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CLIMATOLOGY OF DRY SEASON HEAVY RAINFALL
IN CENTRAL FLORIDA—
NOVEMBER THROUGH APRIL

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UNITED STATES
DEPARTMENT OF COMMERCE
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National Weather Service
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1. Introduction

Average annual rainfall in central Florida is around 50 in. About 70 percent of this falls during what may be termed wet season months from May through October. Wet season heavy rainfall producers are the daily thunderstorms initiated by land and sea breeze regimes and generally abundant moisture, and the tropical systems that occasionally cross the area.

Heavy rainfalls may also occur during the "dry" season of November through April. Causes of heavy rains during those months, however, are usually the synoptic scale systems that periodically reach central Florida. Synoptic features, such as a stationary front or a low level jet are the primary heavy rain producers. Recognition of these features could serve to alert forecasters to the possibility of a heavy rain event.

Surface and 500 mb maps were examined for 62 dry season heavy rain events across central Florida. Significant synoptic features in each case were noted, and the most common features were determined. This study seeks to complete a climatology of dry season heavy rain events for peninsular Florida. Biedinger (1985) researched heavy rain patterns for north Florida, and Reville (1986) studied synoptic patterns for south Florida.

2. Data Used for the Study

The area studied was central Florida, roughly between 27.0 N and 29.5 N. Daily rainfall data from 43 stations were used, obtained from the Monthly Climatological Data for Florida (NOAA 1974-1991). Data from November through April, 1974-1991, or 17 dry seasons, were included in the study.

A heavy rainfall day was defined as a day on which one or more stations received 3 or more inches of rain. A heavy rainfall event was defined as one or more consecutive heavy rainfall days. Since a single heavy rainfall event may comprise a number of heavy rainfall days, there were more heavy rainfall days than events.

Sixty-three events were defined during this period using the above criteria. Synoptic maps, taken from the Daily Weather Maps Series (NOAA 1974-1991), were available for 62 of these. Descriptions of map features for these 62 events can be found in Section I of the Appendix. Out of the 63 events, seven had at least one station with a daily total of 5 or more inches.

3. Significant Synoptic Patterns

Surface and 500 mb maps were analyzed for synoptic patterns existing during heavy rainfall events. Several features at each level seemed to be consistently associated with heavy rainfall, as shown in Section II of the Appendix. Figures 1-13 show maps (surface and 500 mb) that are typical of several groups (types) of events.

At the surface, the two most significant features were a closed low over the eastern or central Gulf of Mexico, or a stationary front, usually over south or central Florida. These features, alone or together, were noted in 38 of the 62 heavy rainfall events for which synoptic charts were available. Cold fronts were involved in 20 events, but were always associated with either a closed surface low (five events), or one of the significant 500 mb patterns.

At 500 mb, nearly all (59 of 62, or 95 percent) of the events had a south, southwest, or west wind flow. Seventy percent of the cases (43 of 62) had either a low-level jet (28 of 62) or 500 mb wind speeds in excess of 40 kt over central Florida.

Only one tropical system produced a heavy rainfall event in the area during the period of this study—Tropical Storm Keith in November 1988.

4. Combinations of Synoptic Patterns

Surface systems referred to in this section are: closed low pressure centers, cold fronts, stationary fronts, and frontal systems (defined as stationary fronts, or a cold/warm front system). Significant features at 500 mb are a low level jet and southwest flow (defined as any flow out of the south, southwest, or west). Figures 1-13 are illustrative of the specific combinations of synoptic features considered to be significant in this study. The number of heavy rainfall events having exactly that combination of synoptic features is included in the figure captions. A table listing each heavy rainfall event and its significant synoptic features can be found in Section II of the Appendix.

5. Conclusions

The most important synoptic feature seems to be southwest flow at 500 mb. This flow enhances the likelihood of a heavy rainfall event by providing a source of tropical moisture. Flow patterns with an easterly component were not encountered in this study. Patterns with a northerly component were noted in three events, but a northerly flow usually lacks sufficient moisture in a deep layer to produce heavy rainfall.

Other features at the surface and 500 mb should serve to alert the forecaster that a heavy rainfall event is a possibility. A closed low or a stationary front in the vicinity may be an indication that heavy rainfall could occur, since either presents the possibility of a stationary or slow moving source for enhanced vertical motion. A 500 mb flow of 40 kt or greater can increase the chances for heavy rainfall if sufficient moisture and a surface forcing mechanism are present.

In particular, a combination of these features should serve as a flag to the forecaster that heavy rainfall is possible, indicating a need for closer examination of the situation. Presence of one or more features is by no means a positive indicator of heavy rain. This study did not consider occasions when these features occurred, but only light rain or no rain fell. Mesoscale or smaller scale features are beyond the scope of the present study, but the forecaster must consider those features, along with the history of the system, in order to successfully predict a heavy rain event.

6. References

- Biedinger, Raymond E., 1985: *Climatology of Heavy Rain Producing Patterns in North Florida*. NOAA Technical Memorandum, NWS SR 112, NWS Southern Region QPF Workshop, April, 1985.
- NOAA, 1991: Daily Weather Maps-Weekly Series, Feb. 22, 1975 to Mar. 19, 1991. U.S. Government Printing Office. Washington, D.C.
- NOAA, 1974-91: Daily Precipitation Totals. Climatological Data, Florida. NOAA, EDIS, Federal Building, Asheville, NC.
- Revitte, Frank J., 1986: *Climatology of Heavy Rain Synoptic Patterns in South Florida: November through April*. NOAA Technical Memorandum, NWS SR 117, NWS Southern Region QPF Workshop, April, 1986.

