locations
- a dual-wavelength radar with digital recording (the "CHILL")
- special radiosonde observations from 2 National Weather Service (NWS) stations in Illinois and from the field headquarters.

The details of the networks, equipment deployed, and the archived data are described in detail in Section II of this report.

Resources did not permit routine observations from all of these facilities. Measurements which were not obtained with a continuously-recording instrument were made only when the weather was forecasted as being favorable for convective precipitation or for a special experimental objective. These special observations were made in a more-or-less standardized mode, which had been specified at the beginning of the project by the requirements of the individual researchers. Decisions regarding the special observations were based on weather briefings and forecasts made at the field headquarters (Base-station) every morning. Instructions were then transmitted to remotely-based field personnel by telephone and radio.

The Base-station was located on the east side of the surface network. The NCAR PAM Base and trailer and the CHILL radar antenna, operations and electronics trailers were located adjacent to the headquarters building. Thus it was convenient for the directors and supervisors of the major field components to meet every morning.

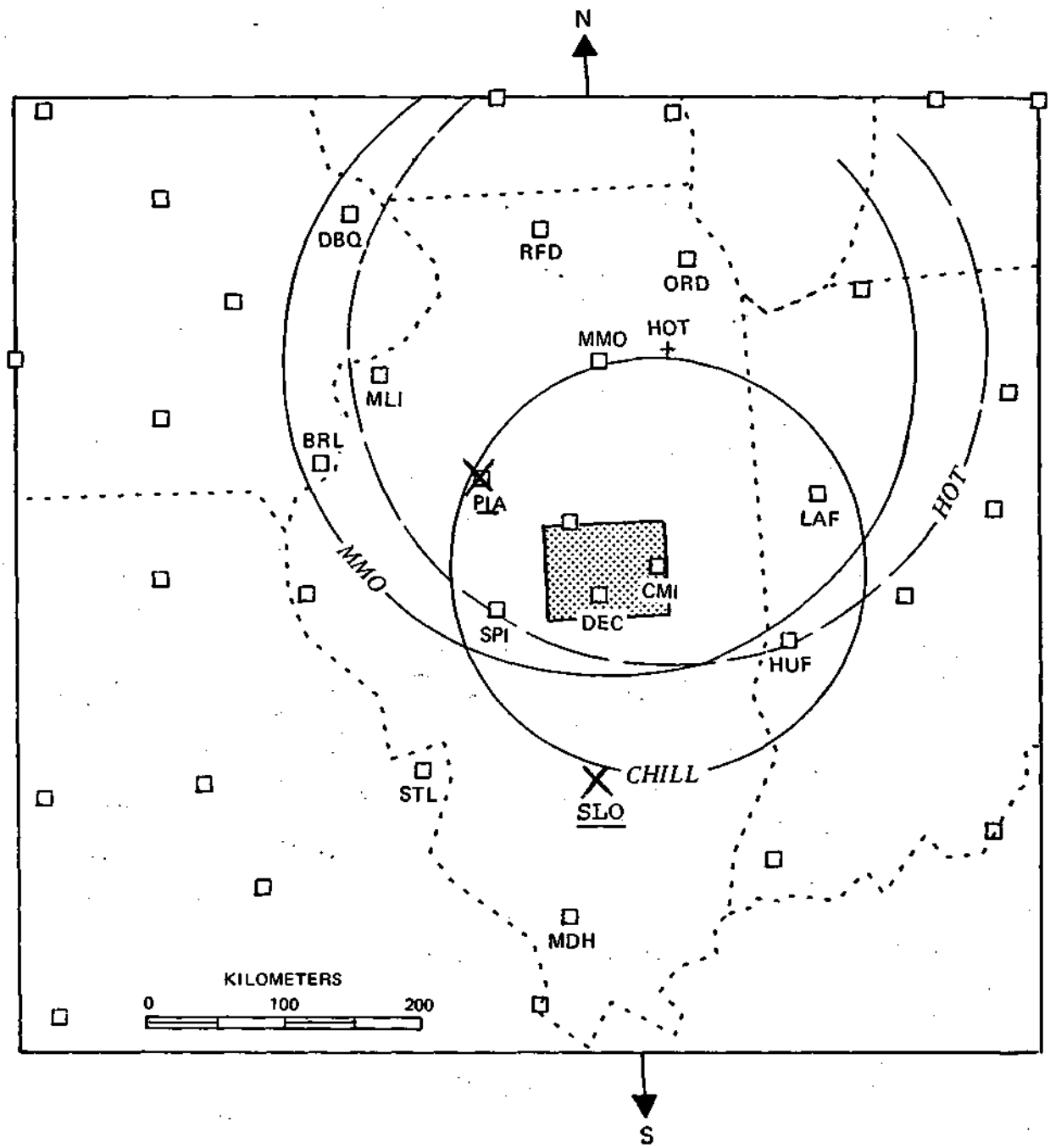


Figure 1. Map of Illinois and surrounding states, showing the location of the VIN network (shaded). The base station was at the site CMI. The two NWS radiosonde stations are identifed by large X's (PIA) and (SLO) and NWS surface stations by small boxes. The areas covered by the CHILL and by the NWS WSR 57 at Marseilles" (MMO) are indicated by the circles.

The weather in the VIN area was somewhat unusual during the summer of 1979 in that near drought conditions were broken by short periods of relatively heavy rain. The month of June was very dry, the fourth lowest June rainfall at Champaign-Urbana in 90 years of record-keeping. Only two stations in the raingage network had normal monthly rainfall (10 cm), while 80% of the network had less than 50% of the normal monthly precipitation (Figure 2a). The rainfall in July, on the other hand, was very heavy for the month in its entirety, with all but a few stations receiving above-normal monthly precipitation. Approximately three-fourths of the network received rain in excess of 150% of normal and about 25% of the stations recorded twice the normal monthly precipitation (Figure 2b). Most of this rainfall came in the last week of July, with only 3 short rain periods in the first three weeks. Rainfall over the network was generally below normal again in August (Figure 2c) although conditions were not nearly as dry as they had been in June. Most of the stations received more than 50% of the normal August precipitation with almost a fourth receiving normal or above normal rainfall. The first half of the month was quite dry with only occasional light showers; most of the rainfall occurred in the last two weeks.

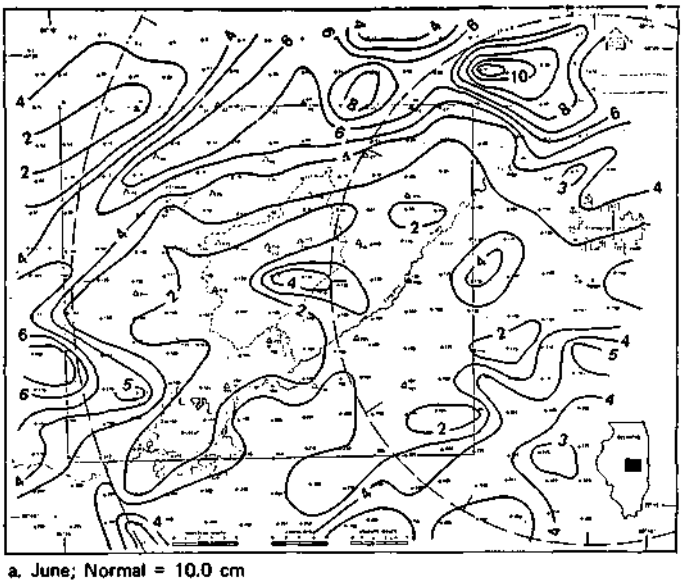
During the 2 months of full operations (July and August) there were about 56 individual rain periods, occurring on about half of the days. Maximum point rainfall in these "rainstorms" ranged from 1 mm to nearly 150 mm. The times and dates of the individual rainstorms, and the fraction of the raingage network that received rain, are shown by vertical bars in the top most section of Figure 3, with the maximum point rainfall shown just below the vertical bar. In the third line of part A of Figure 3 is given the number of stations which received hail, when hail fell at all. As can be seen from this diagram, when the rain occurred over long periods of several days, it generally came from 2 or more storms. (The remainder of Figure 3 diagrams the availability of data from the various facilities. Frequent reference will be made to this figure in the discussions of individual field components in Section II.)

The VIN network experienced a wide variety of cloud systems: small air-mass showers, lines of large thunderstorms, extensive cloud layers with embedded convection. Several different kinds of cloud developments occurred within the network despite its relatively small size and the frequently rapid movement of the cloud systems. These included: new shower clouds, mergers of small clouds into complexes or lines, development of new clouds between pre-existing ones, and formation of new cloud lines ahead of squall lines.

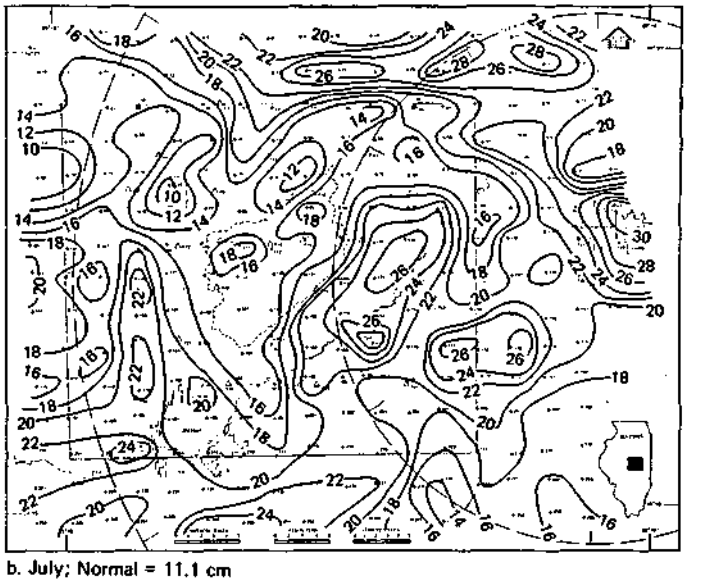
Complementary Programs: CIRCE/SCORE

Researchers in two atmospheric chemistry projects carried out field experiments during the VIN field program to take advantage of the data being generated.

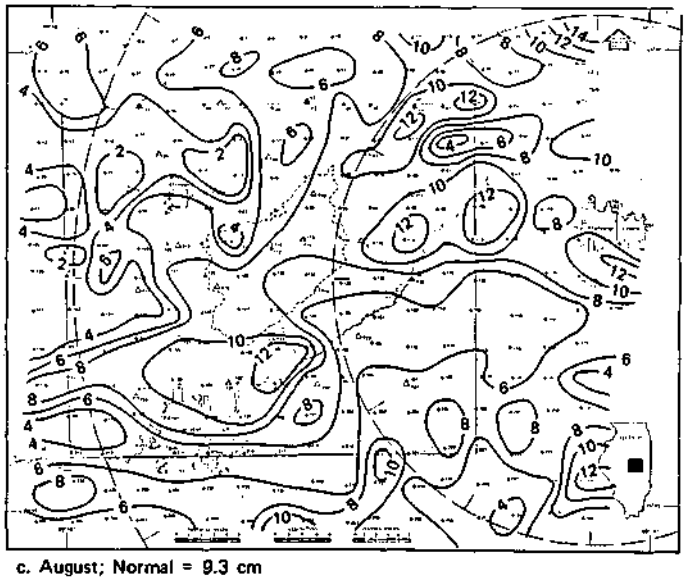
SCORE (Summer Chemistry of Rain Experiment) was a DOE funded-project of the Atmospheric Chemistry group of the ISWS. This experiment was designed to



a. June; Normal = 10.0 cm



b. July; Normal = 11.1 cm



c. August; Normal = 9.3 cm

Figure 2. Isohyets of monthly rainfall (in centimeters) over the VIN network, summer 1979.

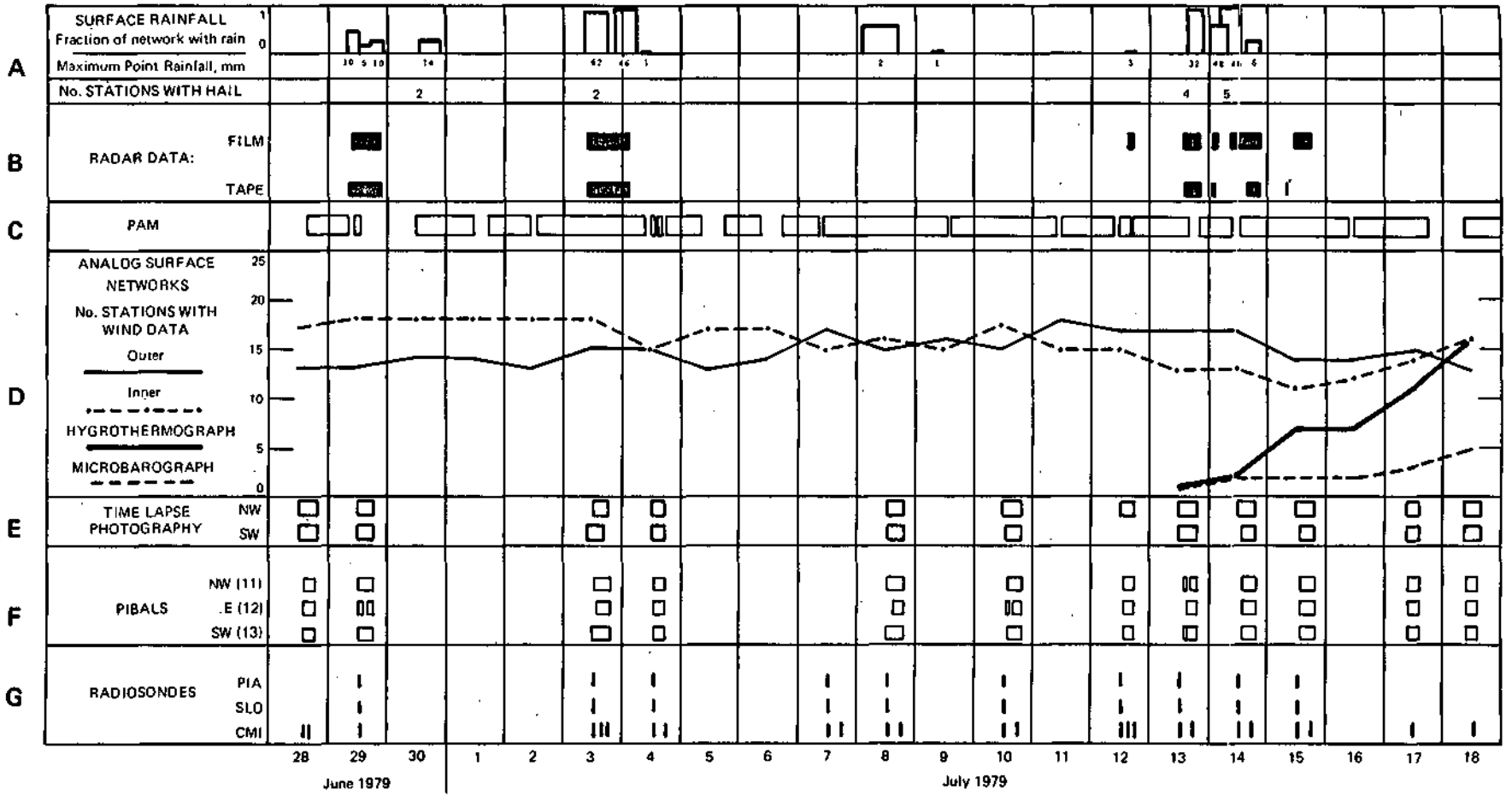


Figure 3. Calendar indicating availability of data, and times, intensities and coverage: of rain storms.

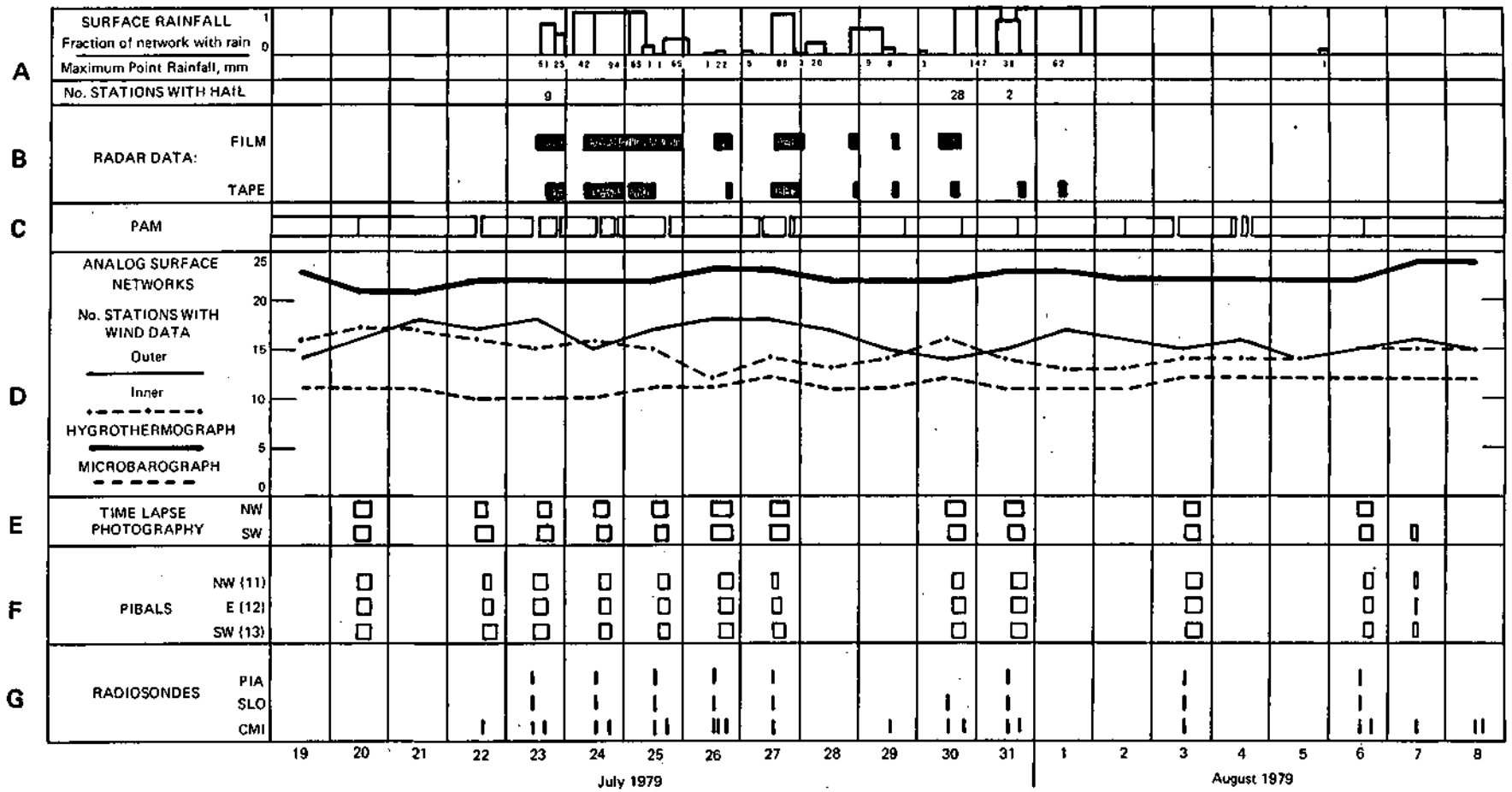


Figure 3. Continued.

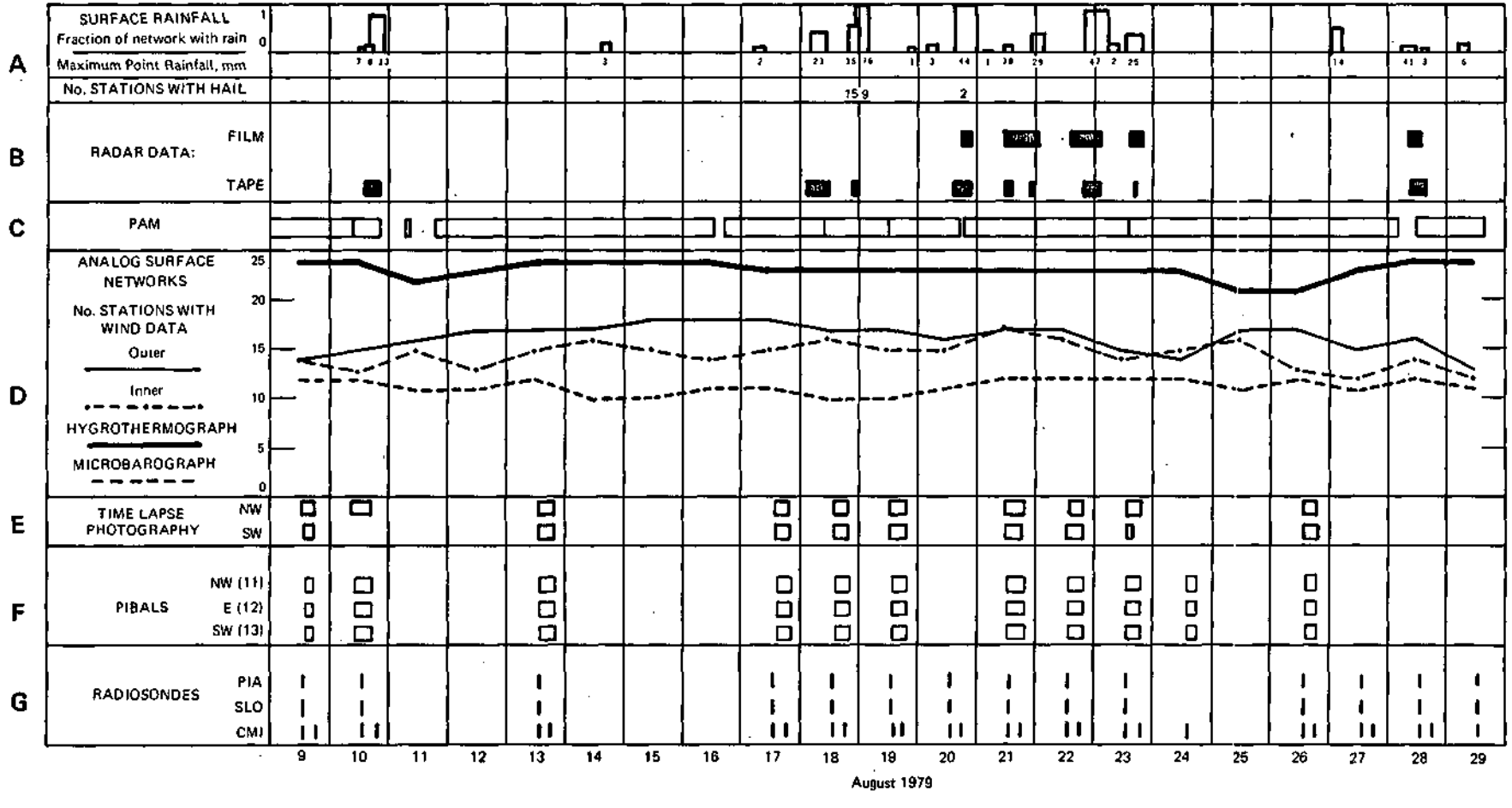


Figure 3. Continued.

study the spatial distribution of rainfall chemistry with high resolution in both time and space. It operated from the last week in June until the first week in August. Deployed within the VIN network for use in this experiment were samplers for determining dry and wet deposition, 2 raindrop size-spectrometers, and 6 additional raingages with 12-in tops and 6-hour gears. The data collected reside at ISWS, but are not in the VIN archives.

The Central Illinois Rainfall Chemistry Experiment (CIRCE) was a collaborative field study involving scientists from the Argonne National Laboratory (ANL), Brookhaven National Laboratory (BNL) and the Pacific Northwest Laboratory (PNL). Their studies had a number of objectives dealing with boundary-layer phenomona, precipitation scavenging and cloud physics and chemistry. These groups utilized a variety of measurement techniques in a 2-week experiment between 9 and 22 July. The data which they collected reside at their home offices.

The group from ANL made extensive micrometeorological and boundary-layer measurements at a site near Weldon, Illinois in the western sector of the VIN network. Their instrumentation included a kytoon profiling system, the "WHAT" (a double-theodolite system which provides wind, height and temperature measurements in the planetary boundary layer), radiosondes, surface instrumentation for calculating turbulent fluxes of heat, moisture and momentum in the surface boundary layer, an acoustic sounder to monitor mixed-layer height and the intensity of the turbulence in the thermal field, and a lidar (owned and operated by the University of Wisconsin) to monitor aerosol loading and velocities over the micrometeorological site. The BNL program centered around the use of a small airplane to monitor the sub-cloud air chemistry and to obtain profiles of pollutants in and just above the boundary layer. Both ANL and BNL were interested primarily in fair-weather situations. The experimental objectives of PNL were concerned with the role of convective storms in the cycling of pollutants. In addition to bulk rainwater samplers which were located at the surface, a DC-3 aircraft was utilized to sample pollutant concentrations in storm inflow, to measure size distributions of particles in the inflow and outflow areas of the storm, and to collect bulk cloud water for chemical analysis.

SECTION II.

FIELD FACILITIES, OPERATIONS, AND DATA BASE

Field facilities were composed primarily of in-situ sensors of varying degrees of sophistication. Described below are the sensors, recording methods, and the data archival for each of the components. Frequent reference will be made to Figure 3 in discussing the availability of data. Unless otherwise indicated, the data are in the VIN archive at the Illinois State Water Survey.

Surface Measurements

Precipitation Network

The core network for measurment of rainfall was composed of 260 recording raingages deployed in a uniform rectangular grid with station density of about 1/23 km (Figure 4). The instruments were standard weighing-bucket gages with 8-in tops and 24-hour recorder clocks. This provided resolutions of 5 minutes in time and 0.25 to 0.50 mm in rain accumulation. The raingages were serviced weekly, at which time charts were also changed. Any uncertainty as to the day on which rain may have occurred at a given station because of multiple revolutions of the recorder between servicings, was resolved using radar data and rainfall records from the PAM stations.

Hailpads were co-located with all 260 raingages. These pads were foil-covered, 12-in styrofoam squares set on 18-in high metal stands. The hailpads were routinely examined but were replaced only when there was evidence that hail had occurred.

All raingages and hailpads were deployed for the full summer, from 1 June to 31 August. All of the raingage charts have been digitized using a curve follower and the measurements for the entire summer have been archived on magnetic tape as 5-min accumulations of precipitation for each station. Both the digital data (on magnetic tape) and the original charts have been archived. The hailpads were evaluated qualitatively, using three categories for stone size and three categories for numbers of stones. These data are archived as hard-copy hand-written tabulations.

PAM: The Portable Automated Mesonet

The Portable Automated Mesonet is a National Center for Atmospheric Research (NCAR) system which provides high temporal resolution recording of surface meteorological parameters. Twenty-seven identical stations were deployed in a fairly uniform array with station spacing of about 13 km

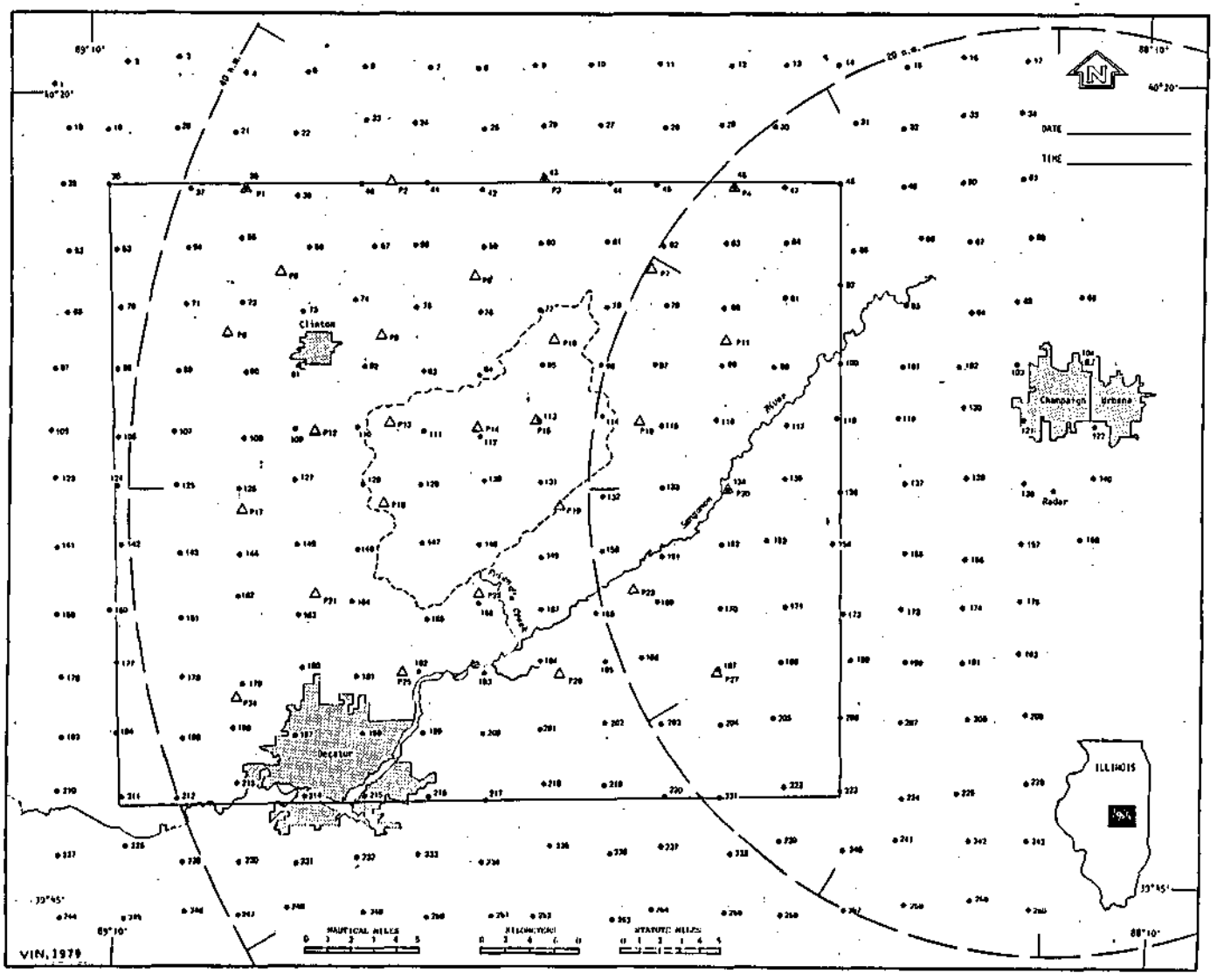


Figure 4. VIN raingage network. The PAM stations are shown by triangles and the inner box the wind network. The areas show range from the CHILL radar.

(Figure 5). This array represented the core network for wind measurements and for measurement of the state parameters.

Pressure, temperature, relative humidity, rainfall, and wind speed and direction were measured at each PAM station. The wind sensors were mounted at 4 meters; the other variables were measured at about 2 meters. All variables were sampled at 1-sec intervals with 1-min averaging by on-site microprocessors. The 1-min data were then telemetered to the PAM base station where they were stored on magnetic disk for real-time analysis and on magnetic tape for archival. A description of the sensors and the recording system for the PAM as deployed in the VIN program can be found in Brock and Govind (1977).

The PAM utilized tipping bucket gages for the rain measurements. Since there are intrinsic differences between the measurements obtained from this type of gage and those from the weighing-bucket used in the core rainfall network, the PAM data have not been merged with the other rainfall measurements. However, 5 of the stations in the 2 networks were co-located, providing a means for comparative studies.

The PAM Base station included a small computer and a terminal which permitted access to the data as they were received as well as access to data stored on disk. This allowed for monitoring of data quality as it was being received and recorded. Thus malfunctions at any of the stations were quickly detected and rapidly repaired. Approximately two days worth of data were stored on disk at any one time, providing a means for some near real-time analyses of the data.

NCAR provided the measurement network and also the personnel to service the stations. The field tapes were processed at NCAR after the termination of the project to convert the data to meteorological units. The archived measurements are these "scaled" data, with 1-min resolution, on magnetic tape. The availability of these data is shown in Part C of Figure 3.

Wind Network

The wind network, a key one for the project, had a wide variety of instrumentation. The wind measurements from the 27 stations in the PAM represented the "core" network. They were supplemented by an additional 22 instruments with analog recording systems which were interspersed with the PAM to provide a high-density "inner" network of 49 stations arranged in a uniform square grid with station spacing of about 6.5 km (Figure 5). An additional 16 wind instruments with analog recording were deployed in linear arrays 9.5 km from the western, southern, and eastern edges of the inner network. These 16 stations with spacing of 9.5 km composed the "outer" network. The sensors for all analog systems were mounted at 4 m to correspond to the PAM exposure.

For several reasons (security being a primary one) it was usually necessary to locate the instruments on rural homesteads or on the corner of fields. It was generally difficult to locate the instruments such that fetches in all direction were unobstructed for the long distance that is preferred for an exposure height of 4 m. Prevailing surface winds in situations favorable

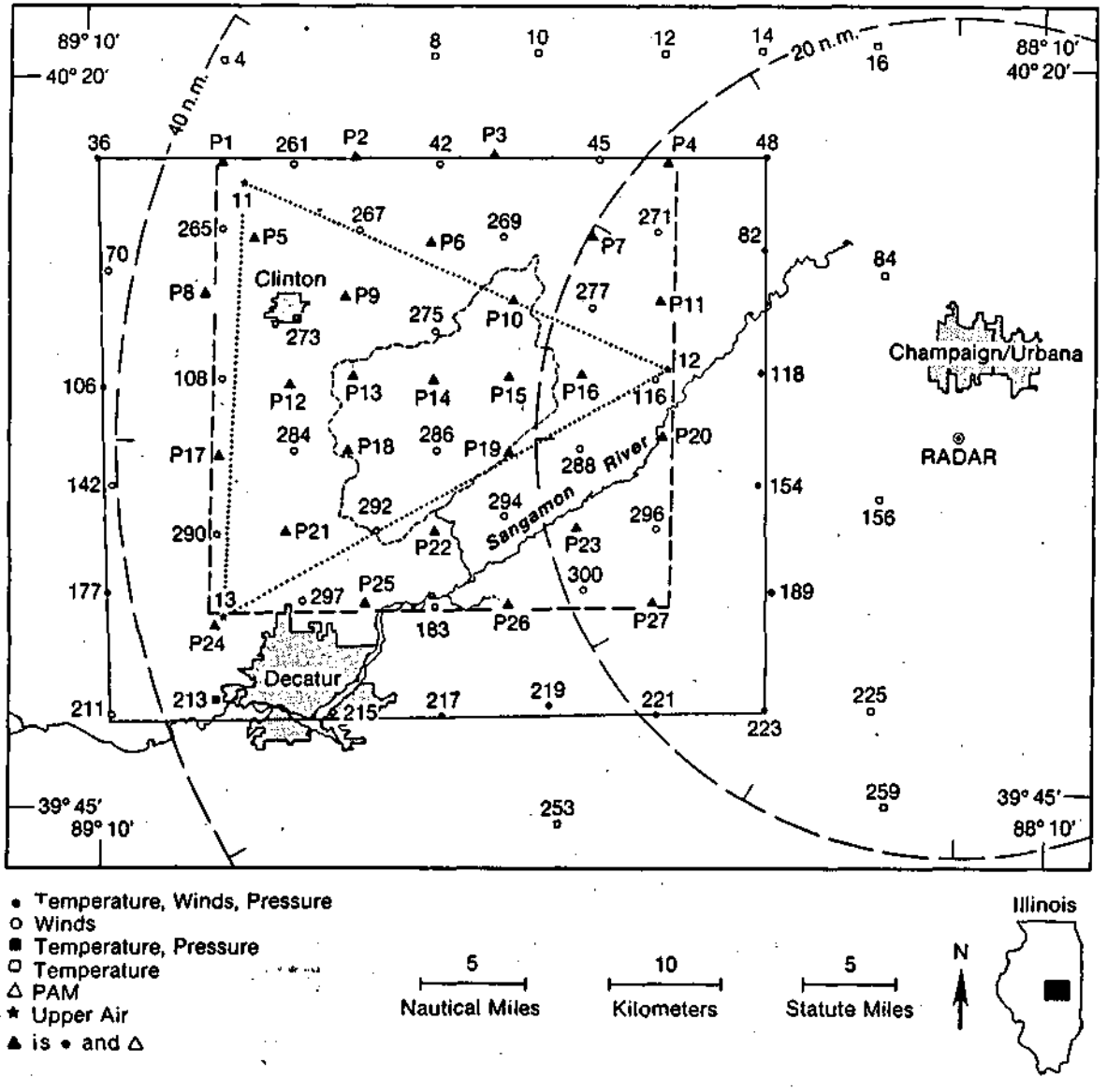


Figure 5. VIN 1979 mesonetwork. The dashed line encloses the inner network, the solid line shows the outer network boundary, and the dotted line, the pibal area.

for the development of convective rains are SSE through SW to W in central Illinois. Thus the instruments were sited such that fetches in these sectors were relatively free of obstructions. Clear exposure to the NW was also sought. Unobstructed exposures in the NE and E were given lowest priority since the low-level winds from these directions are generally associated with suppressed convection in the central U.S.

Each station was photographically documented by personnel from the University of Virginia to insure that the information necessary to determine possible errors due to instrument exposure would be available. These photographic documentations have been retained by, and are available from, University of Virginia, Dept. of Environmental Sciences (Professor Michael Garstang). In addition, a set of 35-mm slide photographs of the sites were made by the NOAA group and is part of the VIN archives. The photographic records have been reviewed and the sectors clear of obstructions identified. These sectors are shown unshaded in Figure 6 for each wind station. It should be noted that the shaded sectors represent areas in which there were some obstructions (e.g., trees, barns) which may have, but did not necessarily, affect the wind measurement at the site when the ambient wind was from that direction.

There were six different kinds of instruments in the 38-station supplementary wind array of which 21 were Climets and 8 were C-sets. In Figure 6 the wind instrumentation at each station is identified. All available charts from the C-sets and from the Lambrechts (identified by C and L 1 to 4 in Figure 6), were digitized at the University of Virginia. These original charts remain at the Dept. of Env. Sciences, U. Va; the recorder charts from all other instruments are in the VIN archive. The digitized data were stored on magnetic tape with maximum resolution possible from the records (5 minutes for the C-set and 15 minutes for the Lambrecht) and are included in the VIN archive. Analog records from the outer network were digitized by the NOAA group for 3 periods during the summer, selected by the principal investigators to serve particular objectives. These dates were 7 to 14 July, 23 to 31 July, and 10 to 26 August. In addition the PAM 1-min wind data were averaged for 5-min intervals during these three time periods. Thus for 34 days of the summer, processed data with 5-min resolution are available on magnetic tape from all but 14 of the wind stations. This data set was used by the NOAA researchers to calculate the average divergence over the wind network at 5-min intervals for each day. Time series of network-average divergence and the mean rain depth in the network are shown as part of the daily summary in the Appendix for each day that such calculations were made.

Five special case days were also selected for special study: July 13, 24, and 30 and August 10 and 22. All available wind records were digitized on these 5 days, the only days for which the full wind network was processed. The availability of the analog wind charts for both the inner and outer networks is indicated in Figure 7 in which the shaded areas denotes missing data. It is summarized in Part D of Figure 3 by the middle-weight solid and dot-dash lines for outer and inner networks, resp.

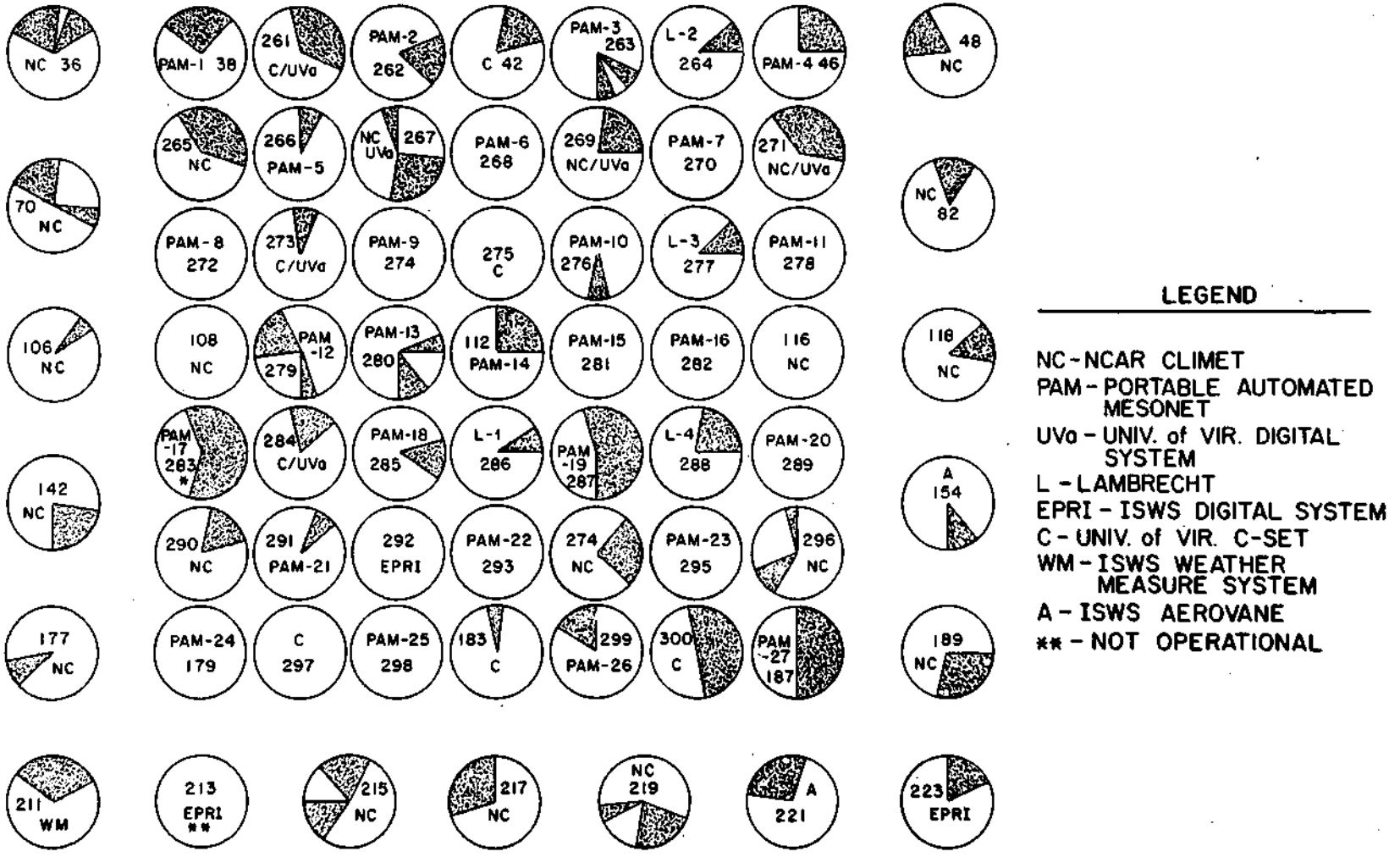


Figure 6. Wind station array showing the instrumentation at each site. The clear sectors are unshaded; the shaded areas indicate sectors in which these were obstructions such as trees; etc.

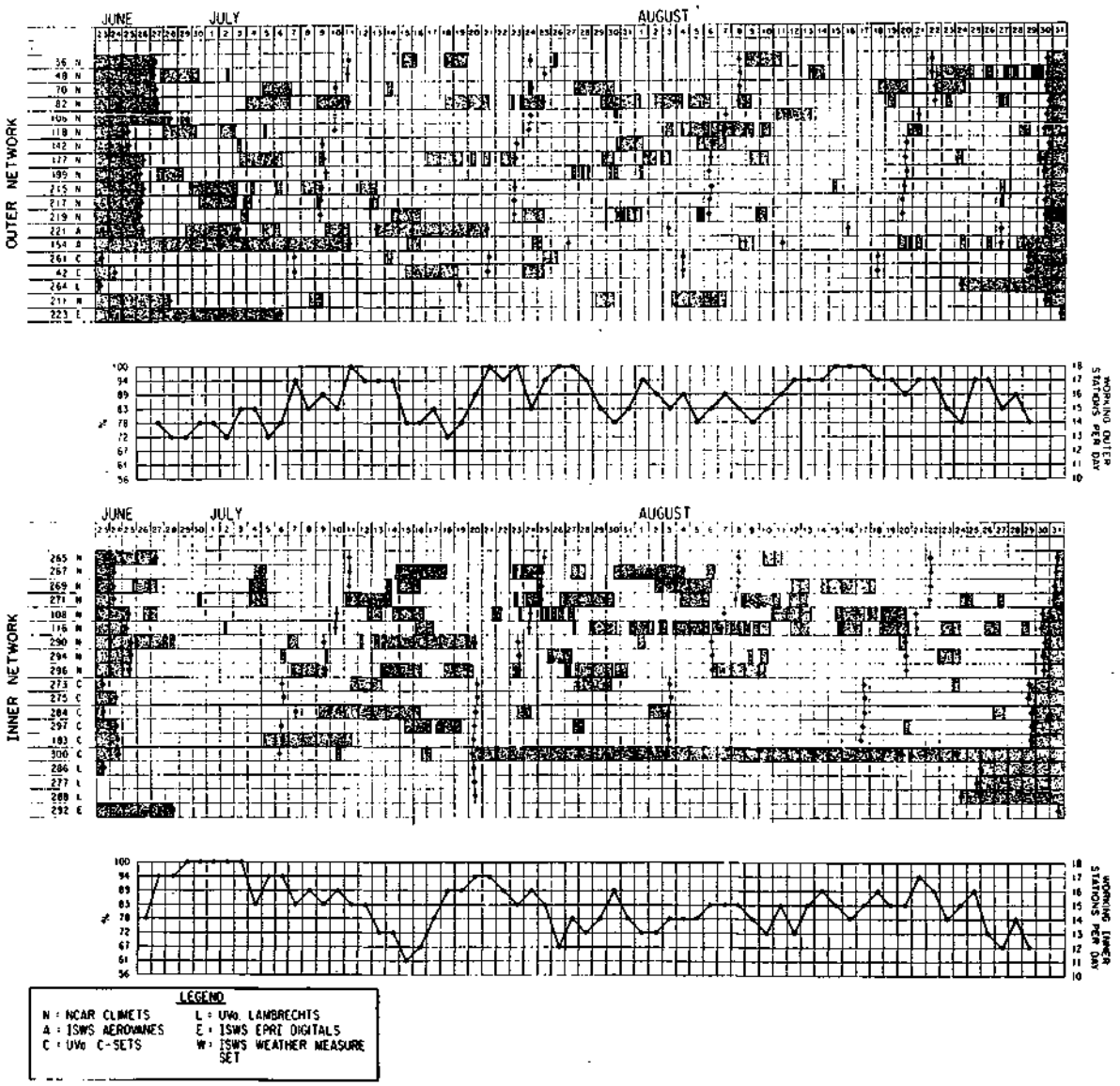


Figure 7 Calendar showing availability of wind data from the analog systems. Data is not available on dates that are shaded. The dots xndxcate dates on which charts were changed.

Supplementary Surface Measurements

The PAM stations provided a core network for state parameters of temperature, humidity and pressure. They were supplemented by 13 microbarographs and 11 hygrothermographs/thermographs in a low density outer network. Where possible these sensors were co-located with wind instruments to provide a full-component station. The locations of these stations are shown in Figure 5. In this secondary network the temperature and relative humidity recorders operated with weekly clock gears. The pressure instruments were Bendix microbarographs, with 24-hour gears. The former were serviced on the same schedule as the raingages; the latter were serviced every other day.

Although it was recognized that these were important measurements, financial resources were not adquate for these supplementary stations to be part of the basic field effort. Thus, instruments available at ISWS were checked out and installed as time permitted and they became part of the data set on different dates. The availability of the analog records from these networks are indicated by the heavy solid and dashed lines resp., in Part D of Figure 3. These records have not been edited, digitized, or analyzed in any systematic manner. The original hard copy charts are archived.

Measurements Aloft

Radiosonde

Special radiosonde releases were provided by the National Weather Service, stations at Peoria (PIA) and Salem (SLO), north and south of the network (Figure 1), on request, under a contract arrangement. These releases were usually made at 1300 CDT, simultaneously with radiosonde releases at the VIN Base station. In addition radiosonde releases were made at the Base station coincident with the routine NWS sondes at 1900 CDT (00Z) and at intermediate times when conditions warranted. These special releases were scheduled on the basis of forecasts of favorable convective weather and, when possible, as a series to begin 1 day prior to the beginning of an anticipated rain period.

The radiosonde records from Base-station releases have been manually reduced using standardized National Weather Service procedures. The PIA and SLO soundings were evaluated by the NWS operators. All have been archived as hard copy. The times at which these special radiosondes were made are shown in Part G of Figure 3. More details about the time of release and the height to which the radiosondes were followed are given in the daily summaries in the Appendix.

Planetary Boundary Layer Winds

Observations of the lower tropospheric winds were obtained at 3 sites using single theodolite tracking of pilot balloons. The sites were located on the edges of the inner wind network in such a way as to provide a triangle of maximum size over the inner wind network (Fig. 5). Pibal releases were scheduled when the forecast indicated conditions favorable for deep convection,

when possible starting on the day prior to the forecasted start of a rain period and continuing to its end. Balloons were released at half-hour intervals, starting at 1130 or 1200 CDT and terminating at dark or at the end of convective activity. One rest break was scheduled in the middle of each sequence.

All releases were made using 30-gram balloons and standard inflation rate. Theodolite readings were taken every 30 seconds and continued as long as the balloon was visible, or until 20 minutes had elapsed since the release of the balloon, whichever was shorter. During the early part of the field program balloons were tracked with a recording theolodite in which the azimuth and elevation angles were recorded by impact printing on carbon tape. However due to delays in delivery of replacement supplies, most of the measurements were made with standard theodolite with azimuth and elevation angles recorded on voice tapes, a method which had been used extensively by ISWS in previous field experiments.

All angular and time information were manually transcribed and entered onto magnetic tapes for processing. All of the pilot balloon ascents have been processed for balloon location and for wind direction and speed based on positions at 30-sec intervals. Both angular measurements and calculated winds are archived on magnetic tape. The availability of the pibal data is given in Section F of Figure 3. Detailed information as to the times and maximum heights for which winds could be calculated are given for each station in the daily summaries in the Appendix, for all days on which releases were made.

Cloud Observations

An essential component of the VIN field program was the collection of observations of the development and growth of clouds over the network. These data consisted of two types: digitized radar measurements and time-lapse photography.

Time-Lapse Photography

Time-lapse photography of the cloud development over the VIN network was obtained at the 2 pibal stations near the northeast and southwest corners of the inner wind network (stations 11 and 13, resp. in Figure 5). The cameras were pointed toward the center of the network, i.e., toward the southeast and northeast respectively. Exposures were made at a rate of 1 frame every 10 seconds. The cameras were operated by the pilot-balloon observers and therefore cloud photography is available only when pibal observations were scheduled. Photographs were made on 33 days during which 211 hours of film was exposed. Researchers at NOAA/OWRM have reviewed the film and have found that all but 3 of the rolls are usable and quite well exposed. Availability of these photographic records in the VIN archive is indicated in Part E of Figure 3; the precise times covered by the film are listed in the Appendix in the summaries for days on which photographs were made.

The CHILL Radar

The cloud volume over the network was continuously monitored by the ISWS CHILL radar. The CHILL is a combination of 10-cm Doppler and 3-cm incoherent radars which are matched with respect to pulse length, pulse repetition frequency, and beam widths (1°). Both antennas are mounted on the same pedestal. The radar was located at the Base Station on the eastern edge of the raingage network (Figure 4).

Radar surveillance was scheduled on the basis of a forecast of convective precipitation and continued as long as significant echoes were being detected. It was operated routinely in a volume scan over the western 180° sector which covered the surface networks. On occasion the 180° sector was increased to cover the later development of clouds that initiated over the network and then moved east. Frequent 360° scans were made at a low elevation to provide a more comprehensive view of the cloud systems. The maximum range of the radar, as it was configured, was 80 nautical miles.

The radar scanned at a rotation rate of 16°/sec, for every 1° elevation from 0.5 to 11.5 and every 2° elevation from 11.5 to 25.5°. This permitted a cycle time of just under 4 minutes for a volume scan over the networks. The return signals from the atmospheric targets were integrated over a time period corresponding to 150 m in range. These were recorded digitally for every "range gate" from the radar to maximum range, with 1° resolution in azimuth. A slave oscilloscope attached to the radar was photographed on 35 mm microfilm when there were echoes of interest within radar range. These microfilm records provide a "quick look" at the storms occurring on a particular day.

The radar was operated on all forecasted rain days--and on some which had not been forecasted as well. A serious interruption in recording occurred on 30 July when a lightning strike caused major damage to most of the electronics. The radar was back on-line in a very limited way, for base elevation angle only, for rains on 31 July and 1 August but the system was not fully operational again until the latter half of August. . However it was not possible to bring the system up to full performance while field operations were continuing. Consequently the radar data subsequent to 30 July, although retrievable, requires special handling. An earlier lightning strike during SESAME in Oklahoma did major damage to 2 of the antenna drive motors, decreasing the precision of the antenna control and introducing some instability at the end of the azimuthal scan when the elevation angle was changed. This instability does not cause any serious problems in the data analysis for the main part of the scan over the network.

Malfunction occurred in the recording of the Doppler velocities during the summer of 1979 which was not detected until analysis commenced after the field program had ended. The cause of malfunction has not been identified, nor has a satisfactory method for correcting the recorded data in software been found. Thus, as of this date, velocity data throughout the VIN operational program are not considered retrievable.

The availability of radar data on both film and digital magnetic tapes is shown in Section B of Figure 3. Exact times for which digital data are available are given in the daily summaries in the Appendix. The radar data have not

been reviewed or edited except for limited segments which have been used by the Principal Investigators in their research. The magnetic tapes are archived in the original field recording format.

References

Brock, F. V., and P. I. Govind, 1977: Portable automated Mesonet in operation. J. Appl. Meteor. , 16, 229-310.

Byers, H. R. , and R. R. Braham, Jr., 1949: The Thunderstorm. U.S. Govt Printing Office, 282 pp. (Out of print; available through NTIS).

Ulanski, S. L., and M. Garstang, 1978: The role of surface divergence and vorticity in the life cycle of convective rainfall. Part I. Observation and analysis. J. Atmos. Sci., 35, 1047-1069.

APPENDIX

WEATHER AND DATA SUMMARIES

The macro-scale and local weather are briefly described in the following pages for each day of the VIN Field Program. In addition the times (CDT) of recorded data from special observations are given for those days on which they were made. Please refer to Section II of this Technical report for details of instrumentation, recording formats, archived formats, and availability of data.

The following information is given for each type of special observation.

Time Lapse Photography: Times (CDT) of photographic record and qualitative description of the visibility.

CHILL Radar: Times (CDT) of digitally recorded data available on magnetic tape.

Radiosonde Data: Release times (CDT) and height attained (expressed as pressure).

Pilot Balloon Ascents: Release times (CDT) and maximum height for which winds were calculated. All releases were within 15 minutes of indicated time; stars indicate that a second release was made because of early loss of balloon.

The following data are routinely available except for occasional malfunctions and maintenance.

PAM: All variables at 1-min intervals, in standard PAM scaled-tape formats.

Analog wind instruments: Original recording charts.

Thermographs/Hygrothermographs: Original recorder charts.

Microbarographs: Original recorder charts.

Weighing-bucket raingages: Digitized 5-minute amounts on magnetic tape; also original recorder charts.

Analog wind records in the outer wind network have been digitized with 5-min resolution and 5-min average winds have been calculated for the PAM winds for the following dates: July 7-14; July 23-31; August 10-26. These data have been used to calculate the average divergence over the wind network. Plots of the time series of the network average divergence and of the mean rain depth accompany the weather summaries for these 34 days. In addition analog records from the C-set and Lambrecht instruments (inner network) have been digitized with 5-min and 15-min resolution, resp., for the full operational period. Digitized wind data are available on magnetic tape.

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 28 June 1979 Julian Day: 179

I. WEATHER SITUATION

Synoptic. The VIN network was located in the warm sector of a wave cyclone. The warm front stretched eastward from the low pressure center in southern Minnesota to southern Michigan and the cold front trailed south-southwest to Oklahoma. At 500 mb, a pressure ridge lay over the Rocky Mountains and a deep trough over the east coastal states. A short wave passed through this long wave pattern, from eastern Nebraska in the morning of the 28th to eastern Illinois on the morning of the 29th.

Local. Midday winds over central Illinois were southerly and very light. Cloudiness increased from scattered high clouds and shallow cumuli in the afternoon to mid-level overcast at about 2100 CDT. The CHILL radar detected weak layered echoes in the evening with tops at about 20,000 feet. No rain was recorded at any of the stations in the network.

II. SPECIAL OBSERVATIONS

Time Lapse Photographs
Stn 11: 1212-1915
12: 1215-1930 (camera jam)
Visibility: poor

Radiosonde
Base Station: 1625 (475 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1430	2026	1471	2278
1500	1846*	917	1738
1530	2565	2461	1288
1600	2116	1831	
1630	1306	1741	3808
1730	2926*	2011	1648
1800	—	821	622
1830	1666	1012	914
1900	2296	917	2098

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 29 June 1979 Julian Day: 180

I. WEATHER SITUATION

Synoptic. Several bands of showers both ahead and behind the cold front of a wave cyclone passed through Illinois during the day. Aloft a train of short waves passing through the long wave pressure pattern caused retrogression of the main trough at 500 mb. During the mid-afternooh a short wave trough at 500 mb was located along the Mississippi River.

Local. The VIN network was in the pre-cold-frontal air mass for most of the afternoon and experienced rain during most of the day. In the forenoon a small line of showers oriented NE-SW moved across the network. Rain from this line was generally light but the coverage was roughly 45%. During the afternoon, congestus imbedded in layer clouds produced scattered precipitation echoes and light rain at 20% of the stations. A third rain, between about 1730 and 2200, was associated with the frontal passage. It came from a line of echoes which produced rain at only one fourth of the stations, but the most intense of the day (maximum point rainfall was about 10 cm).

II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1205-1850
13: 1154-1858
Visibility: unlimited

Radar: 0837-1113; 1329-2146 (Azimuth encoder rotated 181.5°)

Radiosonde
Base Station: 1720 (248 mb)
Peoria: 1300 (64 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1230	1027	1012	1195
1300	2656	917	1378
1330	2296	1471	1288
1400	2476	1471*	2728
1430	• 2296	1921	1918
1500	2026*	—	1828*
1600	836*	—	1558
1630	1936		
1700	1846*	—	1103
1730	1213	724	1558
1800	1027	1291	1738
1830	1936	1831	818

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 30 June 1979 Julian Day: 181

I. WEATHER SITUATION

Synoptic. The cold front which passed through Illinois on 29 June was well to the east and south on the 30th. A second cold front entered the U.S. from Canada and moved south to the Great Lakes during the day. Illinois was in cool air between the two fronts but the main cold air mass was still well to the north and west. The 500 mb pressure was undergoing change to a higher wave number pattern, with a deep ridge over the High Plains and a deep, trough from Lake Erie to western Florida. Short waves continued to ripple through this pattern and one short wave trough was a trigger for showers in the network.

Local. Heavy but scattered rain showers occurred in the network between 1300 and 2130 CDT. These produced rain at about one-fourth of the stations with a maximum point storm rainfall of over 10 cm. Hail was detected at 2 stations in the east central part of the network. Winds were northerly and very light in the morning veering during the day to southwesterly by late evening and increasing to 7-8 m s^{-1}.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 1 and 2 July 1979 Julian Day: 182 and 183

I. WEATHER SITUATION

Synoptic. Frontolysis occurred on 1 July along the central and western sections of the cold front which entered the U.S. on 30 June. The cold front which had passed Illinois on 29 June continued to move south and east. A trailing "stationary" front remained well to the south on July 1 but on July 2 the western portion started to move northeast as a warm front and by midnight of July 2 had entered southwestern Illinois. Aloft a high wave number pattern prevailed and, at 500 mb, Illinois was on the eastern side of the main ridge centered over the plains states. The winds were generally northwesterly over the state at both the surface and aloft.

Local. The weather was fair in the network on both days, with northwesterly winds and shallow fair-weather cumuli.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 3 July 1979 Julian Day: 184

I. WEATHER SITUATION

Synoptic. A poorly defined front was draped across the U.S., from west of the Rockies to the east coast. The central section moved across Illinois as a warm front during the day, providing some synoptic scale convergence. The 500 mb pattern showed signs of transition to a more zonal flow than had existed for the previous 2 or 3 days. A shallow ridge lay over the plains states. A shallow short-wave trough rippled through the east side of this ridge, crossed over southern and central Illinois in the morning and generated some showers. A second short wave farther north, influenced the weather in northern Illinois in the late evening and during the night of July 3-4.

Local: Rain occurred in the VIN network through most of the day, starting at about 0700 CDT and continuing sporadically to the early morning hours on the 4th, with all but about a tenth of the stations experiencing precipitation. Maximum point rainfall for this storm was over 6 cm. Hail was recorded at two stations with many small to medium-sized stones. Rains came in several spells during the day. In the morning, a long line of echoes west of the network moved ENE. Some of the storms had reflectivities of over 50 dbz, and tops around 45,000 feet. Hail was recorded the late morning and early afternoon at two stations. The clouds decreased in early afternoon to scattered showers, a few moderate to heavy. Later in the afternoon another group of scattered showers developed, followed by general clearing around 1800 CDT. During the night a line of clouds approached the network but remained to the north of the network except for the extreme north-east corner. For most of the network, the rains were over by 2000 CDT.

II. SPECIAL OBSERVATIONS

Time Lapse Photographs
Stn 11: 1226-1915
13: 1131-1700
Visibility: poor, changing to excellent later

Radar: 0940-1500, 1600-0305 (4th)

Radiosonde
Base Station: 1314 (500 mb); 1535 (26 mb); 1810 (77 mb)
Peoria: 1300 (65 mb)
Salem: 1300 (281 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1200	—	—	7215
1230	—	—	1103
1300	932	—	721
1330	2206	—	2998
1400	2926*	3451*	3538
1430	2836*	1741*	3358
1500	2476*	1561*	1378
1530	2836*	3541	1009
1600	3016	1921 --	
1630	3106	1291	1648
1730	2566	917*	1468
1800	2386	526	2908
1830	2026	1106	1378
1900	2566	1106	1103
1930	2836	917	1558

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 4 July 1979 Julian Day: 185

I. WEATHER SITUATION

Synoptic. The east-west front draped across the U.S. on 3 July shifted southward as a cold front during the day, as a large high pressure area moved into the United States from central Canada. A high wave number pattern persisted at 500 mb, with closed low pressure centers over New England and the Pacific northwest and a deep ridge over the Great Plains.

Local. Winds were southeasterly in the early part of the day, shifting to northeasterly after the front passed. There was broken to overcast mid-level layer clouds, clearing late in the day. Some very light spotty rains occurred in the pre-dawn hours from a cloud line which was primarily to the north of the network. (See 3 July).

II. SPECIAL OBSERVATIONS

Time Lapse Photographs
Stn 11: 1225-1810
13: 1232-1815
Visibility: good

Radar: None after 0300 (see 3 July for pre-dawn recordings)

Radiosonde
Base Station: 1336 (236 mb); 1800 (239 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	739	821*	622
1330	836	724	721
1400	836	917	818
1430	932	821	914
1500	932	724	622
1600	1121*	917	419
1630	2566	1012	1103
1700	1576	724	1103
1730	2296	1012	1009
1800	2116	1921	1009
1830	3196	--	--
1900	2476	--	--

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 5 and 6 July 1979 Julian Day: 186 and 187

I. WEATHER SITUATION

Synoptic. The cold front continued to move southward as a large cold high moved into the U.S. from Canada. By the evening of July 6 the high pressure area covered the eastern 2/3 of the U.S. Illinois was south of the high pressure center on 5 July and southwest on 6 July. Aloft the main wave pattern shifted northward and on the 6th, Illinois was in a flat pressure gradient at 500 mb, with light westerly or northwesterly winds.

Local. Winds over the VIN network were generally easterly and light. The weather was fair, with practically no clouds on either of these two days.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 7 July 1979 Julian Day: 188

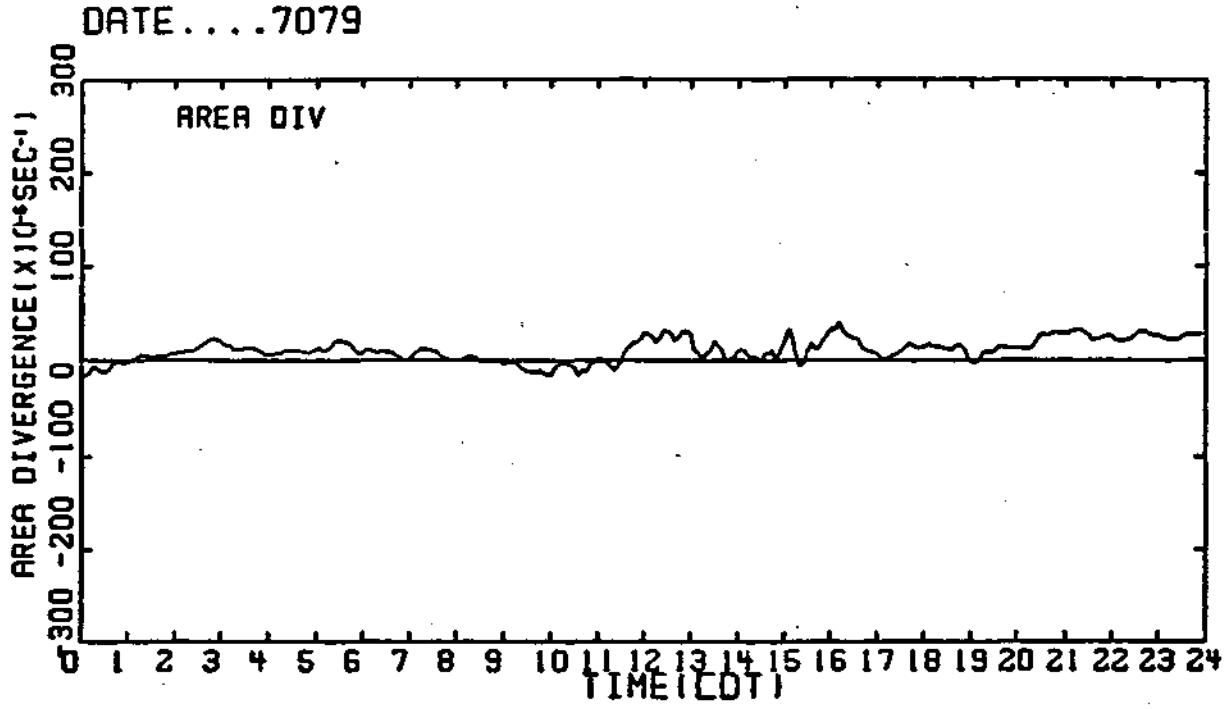
I. WEATHER SITUATION

Synoptic. Illinois was on the west side of the modified, polar, high-pressure area that entered the United States on the 4th of the July and persisted over the eastern half of the U.S. on subsequent days. A wave developed on the east-west stationary front that marked the southern border of this air mass, with the low center on the Ark-Tenn-Miss border. Aloft, a trough at 700 and 500 mb extending from North Dakota to southern Missouri in the morning moved eastward to the Mississippi River during the day.

Local. Weather in the VIN network remained fair with generally light easterly or southeasterly winds. No significant convection developed during the day. The network average divergence was slightly positive through most of the day (see accompanying figure).

II. SPECIAL OBSERVATIONS

Radiosonde
Base Station: 1307 (37 mb); 1808 (516 mb)
Peoria: 1300 (61 mb)
Salem: 1300 (70 mb)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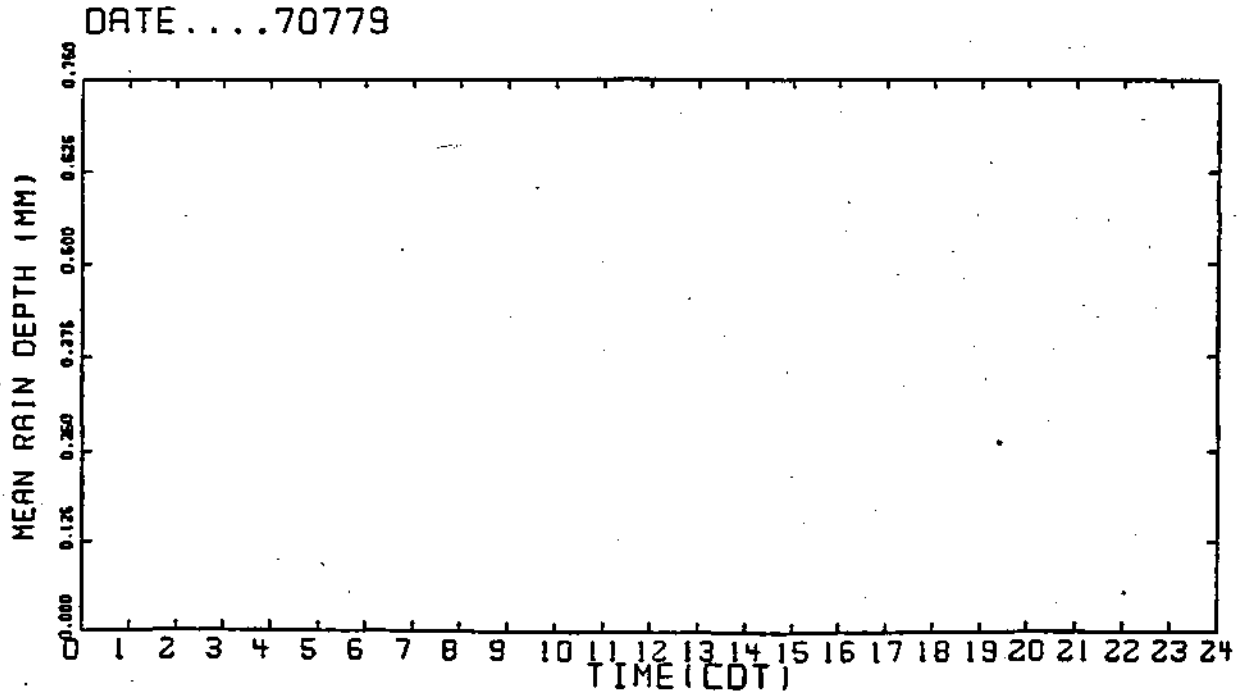
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 8 July 1979 Julian Day: 189

I. WEATHER SITUATION

Synoptic. The center of the large high pressure which had persisted over the U.S. for 3 days moved out to sea. Illinois remained on the west side of this high pressure system. Shallow waves formed on the stationary front extending from Texas east to the Atlantic. At 500 mb the flow was generally westerly. A very shallow trough from eastern Minnesota to northeastern Arkansas in the morning shifted eastward across Illinois during the day. A minor short wave at 850 mb and 700 mb, from eastern Missouri to southern Illinois caused extensive cloudiness.

Local. Overrunning from the front to the south coupled with the lower tropospheric trough passage resulted in broken or overcast cloudiness and drizzle most of the day. Light rain was recorded at about one half of the stations (maximum point rain: 1.65 cm). Layered clouds were detected by the radar, but no convective cells. Network mean divergence was near zero in the forenoon, but there was net outflow throughout the rest of the day (see accompaning figure).

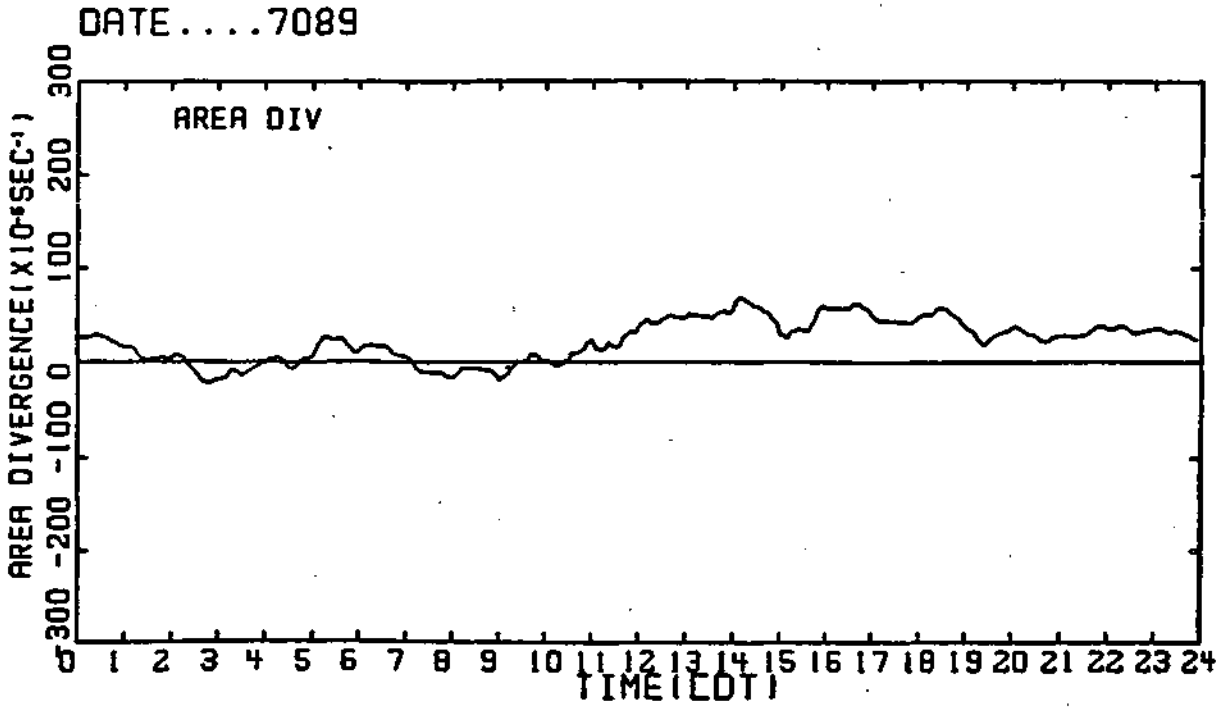
II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1300-1945
13: 1317-2000
Visibility: fair

Radiosonde
Base station: 1310 (200 mb); 1832 (250 mb)
Peoria: 1300 (59 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	—	—	523
1400	—	—	419*
1430	—	—	419*
1500	437	—	1195
1530	437	—	2278
1600	437	319	818
1700	437	319	1288
1730	437	319	2278
1800	541	526	1738
1830	437	422	1468
1900	541	422	1828
1930	437	526	1558
2000	437	625	2008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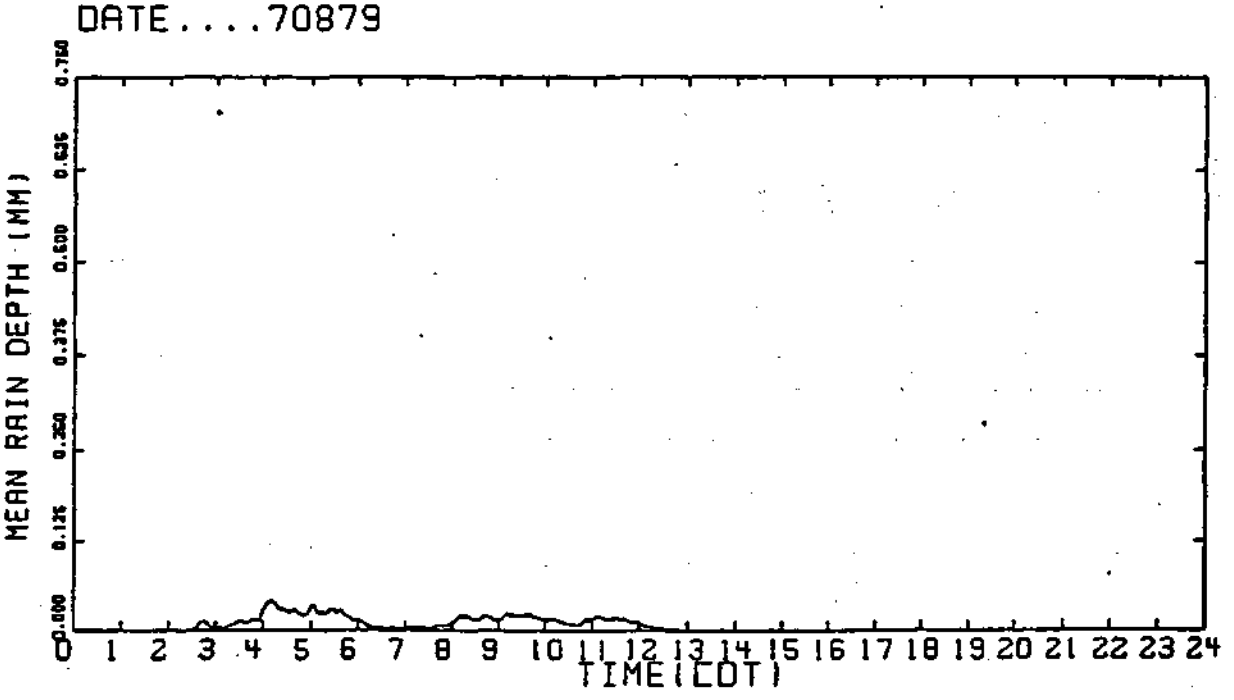
TIME(LDT)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0.250
0.125
0.000
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TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 9 July 1979 Julian Day: 190

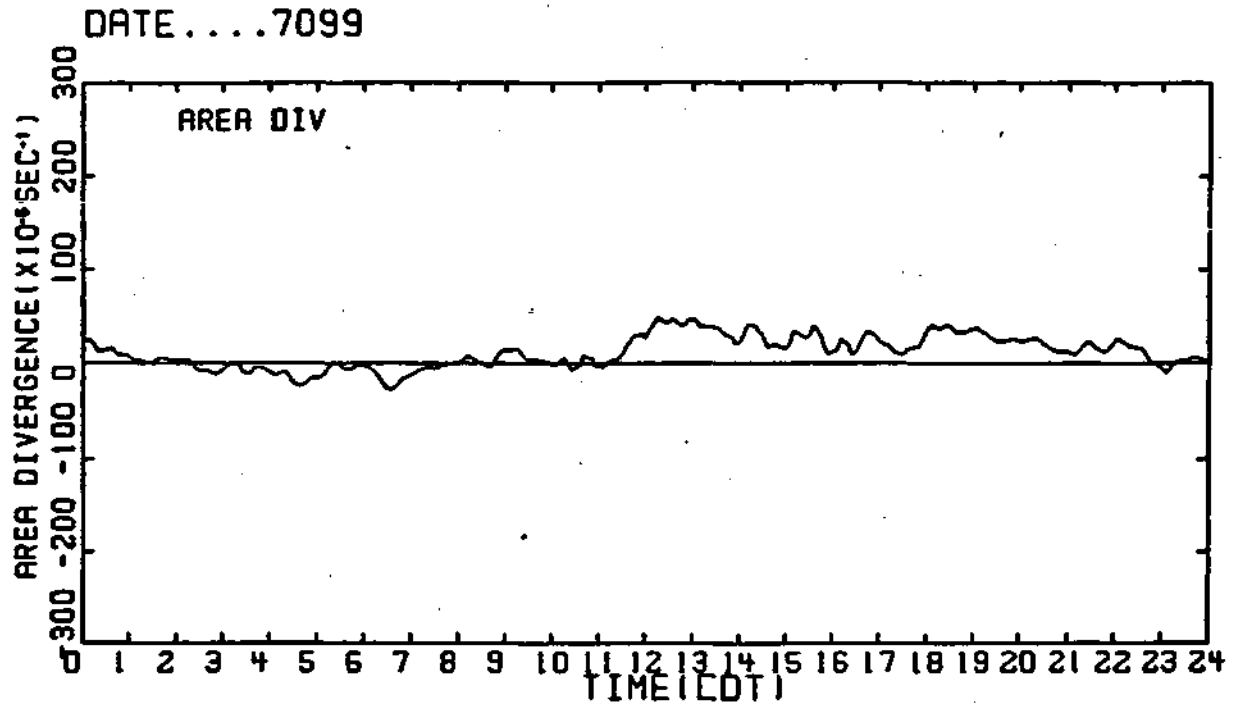
I. WEATHER SITUATION

Synoptic. Illinois remained on the west side of the high pressure area, the center of which was now moving out to sea. A shallow wave on the frontal boundary of the high pressure area, moved into southern Illinois in the late afternoon. Aloft a deep short wave which was over eastern Illinois and western Indiana in the morning moved eastward and a new short wave developed in the eastern Dakotas.

Local. Weather on this day was very similar to that on the 8th, with generally overcast conditions and very light rains at a few stations during the morning. Maximum point rainfall was only about 1 mm. As on the 8th, the network average divergence was near zero (or slightly negative) in the forenoon with weak outflow in the afternoon and evening (see accompanying figure).