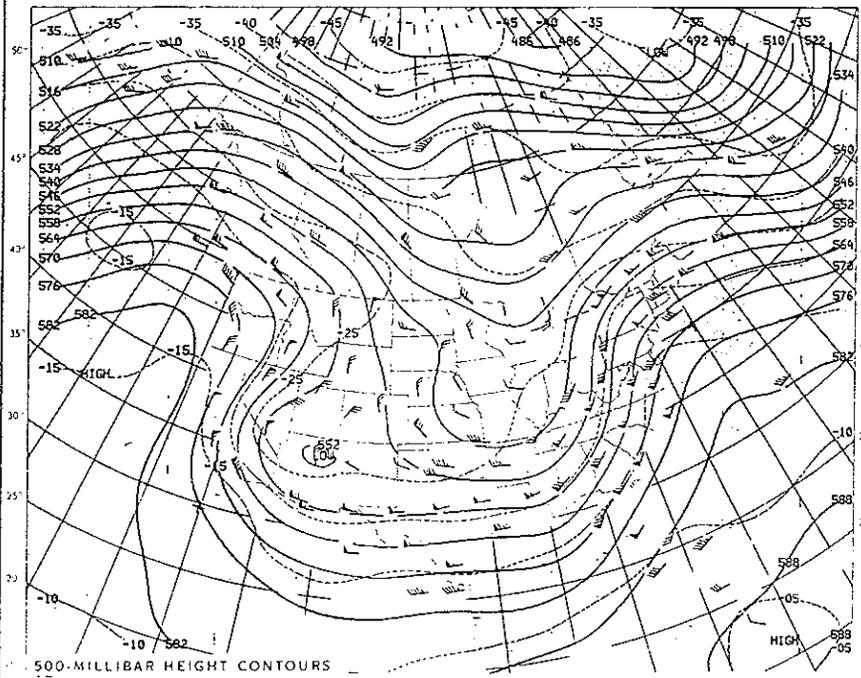
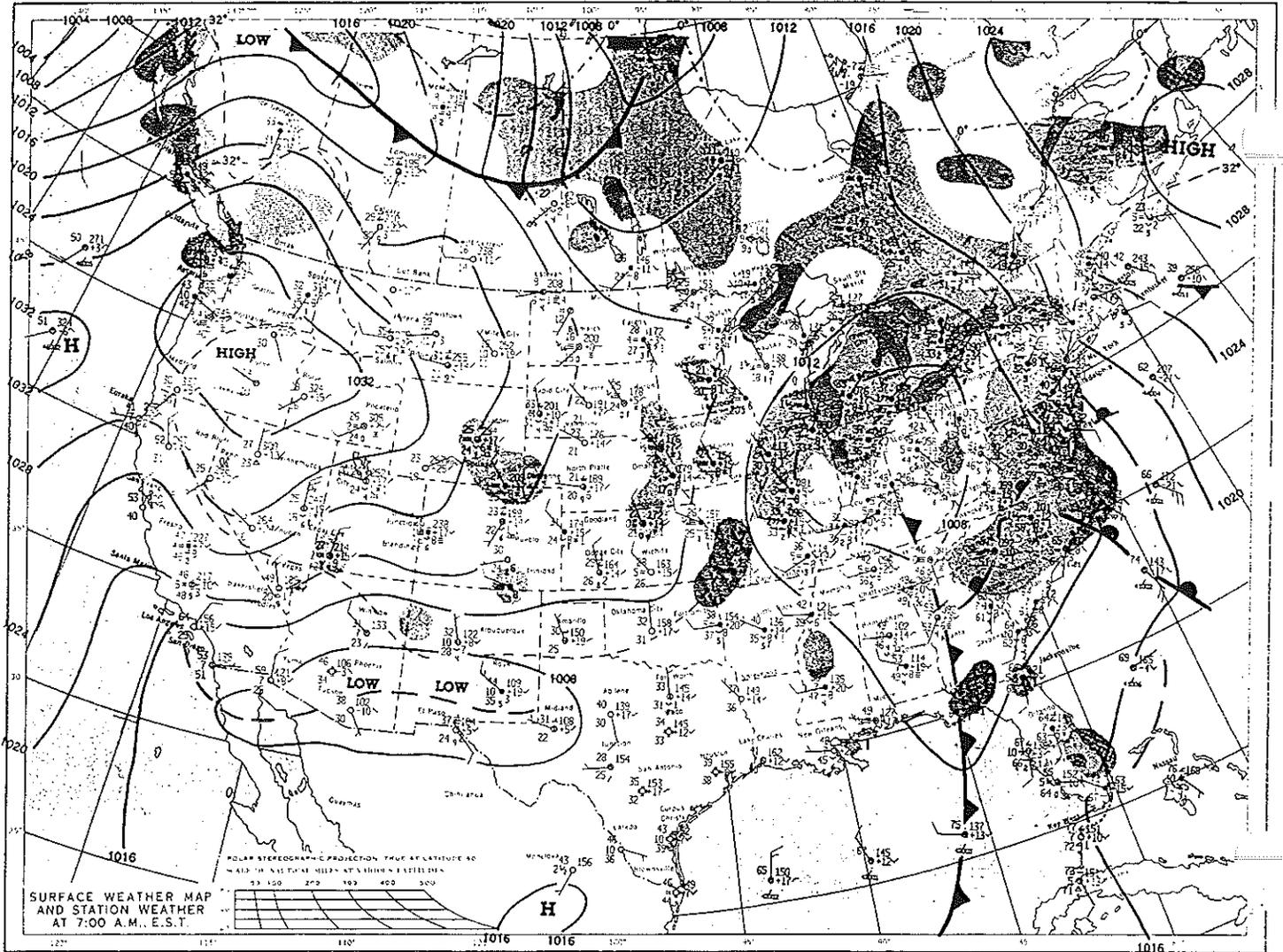


Fig. 1. Cold front, low level jet, SW flow aloft: 9 events.

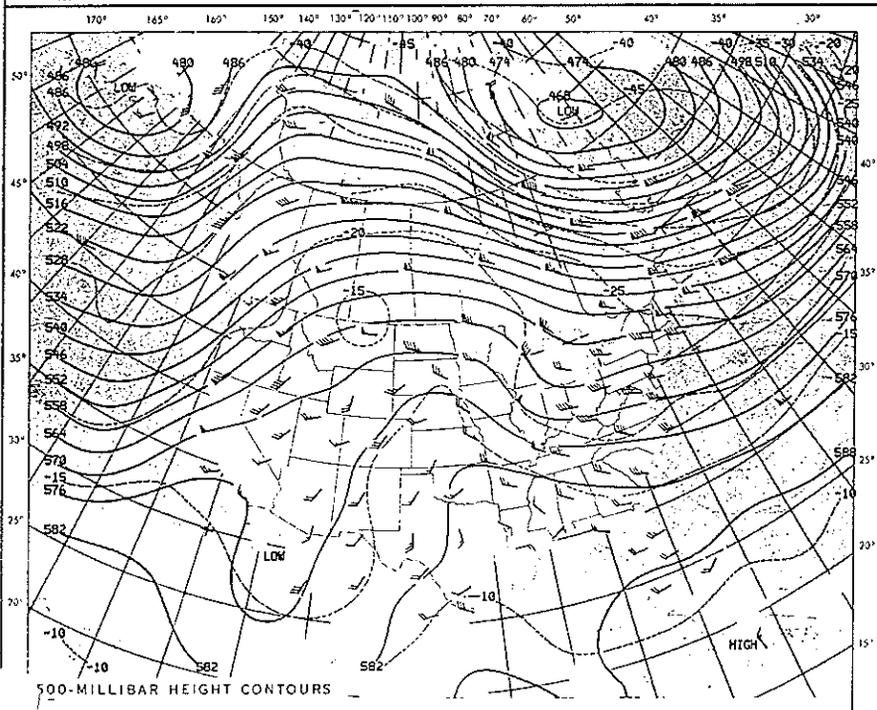
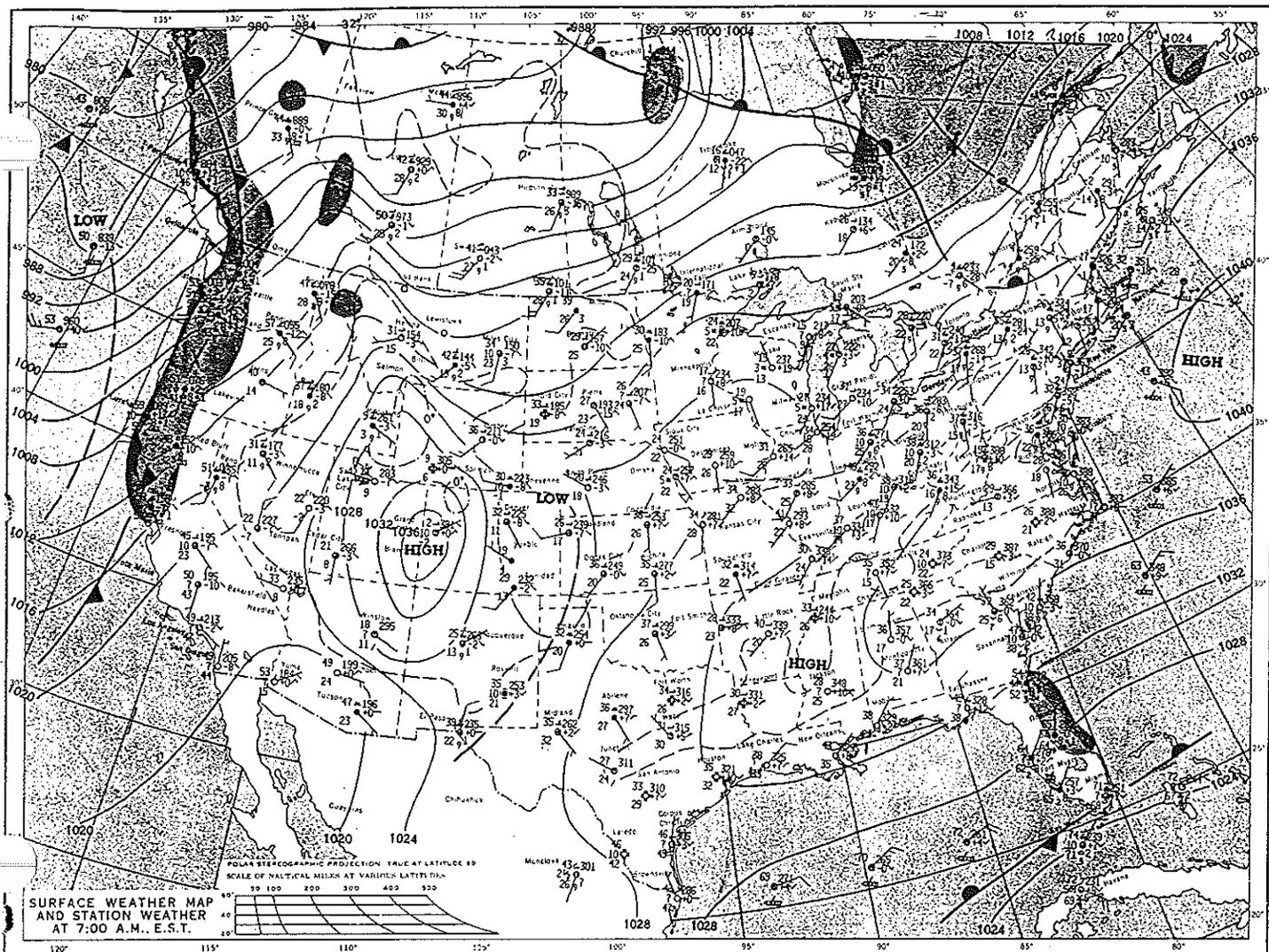