II. SPECIAL OBSERVATIONS

None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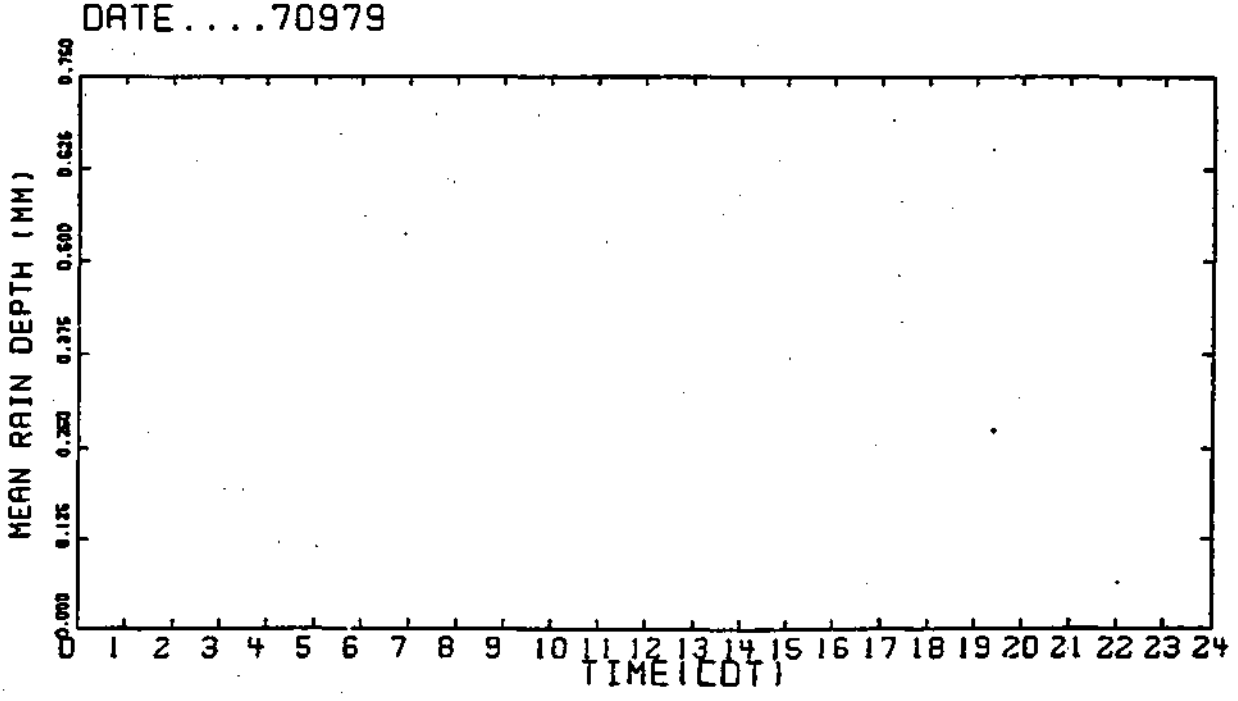
TIME(CDT)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0.000
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 10 July 1979 Julian Day: 191

I. WEATHER SITUATION

Synoptic. There was frontolysis along the front which extended ESE from Kansas to western Kentucky. The eastern part of the United States came under the influence of a tropical storm that developed rapidly in the northern Gulf and reached the Louisiana coast a few hours after midnight, AC 500 mb the flow split, with the northern sector becoming zonal, and a closed low developing over the Gulf. Illinois was in a flat pressure gradient through much of the troposphere, resulting in weak southeasterly winds at the surface and westerly winds aloft.

Local. Surface winds in the VIN network were highly variable and very light. Skies were clear in the morning with scattered shallow cumuli developing in the afternoon. No rain and no significant radar echoes developed during the day. The network average divergence (see accompanying figure) hovered near zero with minor net outflow for the day as a whole.

II. SPECIAL OBSERVATIONS

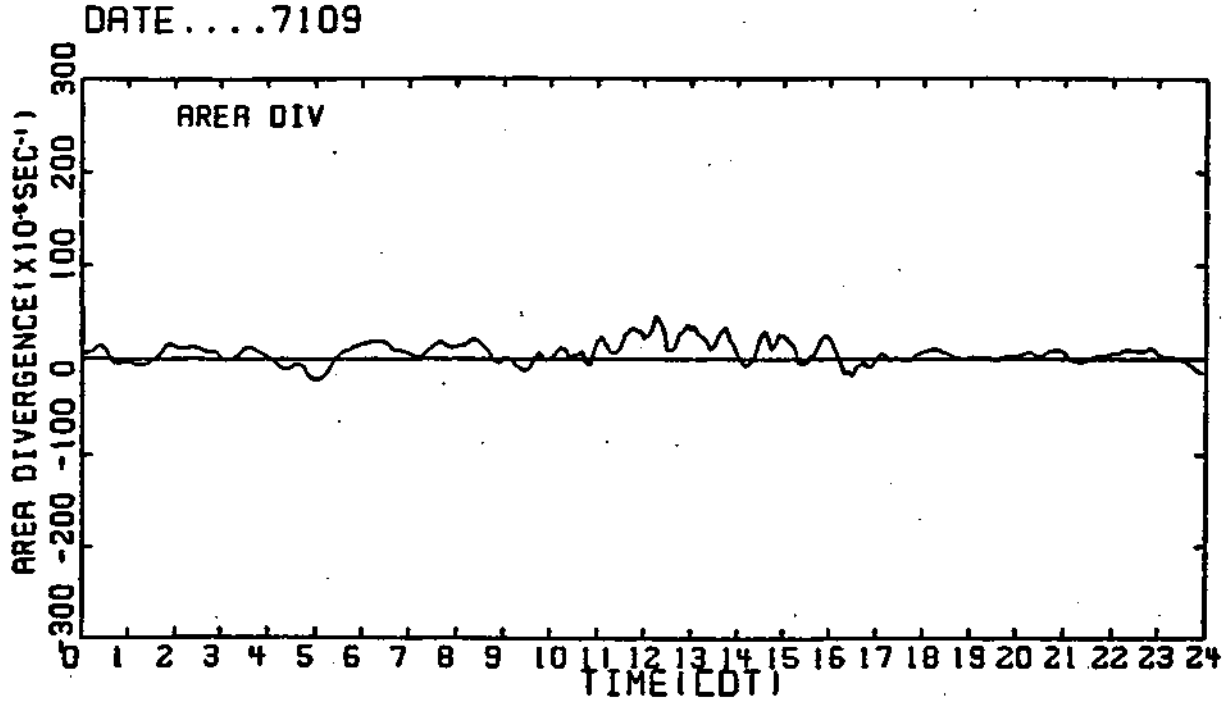
Time Lapse Photography
Stn 11: 1200-2030
13: 1327-2015
Visibility: excellent

Radiosonde

Base station: 1310 (180 mb); 1800 (157 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	3376	3191	1558
1430	2206*	319	2638*
1500	3826	–	1378
1530	3826	–	1558
1600	1306*	3001	1738
1630	3826	–	2458
1730	3826*	1198	2458
1800	3826	2551	1288
1830	3826*	3811	3808
1900	3826	3811	1648
1930	3826	2731	1648
2000	2656	2821	2008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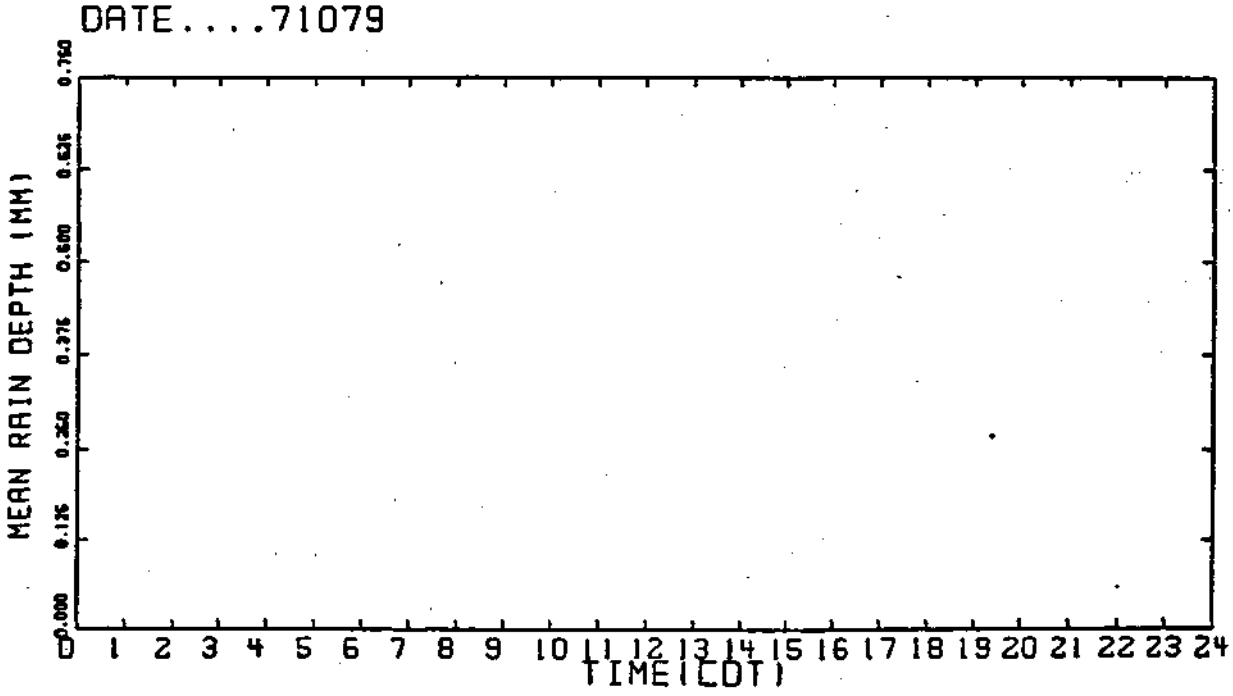
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 11 July 1979 Julian Day: 192

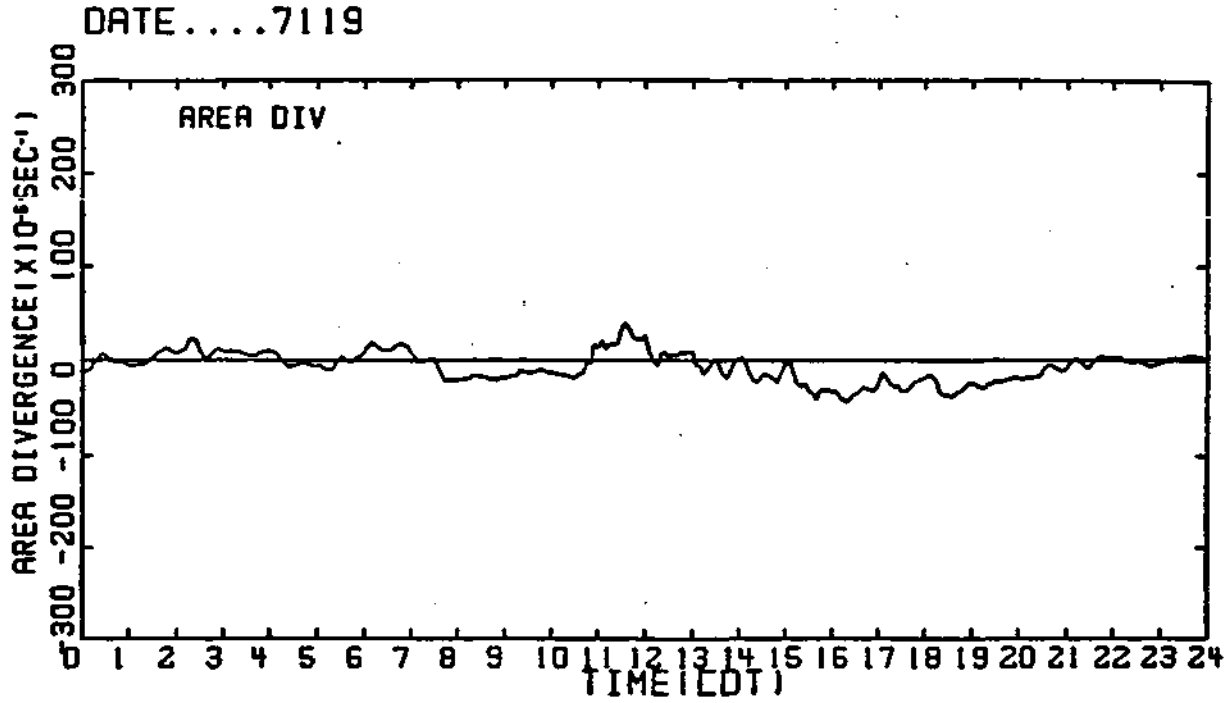
I. WEATHER SITUATION

Synoptic. Tropical storm Bob made landfall on the southeast Louisiana coast in the pre-dawn hours and moved northward up the Mississippi River Valley. By midnight the center was located in northern Mississippi. The low pressure area associated with the tropical disturbance was fairly deep in the morning and a closed low still existed at 500 mb. However the system filled during the day and by late that night the pressure pattern at 500 mb just showed a deep trough over the Mississippi valley.

Local. The winds in the VIN network were SSE and less than 2 or 3 m s^{-1}. The cloudiness increased during the day as the cloud shield of the tropical storm moved northward, bringing middle level broken to overast cloudiness in the afternoon and evening. However, no rain was recorded in the network nor were there any significant radar echoes. The average network divergence (see accompanying figure) hovered around zero but unlike the previous days, there was net inflow into the area in the afternoon rather than outflow.

II. SPECIAL OBSERVATIONS

None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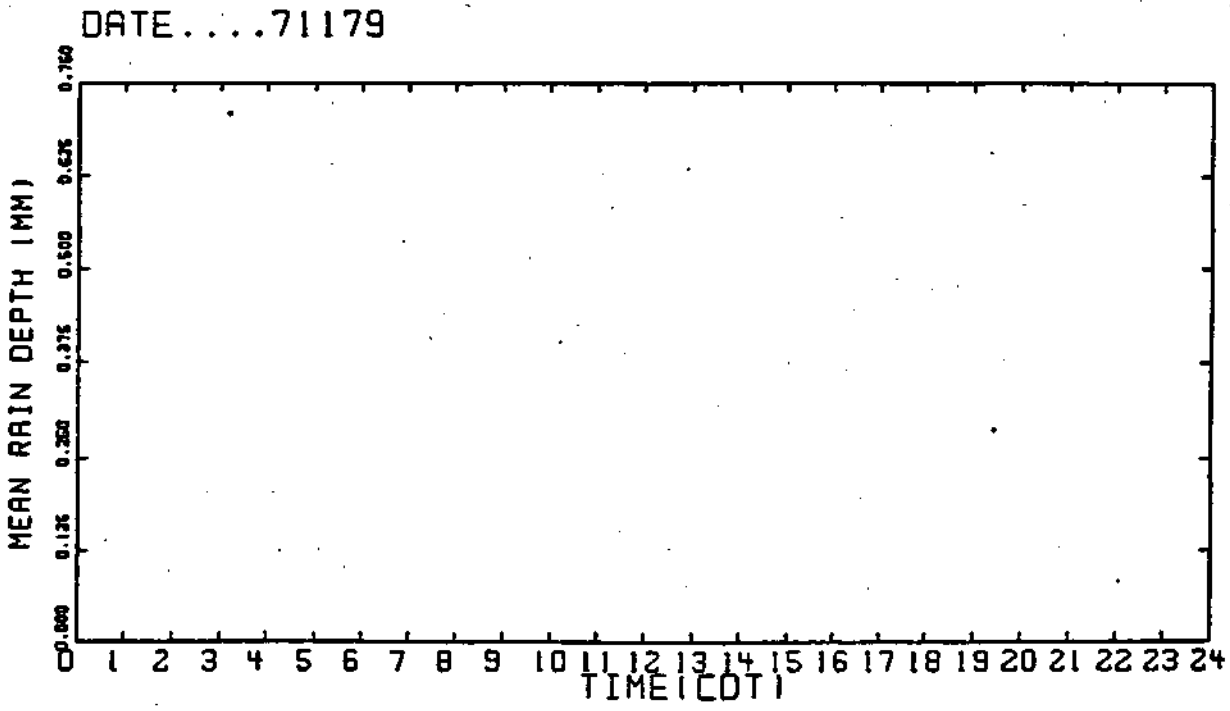
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 12 July 1979 Julian Day: 193

I. WEATHER SITUATION

Synoptic. Tropical storm Bob continued its movement north and then turned ENE up the Ohio Valley. Illinois was under the influence of the circulation of this system, which was filling during the day at all levels. Illinois was in the trough associated with the system at 500 mb. The outer portion of the cloud shield from the storm covered the southern half of the state.

Local. The winds were easterly and southeasterly, 2 or 3 m s^{-1}. There was a middle and/or high-level overcast throughout the day with occasional breaks and a few small cumuli in the afternoon. Some very light rain fell at a few stations in the network between 1400 and 1700. The CHILL radar detected some thin layer-type echoes with no significant embedded convection. The network-average divergence (see accompanying figure) indicated persistent weak outflow from late morning to late evening.

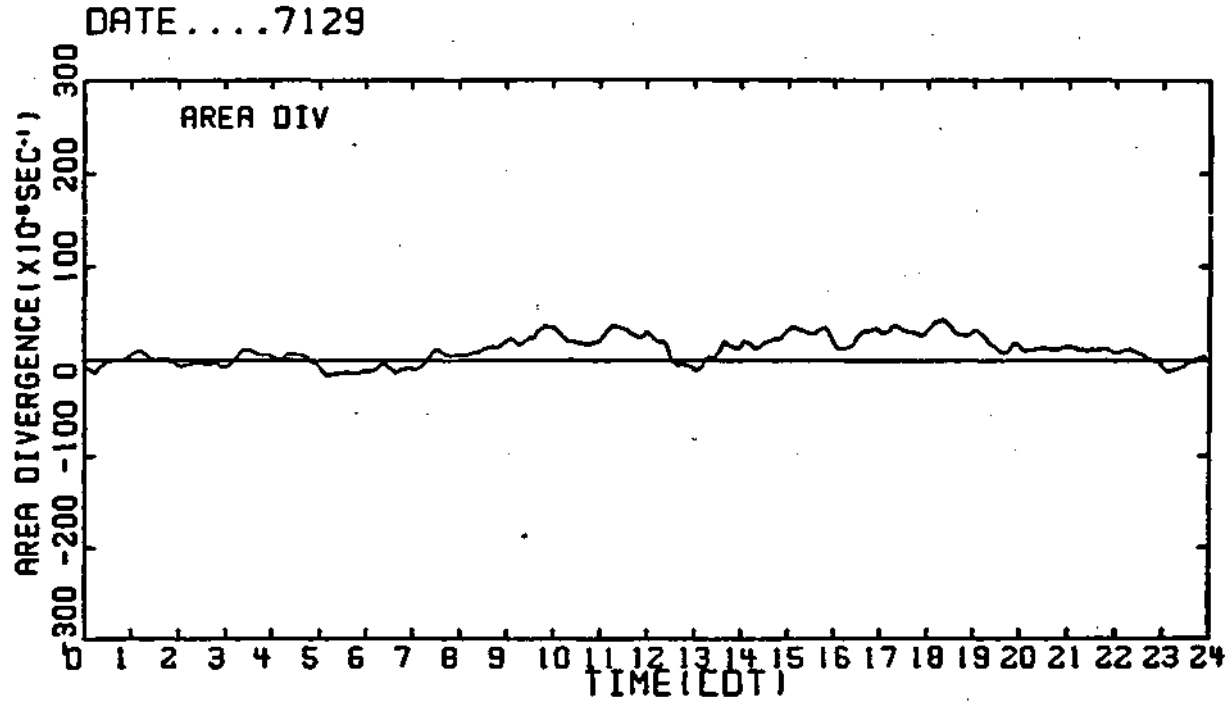
II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1257-1830
Visibility: fair

Radiosonde
Base Station: 1303 (55 mb); 1537 (35 mb); 1803 (31 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (77 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	1213	2011	818
1400	2206	917	1009
1430	3646	1012	721
1500	3196	3451	1103
1530	3376	2911	1288
1630	3826*	1471	1558
1700	3376	—	1009
1730	2656	1921	1738
1800	3736	1651	1468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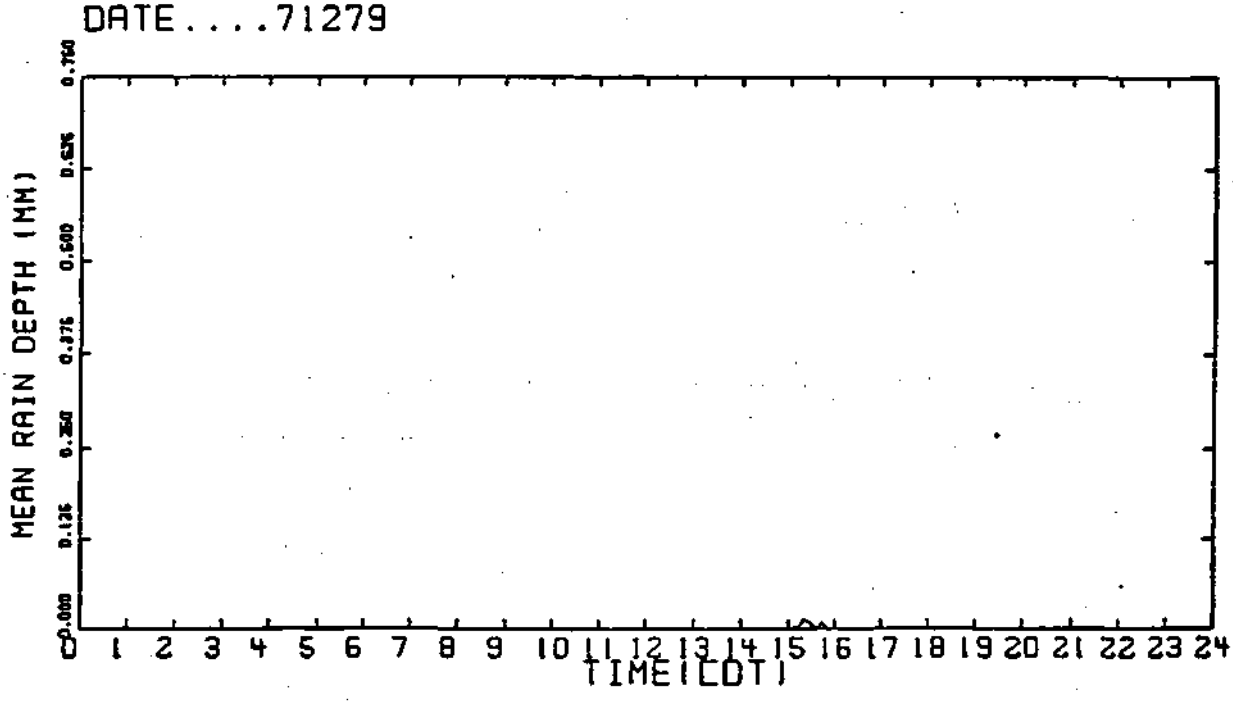
TIME(LDT)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TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 13 July 1979 Julian Day: 194

I. WEATHER SITUATION

Synoptic. Tropical storm Bob weakened, although an area of low pressure could be followed eastward to West Virginia. A cold front, which had been more-or-less stalled in the central plains, moved east during the day but remained well to the west of Illinois. By midnight it extended from Lake Superior to NE Iowa and thence SW to SE Colorado. At 500 mb the trough associated with the tropical storm extended from the low center in NE Indiana southwest to east Texas in the morning, filled during the day. By late evening the southern half of the U.S. was in a flat area of relatively high pressure.

Local. There was middle to high level overcast with low level scattered to broken clouds over the local area. A band of convective showers developed in the western part of the network at about 1400 and moved eastward very rapidly, followed by another line of clouds which entered the network from the northwest. Rain was recorded at nearly every station between 1400 and 1900, with several parts of the network receiving over 2.5 cm. Hail (some marble size) fell at 4 stations during the afternoon. The temporal profile of the network average divergence revealed a significant convergence/precipitation event between 1500 and 1800 CDT (see accompanying figure), with strong inflow into the network before and during the early part of the rain storm followed by strong outflow as the rain reached the maximum. The main showers ended shortly after 1800, after which the rains became very light and the echoes became more and more stratified, continuing through the night.

II. SPECIAL OBSERVATIONS

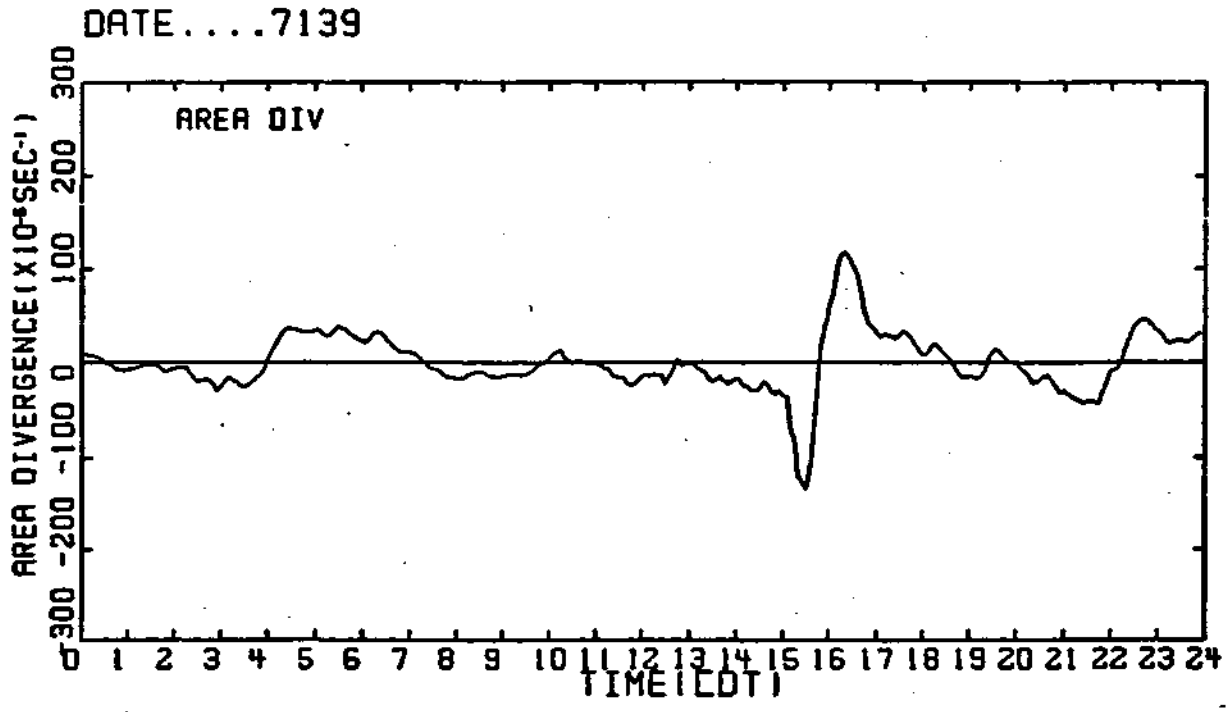
Time Lapse Photography
Stn 11: 1150-1515; 1725-2030
13: 1149-1550; 1600-2015
visibility: poor to excellent

Radar: 1421-0240 (14 July)

Radiosonde
Base Station: 1307 (88 mb); 1800 (139 mb)
Peoria 1300: (70 mb)
Salem 1300: (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1430	1846	821	1458
1500	2116	2011	914
1530	--	1741	1468
1600	-- -- --		
1630	-- --	--	
1730	640*	3451	--
1800	2926*	3451	--
1830	3376	3721	2458*
1900	3466	3631	2008
1930	2206	3811	2008
2000	1121*	1106	2368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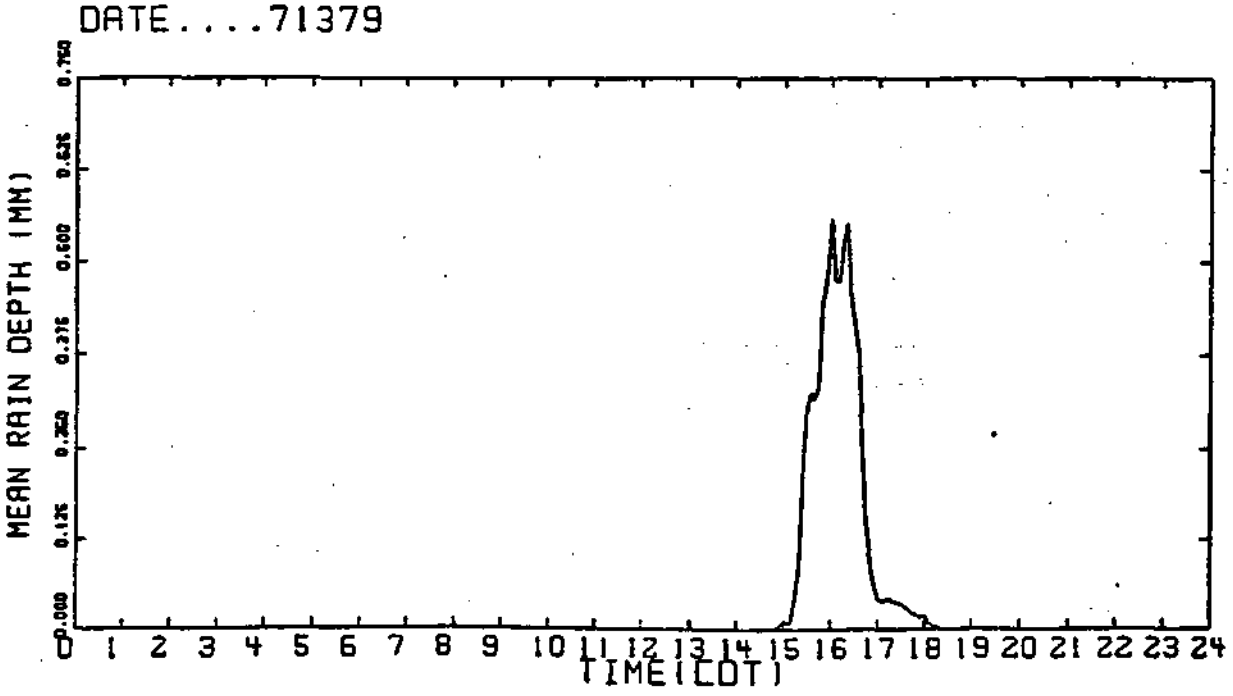
TIME(LDT)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TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 14 July 1979 Julian Day: 195

I. WEATHER SITUATION

Synoptic. A cold front which extended from Lake Superior to the Texas panhandle entered northwestern Illinois in the pre-dawn hours and moved SE. The northern portion of the front moved much more rapidly than the southern, reaching the eastern Great Lakes by the next morning, so that the southern edge took on an E-W orientation across southern Illinois. A well-defined short wave was associated with the front at 850 and 700 mb, but was very poorly defined at 500 mb. Lines of showers occurred both ahead of and along the frontal system.

Local. Cloudy conditions prevailed throughout most of the day with high level overcast as well as low and middle clouds providing precipitation off and on all day. Between midnight and about 0500, a line which formed on the west side of the VIN network moved east producing rains at over half of the stations. Most of the point rainfalls were in excess of 1 cm with a maximum of 4.75 cm. During a second storm, between 0500 and noon, rain was recorded at every station with maximum point rainfall of 4.5 cm and over 1 cm at many stations. Hail fell at 5 stations in an east-west line to the north of the center of the network. Very strong signatures in the temporal profile of the network-average divergence (see accompanying figure) were associated with both of these early rains. The third rainstorm in mid and late afternoon, was due to two N-S squall lines which developed around 1430: one mainly south of the network, and the other to the north. Only the outrider echoes of these lines entered the network, with rain occurring at only one-fourth of the stations, largely on the north and south edges of the network. The maximum point rainfall was only 0.5 cm.

II. SPECIAL OBSERVATIONS

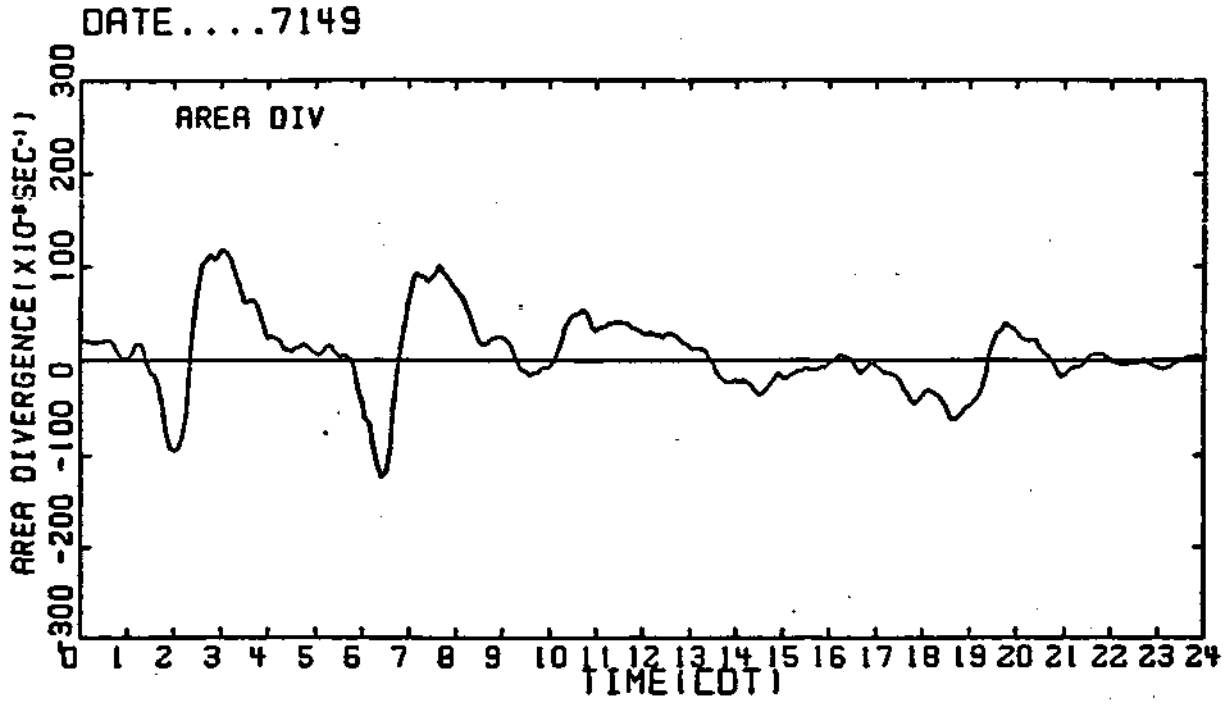
Time Lapse Photography
Stn 11: 1155-2020
13: 1318-2015
Visibility: Poor to fair

Radar: 1550-2050 (See 13 July for pre-dawn hours)

Radiosonde
Base Station: 1302 (100 mb); 1801 (183 mb)
Peoria: 1300 (67 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	1027	3181	914
1430	1027	724*	1103
1500	932	1012	1009
1530	836	1291	1648
1600	1486	1291	1738
1630	2206	1381	2188
1730	1756*	3811*	2278
1800	—	3811	1918
1830	932	3361	1288
1900	739	724	1288
1930	541	2011	1103
2000	1486	3091	721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-300
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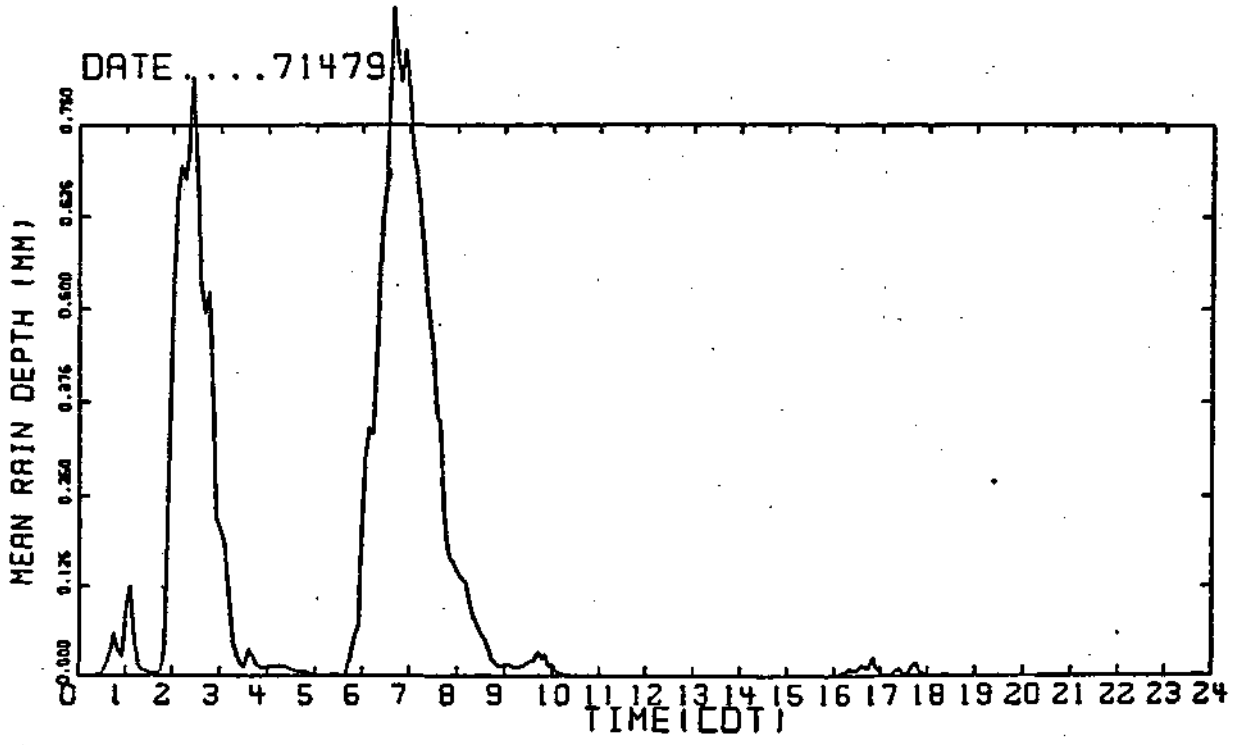
TIME(LDT)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0.500
0.375
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0.125
0.000
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TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 15 July 1979 Julian Day: 196

I. WEATHER SITUATION

Synoptic. A front extending E-W across much of the U.S. shifted back and forth across the southern half of Illinois during the day. A Canadian high pressure moved into the U.S. in the morning, with the leading edge reaching the Wisconsin-Illinois border by midnight. The flow was largely zonal at 500 mb, with a very shallow long wave trough which moved from Iowa to Indiana between the morning of the 15th and the morning of the 16th.

Local. Local winds were westerly and light. There were broken middle and high level cloud layers throughout most of the day, with sky cover between .5 and .8. Small cumuli developed in the afternoon. No rains fell and no significant radar echoes were detected.

II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1225-2005
13: 1255-2000
Visibility: Excellent

Radar: 0840-1143 (with interruption)

Radiosonde
Base Station: 1300 (526 mb); 1800 (267 mb)
Peoria: 1303 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	2566	1741	572
1400	1846	2731	1288
1430	2386	1291	2368
1500	2386	821	2548
1530	3826	2551	2278
1600	3826	1381	316
1630	2746	2641	2188
1730	2206	3811	2818
1800	2566	3451	2368
1830	3826	3721	--
1900	3106	3631	2458
1930	3106	3721	2008
2000	3826	3811	2458

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 16 July 1979 Julian Day: 197

I. WEATHER SITUATION

Synoptic. The cold front from Canada moved rapidly south, putting Illinois in the southeast quadrant of a Canadian high pressure area during most of the day. A long wave pressure pattern dominated at the 500 mb level, with the centers lying in the far north. The southern half of the United States was in an extremely flat pressure gradient and the flow over Illinois was largely zonal.

Local. The skies were generally clear with high level scattered clouds occurring in the late afternoon and evening. Winds were from the north at about 5 m s^{-1} and visibility was excellent.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 17 July 1979 Julian Day: 198

I. WEATHER SITUATION

Synoptic. Most of the United States was dominated by a large high pressure area with a center in the vicinity of the Minnesota-Dakota border and southern limits at the latitude of southern Arkansas. Aloft, a long-wave pattern persisted and the southern half of the United States was in a flat field of high pressure.

Xocal. The winds in the VIN network were northerly and very light. Scattered high clouds occurred during most of the day with low-level straticumuli occurring in the late afternoon.

II. SPECIAL OBSERVATIONS (Clear-air experiment)

Time Lapse Photography
Stn 11: 0930-1508
13: 0922-1530
Visibility: unlimited

Radar: 1055-1642

Radiosonde
Base Station: 1200 (349 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1000	3196	3811	2008
1030	3826	3811	1288
1100	2476	3541	2728
1130	3466	3811	1828
1200	3826	--	2188
1300	3826	3721	3808
1330	3826	2011	2278
1400	3826	1381	3808
1430	3826	625	3808
1500	3211*	1381	2368

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 18 July 1979 Julian Day: 199

I. WEATHER SITUATION

Synoptic. Conditions were very little changed from the day before. There was high pressure over the entire U.S. with essentially no movement during the day. The flow aloft was predominatly zonal.

Local. Winds were northerly and very light, and the sky was clear.

II. SPECIAL OBSERVATIONS (Clear-air experiment)

Time Lapse Photography
Stn 11: 0908-1545
13: 0920-1530
Visibility: unlimited

Radar: 0937-1651

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1000	3826	2821	3808
1030	3826	3811	3808
1100	3826	3811	3808
1130	3826	3811	3808
1200	3826	3721	3808
1300	3826	1921	523
1330	3826	2011	3808
1400	3826	2461	3808
1430	1756	3811	2638
1500	3826	3181	3808

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 19 July 1979 Julian Day: 200

I. WEATHER SITUATION

Synoptic. High pressure still dominated most of the United States but the center had started to shift to the east and by the morning of the 20th it was over the east coast. At 500 mb Illinois was in a region of very flat pressure gradient. A short wave started to develop in the morning and deepened during the day, but the trough was well to the west of Illinois.

Local. Winds were northeasterly and extremely light (less than 2 m s^{-1}). There were scattered low clouds during the afternoon with a high level, thin broken cloud deck.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 20 July 1979 Julian Day: 201

I. WEATHER SITUATION

Synoptic. The large high pressure area which had dominated most of the United States for the previous few days shifted eastward with the center moving off the east coast by late in the day. A front extended from the northwest Gulf to Cape Hatteras and east into the Atlantic but the rest of the U.S. remained under high pressure. The pressure pattern aloft was predominatly flat with light winds and dry air in the lower troposphere. At 500 mb a short wave trough moved through the long wave pattern over the northern U.S., with the trough line moving from the Mississippi River on the morning of the 20th to northern Ohio by the following morning.

Local. The local area was unaffected by the trough at 500 mb. The winds remained very light, less than 2 m s^{-1}, and northeasterly. The skies were clear except for shallow cumulus clouds in the late afternoon.

II. SPECIAL OBSERVATIONS (Clear-air experiment)

Time Lapse Photography
Stn 11: 1015-1635
13: 1021-1630
Visibility: excellent

Radar: 0721-1743

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1100	3826	3091	3808
1130	3826	3811	3358
1200	3826	2011	419
1230	2656	1471	3448
1330	1306	3631	2008
1400	1846*	3181	1468
1430	1306	3811	3088
1500	1666	3811	3808
1530	3826	1291	2998
1600	1936	3541	3808

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 21 July 1979 Julian Day: 202

I. WEATHER SITUATION

Synoptic. A short wave developed on a front lying over the southeastern states and a cold front edged into the U.S. from Canada late in the day. Illinois was in a pressure col between the two fronts. The troposphere over the state remained dry, with a very flat pressure gradient. A short-wave train moving through the long-wave pattern at 500 mb was well to the north of Illinois.

Local. The weather was fair with clear skies throughout the morning and just a few scattered clouds in the late afternoon. Winds were east to northeast at 2 m s^{-1} or less.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 22 July 1979 Julian Day: 203

I. WEATHER SITUATION

Synoptic. Tropical storm Claudette formed in the central Gulf of Mexico and shifted to the northwest during the day. The front in the southeastern states moved north, and weakened during the day and a cold front remained on the Canadian border. The central U.S. was in a generally flat pressure col between these two fronts. The pressure gradient was quite flat aloft also. At 500 mb, a weak short wave trough extended from Wisconsin to Louisiana.. This retrogressed during the day in the south and weakened in the north so that the flow became more zonal and weaker.

Local. Minds were very light in the network, 1 to 2 m s and highly variable. The skies were clear in the morning and shallow cumuli developed in the afternoon.

II. SPECIAL OBSERVATIONS (Clear-air experiment)

Time Lapse Photography
Stn 11: 1215-1638
13: 1125-1940
Visibility: good

Radiosonde
Base Station: 1433 (300 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	3826	319	2728
1430	1486	625	3178
1500	1121	3811	1828
1530	1576*	3811	2098
1600	--	1561	1288
1700	--	--	1648
1730	--	--	3808

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 23 July 1979 Julian Day: 204

I. WEATHER SITUATION

Synoptic. The cold front in the northern tier of States developed a wave and became a warm front in central Wisconsin which moved rapidly to the north and northeast. The old front to the south had moved to the Ohio River valley and underwent frontolysis. Illinois experienced increasingly strong southerly flow as a cold front which had developed to the lee of the Rockies moved rapidly eastward. Aloft, the pressure pattern was largely zonal and flat over most of the United States. However as the day wore on both the surface and upper air began to react to Tropical Storm Claudette which was approaching Texas-Gulf coast. Clouds covered much of the eastern U.S., with the northern boundary of the cloud cover extending from Lakes Erie and Ontario westward to central Illinois and then SSW into eastern Texas. In addition, clouds, some relatively severe, developed along the cold front moving eastward from the Rockies.

Local. The winds were southerly and generally less than 4 m s^{-1}. During most of the morning and early afternoon the visibility was poor because of haze. Clouds did move into the network during the early afternoon, mainly stratified. Convective echoes developed in the southwest around 1500 and expanded into a wide band of showers which moved across the network in the next 2 1/2 hours. In the early evening the convection degenerated into stratiform echo with occasional, isolated, convective cells. Most of the rain occurred in the southern 2/3 of the network. The rain was heaviest between 1330 and 1900 with a number of stations receiving over 1 cm and maximum point rainfall of 5 cm. Hail, mostly small stones, occurred at 9 stations, all in the southwestern part of the network. Rain continued all evening, but with generally less than 3 mm point accumulations between 1900 and midnight. Significant mass outflow from the network occurred with the afternoon rain (see accompanying figure), and there was continuous inflow in the evening.

II. SPECIAL OBSERVATIONS**

Time Lapse Photography
Stn 11: 1222-1843
13: 1229-1900
Visibility: poor

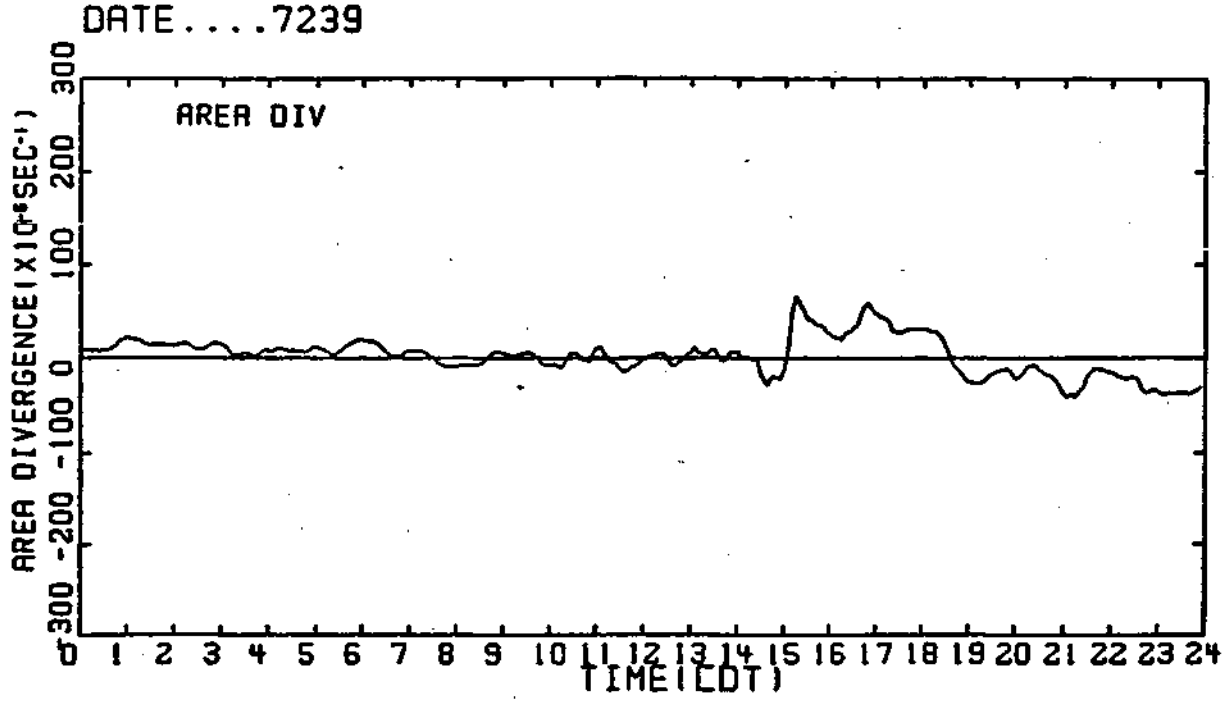
Radar: 1607-2318

Radiosonde
Base Station: 1305 (272 mb); 1808 (120 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	932*	1291	419
1330	1396	1291	1103
1400	1666	1291	1468
1430	1121	1381	419
1500	1213	1471	622
1530	1666	1471	316*
1630	2476*	---	
1700	3106	1831	--
1730	3376	2911*	--
1800	1213*	3811	2098
1830	2386*	3541	1648

**PAM base station down for software development, 0900-1300.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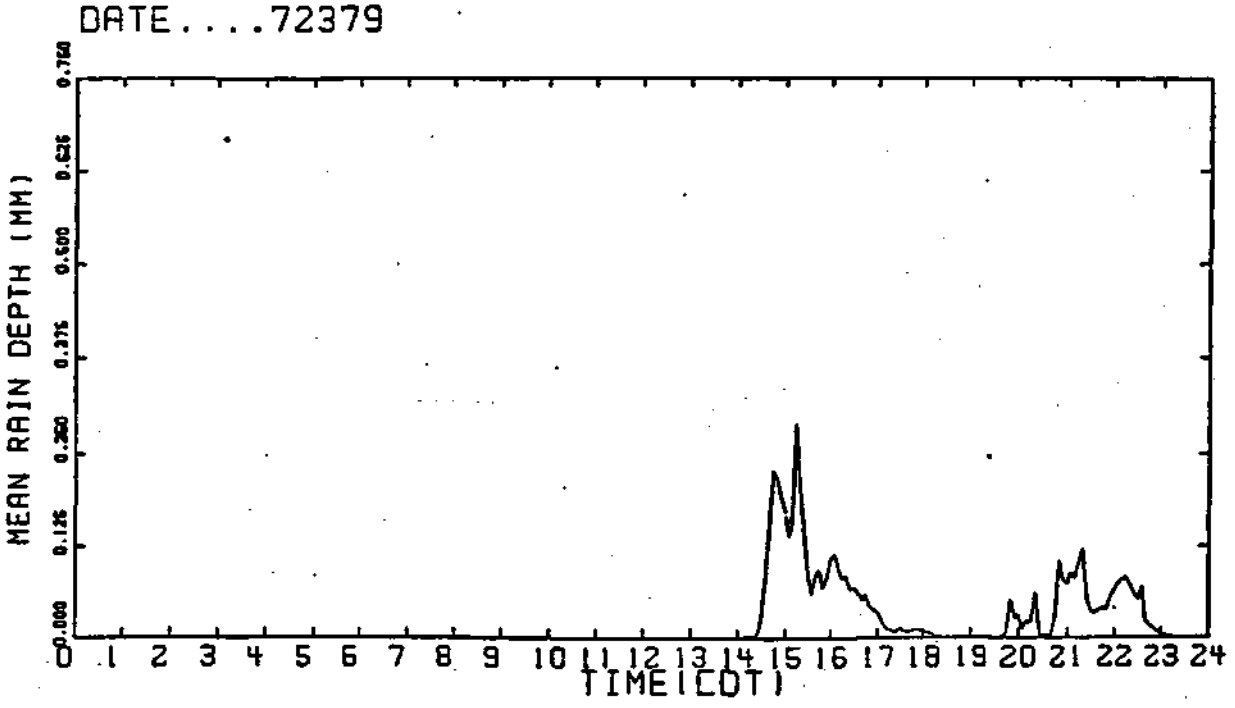
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 24 July 1979 Julian Day: 205

I. WEATHER SITUATION

Synoptic. Tropical Storm Claudette made landfall in extreme east Texas late in the afternoon. A cold front, extending from NE Minnesota to the Oklahoma panhandle, moved very slowly, reaching eastern Iowa and Kansas by the end of the day. A second cold front moved into the High Plains and rapidly SE, nearly overtaking the southern front by mid-night. Throughout the day Illinois was in relatively strong southerly flow, open to the Gulf throughout the lower troposphere. At 500 mb, the low pressure center associated with Claudette was in east Texas and western Louisiana. The flow was largely zonal across the northern half of the U.S. with a nearly stationary short wave over central Iowa and Missouri. As the day warmed up, convective clouds developed over the U.S. and by early afternoon there was nearly a solid mass of echoes reaching from the Plains to the Atlantic and from Canada to the Gulf.

Local. Winds were southerly at 4 to 5 m s^{-1} increasing in the evening to 7 or 8 m s^{-1}, with frequent gusts from thunderstorms throughout the day. Skies were broken to overcast with rain occurring somewhere in the network throughout the day. The main rain came in two periods. Rain occurred at 95% of the stations in the forenoon from extensive stratiform clouds in which were embedded lines of convective cells. Maximum point rainfall during this period was about 4 cm. Although there was little net inflow into the network, there was strong outflow associated with this rain (see accompanying figure). A second period of rain started shortly after noon and continued into late evening. Many small echoes developed early in the afternoon and a line organized within the network at approximately 1600. Other lines moved into radar range from the west starting about 1700, and 1 or 2 more developed within the network. Practically every station in the VIN network had rain, with a swath exceeding 2.5 cm for the period 1330 to midnight, over the central part. There was net inflow into the network in the early part of this storm followed by relatively minor outflow (see accompanying figure). A third period of rain came from 2 or 3 convective lines which entered the range of the CHILL radar around midnight, but did not cross the network until the morning of the 25th (see 25 July).

II. SPECIAL OBSERVATIONS

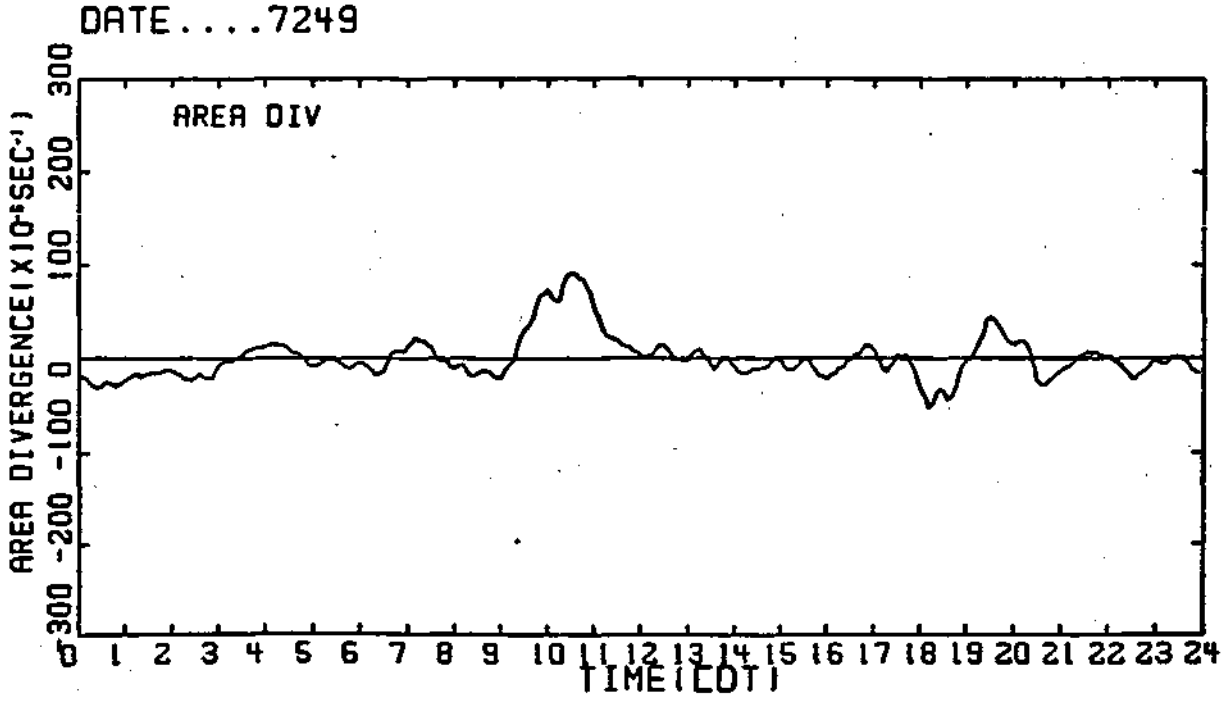
Time Lapse Photography
Stn 11: 1141-1815
13: 1302-1830
Visibility: excellent

Radar: 0730-Midnight (continued to 1246 on 25 July)

Radiosonde
Base Station: 1300 (127 mb); 1812 (150 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	1486	526	1328
1400	2026	526	622
1430	1306	1106	1288
1500	1306	1106	1918
1600	2026*	724	1738
1630	2296	1291	1558
1700	1666	1012	1918*
1730	1213	2731	1288
1800	2656*	1012	622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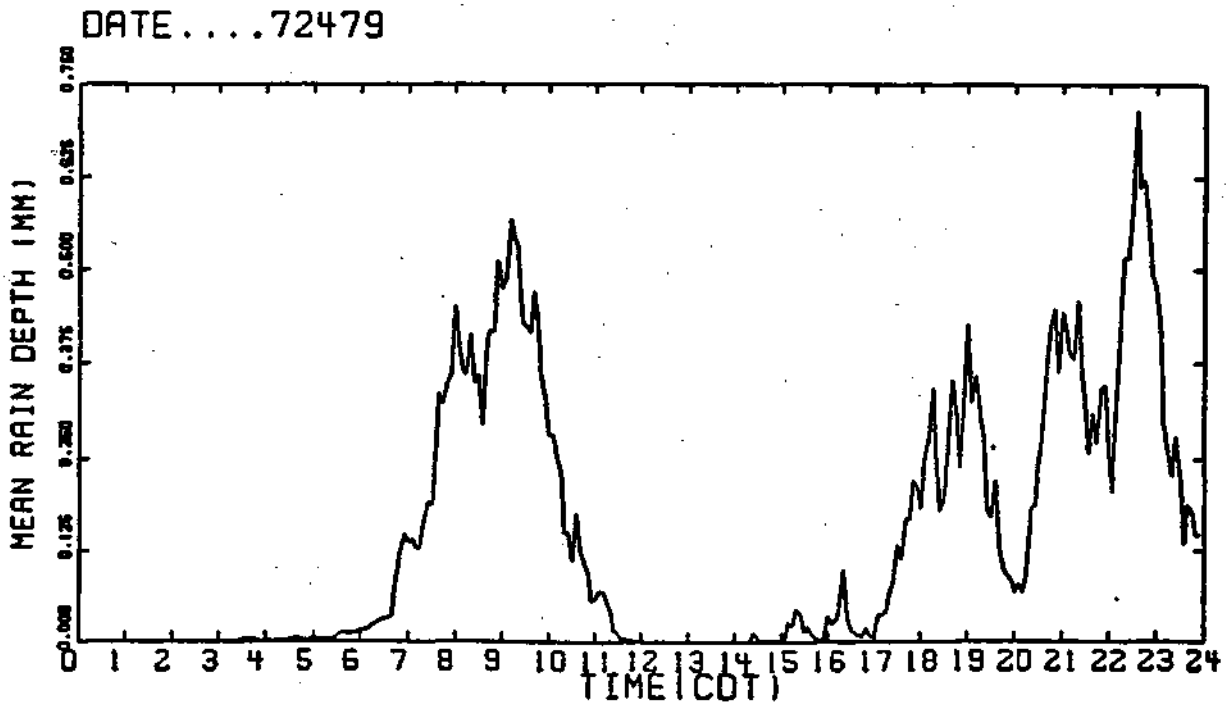
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 25 July 1979 Julian Day: 206

I. WEATHER SITUATION

Synoptic. The greatly weakened Tropical Storm Claudette was nearly stationary over east Texas. A cold front extended from eastern Canada to west Texas in the morning. It moved eastward during the day, entering Illinois by mid-day and reached central Illinois by midnight. Aloft, a deep trough over east Texas and Oklahoma, which was associated with Claudette, also remained fairly stationary during the day. Over most of the mid-part of the U.S. the pressure gradient was very flat, with a long wave pattern over Canada. A short wave trough passed through the southern limits of this nearly zonal flow, moving from eastern Iowa on the morning of the 25th to western Pennsylvania on the morning of the 26th. As the day warmed, deep convection developed and convective echoes covered the U.S. from the eastern plains to the Atlantic in the afternoon and late evening.

Local. Hinds in the VIN network were southerly in the forenoon shifting around to southwest and then west in the evening as the front passed. The main rainfall on this day occurred in predawn and early morning hours primarily from prefrontal lines. Nearly every station received rain, with amounts greater than 2.5 cm in a wide band WSW-ENE across the network. Net inflow occurred during the early period of rain followed by some weak outflow (see accompanying figure). In the afternoon, several layers of clouds provided some scattered light rain, generally less than 1 mm. During the late evening and into the predawn of 26 July some scattered cells developed in the network, outriders of 2 lines of convective cells one lying primarily to the north and the other to the south, both skimming the edges of the network. Rain fell at about 1/3 of the stations between 1630 and 0300 the next morning, with some extremely heavy (point maximum in excess of 6 cm) on the extreme north edge of the network.

II. SPECIAL OBSERVATIONS

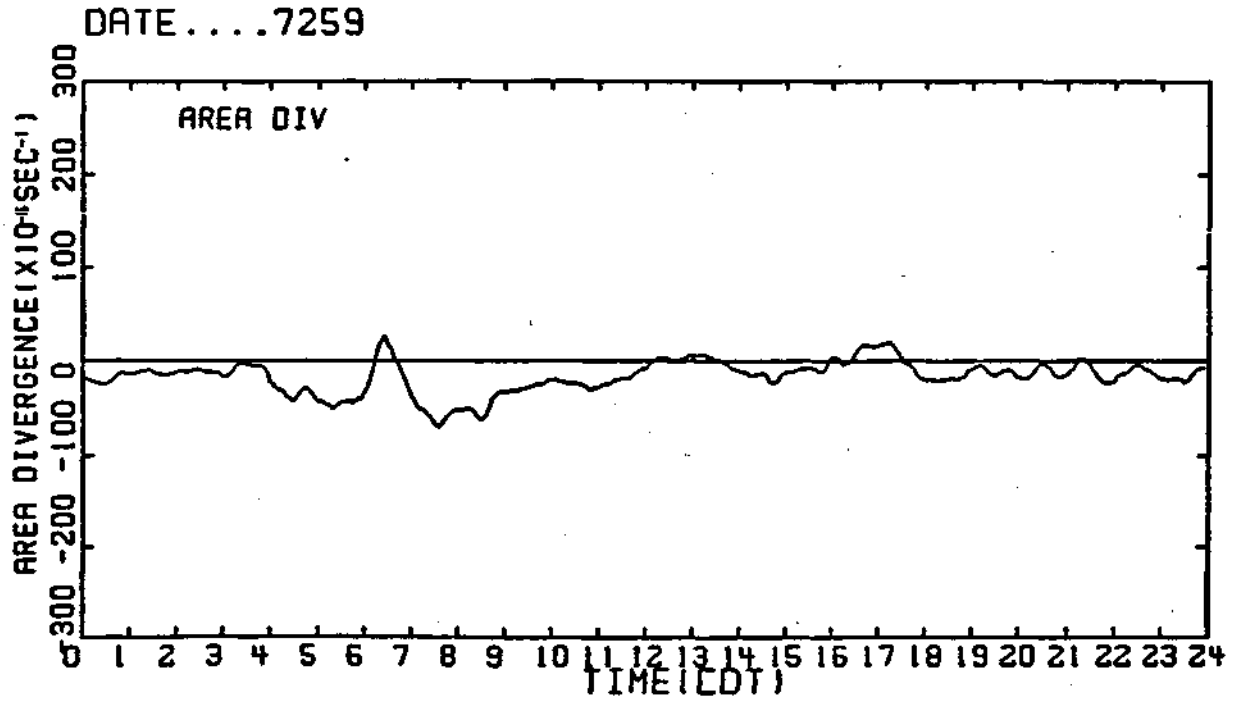
Time Lapse Photography
Stn 11: 1153-1830
13: 1258-1823
Visibility: very good

Radar: 0000-1246 (continuous from 24 July)

Radiosonde
Base Station: 1320 (510 mb); 1801 (200 mb)
Peoria: 1200 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	437*	2371	419*
1400	1756	2821	419
1430	437	526	914
1500	541	625	721
1600	1121	1741	818
1630	1396	2821	1738
1700	1576	724	2068*
1730	3016	1012	818
1800	640	1291	3088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200
100
0
-100
-200
-300
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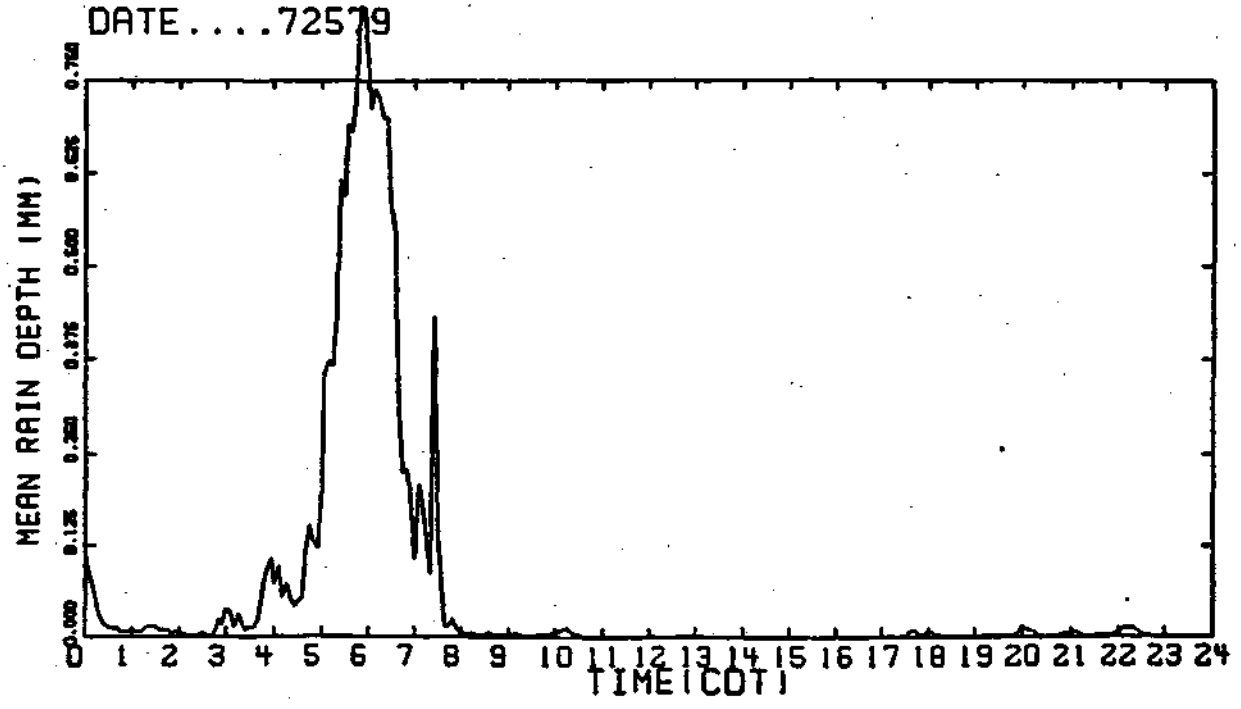
TIME(CDT)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MEAN RAIN DEPTH (MM)
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0.625
0.500
0.375
0.250
0.125
0.000
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 26 July 1979 Julian Day: 207

I. WEATHER SITUATION

Synoptic. The cold front which passed through the northern 2/3 of Illinois on the night of 25-26, was stationary in southern Illinois and shifted back north across central Illinois late in the day. Tropical storm Claudette was dissipating and nearly stationary in eastern Texas but was still evident at 500 mb as a weak trough extending from Missouri to Mexico. At 500 mb the flow over the northern third of the U.S. was zonal, with weak short wave troughs passing rapidly through the long wave pattern.

Local. Winds were predominatly easterly and light. There was fog in the morning with hazy conditions in the late afternoon. As heating increased, shallow cumulus formed, followed by congestus late in the afternoon. . Some convective echoes developed to the south, just skimming the southern edge of the network. These provided rainfall at about 10%, of the stations in the afternoon, with maximum point rainfall of about 2 cm. The network-average divergence indicated some outflow during the late morning and early afternoon and inflow in the early evening (see accompanying figure).

II. SPECIAL OBSERVATIONS

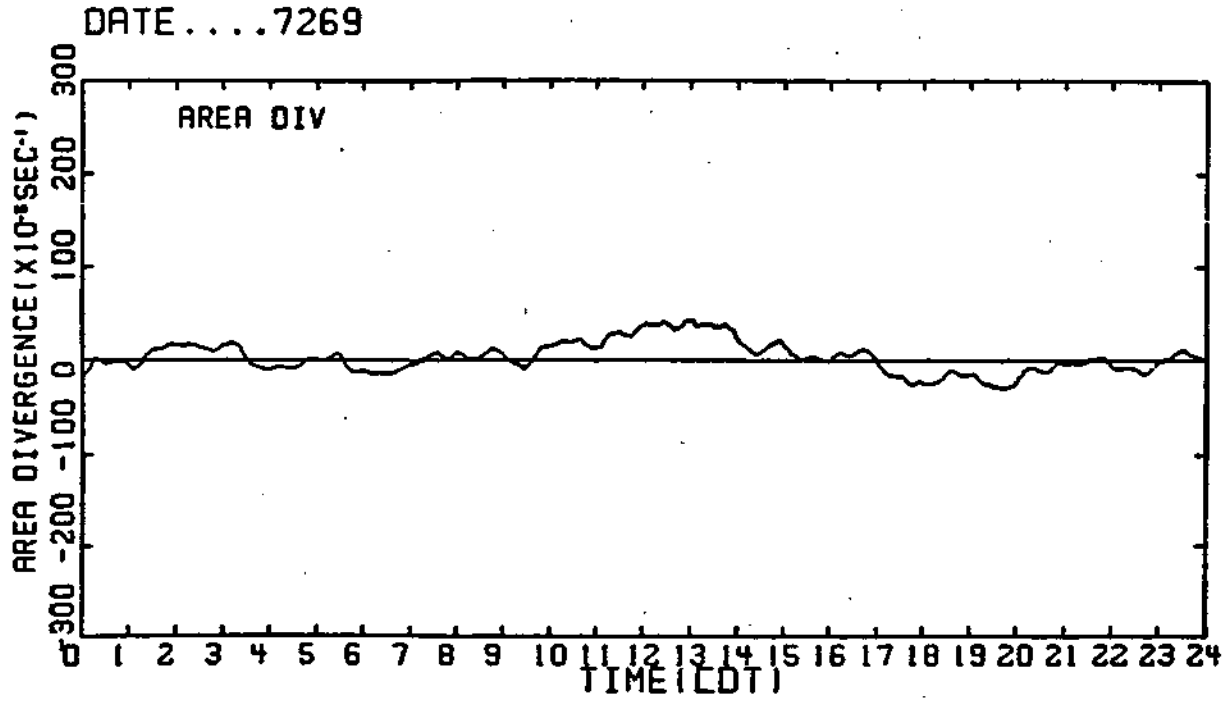
Time Lapse Photography
Stn 11: 1157-1945
13: 1152-2015
Visibility: fair

Radar: 1242-1423, 1714-1919

Radiosonde
Base Station: 1300 (829 mb); 1420 (400 mb); 1802 (315 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	932*	1012	2008
1430	932	1198	1648
1500	1936	526	3088
1530	932	1561	2278
1600	2476	917	2008
1630	739	1012	818
1730	1846	1198	2458
1800	1846	1198	3088
1830	3826	1831	2728
1900	3826	2821	1738
1930	3466	2191	1558
2000	1486	2101	3628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100
0
-100
-200
-300
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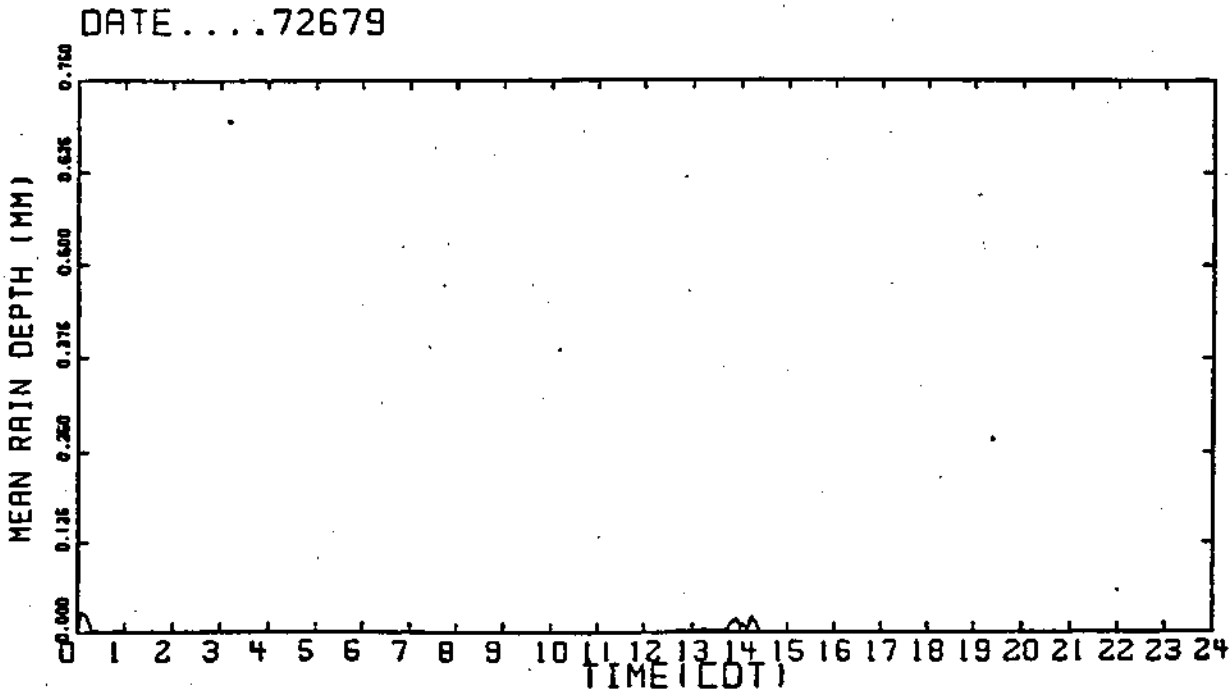
TIME(LDT)


DATE....72679
MEAN RAIN DEPTH (MM)
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0.625
0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 27 July 1979 Julian Day: 208

I. WEATHER SITUATION

Synoptic. A wave cyclone developed on the old front which had passed across Illinois twice in the two previous days. The center was over central Wisconsin, a cold front extended SW to Iowa and a warm front SE to Indiana. The center moved east and the cold front moved into northern Illinois during the day. Remnants of Tropical storm Claudette, now barely more than a local low pressure area south of the front, moved NE from Texas into SE Missouri. Significant changes were taking place in the 500 mb flow also. A minor trough over the Mississippi valley, extending from Wise-Minn into Texas, deepened during the day but remained over the Mississippi River Valley. The major cloud development in the eastern half of the United States was associated with the 500 mb trough and with the warm front of the wave cyclone but the cloud system associated with Claudette moved out ahead of the pressure center, reaching Illinois during the late afternoon and evening.

Local. The network winds from the SW, 3-4 m s^{-1}, during the afternoon increasing in the evening to 6 to 7 m s^{-1}. The skies were broken to overcast from several layers of clouds with significant shear indicated in the individual layers. A large field of echoes moved into the network from the south and west in the early afternoon and continued throughout most of the remainder of the day. The echoes were primarily in layers with embedded convective cells. This cloud system provided significant rains in the network, with over 85% of the stations recording precipitation. The heaviest rain occurred in a NNW-ESE band across the network; maximum point rainfall was nearly 9 cm. There was no significant mass inflow into the network but strong outflow started after the first hour of rain and continued through the remainder of the storm (see accompanying figure).