Fig. 2. Stationary front, SW flow aloft: 9 events.

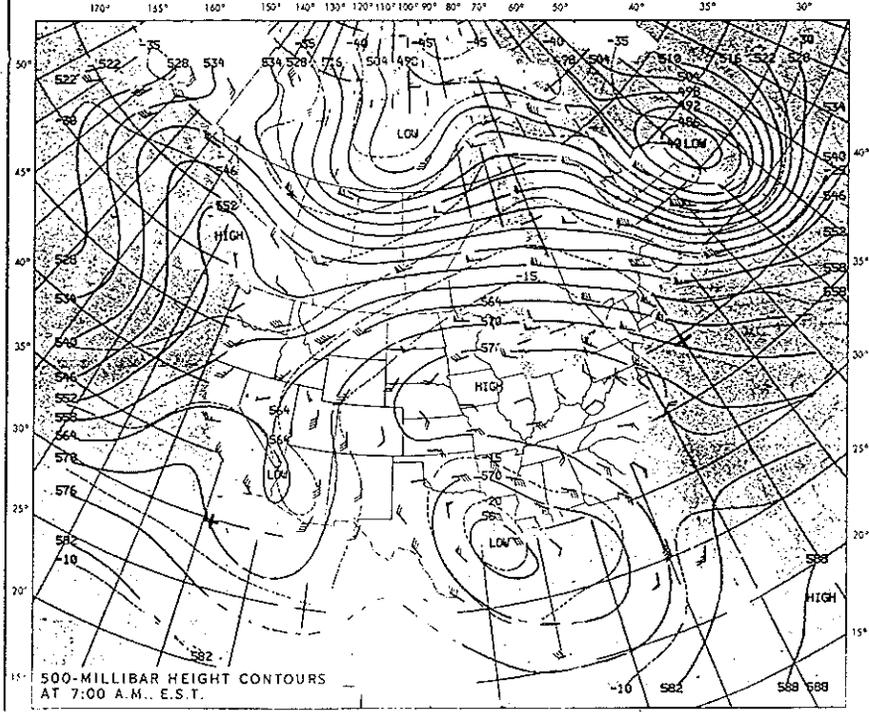
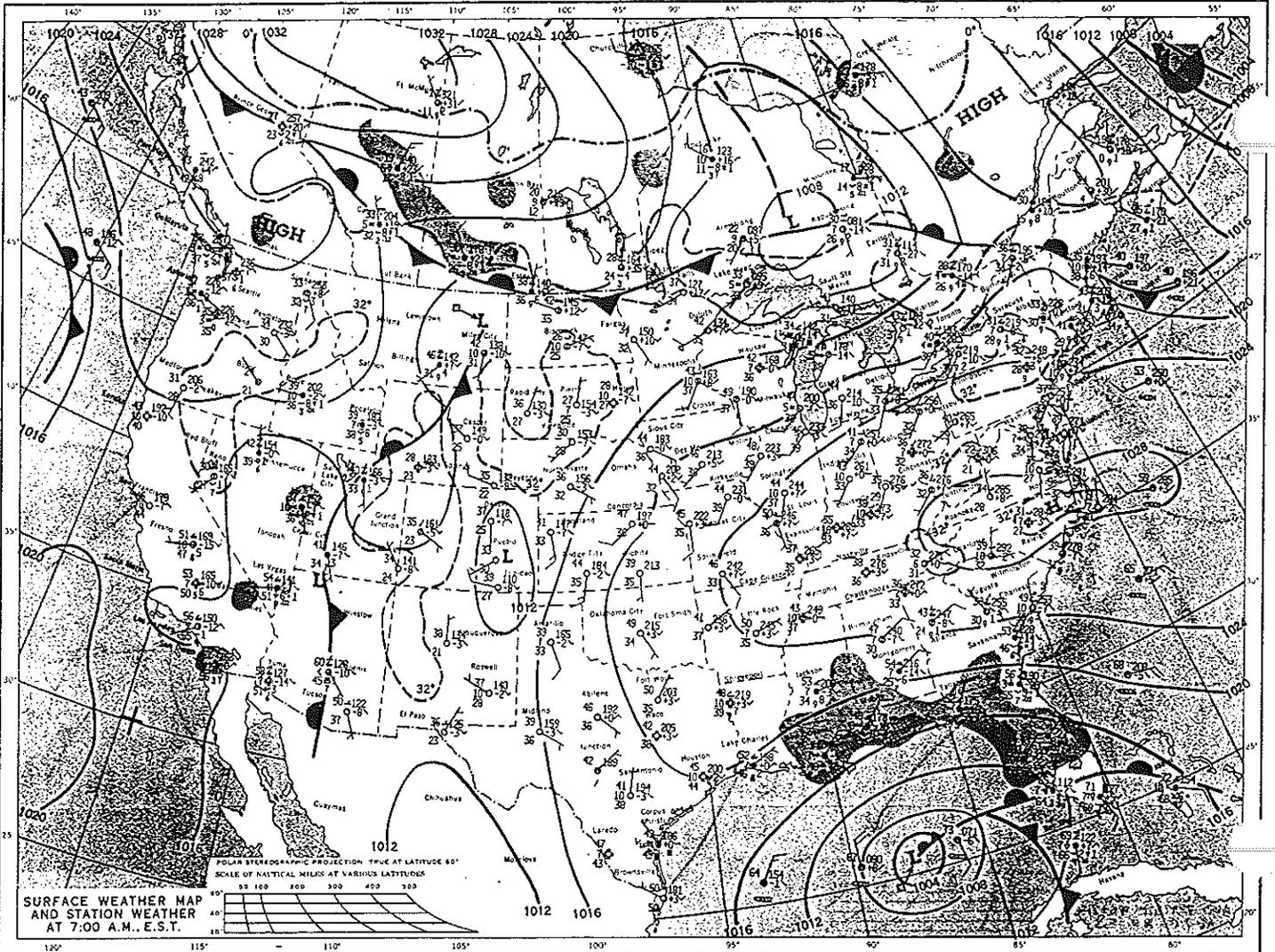