II. SPECIAL OBSERVATIONS

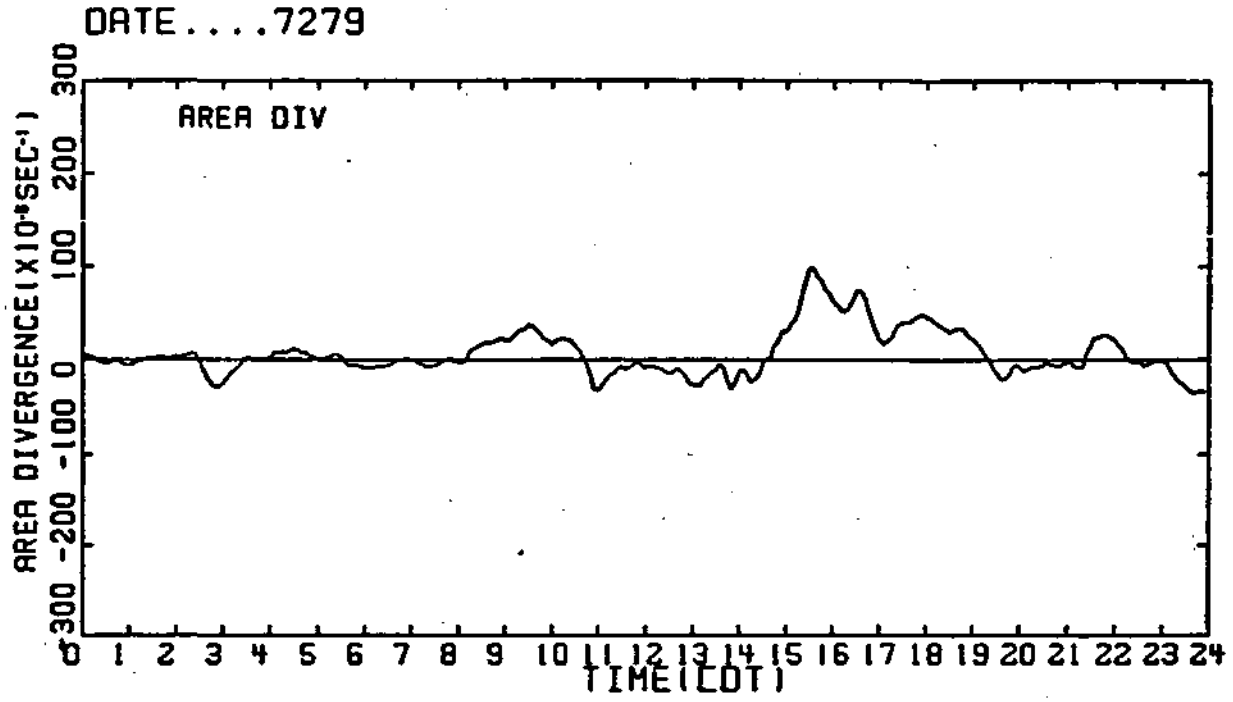
Time Lapse Photography
Stn 11: 1205-1912
13: 1300-2015
Visibility: good

Radar: 1143-0100 (18 July)

Radiosonde
Base Station: 1310 (385 mb); 1821 (317 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	3826	3541	--
1430	3826	1741	--
1500	3646	724	914
1530	1027*	--	622
1600	3826	--	--
1630	2836	--	--
1730	--	1561	--
1800	--	--	--
1830	--	3631	--
1900	--	--	3088
1930	--	3181*	3358
2000	--	3721	1738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AREA DIVERGENCE(1X10**SEC**-1)
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200
100
0
-100
-200
-300
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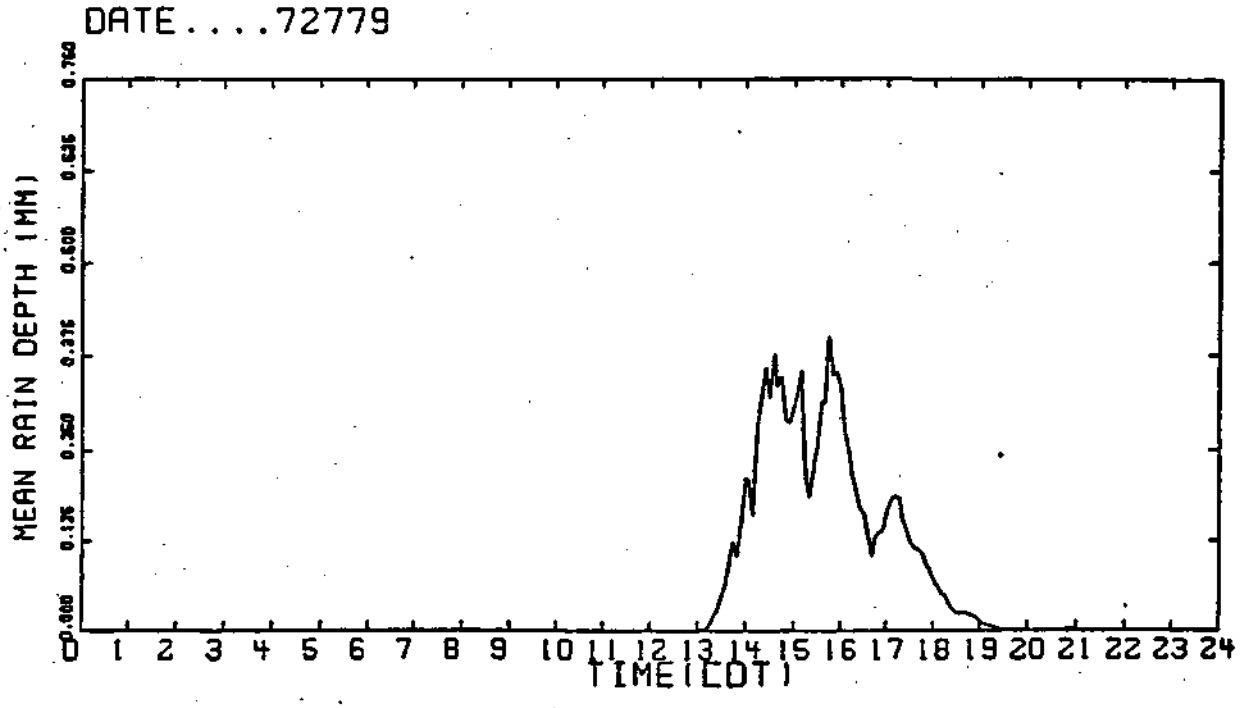
TIME(LDT)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0.635
0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 28 July 1979 Julian Day: 209

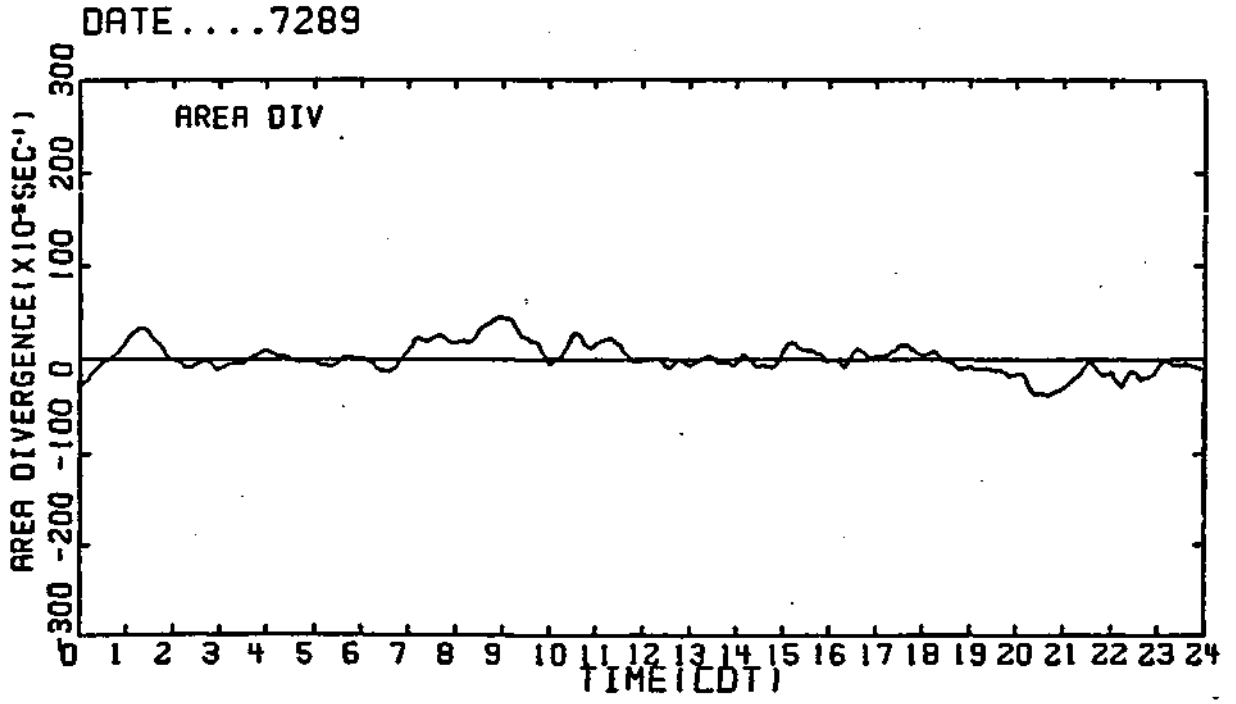
I. WEATHER SITUATION

Synoptic. The wave cyclone which developed on 27 July had deepened and occluded by early morning of the 28th. The cold front extended WSW from Lake Huron to western Kansas. The cold front which was in northern Illinois in the morning drifted south, and went stationary in central Illinois. The local low pressure center associated with the decayed tropical storm Claudette was in southern Illinois in the morning and slowly degenerated in that region. The 500 mb trough line associated with the tropical storm, extended from western Indiana SW into Arkansas in the morning moved slowly eastward and filled, as the 500 mb pressure pattern returned to a very flat gradient over the southern half of the U.S. and largely zonal flow over the northern half. A cloud line, with some severe and strong cells, associated with the upper air trough during the late morning and early afternoon dissipated as the trough filled in the evening.

Local. With a stationary front in the vicinity, the winds in the VIN network were variable during the day shifting from southwest in the predawn hour to east and northeast during the mid-day and then coming around to the north in the evening. There was scattered precipitation echoes in the area in the morning with recorded rainfall at a little over 1/4 of the stations and maximum point rainfall of about 2 cm. Scattered individual showers developed again in the southern part of the network in the late evening and in the northern part of the network in the predawn hours of the 29th of July. The rainfall tended to be isolated, with several scattered centers and maximum point accumulation of less than 1 cm. The network average divergence indicated outflow in the late morning and weak inflow prior to and during the initial stages of the precipitation in the evening (see accompanying figure).

II. SPECIAL OBSERVATIONS

Radar 2010-0030 (29 July). Some interruptions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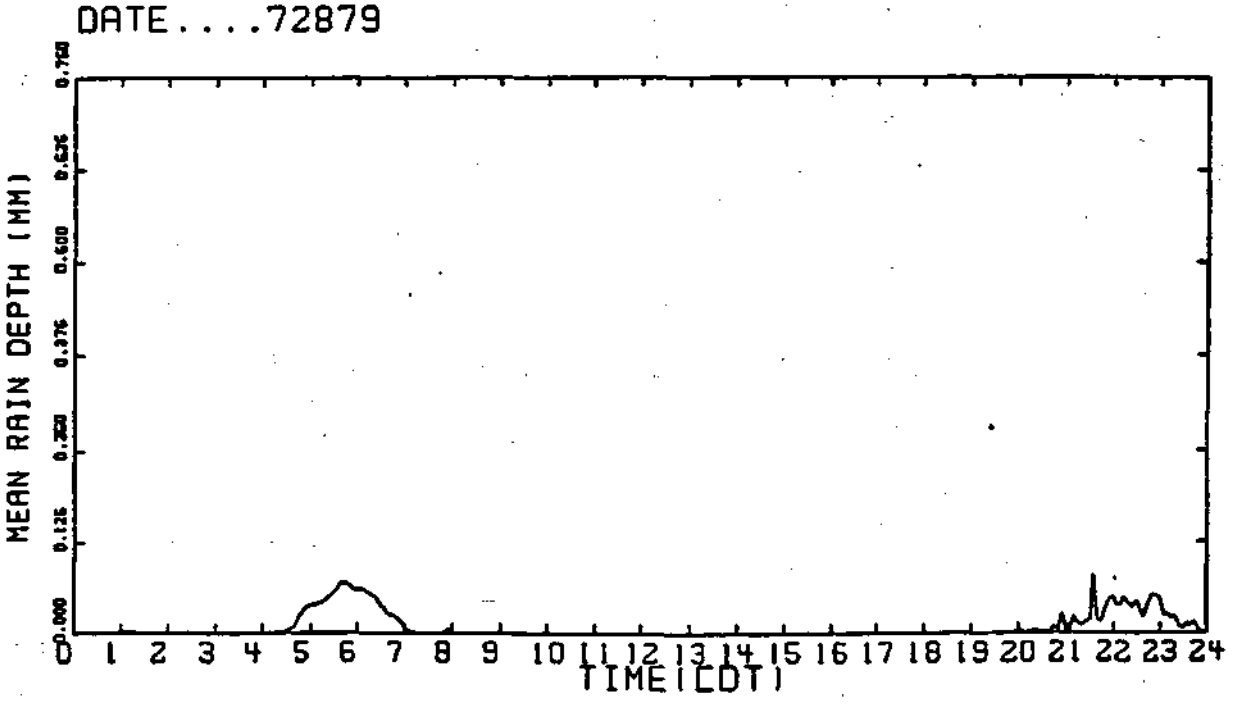
TIME(CDT)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MEAN RAIN DEPTH (MM)
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0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 29 July 1979 Julian Day: 210

I. WEATHER SITUATION

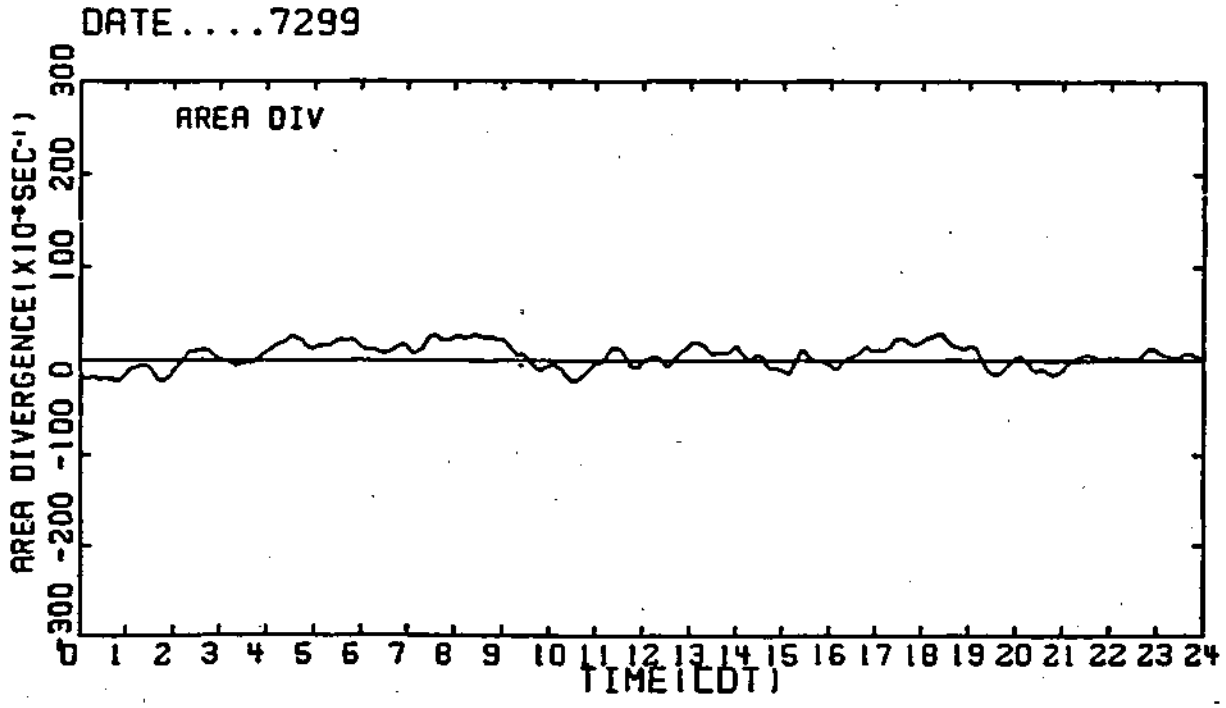
Synoptic. A weak front extending eastward from SE Colorado to the east coast wavered back and forth across central and northern Illinois during most of the day. A second front moved into the U.S. from Canada at the Montana-North Dakota border, in the very early hours. At 500 mb, the pressure gradient was very flat over the southern half of the U.S. with short waves rapidly passing through a largely zonal flow over the northern half of the U.S. A high pressure ridge was developing over Illinois during the day.

Local. Surface winds in the network were northeasterly or easterly during the morning and afternoon and southwesterly or southerly in the evening. Cloudiness was variable, with scattered to broken coverage throughout the day. There were some small isolated showers in the VIN network in the late morning and early afternoon. Relatively light rains, mostly less than 3 mm, were recorded at about a tenth of the stations in the network, largely over the western sector. For the day in its entirety, the network average divergence suggests some weak outflow (see accompanying figure).

II. SPECIAL OBSERVATIONS

Radar: 1318-1712

Radiosonde
Base Station: 1340 (165 mb)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-300
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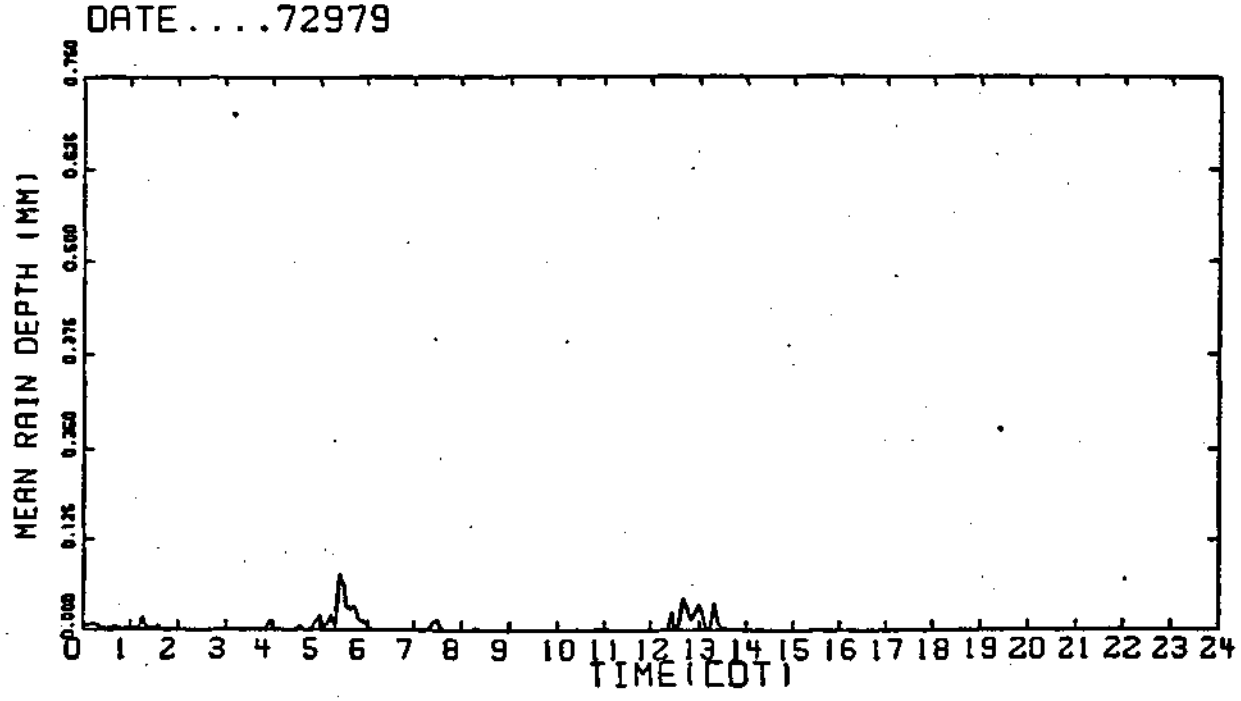
TIME(LDT)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0.625
0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 30 July 1979 Julian Day: 211

I. WEATHER SITUATION

Synoptic. A wave cyclone developed rapidly on the weak front which had stretched E-W across the U.S. for the previous two days. The low pressure center moved rapidly NE from the Minn-Wisconsin border to Ontario during the day. The cold front, extending from Minn to Colorado, moved rapidly southeast during the day, accelerated by a second front which moved rapidly south from the Canadian border. Illinois was in the warm sector of the wave cyclone throughout the day; the cold front entered the state after midnight on 30 July. At 500 mb there were two short wave troughs in the morning: one from Madison, Wisc to St. Louis which filled and moved rapidly eastward, and a second, more major trough, from south-central Nebraska to the Texas Panhandle which deepened during the day.

Local. A squall line developed in central Illinois from scattered convective clouds in the afternoon, providing heavy, but spatially variable, rainfall in the network. Small relatively isolated congestus started to form around 1300 CDT. Some of these early clouds in the network merged and as they moved east evolved into a severe rainstorm at about 1700. Rain occurred at about 20% of the stations between 1500 and 1720, with the heaviest amounts on the eastern border of the network. At about 1800, a solid squall line which had developed iust to the north entered the network. The leading edge produced very heavy rain at some stations and was trailed by an extensive rain shield. Between 1800 and midnight every station in the network experienced rain, most in excess of 2 cm. Maximum point rainfall within the network was 8 cm with 12 cm recorded just to the east of the radar. Hail fell at 28 locations between 1800 and 2000. There was continual inflow into the network during the rains between 1500 and 1700 which had relatively small coverage in the network, but a very strong "signature" of strong inflow followed by strong outflow is evident in the time series of average divergence, as the leading edge of the squall line crossed the network (see accompanying figure).

II. SPECIAL OBSERVATIONS**

Time Lapse Photography
Stn 11: 1200-1940
13: 1252-2030
Visibility: excellent

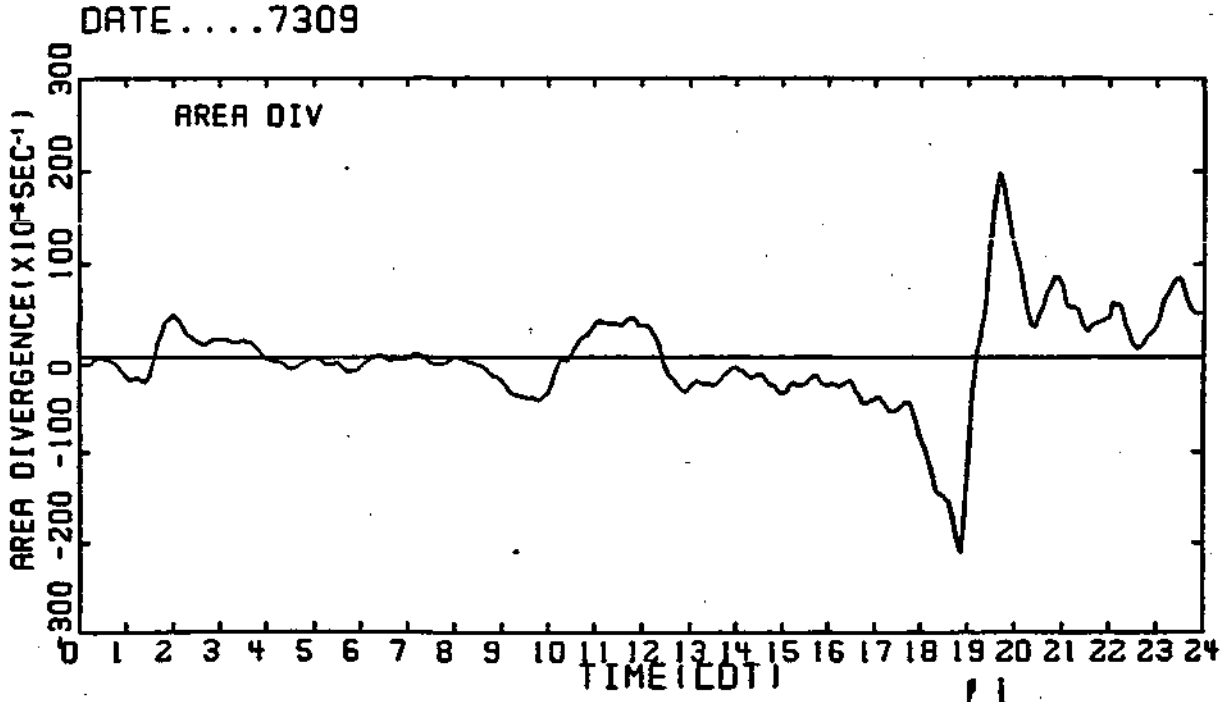
Radar: 1416-1712 Some breaks between 1645 and 1712 due to power surge. Lightning strike at 1715 damaged radar which was inoperable the remainder of the day.

Radiosonde
Base Station: 1309 (530 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	1441	821	1009
1400	1936	821	1195
1430	1936	821	1468
1500	739	1291	1103
1530	2116	1291	818
1600	1306	1561	914
1630	1936	--	1009
1730	1213	1921	1468
1800	1306*	1012	1648
1830	--	1012	1378
1900	--	724	--

**Break in PAM data, 1715-1740, because of power outage.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100
0
-100
-200
300
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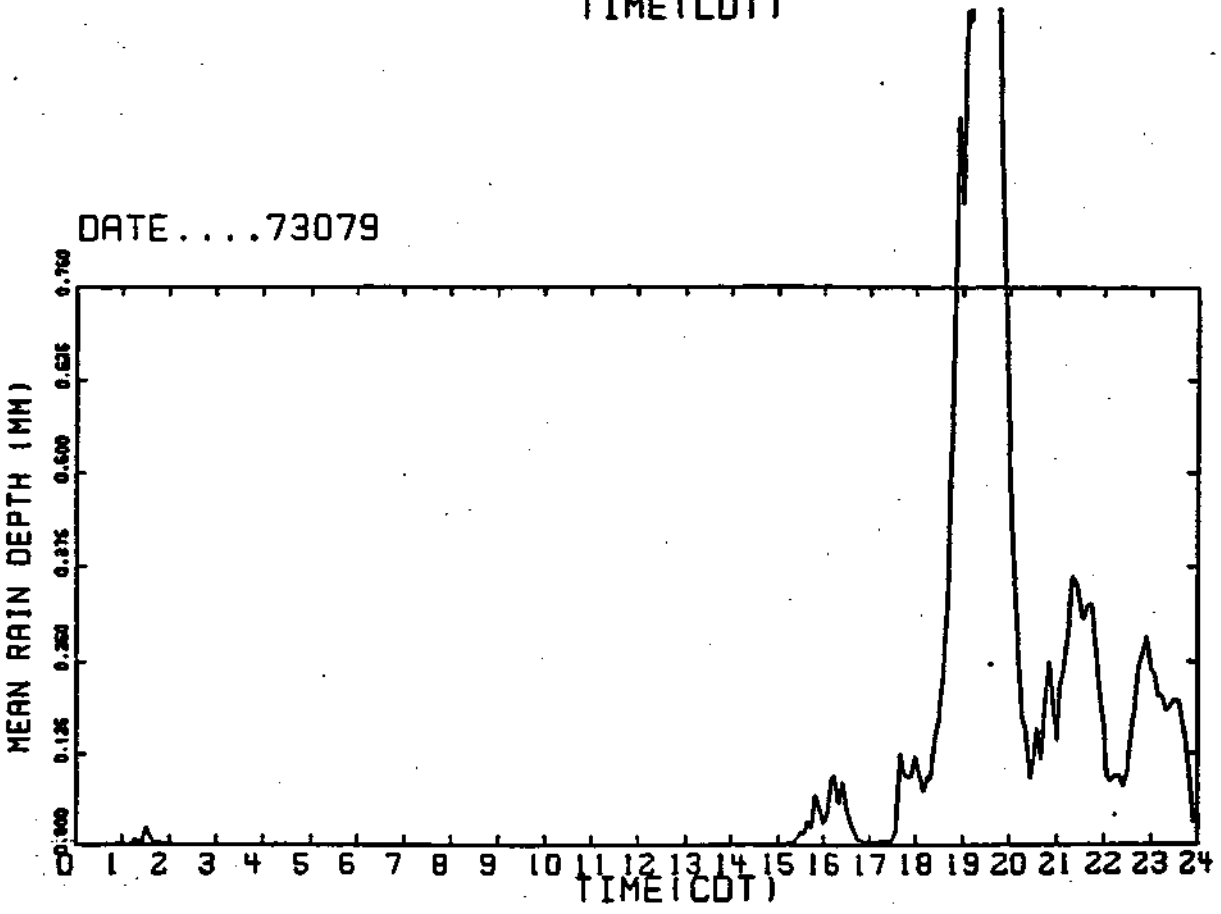
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 31 July 1979 Julian Day: 212

I. WEATHER SITUATION

Synoptic. In the early morning a cold front extended from Lake Huron through the northwest corner of Illinois to the Texas Panhandle and a second one was parallel to it and about 250 km to the northwest. The two fronts moved rapidly southward, as the latter overtook the first, reaching southern Illinois by midnight. The double frontal system was associated with a trough at 500 mb, extending from Iowa to the Texas Panhandle. This trough deepened as it remained almost stationary during the day. By the following morning there were indications of splitting in the upper air flow. Cloud lines which had developed along the front on the previous day decayed during the night and then reformed as solar heating increased during the early afternoon.

Local. There were broken to overcast stratiform cloudiness throughout the day. In the pre-dawn hours, some relatively light rain fell from the trailing rain shield of the squall line that had crossed the network on the evening of the 30th of July. Around noon a strong line crossed to the south side which produced rain in the southern two thirds of the network. The highest rainfall was in a W-E band over the southern third of the network, with maximum point rainfall of 3.75 cm and hail reported at two stations in the SW corner. There was a increase in the inflow into the network during this rainstorm but no significant outflow (see accompanying figure). Later in the evening and continuing into the early morning hours of the following day rain occurred in a band on the north side of the network which with a second band of rain extending from the SW corner to the east central part of the network, gave 85% coverage. Maximum point rainfall in these two bands were just under 1 cm.

II. SPECIAL OBSERVATIONS

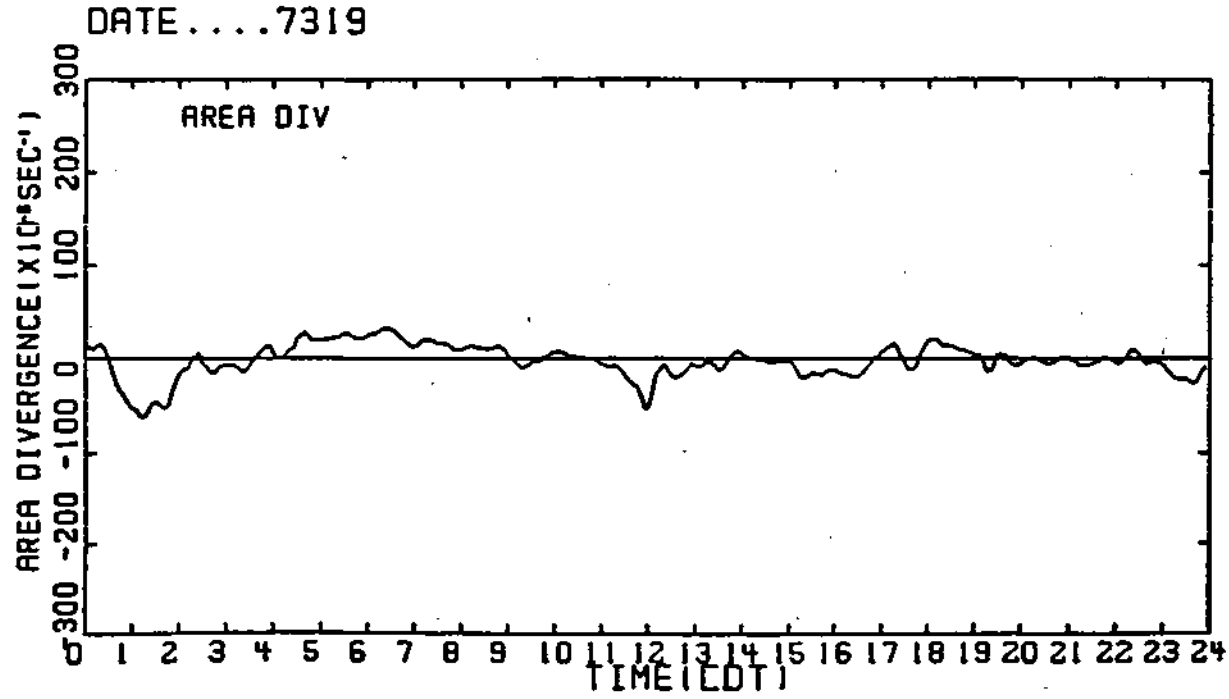
Time Lapse Photography
Stn 11: 1200-1945
13: 1246-1945
Visibility: excellent

Radar: 1550-2000 (constant elevation, 2.1°)

Radiosonde
Base Station: 1808 (300 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	1396	--	2368
1400	3826	526*	2188*
1430	1396	2011	2368
1500	2206	625	1378
1530	2116	2281	2638
1600	3826	1471	2368
1630	1576	1651	2548
1730	2566	1291	2368
1800	2836	2101	1009
1830	2836	--	2818
1900	2746	2011	2368
1930	2566	2281	1558
2000	2296	2461	2278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0
-100
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-300
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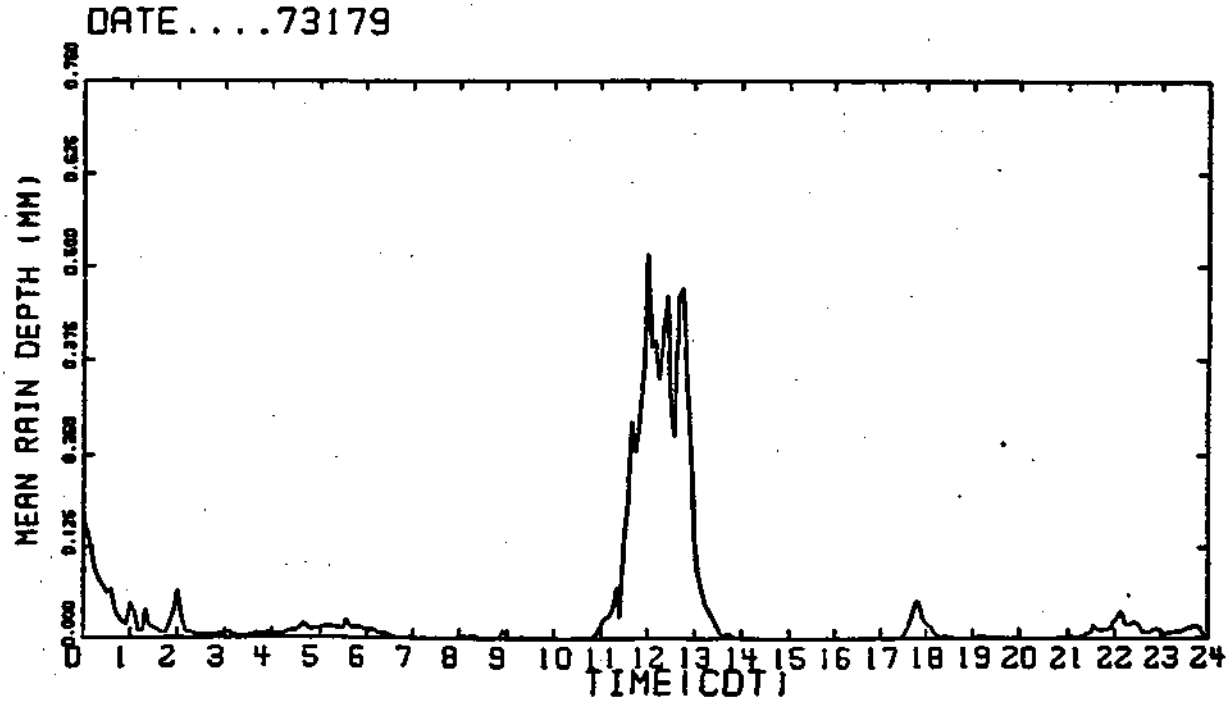
TIME(CDT)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MEAN RAIN DEPTH (MM)
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 1 August 1979 Julian Day: 213

I. WEATHER SITUATION

Synoptic. A front extended from Maine southwestward to eastern Texas through southern Illinois. A shallow wave developed in SE Missouri in the morning, and deepened as it rapidly moved to the northeast. The center was in SE Michigan by midnight. The cloud system associated with this wave extended over the southeastern 2/3 of Ill. At 500 mb a relatively deep trough extending from southern Minnesota to central Texas split during the day, with the southern portion retrogressing slightly as the northern section moved eastward. A fairly narrow line of convective clouds developed along the front in the pre-dawn hours and moved eastward with it.

Local. The VIN network was on the north side of the cloud systems of the wave cyclone most of the day. Multi-layer stratiform clouds produced light rainfall throughout the morning and early afternoon with occasionally heavier rain from embedded convective cells. All of the stations received rain in excess of 1 cm from this system and all but those in the northwest corner received over 2.5 cm. Maximum point rainfall was 6 cm. The rain showers ended by 1400 CDT but scattered light rain continued throughout the remainder of the afternoon.

II. SPECIAL OBSERVATIONS

Radar: 0927-1212 (power surges due to lightning caused malfunction after 1145)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 2 August 1979 Julian Day: 214

I. WEATHER SITUATION

Synoptic. The north central sector of the U.S. was in a region of relatively flat pressure gradient in the morning behind a frontal system which extended from eastern Lake Huron into Kentucky and then SW into Texas. The northern part of this front moved rapidly and was in the east coastal states in the evening, while the southern sector was essentially stationary. The trough at 500 mb was split, with a cut-off low developing in northern Mexico and a trough in the northern half of the U.S. extending from eastern Lake Superior southward through Illinois. The north central part of the United States was free of precipitating clouds through most of the day, although some convective clouds developed in Minnesota and Iowa late in the day.

Local. Fair conditions prevailed. Winds were extremely light and variable in direction. No rain or precipitation echoes occurred within the VIN network.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 3 August 1979 Julian Day: 215

I. WEATHER SITUATION

Synoptic. Illinois was in a pressure col between two fronts: a weak "stationary" front extending from Oklahoma eastward, through Tenn to the Atlantic and a cold front along the U.S.-Canadian border. At 500 mb the flow was split, with a cutoff low in northern Mexico and a shallow' long wave pattern over the northern half of the United States. A small amplitude short-wave trough, from northern Wisconsin through western Illinois, passed through the long wave pattern during the day, causing some scattered convective showers in the north central part of the United States in the morning and early afternoon.

Local. Generally fair conditions existed throughout the day in the VIN network. Although some spotty rains occurred elsewhere in central Illinois, only shallow cumuli occurred in the network.

II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1225-2025
13: 1350-2025
Visibility: unlimited

Radiosonde
Base Station: 1303 (300 mb); 1800 (209 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases.

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	3826	3311	1828
1330	3826	1012	1378
1400	3826	3811	--
1430	3826	3811	2278
1500	3826	2101	3178
1530	3826	1106	2098
1600	2826	2281	3088
1700	3826	2911	3808
1730	3826	3811	3268
1800	3826	3811	3808
1830	3826	3811	3268
1900	3826	3811	3808
1930	3826	1741	1009
2000	3826	2101	2368

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 4-5 August 1979 Julian Day: 216 & 217

I, WEATHER SITUATION

Synoptic. An extensive cold front across the northern tier of states on the morning of August 4 moved southward, reaching northern Illinois by late afternoon on August 5. At 500 mb, the southern half of the U.S. was in nearly uniform pressure on these two days as a long wave pattern prevailed over northern U.S. and Canada. The ridge of this long wave moved eastward from the Rocky Mtns to the Dakotas and by the evening of the 5th Illinois was on the east side of a high pressure area that covered the Plains States.

Local. Fair weather prevailed throughout the day on August 4 and through most of the day on August 5th. After 2000 on the evening of 5 August a few stations along the north edge of the network experienced very light rain showers as the leading edge of the frontal system moved into Illinois.

II. SPECIAL OBSERVATIONS

None

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 6 August 1979 Julian Day: 218

I. WEATHER SITUATION

Synoptic. A weak cold front extending from Pennsylvania through central Illinois into Iowa moved back northward as a warm front as a low pressure center in North Dakota moved rapidly east to Wisconsin during the day. At 500 mb, a high pressure area covered the entire southern 3/4 of the U.S; Illinois was on the east side of the center. Conditions in the lower part of the troposphere were favorable for convective development, but this high pressure aloft and the associated subsidence resulted in fair weather over most of the north central United States throughout the day.

Local. Fair weather prevailed in the VIN network throughout the day with shallow cumuli forming during the afternoon.

II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1155-1830
13: 1326-1827
Visibility: excellent

Radiosonde
Base Station: 1300 (500 mb); 1800 (834 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	2656	2191	2638
1430	2656	1381	3088
1500	3106	3631	622
1530	3826	3631	3628
1600	3826	2461	3268
1630	1306	3001	1103*
1730	3826	1561	1648
1800	3826	1106	2008

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 7 August 1979 Julian Day: 219

I. WEATHER SITUATION

Synoptic. The center of a weak wave cyclone moved from NE Wisconsin in the morning to Pennsylvania. The cold front extended westward from the center to the Rockies, shifting southward in the first half of the day then back north later. A Canadian high moved into the U.S. during the day behind a cold front which reached northern Wisc, by midnight. Most of the southeastern quadrant of the U.S. was in a high pressure area throughout the troposphere. At 500 mb the high pressure extended over most of the U.S. with the center drifting slowly eastward from Missouri during the day. The north central part of the United States was free of precipitation all day.

Local. Fair weather again prevailed in the VIN network, with clear skies and weak winds.

II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 13: 1032-1155
Visibility: unlimited

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1100	3376	--	914*
1130	3466	3811	2368*

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 8 August 1979 Julian Day: 220

I. WEATHER SITUATION

Synoptic. A weak front was draped across the United States, from the eastern Rockies across northern Illinois eastward to the Atlantic. A second fronc which had entered the U.S. from Canada the previous day moved southward nearly overtaking the front to the south by midnight. Generally high pressure prevailed over the southern two thirds of the U.S. throughout the troposphere.

Local. Fair weather prevailed in the VIN network throughout the day with generally clear skies and weak winds.

II. SPECIAL OBSERVATIONS

Radar: 1000-1544 (clear air mode)

Radiosonde
Base Station: 1232 (100 mb); 1530 (86 mb)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Dace: 9 August 1979 Julian Day: 221

I. WEATHER SITUATION

Synoptic. A cold front in northern U.S. overtook a stationary front to its south which was lying across IA and northern Ill early in the day. The merged system took on a wave form by mid-morning with a cold front extending from the low center in SW Minnesota to the Panhandle of Texas. The low pressure center moved eastward, reaching northern Michigan by midnight, and carrying the northern part of the cold front with it. At 700 mb a pronounced, trough extended from eastern North Dakota, SSW to northeastern Colorado. This trough was much weaker aloft and during most of the day the pressure gradient at 500 mb over Illinois was extremely flat. A line of precipitating convection developed along the cold front during the day, from Lake Superior SW into New Mexico.

Local. Illinois was in the warm air and generally fair weather prevailed in the network as it did over almost the entire State during the day. Only shallow cumuli were observed locally.