Fig. 3. Surface low, frontal system, SW flow aloft: 8 events.

WEDNESDAY, NOVEMBER 18, 1987

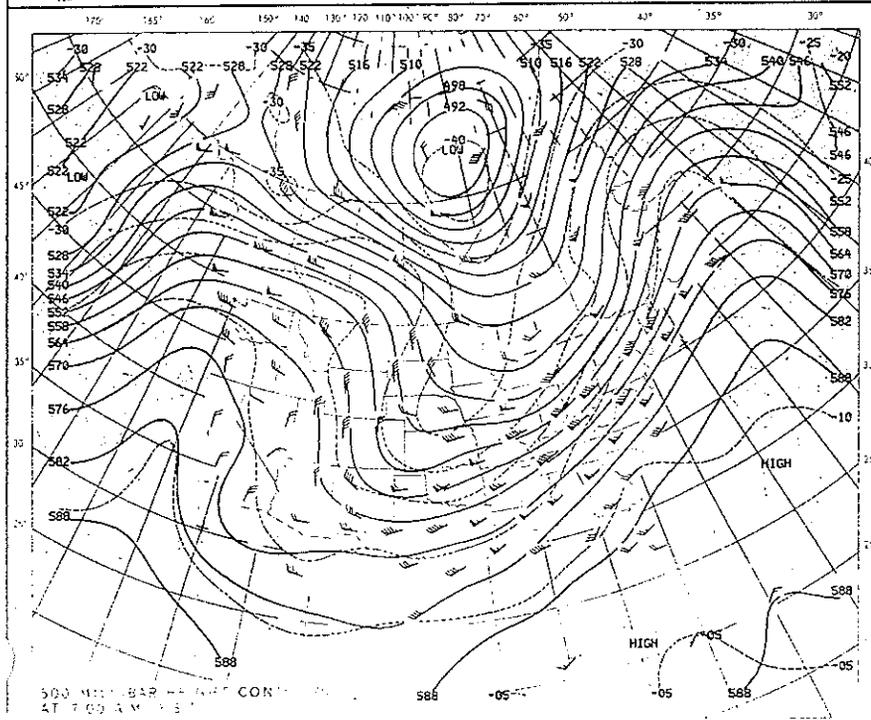
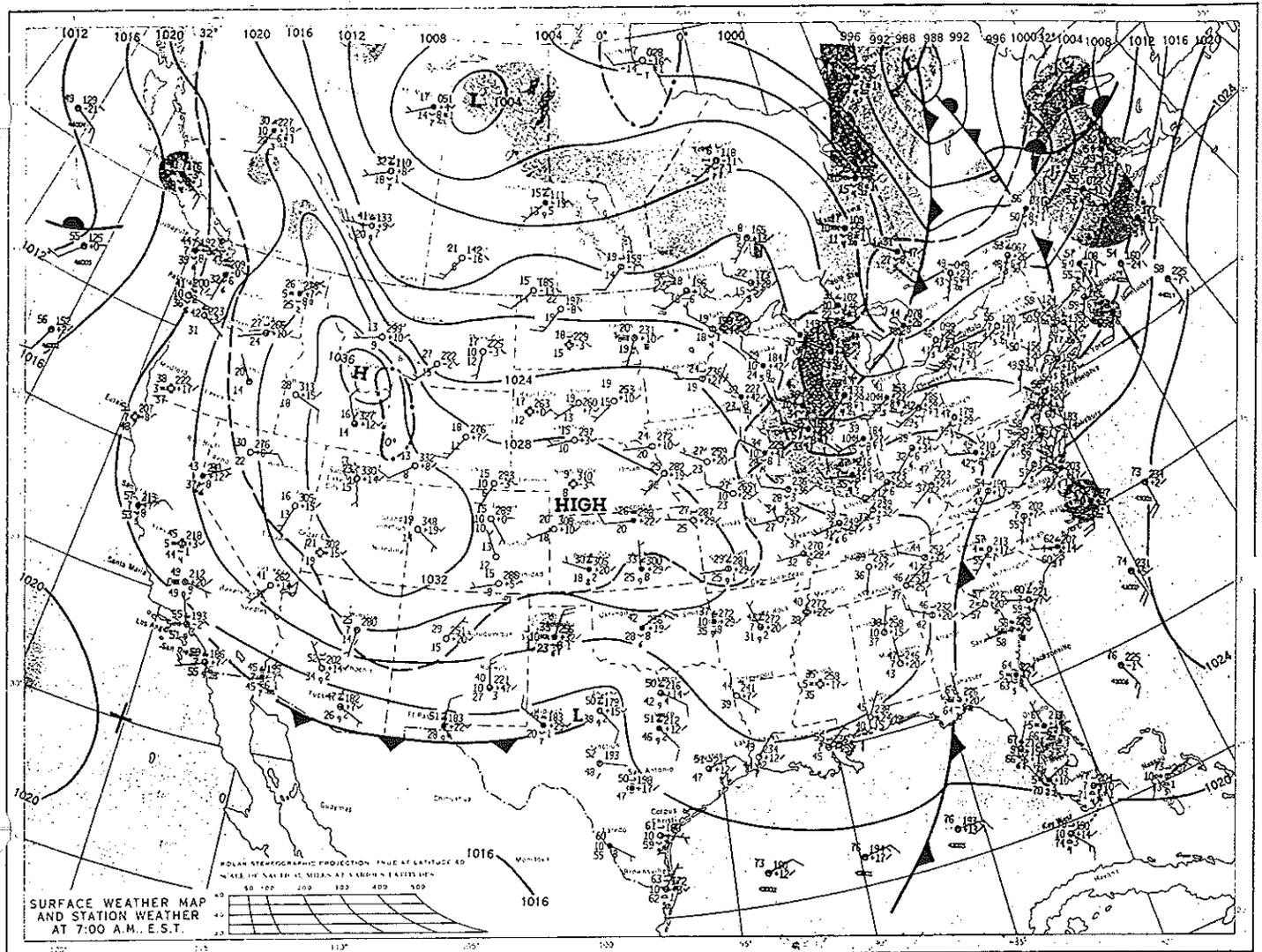


Fig. 4. Cold front, SW flow aloft: 6 events.

MONDAY, MARCH 30, 1987

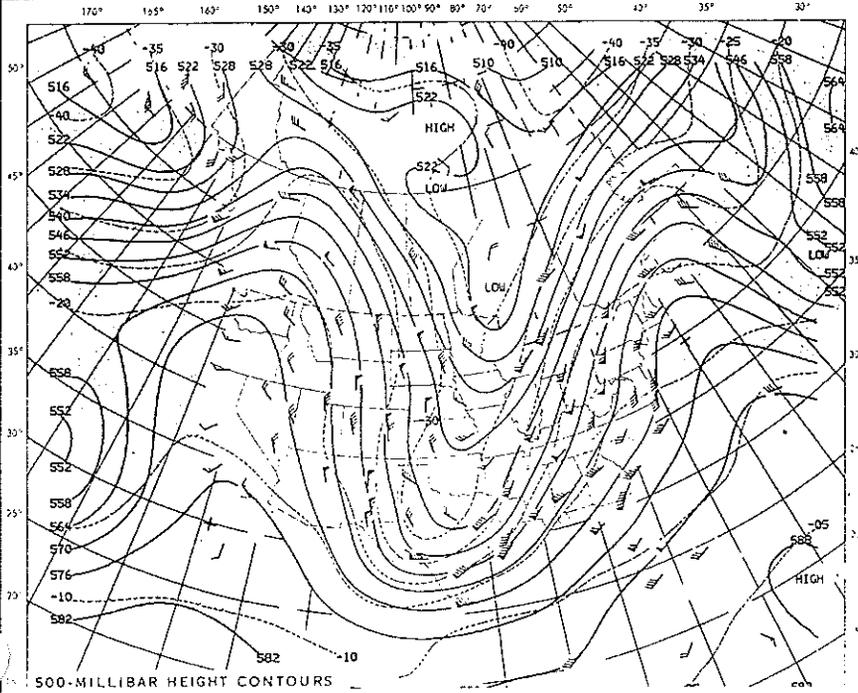
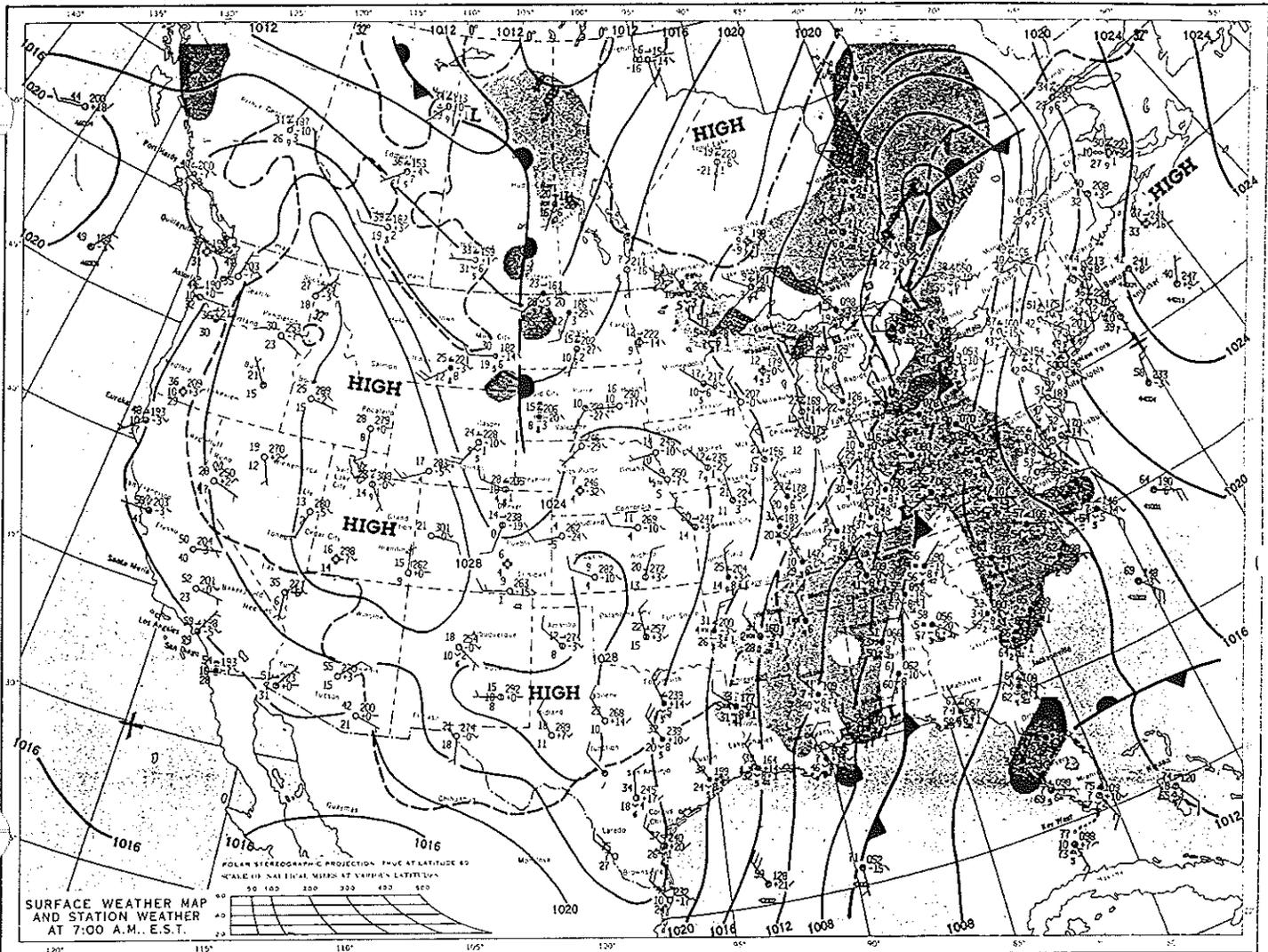


Fig. 6. Stationary front, low level jet, SW flow aloft: 4 events.