II. SPECIAL OBSERVATIONS (Clear-air Experiment)

Time Lapse Photography
Stn 11: 1315-1805
13: 1352-1817
Visibility: very good

Radar: 1059-1334; 1508-1622

Radiosonde
Base Station: 1302 (36 mb); 1826 (151 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	1486	1198	818
1430	932*	1561	1009
1500	1213	917	1009
1530	1346	1381	1009
1600	1486	2371	1468
1630	2206	1198	818
1700	2566	2191	1378
1800	--	--	1103

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 10 August 1979 Julian Day: 222

I. WEATHER SITUATION

Synoptic. A cold front extending from a low pressure center in the eastern Great Lakes to the Texas Panhandle in the morning moved southeast across Illinois as a large Canadian air mass moved into the High Plains. At 500 mb the main long wave trough was over the Mississippi valley. A short wave trough formed, extending from south-central Minnesota to northeastern Nebraska and moved rapidly eastward into the main trough line by the following morning. A line of clouds from the eastern Great Lakes into Kansas in the early morning decayed and then reformed as solar heating increased. Active convection also developed in SE U.S in the afternoon. By late evening, convective clouds were occurring over most of the U.S. east of the Mississippi valley and through much of the southern High Plains.

Local. The VIN network experienced stratified overcast in the morning and early afternoon, with embedded convective echoes detected by the CHILL as early as 1300 CDT. The stratified nature of the clouds disappeared during the mid afternoon as convection increased. The convective echoes increased in density after about 1430 due both to formation within the network and to small lines moving in from the west. Most of the activity had moved to the east by 2000. Rain started in the network about 1215 CDT but prior to 1600 it was scattered (less than 10% coverage) and relatively light (accumulations less than 7 mm). After 1600, the rain was widespread, with about 85% of the stations recording precipitation between 1600 and 2200. However, the rain was light except in the south central part of the network where storm rainfall exceeded 1.5 cm. There was no significant network-wide inflow or outflow associated with the rain storms (see accompanying figure). However, the network-average divergence indicates a significant convergence and some outflow around 0830. Although there was no rain at this particular time a precipitation echo did move across the network producing a significant deformation in the windfield, suggesting dry outflow from the storm.

II. SPECIAL OBSERVATIONS

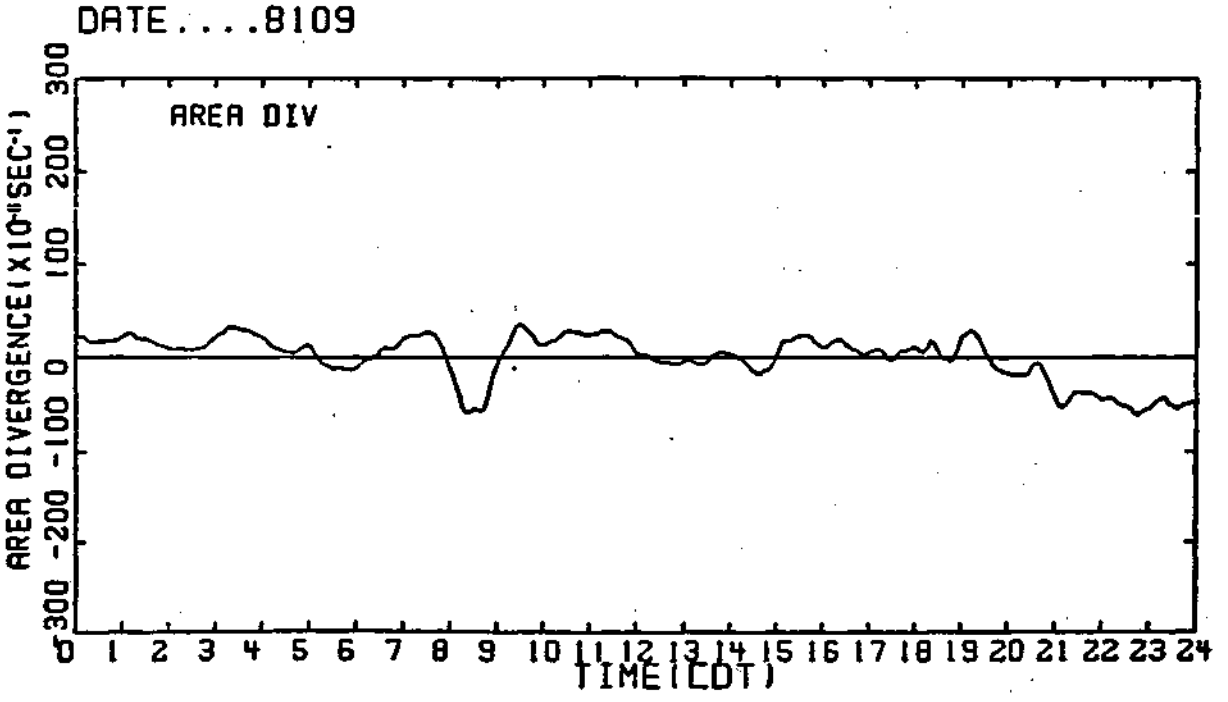
Time Lapse Photography
Stn 11: 0940-1723
Visibility: very good

Radar: 0755-0956; 1308-2023

Radiosonde
Base Station: 1307 (100 mb); 1854 (213 rab)
Peoria: 1300 (66 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1000	1576*	724	1103
1030	2206*	1471	1468
1100	739	1198	1288
1130	2566	2101	1468
1200	1306	1381	523
1230	739	1831	721
1330	541	1106	914
1400	640	1291	721
1430	437	821	1009
1500	1027*	821	1195
1530	1306	1831	1195
1600	1666	724	818
1630	739	1012	1558
1700	1306	625	622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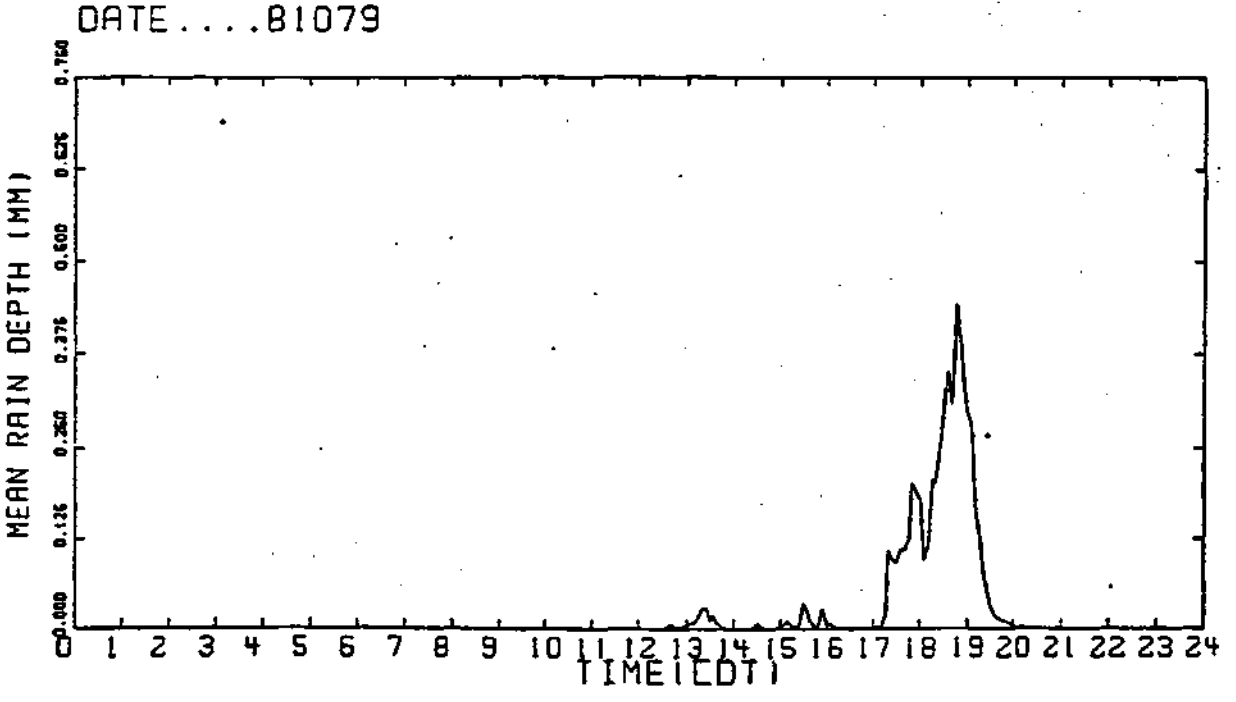
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 11 & 12 August 1979 Julian Day: 223 & 224

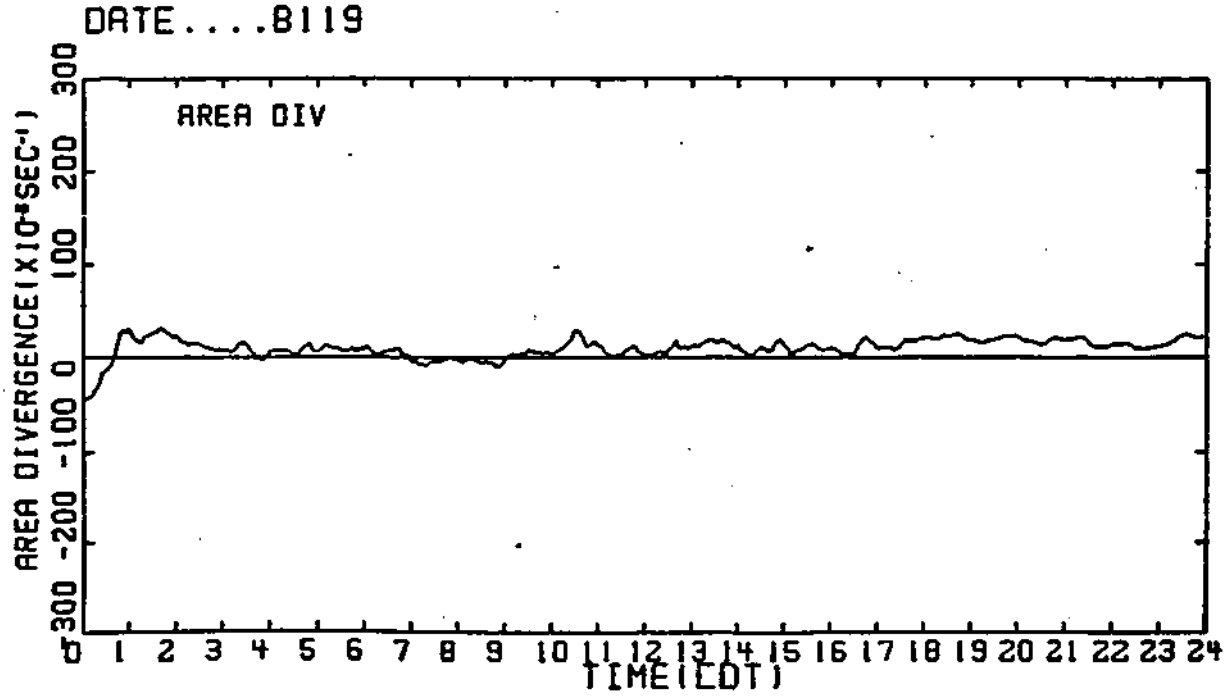
I. WEATHER SITUATION

Synoptic. A large Canadian high covered the Plains states on the morning of 11 August behind a frontal system that extended from New York to east Texas. The high pressure moved eastward during the 11 and the 12th, forcing the front southward and eastward out of the U.S. A low tropospheric trough developed late on the 12th on the west side of the high, from northern Minn, to Colo, but Illinois was within the high pressure system on both days. A short wave pattern dominated the 500 mb level over the U.S. with the trough over Illinois and Missouri and ridge over the Rockies on 11 Aug. The wave moved rapidly to the east on the 12th. Illinois and most of the rest of the north central U.S. was essentially clear of precipitation echoes by the mid day of the 11th and remained so throughout the 12th.

Local. The VIN network was in high pressure through most of the troposphere on both days. Skies were clear except for a few scattered fair weather cumuli and winds were light.

II. SPECIAL OBSERVATIONS

None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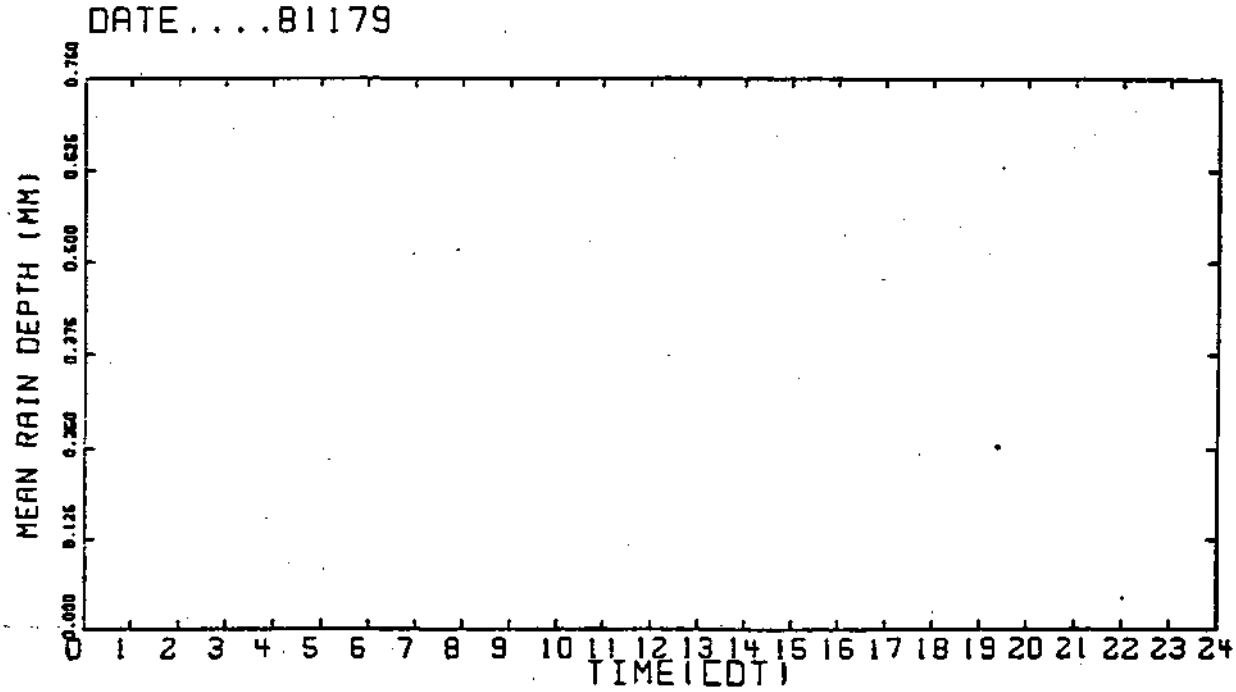
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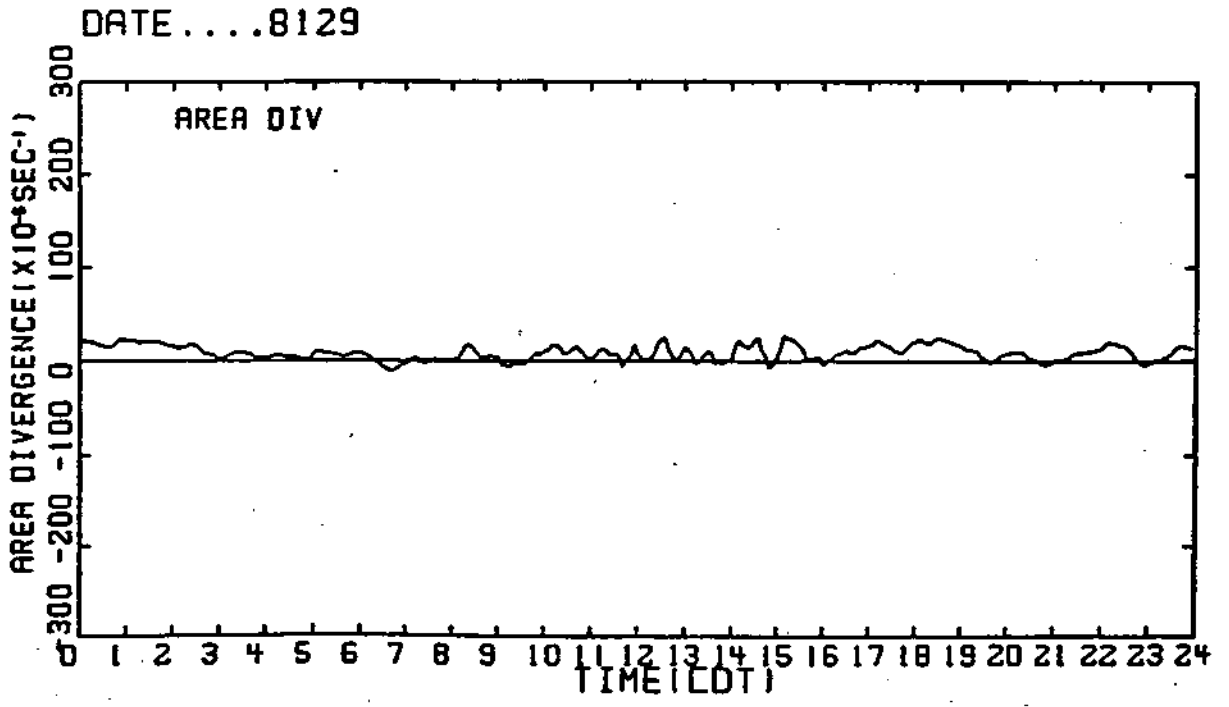
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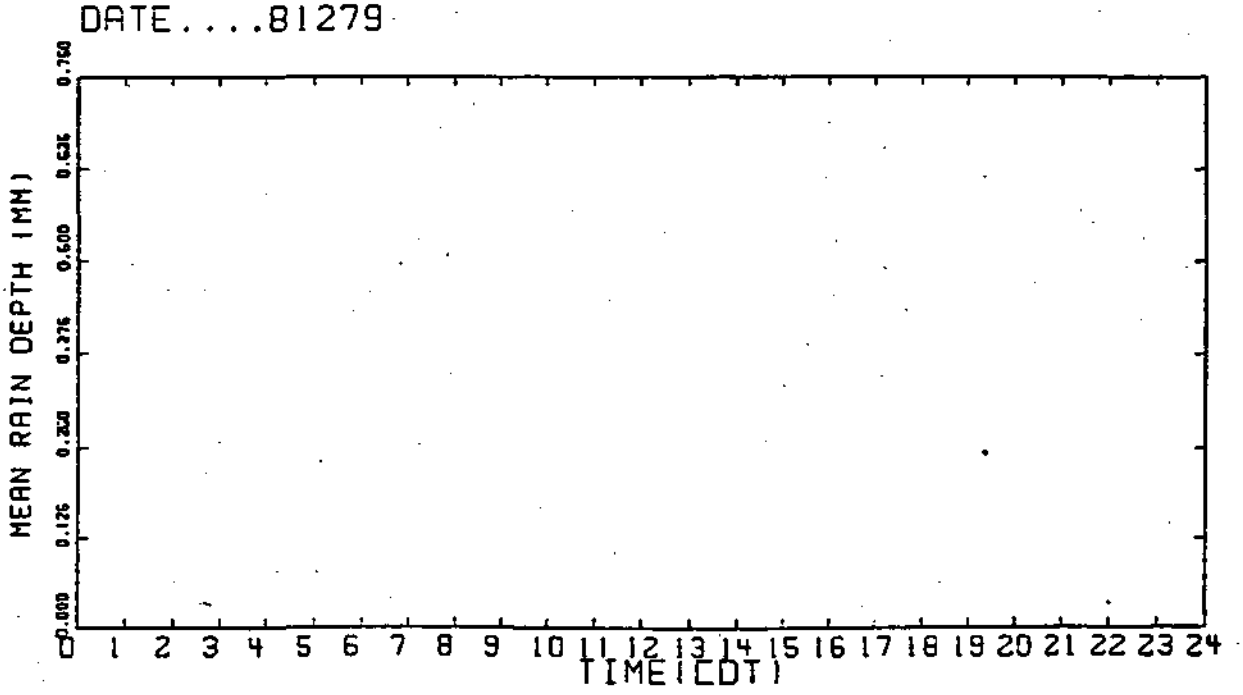
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 13 August 1979 Julian Day: 225

I. WEATHER SITUATION

Synoptic. A cold front developed in a trough on the west side of the high pressure area which had moved to the eastern U.S. The front went from a low in central Canada to eastern Colorado on the morning of the 13th but moved rapidly southward, passing through the northern half of Illinois by midnight. By late evening it had taken on more of an ENE-WSW orientation as low pressure center moved into eastern Canada. The center of another Canadian high pressure area entered North Dakota by midnight. At 500 mb the main pressure trough lay off the east coast of the United States and a ridge extended northwestward from Texas to the state of Washington. Illinois was in west-northwesterly flow from this pattern. A wide band of weak precipitation echoes occurred along the frontal system during the day, reaching northern Illinois during the afternoon. However most of the central Mississippi valley had no precipitation during the day.

Local. Winds were southwesterly in the network, less than 5 m s^{-1}. Skies were clear except for some scattered cumuli. There was some evidence of thin scattered stratified layers within radar range (but well to the north of the network) in the evening, but no precipitation was reported in the network.

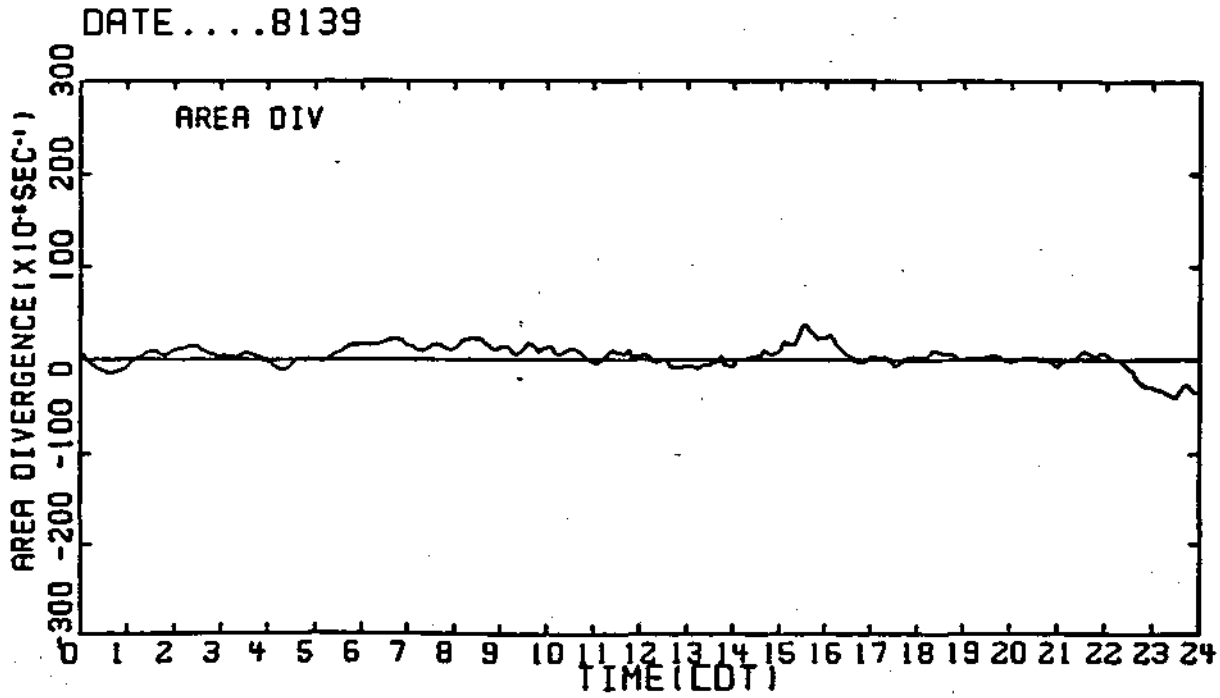
II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1336-1945
13: 1336-1931
Visibility: excellent

Radiosonde
Base Station: 1305 (135 mb); 1802 (162 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (8 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	1121*	1106	1378
1430	3826	2461	1195
1500	3376	1291	1195
1530	3736	2011	1828
1600	3646	3811	1648
1630	--	3811	1648
1730	3466	3811	2098
1800	2386*	2686	1558
1830	1756	3811	2008
1900	1756	3811	2008
1930	1027	3811	1738
2000	1756	917	2188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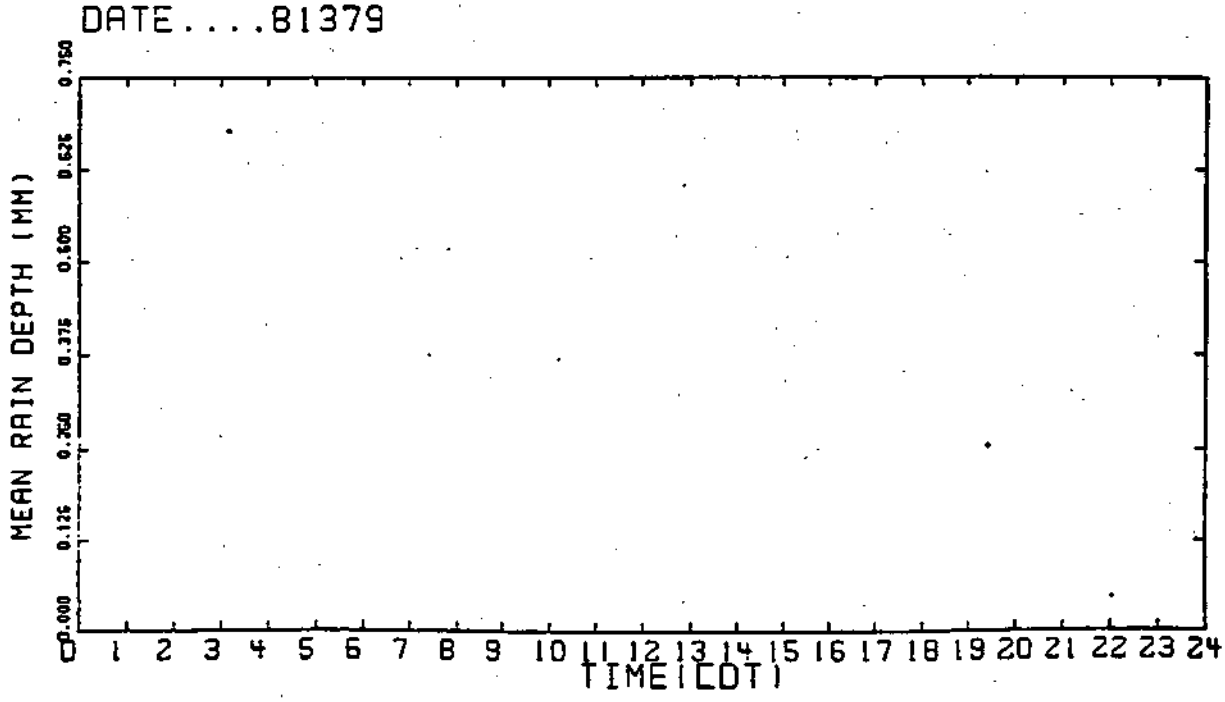
TIME(LDT)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TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 14-16 August 1979 Julian Day: 226, 227 & 228

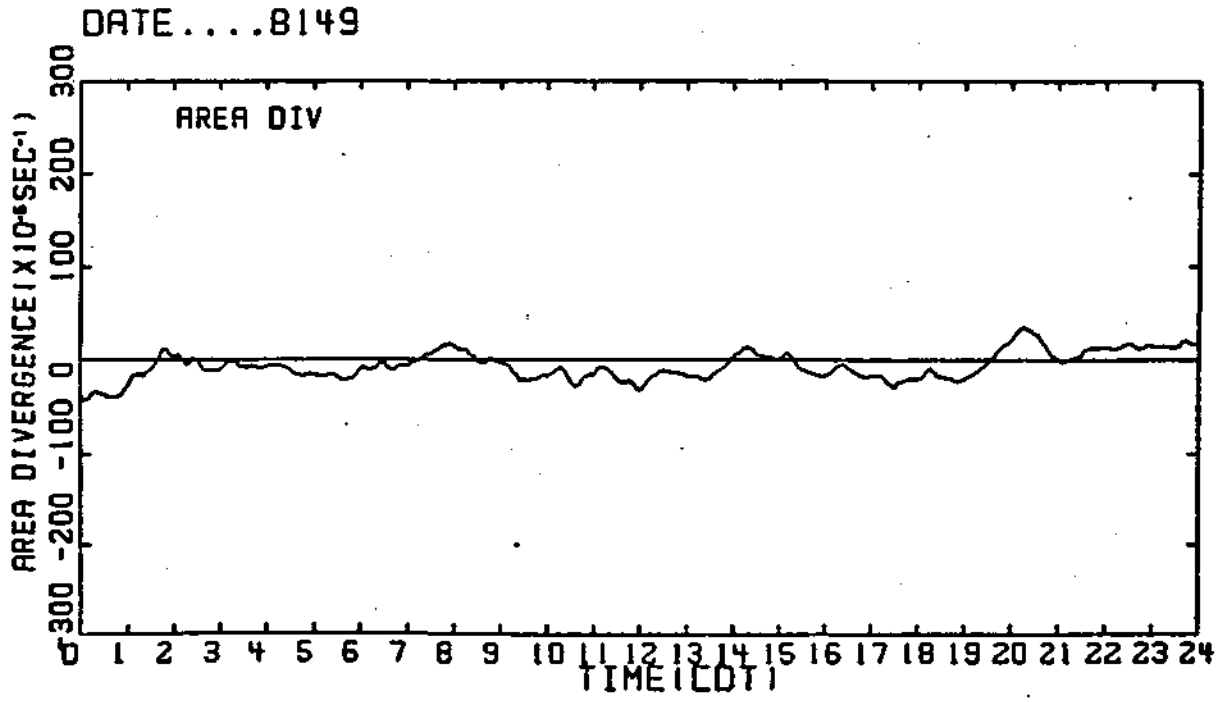
I. WEATHER SITUATION

Synoptic. An extensive frontal system, from New England to the Texas Panhandle, passed through Illinois on the night of the 13th reaching southern Illinois on the morning of the 14th. It continued to move southward for the next two days, reaching the Gulf by the early morning of the 17th. This placed Illinois in a large Canadian air mass and high pressure for the three-day period. There was some overrunning of the frontal system on the 14th which provided mid-level moisture and some layer clouds in Illinois. Aloft there was extensive ridging over the Plains states. Illinois was on the east side of the ridge at 500 mb and experienced comparatively strong winds aloft.

Local. The surface winds came around from southerly to northerly during the pre-dawn hours of 14 Aug and were from the north at about 3 or 4 m s^{-1} by noon on the 14th. They remained north or northeasterly throughout the 15th and much of the 16th, veering to southeast late on the evening of the 16th. Skies were overcast most of the day on the 13th and light rains were experienced at a very few stations along the south edge of the network in mid-afternoon. Skies cleared on the 15th but broken cloud layers started to move in again late in the evening and on the 16th cloud cover was 0.5 to 0.8 throughout much of the day. No rain was recorded in the network on either the 15th or the 16th of August. As can be seen on the accompanying figures, there was weak inflow into the network most of the day on the 14th but the network average divergence was about zero on the 15th and became positive on the 16th.

II. SPECIAL OBSERVATIONS

None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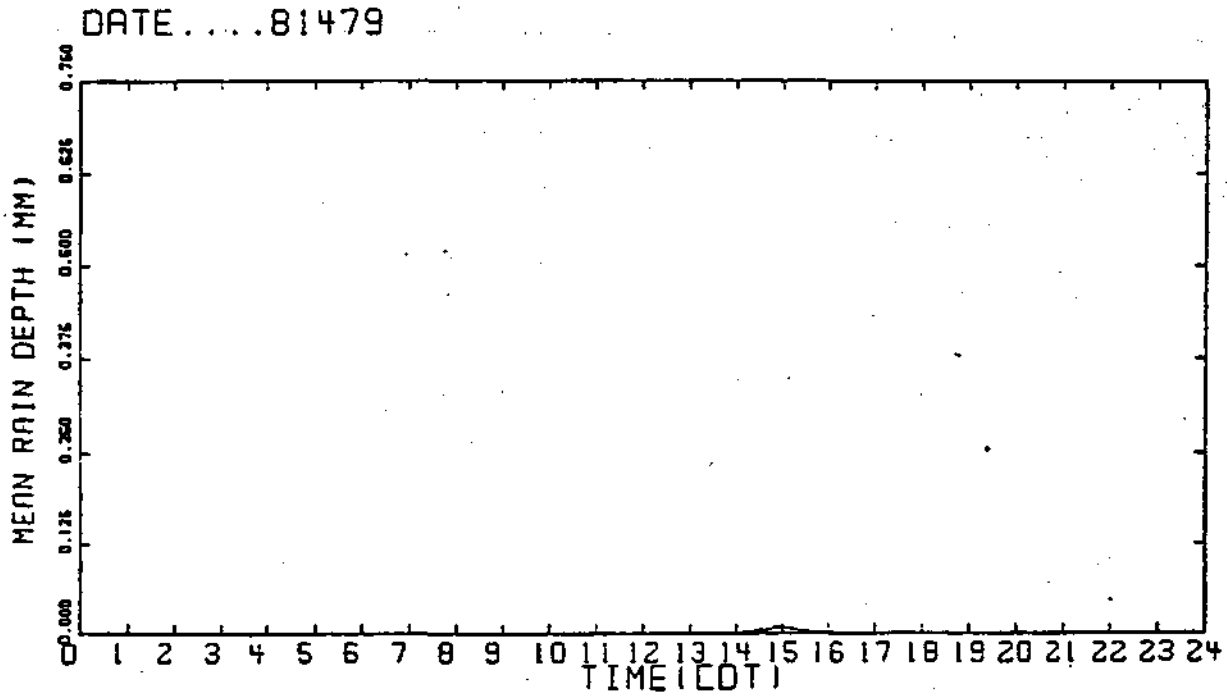
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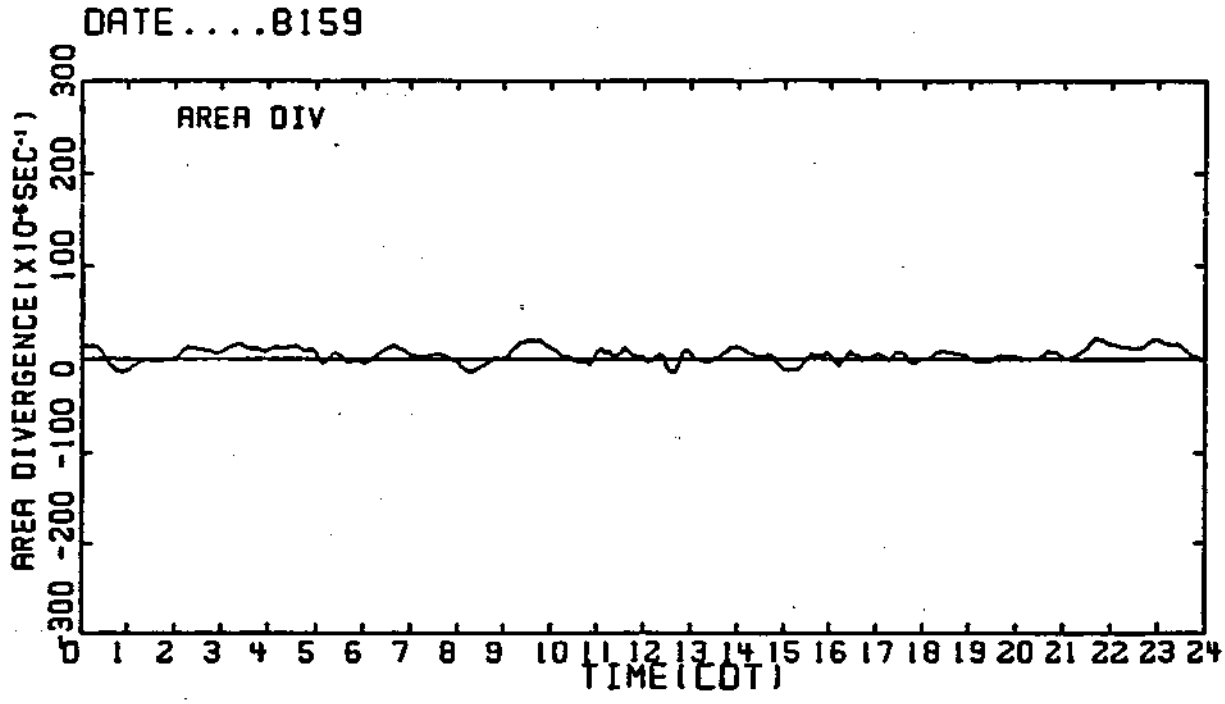
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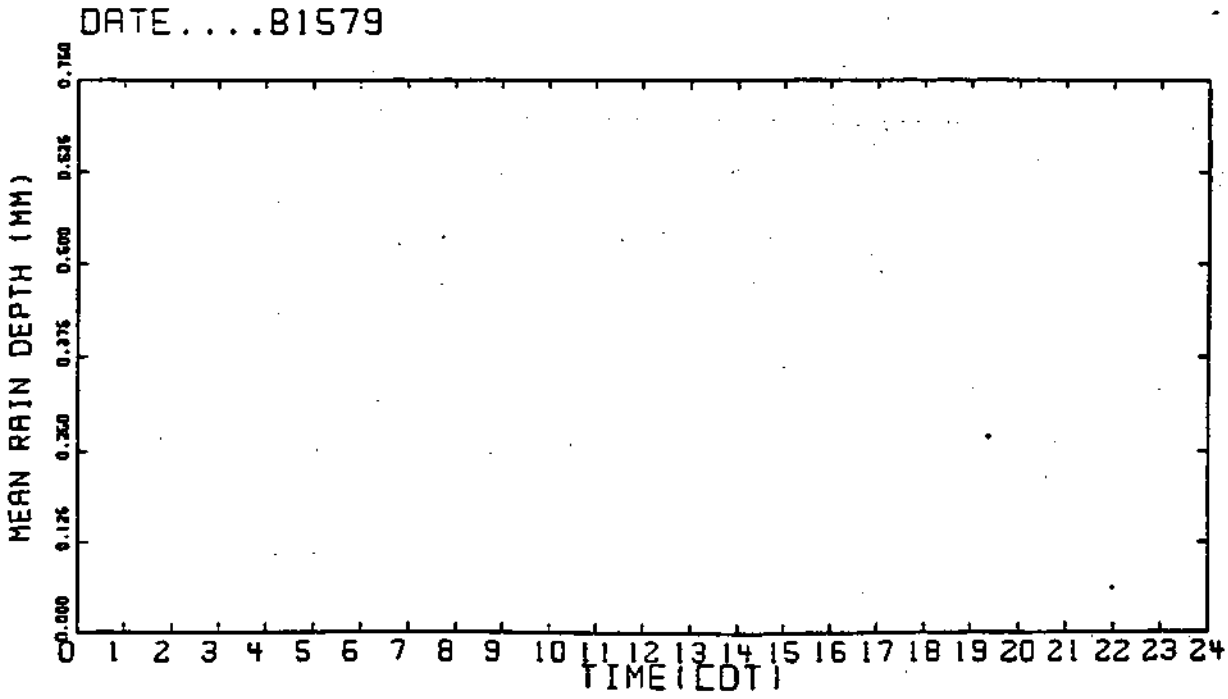
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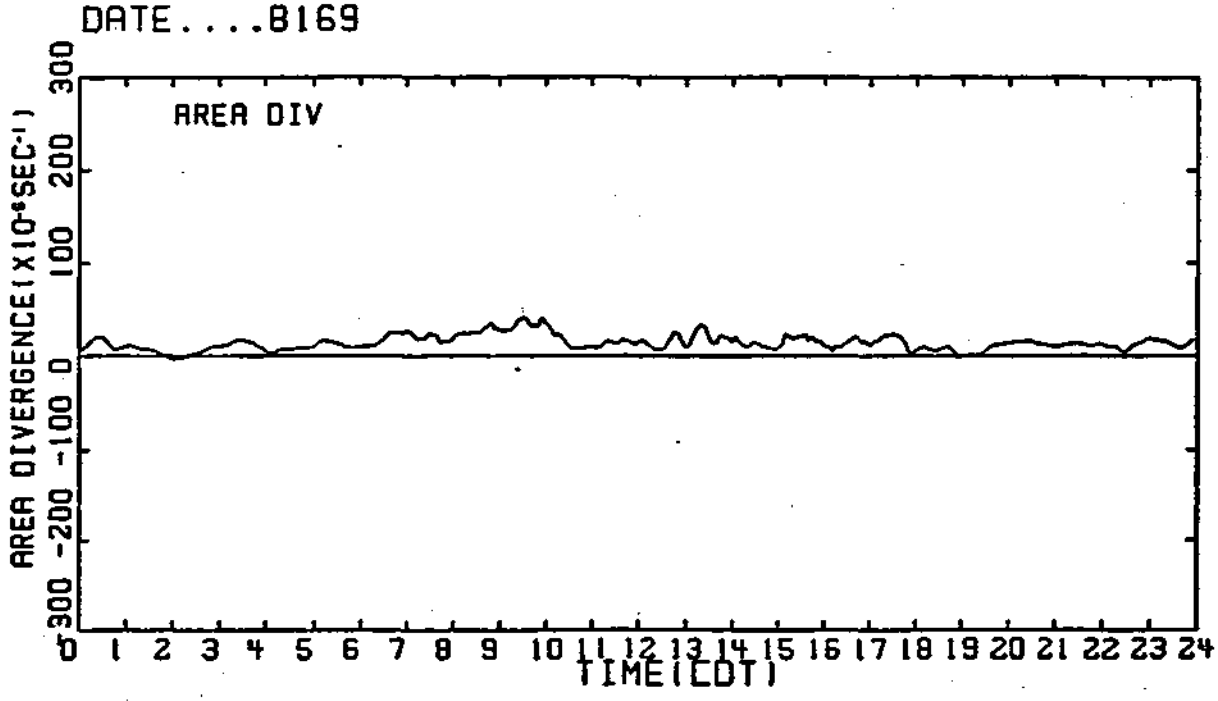
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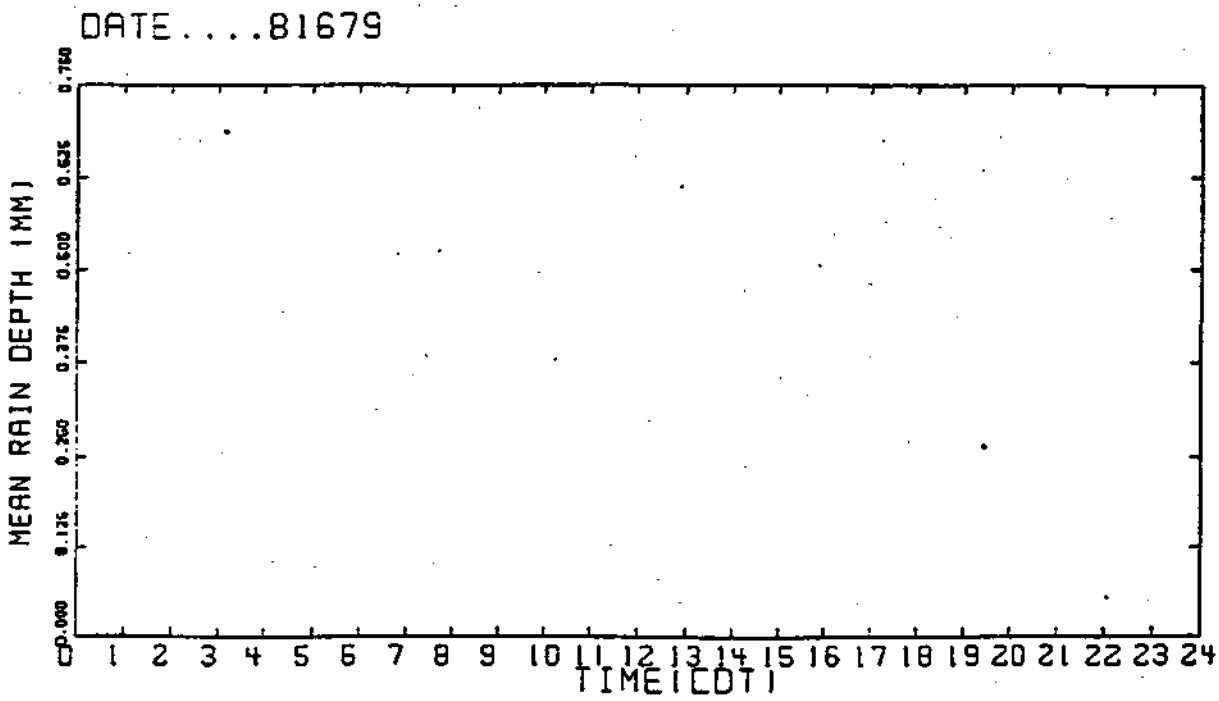
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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 17 August 1979 Julian Day: 229

I. WEATHER SITUATION

Synoptic. A cold front extending east-west in the northern Gulf with a north-south warm front extension through eastern Oklahoma and Kansas underwent frontolysis, primarily in the southern segments. This opened Illinois, which was oh the west side of greatly-modified polar air, to southerly flow from the Gulf. Around noon a cold front formed in a trough from North Dakota to New Mexico as part of the genesis of a small wave cyclone with center in eastern South Dakota/Nebraska. A warm front extended eastward and southeastward from the low center toward Illinois. Frontegenesis continued but the wave cyclone was poorly defined. The warm front moved through Illinois with no significant weather change. At 500 mb, a ridge which had been more or less stationary over the Great Plains for the previous two or three days, weakened during the day permitting more zonal flow. However the upper atmosphere, 700 mb and up, continued dry and the Mississippi valley was clear of precipitation except for a small band of showers in southern Wisconsin.

Local. The winds were southeasterly and very weak in the pre-dawn hours but then shifted to south and increased to 7 m s^{-1} by early evening. Skies had 50% to 100% cloud cover, primarily middle—level layers with scattered shallow cumulus clouds developing in mid-afternoon. No convective echoes were detected in the area. Light rain fell at a few stations in the early morning hours, but there was no significant perturbation in the area mean divergence (see accompanying figure).

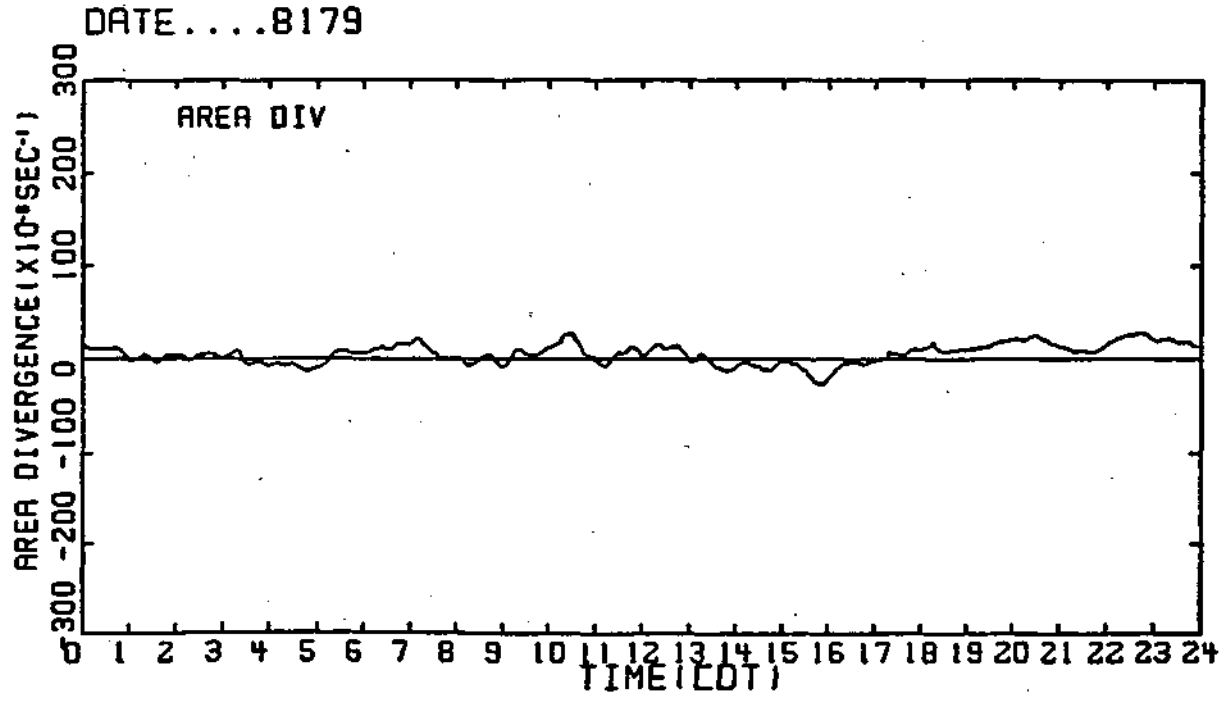
II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1345-1945 (film over-exposed)
13: 1408-1945
Visibility: very good

Radiosonde
Base Station: 1500 (181 mb); 1840 (171 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1430	2296	1561	2188
1500	2746	3811	1738
1530	2566	3631	1195
1600	2206	2911	1558
1630	1486	3271	1738
1700	2656*	3811	818
1800	2116*	3001	1009
1830	1756	1012	1378
1900	2296	3361	1468
1930	1213	3811	1195
2000	1121*	1381	1195
2030	334	1012	1103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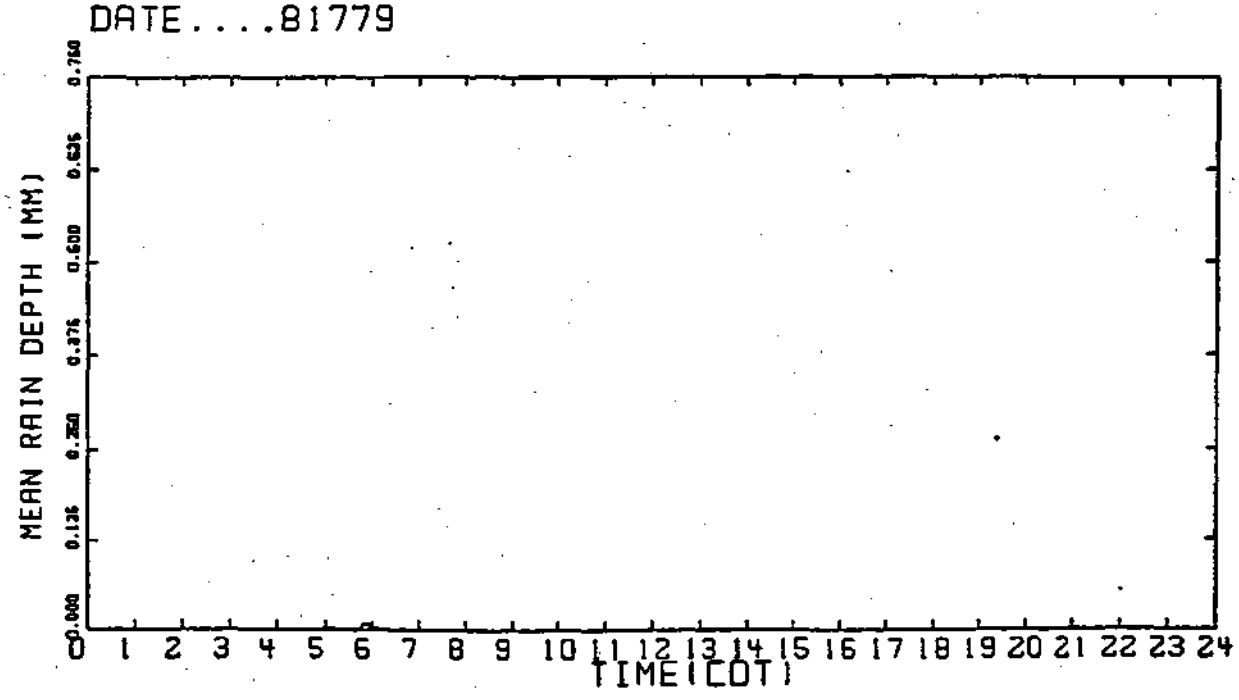
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TIME(LOT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 18 August 1979 Julian Day: 230

I. WEATHER SITUATION

Synoptic. A weak front meandered north from New Mexico to Nebraska, east to Michigan and then south to Virginia in the morning. The central section drifted southward, crossing the northern half of Illinois between mid-day and midnight. A short wave trough located over Illinois in the lower troposphere moved rapidly eastward under a ridge at 500 mb. There was evidence of adjustment of the 500 mb pressure pattern to a deepening closed low pressure center over the Pacific Northwest.

Local. Cloudiness along the front produced some rain in the network, primarily on the north side, during the pre-dawn and early morning. The skies continued overcast to broken most of the day with middle and high level clouds, with scattered shallow cumuli during most of the afternoon. The convection started to intensify around 1600 CDT and cumulonimbus clouds were visible after 1700. Large convective echoes were observed in the network and in the immediate surroundings from shortly after 1800 to the early morning of the 19th. These came as two storms. An earlier one from 1900 to 2300, producing rain at about 50% of the stations (peak point rainfall of 3.5 cm) and hail at over a dozen stations. Another period of rainfall, with 100% coverage, occurred from about 2300 to 0300 on the 19th. The heaviest rains from this rain was in a west-east band extending from the central part of the network to the extreme eastern border, with maximum point rainfall of over 7.5 cm. Hail occurred at 9 stations during this storm, primarily in the east central and southeast parts of the network.

There was evidence of perturbation in the wind field associated with all three rain storms. There was significant inflow into the network during the morning hours, except during the rain periods (see accompanying figure). There was also sustained moderate inflow for several hours prior to the second period of precipitation and some relatively small outflow. A major signature in the temporal profile of network-average divergence occurred with the third rain period (see figure accompanying summary for 19 August), with strong net outflow, as well as inflow during early storm periods.

II. SPECIAL OBSERVATIONS

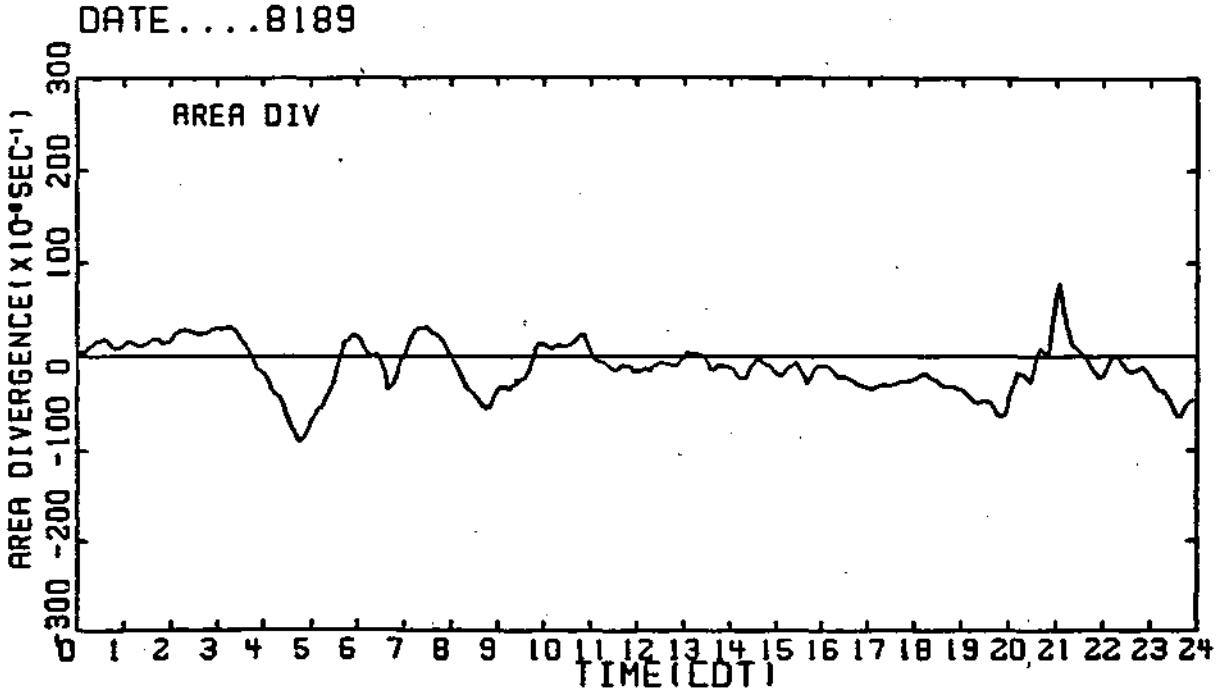
Time Lapse Photography
Stn 11: 1353-1945
13: 1402-1940
Visibility: excellent

Radar: 2050-0017 (19 August)

Radiosonde
Base Station: 1300 (114 mb); 1800 (250 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1430	1027	917	1195
1500	1306	724	818
1530	1396*	724	914
1600	1306	1012	1009
1630	1756	1471	2008
1700	1936	1291	1558
1800	1756	1561	2278
1830	1576	--	--
1900	2746	2011	1378
1930	2656	2191	1195
2000	1666	1198	818
2030	932	--	818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-200
300
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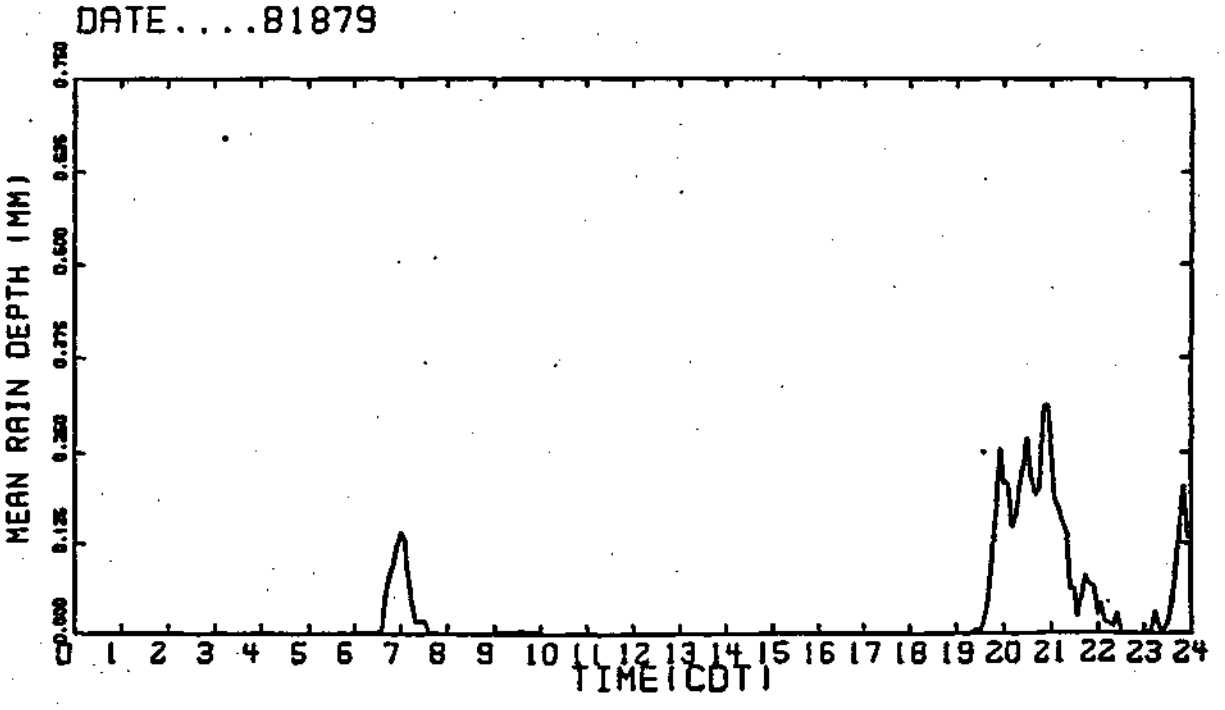
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 19 August 1979 Julian Day: 231

I. WEATHER SITUATION

Synoptic. A weak front extending across the U.S. on 17 and 18 Aug. took on the characteristic of a wave with peak in eastern Nebraska. The section that had moved into central Illinois as a cold front on the 18th drifted northward to the Wisconsin border as a warm front during the day. Aloft, Illinois was under light zonal flow, permitting a short wave train to drift through the weak tropospheric ridge. Cloudy areas along the front decayed in. the forenoon but convection intensified with solar heating in the afternoon providing some very heavy convective echoes in a band from northern Illinois through Indiana to northeastern Kentucky.

Local. The rain which had started before midnight on the 18th reached its peak between midnight and 0100 and ended within the following hour. (See writeup of 18 Aug.) Skies continued broken to overcast, primarily with middle level clouds, during the remainder of the day, with some scattered, shallow cumuli in the afternoon and evening. Very weak precipitation echoes developed after 2100, with light rains occurring at a very few stations in the network. Although the rain was not significant, there was significant mass inflow into the network after 2000 (see accompanying figure).

II. SPECIAL OBSERVATIONS

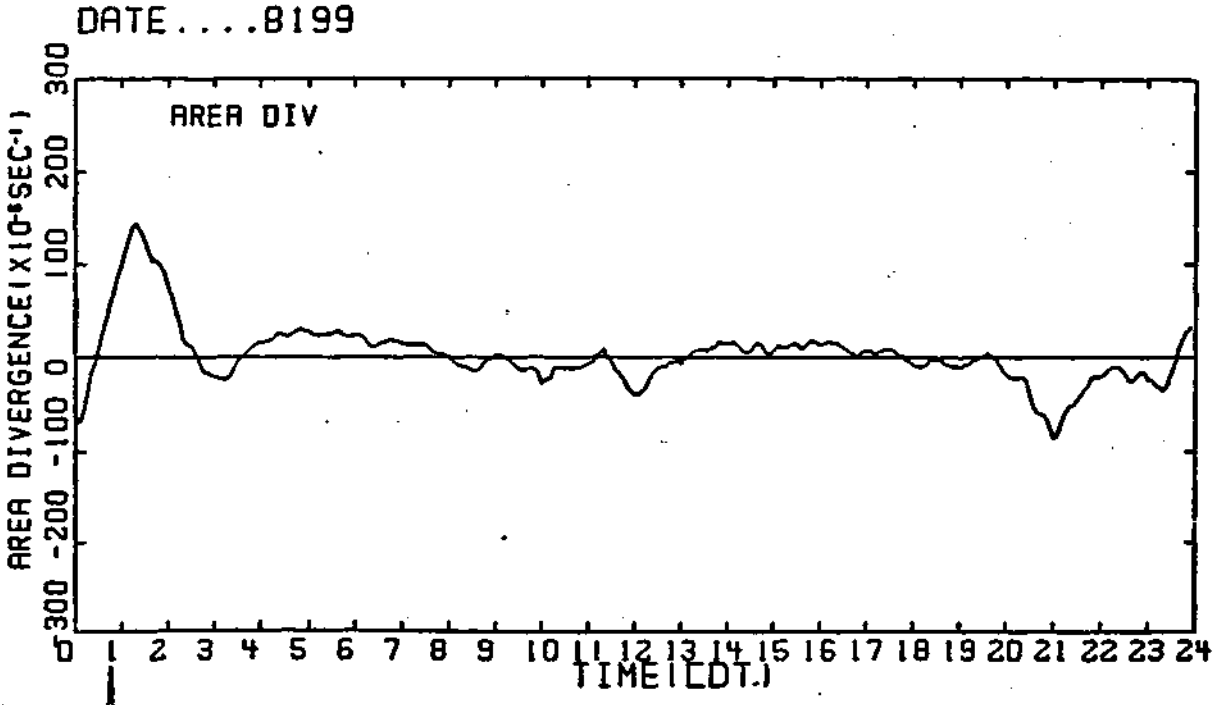
Time Lapse Photography
Stn 11: 1250-1915
13: 1319-1945
Visibility: excellent

Radar: 2137-2222

Radiosonde
Base Station: 1340 (89 mb); 1808 (270 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1300	--	3271	622
1330	1213	1741	1558
1400	3016	3541	1648
1430	2386	2191	1468
1500	2206	3811	1103
1530	2296	2371	2008
1600	1936	2101	2008
1700	1756	2731	1288
1730	1306	3271	1828
1800	2386	2731	818
1830	2656	3181	1103
1900	1396	1651	1648
1930	1486	1921	1828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100
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-100
-200
300
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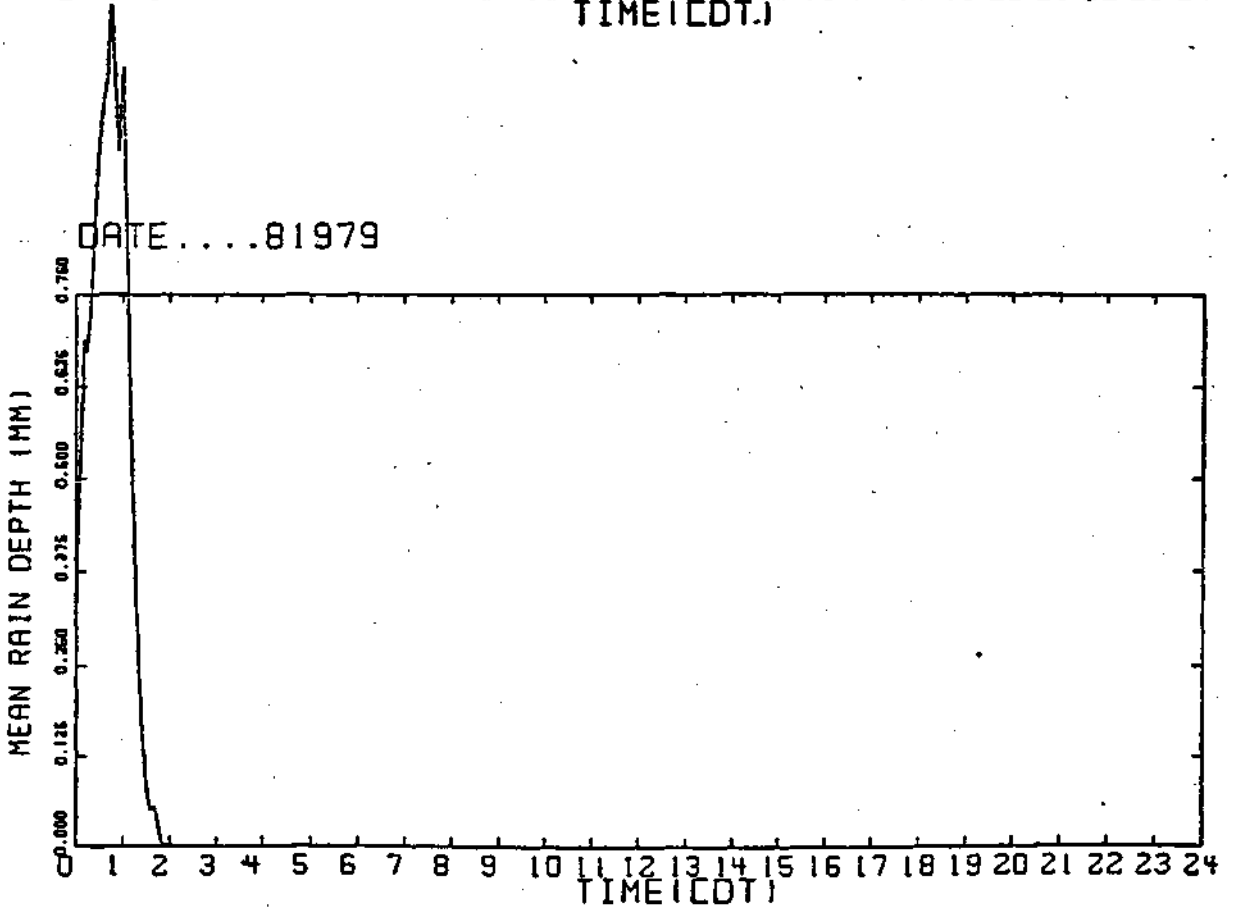
TIME(CDT)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0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 20 August 1979 Julian Day: 232

I. WEATHER SITUATION

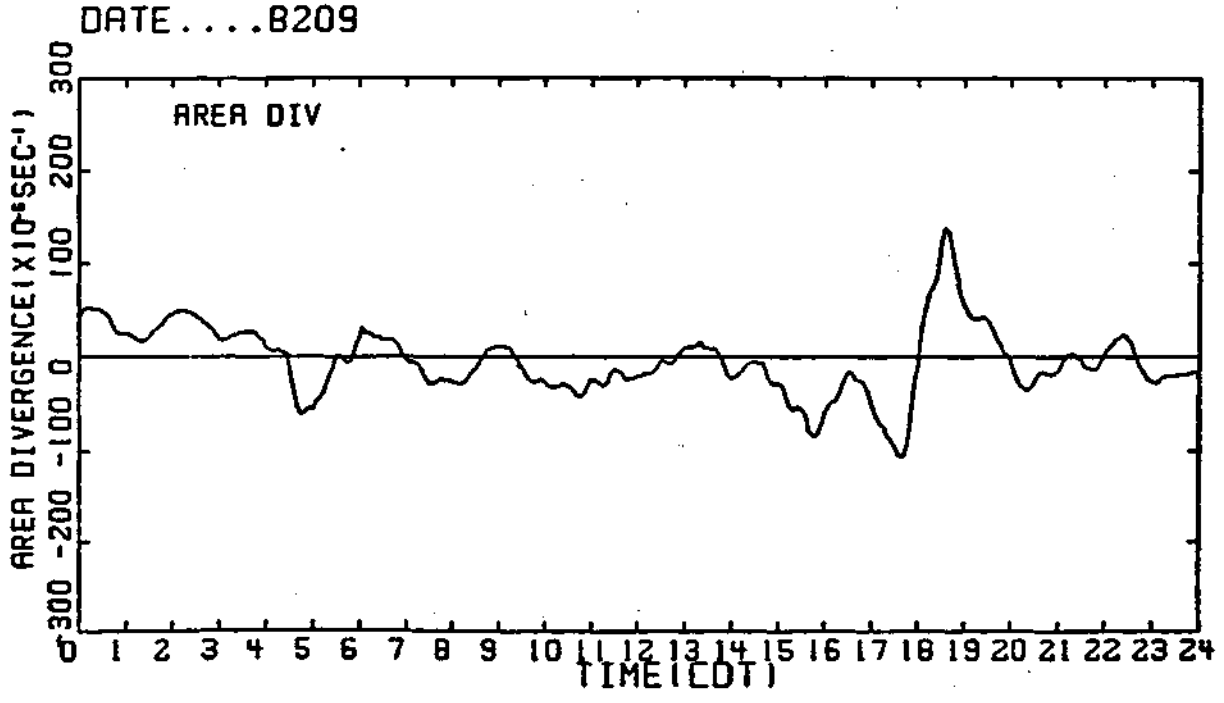
Synoptic. The weak frontal zone continued to meander across the U.S., north from west Texas to Nebraska, east along the Wisconsin border to the Carolinas. The central part of the front, in southern Wisconsin during the first part of the day, moved back south again to central Illinois in the afternoon. The 500 mb pressure pattern over the U.S. was unsteady as a closed low along the west coast dominated the flow. Illinois was in a weak ridge and the winds were westerly and quite light. Convective echoes developed in the afternoon in the Mississippi valley continuing throughout the afternoon and dissipating around midnight.

Local. The winds were SE in the early part of the day coming around to SW at about 1700 as the frontal zone moved into the area. Middle to high clouds gave broken to overcast skies throughout most of the day, with low clouds developing in mid-afternoon. In the early morning (0400 to 0700 CDT) light rains were recorded at a few of the stations along the north end of the network. However significant echoes did not develop in the area until mid-afternoon, when an east-west oriented line of echoes was detected within radar range. However, the line soon took on the character of an area of layered echo with embedded showers. This area moved across the network producing rain at essentially every station, with the heavier rains in a band from the center of the network to the eastern edge. Some heavy rains occurred in the southwest and northeast corners as well. The maximum point rainfall was 4.3 cm, and hail occurred at two stations. There was weak inflow into the network for most of the day, (see accompanying figure), with increasing significance after 1400. A typical "signature" of pronounced inflow followed by outflow was associated with the evening rains.

II. SPECIAL OBSERVATIONS

Radar: 1435-2139

Radiosonde
Base Station: 1300 (27 mb); 1800 (619 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)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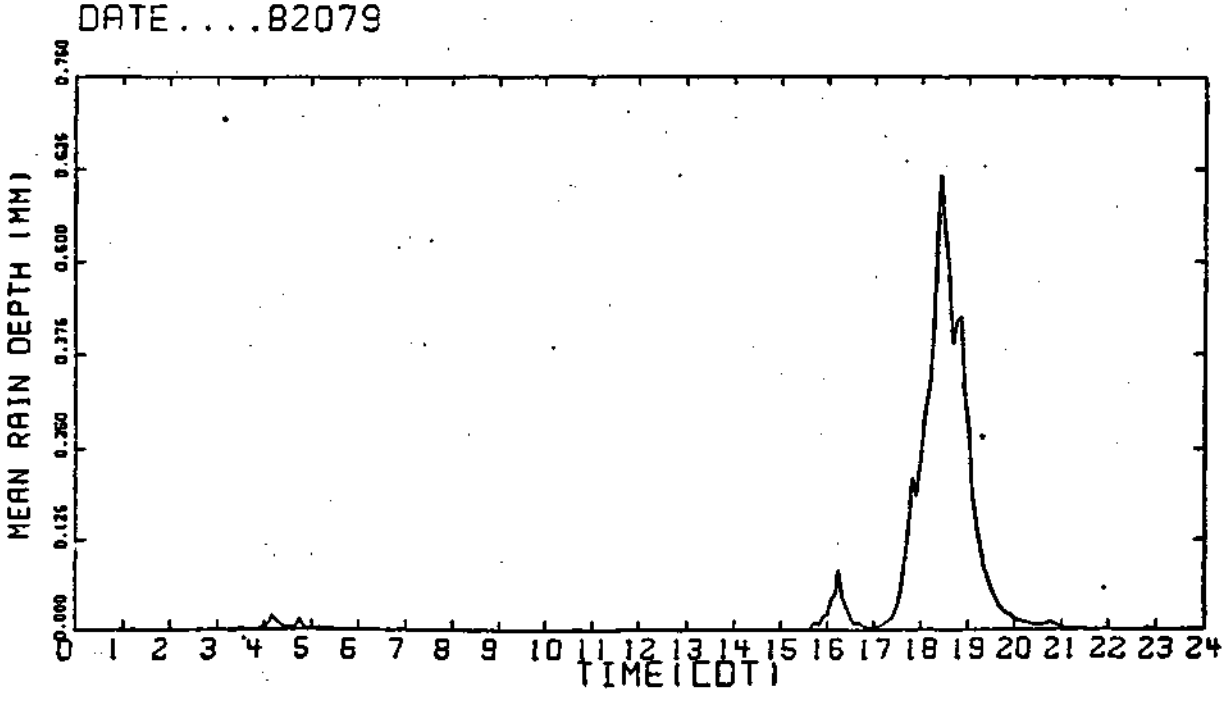
TIME(CDT)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MEAN RAIN DEPTH (MM)
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0.625
0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 21 August 1979 Julian Day: 233

I. WEATHER SITUATION

Synoptic. The weak frontal system continued across the U.S. A cold front entered the U.S. around midnight but dissipated as the high pressure behind it remained in Canada. The "old" front was over Central Illinois most of the day, drifting into southern Illinois in the evening. At 500 mb, the closed low off the west coast started to fill but the pressure pattern was still highly perturbed and was adjusting to a high-wave number pattern. A trough extended from southwest South Dakota to western Oklahoma in the morning and moved east during the day. Illinois was in this trough and in weak westerly flow throughout the day.

Local. The winds were SE at the surface, 4 to 5 m s^{-1}. There were medium to upper-level broken to overcast clouds through most of the day with occasional low clouds in the afternoon. There was some clearing around 1700, however the clouds filled in again later in the evening. The rain, mostly light, came in several periods. In the pre-dawn hours light rain occurred at a few stations, primarily in the northeast. During the afternoon the rain was widely scattered, occurring at 7% of the stations, with maximum point rainfall around 1 cm. Although the rain was light and scattered, there was mass outflow from the network (see accompanying figure). However, the main precipitation occurred very late. A line of precipitating echoes detected by the radar at 80 nautical miles at about 2230 CDT moved eastward, and new precipitation echoes formed in advance of the line. Rains within the VIN network began at 2300 and continued to about 0300 on the 22nd, mainly in the northern half of the network. Maximum point rainfall from this storm was 3 cm. There was mass inflow associated with this rain that started at 2300, and continuing for the next 2 or 3 hours (see figures accompanying descriptions for 21 and 22 August), although no significant outflow occurred.

II. SPECIAL OBSERVATIONS

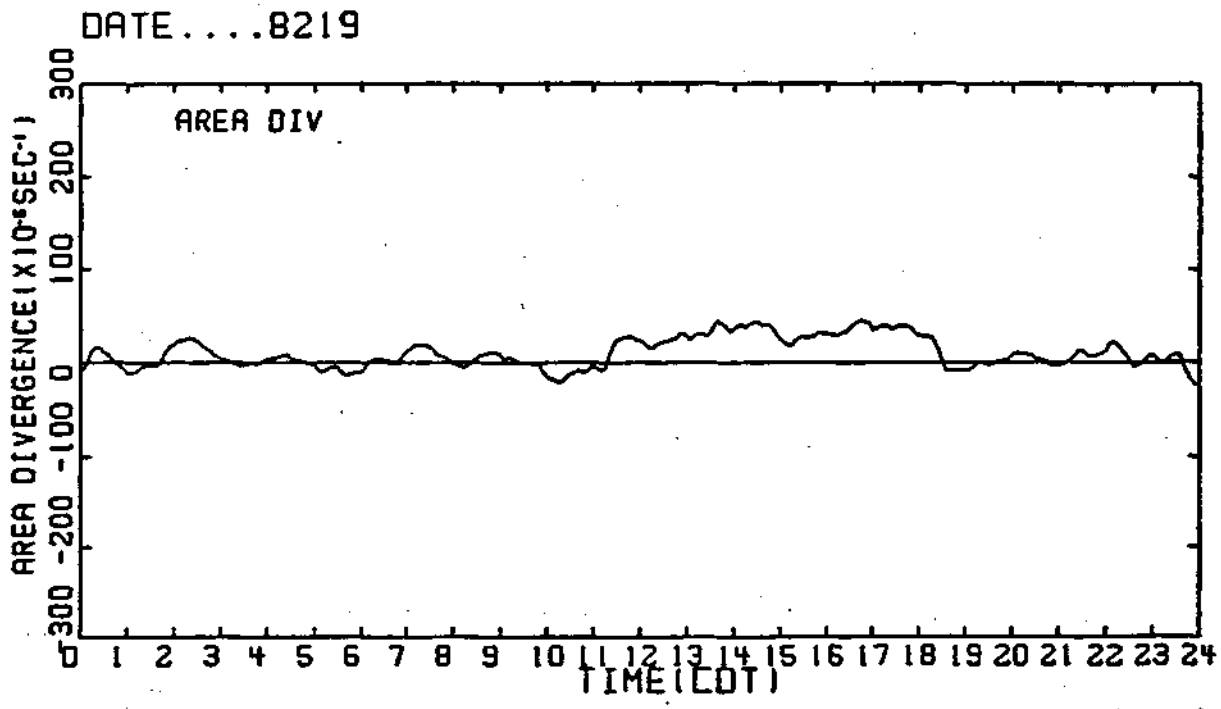
Time Lapse Photography
Stn 11: 1150-1930
13: 1205-1905
Visibility: fair

Radar: 1127-1437; 2229-0200

Radiosonde
Base Station: 1300 (89 mb); 1801 (88 mb)
Peoria: 1300. (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1230	541	422	1558
1300	640	526	1009
1330	541	526	1648
1400	437	526	1918
1430	541	526	1195
1500	640	917	419
1530	640	724	818
1630	541	625	1288
1700	640	625	1195
1730	2476	917	818
1800	2476	1106	818
1830	2116	1106	1103
1900	2206	1291	1004
1930	1213	1012	1009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-100
-200
-300
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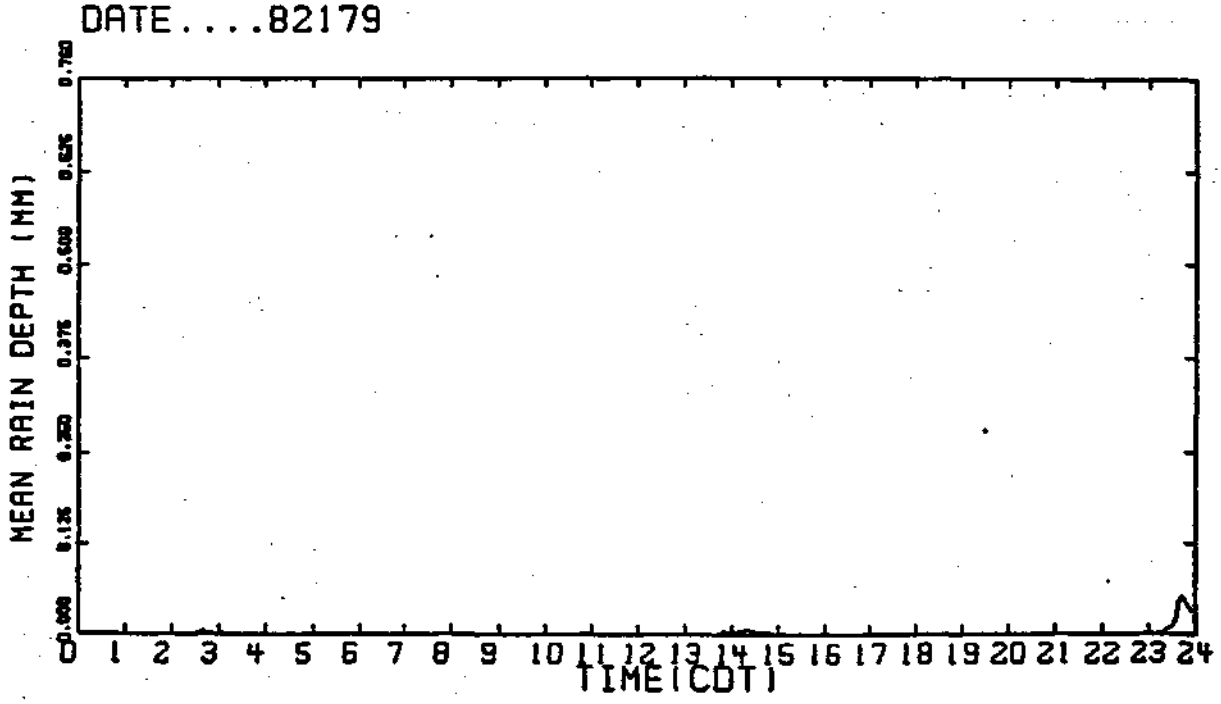
TIME(CDT)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TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 22 August 1979 Julian Day: 234

I. WEATHER SITUATION

Synoptic. A cold front entered the High Plains States in the early morning and pressed rapidly southward to Colorado. This caused the weak front which had been over the central part of the United States for the previous several days to change character and move. A low pressure center along the front deepened and moved into western Wisconsin, the warm front moved from southern Illinois into Wisconsin, while the cold front moved rapidly eastward from central Kansas into eastern Missouri and Iowa. At 500 mb the perturbed short wave pattern persisted. The trough moved slowly eastward but remained over the central and eastern Plains states throughout the day. Widespread convective precipitation occurred over the eastern half of the United States reaching its peak in coverage and intensity late in the evening.

Local. The rain which started after 2300 on the 21st of August continued and reached its peak in the hour following midnight. (See summary for Aug. 21). There was some cloudiness during the day, with moderate congestus in the afternoon, but no precipitation in the network until evening. At 2000 an extensive line of echoes in the west was moving east. The line was in two segments, with some new cells building northward from the southern sector into the network by 2200. The line became more solid with time and passed to the east of the network by midnight. New echoes developed in the network shortly after midnight of the 22nd and echoes continued until about 0400 on the 23rd of August (see summary for 23 August). The evening rainfall had wide coverage and inflow into the network, followed by outflow, is evident in the temporal profile of the average divergence (see accompanying figure).

II. SPECIAL OBSERVATIONS

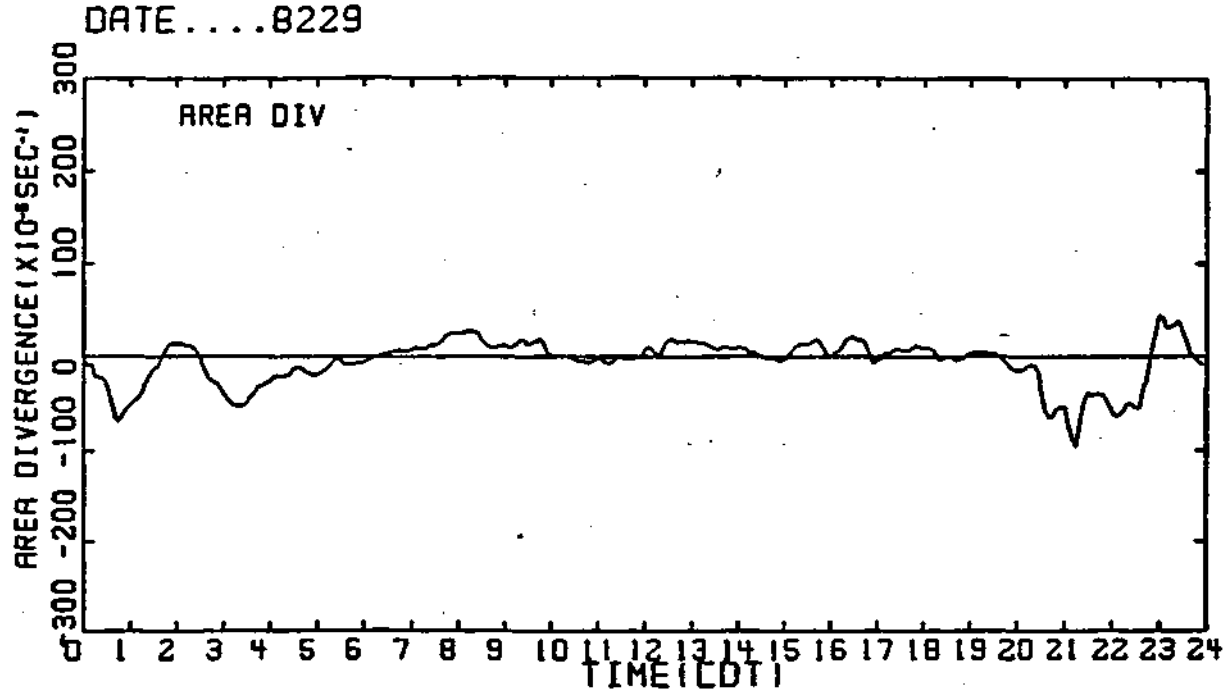
Time Lapse Photography
Stn 11: 1410-1930
13: 1307-1915
Visibility: very good

Radar: 1851-0356 (on 23 Aug)

Radiosonde
Base Station: 1300 (227 mb); 1800 (124 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	--	1561	1468
1400	1486	1012	1007*
1430	1936	1921	914
1500	2656	1198	721
1530	1846*	1921	914
1600	836	2101	1009
1700	3286	2371	1288
1730	2656	3811	1195
1800	3016	3811	1828
1830	3016	3811	2278
1900	3826	3811	2188
1930	3646	3091	1558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100
0
-100
-200
-300
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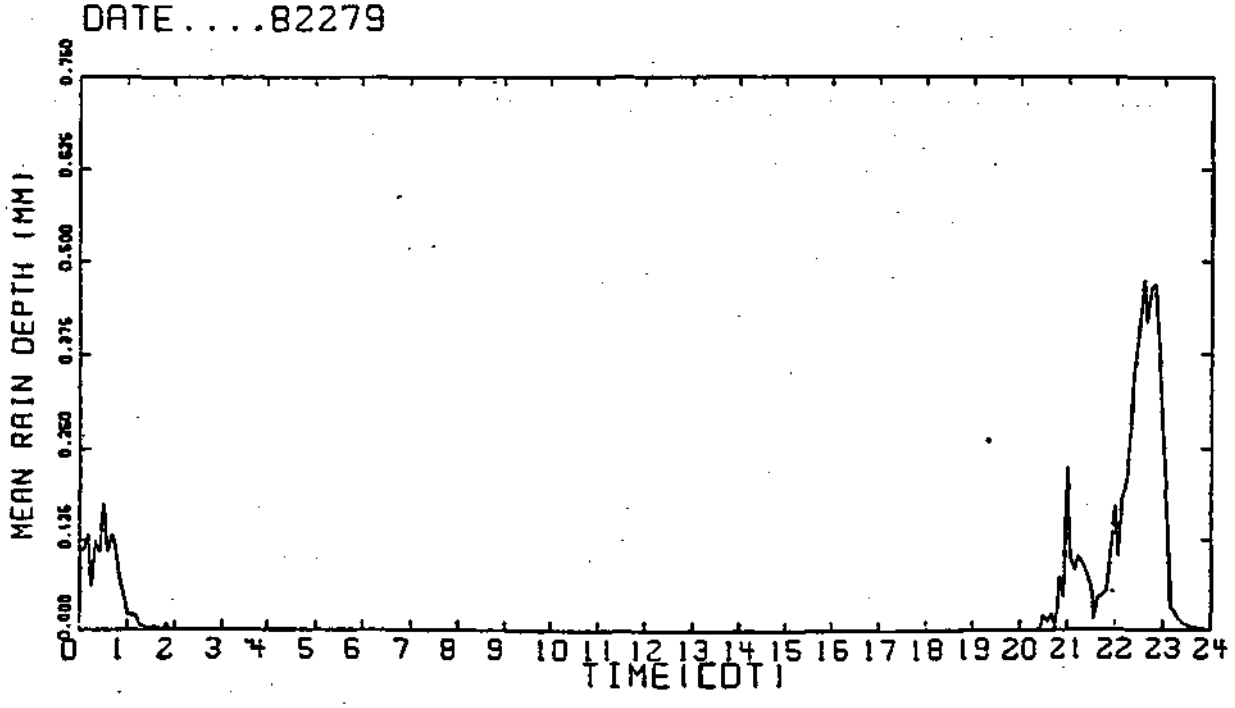
TIME(CDT)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0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 23 August 1979 Julian Day: 235

I. WEATHER SITUATION

Synoptic. The front which had entered the U.S. from Canada early on the morning of the 22nd formed a deep arc, extending southward from Montana to Kansas then curving back north to a low center on the Minnesota-Canada border. Its rapid movement south and east caused an increasing intensification of the wave cyclone in the United States and a rapid acceleration of the cold front. By late afternoon the northern cold front had overtaken the one to *the* south and the two low pressure centers had merged over the northern part of Lake Michigan. The cold fronts slowly passed through Illinois during the day. At 500 mb a high wave-number pattern persisted, with a deep trough extending from northern Minnesota to the Gulf. The trough began to split during the day, with the southern portion retrogressing and a closed low developing in the north. Illinois was in southwesterly flow. Some convection developed ahead of the front with a major squall line along the front in late afternoon, decreasing in intensity after sunset and dissipating during the night.

Local. The weather system which had brought significant rains just before midnight on the 22nd provided a second rainstorm in the pre-dawn hours of the 23rd. Associated with this rainstorm, which had wide coverage was a net mass outflow from the network (see accompanying figure). In the forenoon there was variable cloudiness and some very light scattered rains in the network. However more significant cloud systems occurred in the afternoon as two cloud lines passed through the network, producing light rainfall at about 35% of the stations, with isolated heavier rain, (to 2.5 cm). The temporal profile of the network-mean divergence (see accompanying figure) indicates moderate inflow into the network prior to and during this afternoon storm although there was no significant outflow.

II. SPECIAL OBSERVATIONS

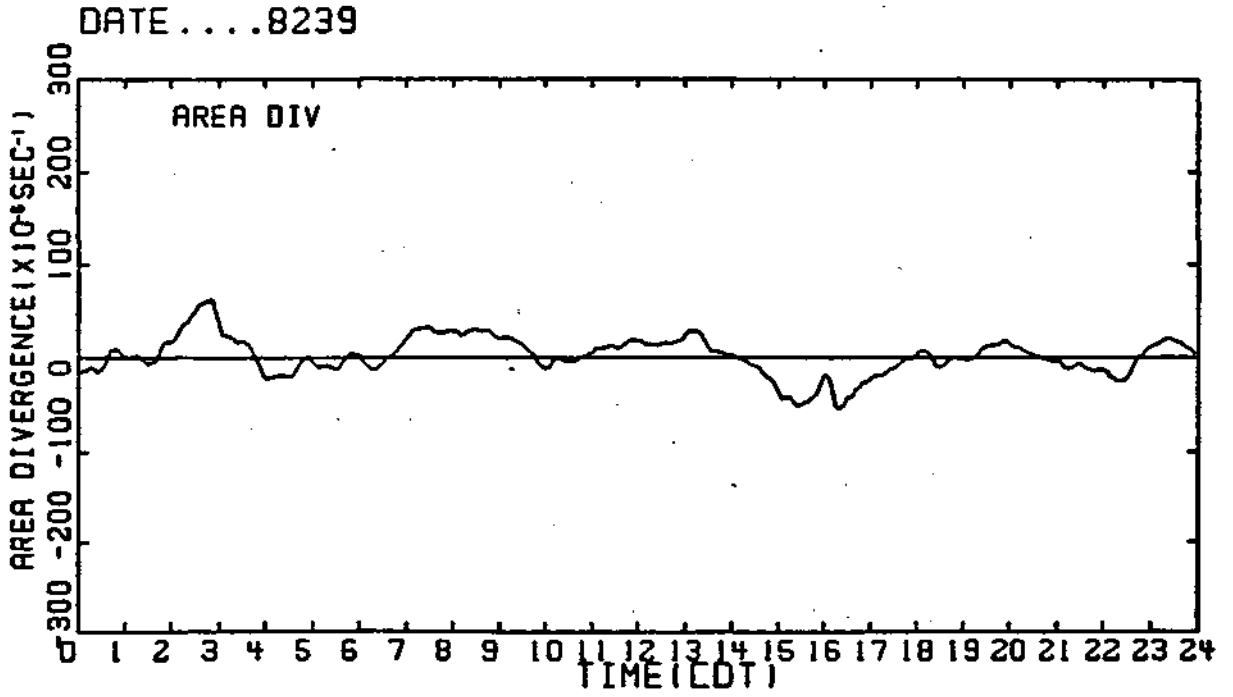
Time Lapse Photography
Stn 11: 1328-1917
13: 1303-1543
Visibility: excellent

Radar: 1400-1722 (For pre-dawn hours, see summary of 22 August)

Radiosonde
Base Station: 1300 (292 mb); 1820 (250 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	1666*	2641	1009
1400	1396*	821	1648
1430	1846	917	1288
1500	932	2191	1995
1530	739	1471	1738
1600	3286*	--	1288
1700	2386	1651	1103
1730	1213	2371	1828
1800	1666	3541	1378
1830	2386	2101	
1900	1576	1106	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0
-100
-200
-300
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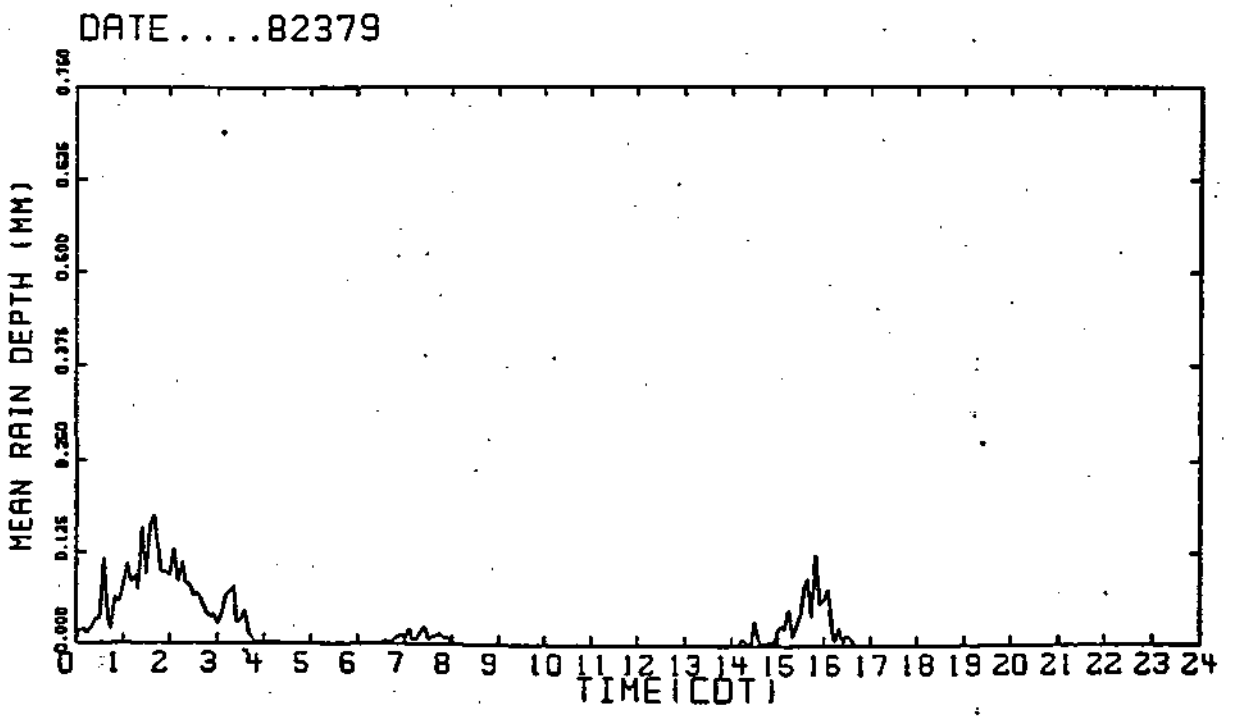
TIME(CDT)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0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 24 August 1979 Julian Day: 236

I. WEATHER SITUATION

Synoptic. Most of the central third of the United States was in a pressure col at the surface, between two fronts, a cold front which extended from the eastern Great Lakes SW to Louisiana and a second cold front entering the United States in the northern Rocky Mountain states. At 500 mb, the pressure pattern over the U.S. was in transition from the high wave number that had existed for several days to a more zonal flow. The deep trough oven, the central U.S. was breaking up, with an area of lower pressure between the Bermuda High in the east and the Pacific High in the west covering the southern half of the U.S., and the flow over the northern half taking on a more zonal, long wave pattern. The winds over Illinois remained very light. Although significant convection occurred over most of eastern and southeastern United States, Illinois remained free of precipitation echoes throughout the day.

Local. Following the frontal passage on the night of the 23rd the winds in the VIN network came around to north and northwest, backing to more westerly flow as the day wore on. Winds were quite light. Skies were clear or with high scattered to broken high clouds during the afternoon.

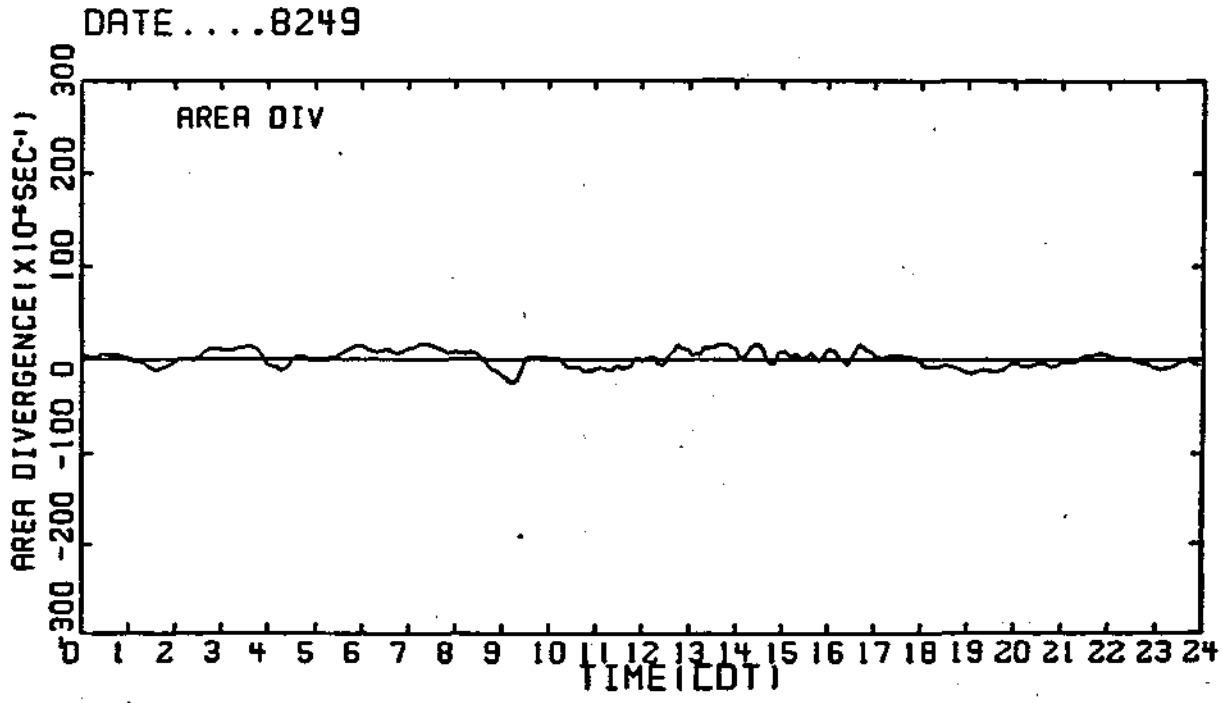
II. SPECIAL OBSERVATIONS

Radar: 0258-1730 (Clear Air Experiment)

Radiosonde
Base Station: 1435 (322 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1330	2026	917	1288
1400	1486	2281	2098
1430	1756	2011	2098
1500	1666*	2011	1358
1530	1846	2281	2188
1600	2656	2551	2458
1630	3376	1921	1378
1700	3826	3001	2098
1730	2026	3181	1918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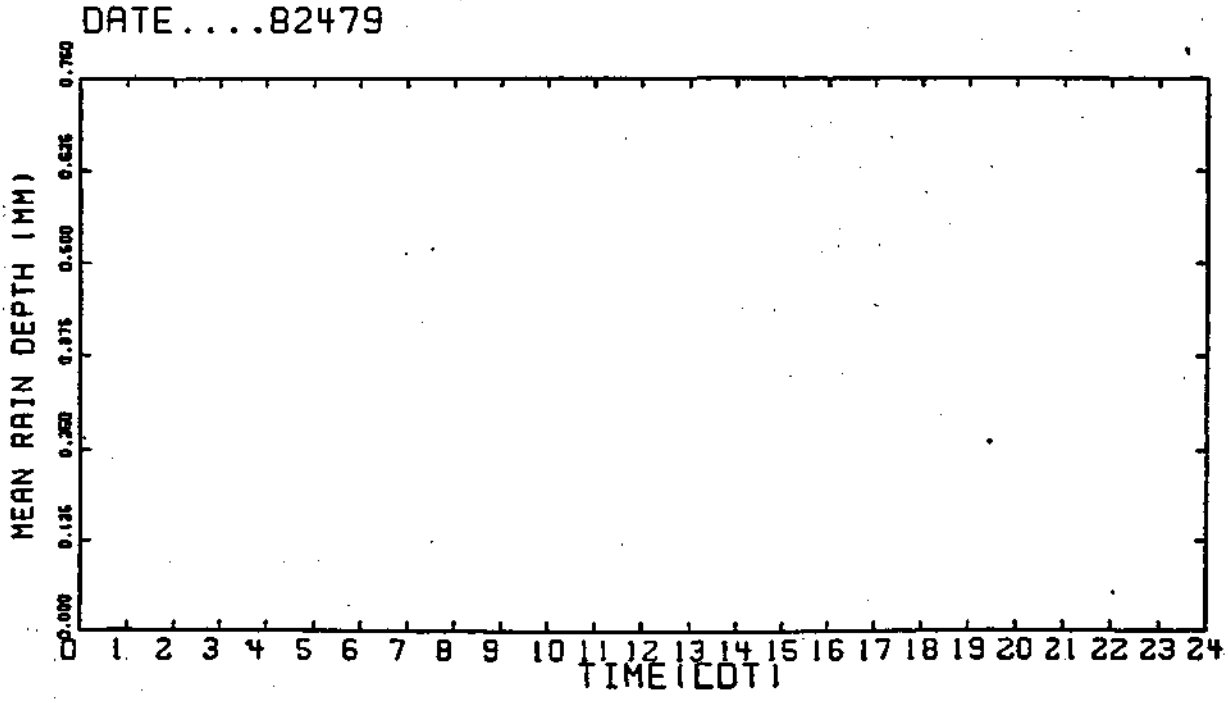
TIME(LDT)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0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 25 August 1979 Julian Day: 237

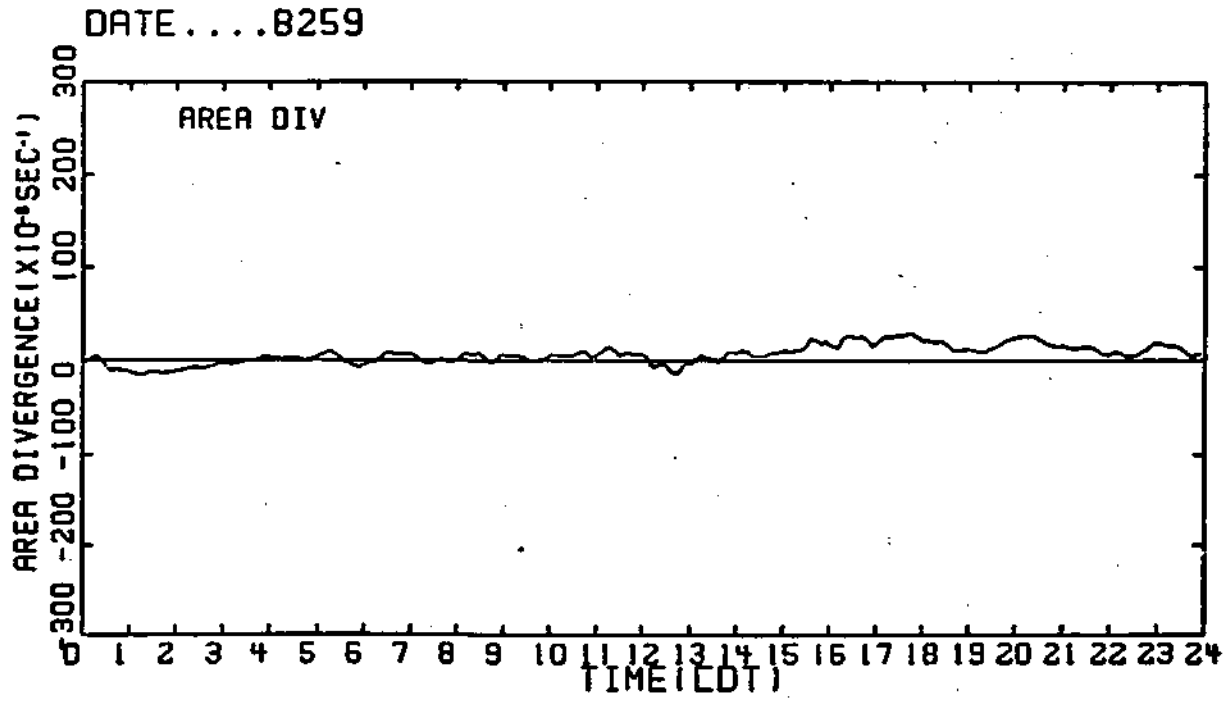
I. WEATHER STTITATTON

Synoptic. As on the day previous, much of the central part of the United States was in a weak pressure col between a front extending from northern New England southeastward to Louisiana and a cold front which extended from the Great Lakes southwestward to Colorado. At 500 mb the pressure pattern was still in a state of transition, with short waves rapidly passing through a long wave pattern over the northern part of the continent and relatively low pressure over the southern Miss, valley. Although considerable convective activity occurred along both fronts Illinois was free of convective echoes throughout the day.

Local. Winds in the network backed from westerly to SW and finally to S during the day. They remained extremely light (2 or 3 m s). Skies were clear in the morning, but some broken high cloudiness occurred late in the afternoon.

II. SPECIAL OBSERVATIONS

None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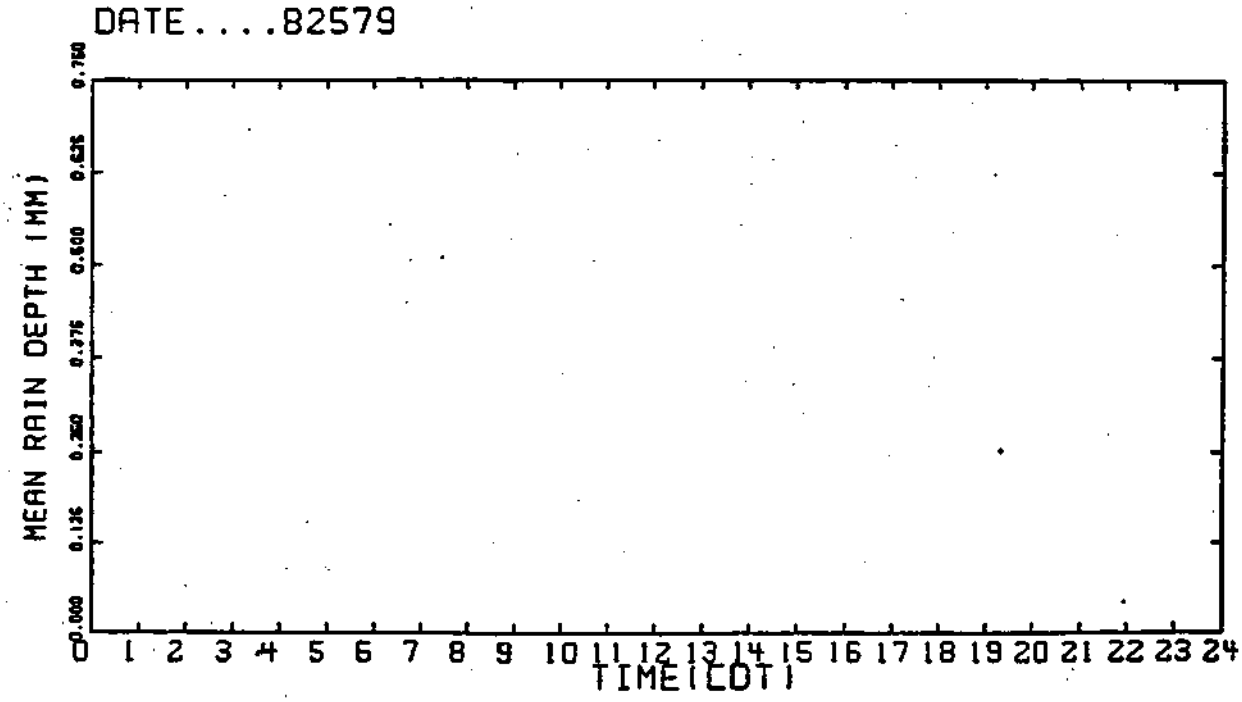
TIME(LDT)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0.500
0.375
0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(LDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 26 August 1979 Julian Day: 238

I. WEATHER SITUATION

Synoptic. Illinois remained in a pressure col between a front which extended WSW from S. Carolina to Texas and a second front in the northern tier of states. The northern of these two fronts started to move south and east early in the day. A small wave developed in northwestern Iowa and moved rapidly northeastward. By the end of the day there were fronts on both the southern border of Illinois and on its northwest border. At 500 mb a long wave pattern had been established with the southern third of the United States beneath generally high pressure. However several short waves passed rapidly through the long wave pattern in the middle tier of States. Convective developments occurred along both frontal systems with considerable increase in convection during the mid-day. However Illinois remained essentially free of convective echoes.

Local. The winds were easterly and southeasterly and very light through most of the day. The skies were clear in the early morning but scattered to broken cloudiness at the middle and upper levels developed mid-morning, increasing to broken and overcast conditions later in the day. By mid afternoon some shallow cumuli developed, increasing in coverage during the day. No rain occurred on the 26th although rain did occur in the very early morning the following day.

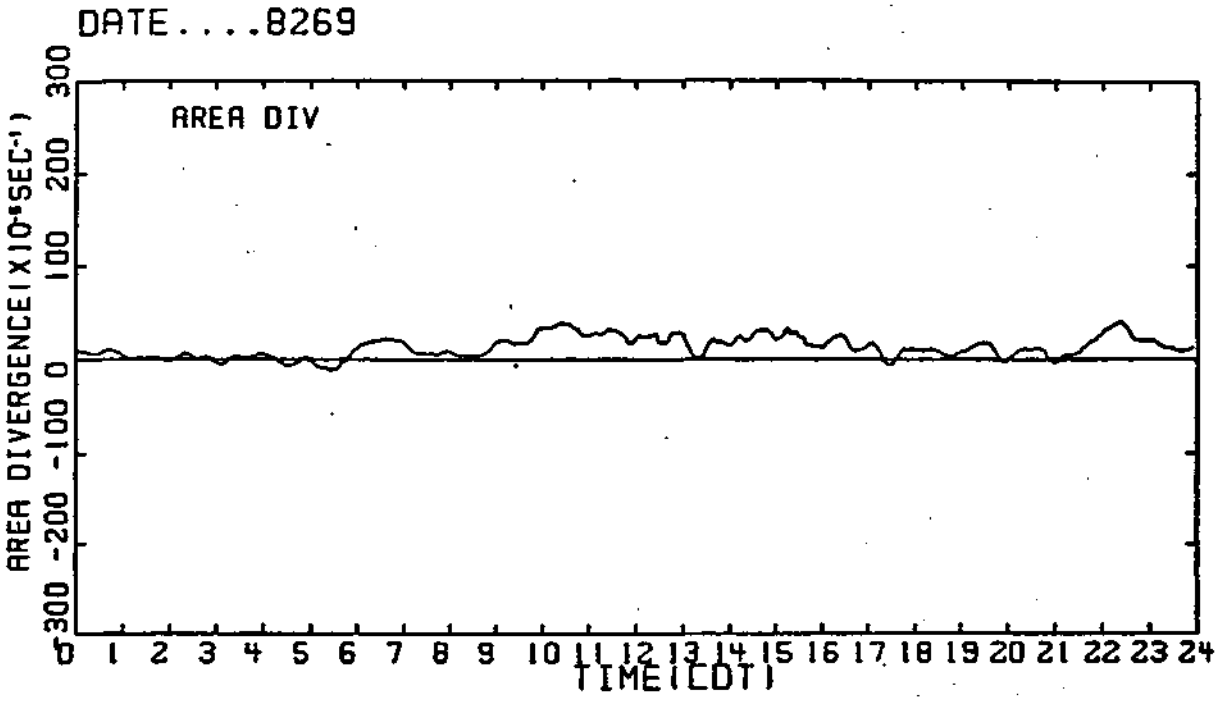
II. SPECIAL OBSERVATIONS

Time Lapse Photography
Stn 11: 1330-1915
13: 1332-1925
Visibility: excellent

Radiosonde
Base Station: 1315 (281 mb); 1833 (158 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

Pilot-balloon Releases

	Maximum Height (m MSL) Station		
Time	11	12	13
1400	—	1561	3808
1430	3826	526	2188
1500	3556	917	3358
1530	1846	821	1918
1600	2386	917	1103
1630	--	--	2008
1700	--	1012	1288
1730	2386*	917	622
1800	3286	1291	1288
1830	3016	1921	1648
1900	2026	3811	1828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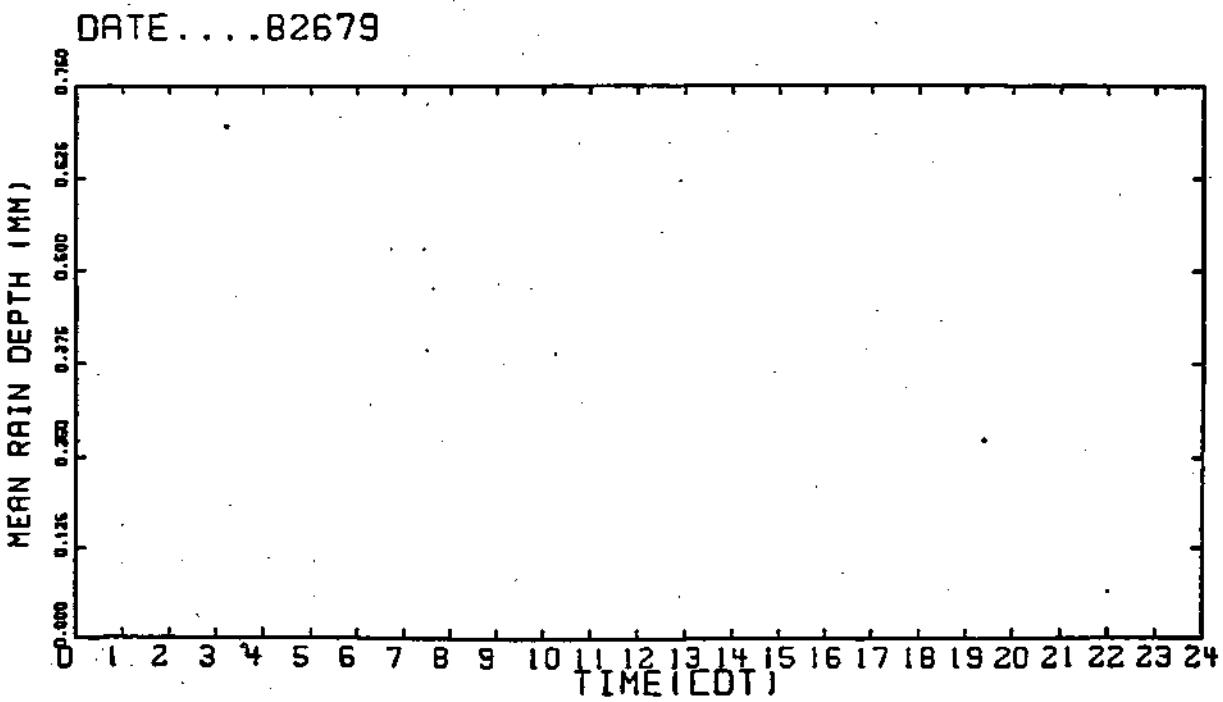
TIME(CDT)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0.250
0.125
0.000
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24
TIME(CDT)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 27 August 1979 Julian Day: 239

I. WEATHER SITUATION

Synoptic. A front curving from the Great Lakes to Missouri and then westward and northwestward along the Rockies moved southward during the day, passing through Illinois, overtaking the front which had been on its southern border. The combined system went stationary in southern Illinois and tended to weaken late in the evening. At 500 mb a shallow short wave which was over western Illinois in the early morning moved rapidly east. A second short wave coming in from the west reached western Missouri by the end of the day. Although the fronts were relatively cloud-free in the pre-dawn hours, as solar heating warmed the surface, a line of echoes developed, decreasing and dissipating again after sunset.

Local. The winds were southeasterly in the morning coming around to southwest and west as the front passed through in mid afternoon. Skies were generally overcast through much of the day with fog and haze as the frontal zone passed through. Rain was recorded in the network at about 50% of the stations in the 3 to 4 hours just after mid-night on the 27th. This rain was generally less than 6 mm, a point maximum of about 1 cm.

II. SPECIAL OBSERVATIONS

Radiosonde
Base Station: 1310 (134 mb); 1800 (420 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 28 August 1979 Julian Day: 240

I. WEATHER SITUATION

Synoptic. The front which had passed through Illinois on the 27th developed a wave and then moved back across Illinois as a warm front, putting the southern two-thirds of the State in low-level southwesterly flow by evening. At 500 mb, short waves continued to pass through the long wave pattern in the northern half of the U.S. A minor short wave trough in central Missouri early in the day moved eastward to Illinois. Extensive convective activity occurred over the eastern third of the U.S. and the southeastern states. In addition there was an isolated squall line in Iowa and Missouri. There were some stratiform echoes in Illinois but no significant convective precipitation.

Local. Winds were quite variable in direction throughout the day and less than 4 m s^{-1}. Skies were generally clear in the pre-dawn hours but middle to overcast broken clouds developed mid-morning and low-level clouds during the afternoon. Small areas of echoes occurred within range of the CHILL radar in the forenoon with light rains occurring at about 10 to 15% of the stations. Widely scattered small precipitation echoes occurred in the afternoon, with rain recorded at 2 or 3 stations in the network.

II. SPECIAL OBSERVATIONS

Radar: 0852-1544

Radiosonde
Base Station: 1311 (199 mb); 1810 (212 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)

"VIN" FIELD PROGRAM
DAILY SUMMARY

Date: 29 August 1979 Julian Day: 241

I. WEATHER SITUATION

Synoptic. The front which moved north over Illinois on the 28th continued its northward movement. In the lower troposphere, a high pressure ridge built westward from the high pressure center over the Atlantic, over the eastern half of the U.S. At 500 mb the train of short waves which had been passing through the zonal flow over the central U.S. dissipated as ridging occurred over the eastern Plains States.

Local. Some very light rains occurred in the pre-dawn and early morning hours, probably associated with a residual lower-tropospheric trough. There was variable cloudiness throughout the afternoon and evening but no rain.

II. SPECIAL OBSERVATIONS

Radiosonde
Base Station: 1300 (258 mb)
Peoria: 1300 (70 mb)
Salem: 1300 (70 mb)