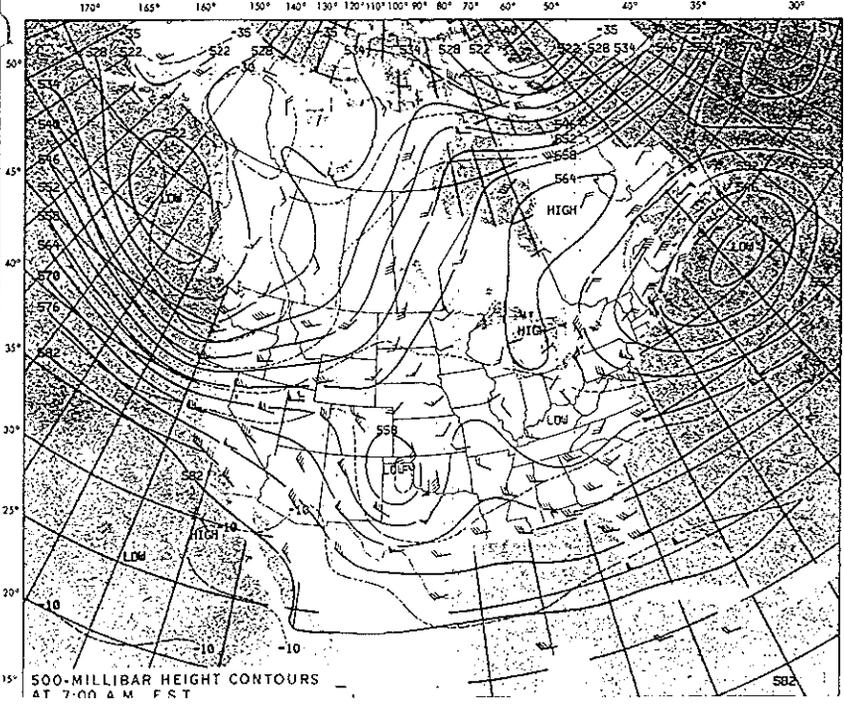
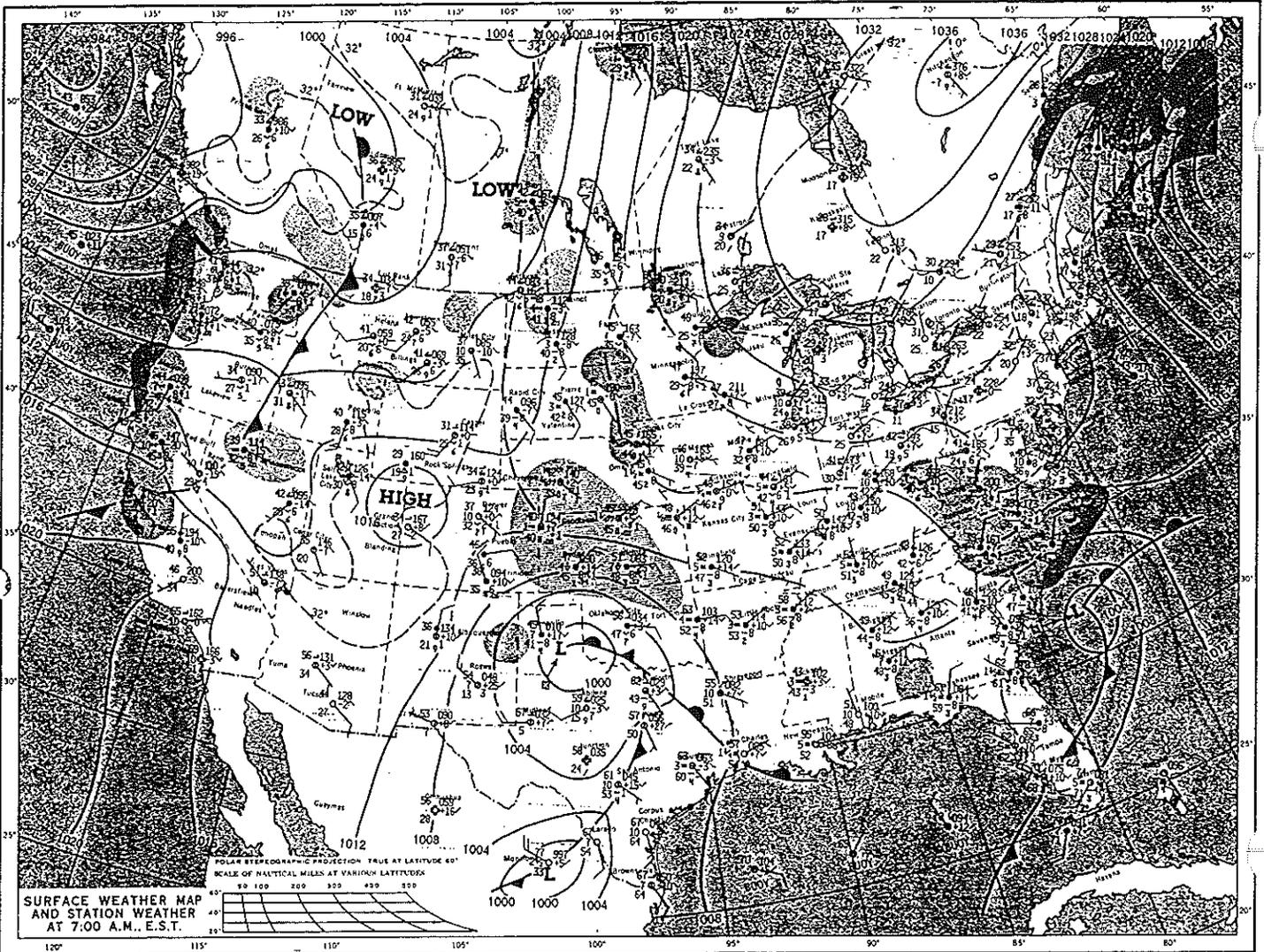
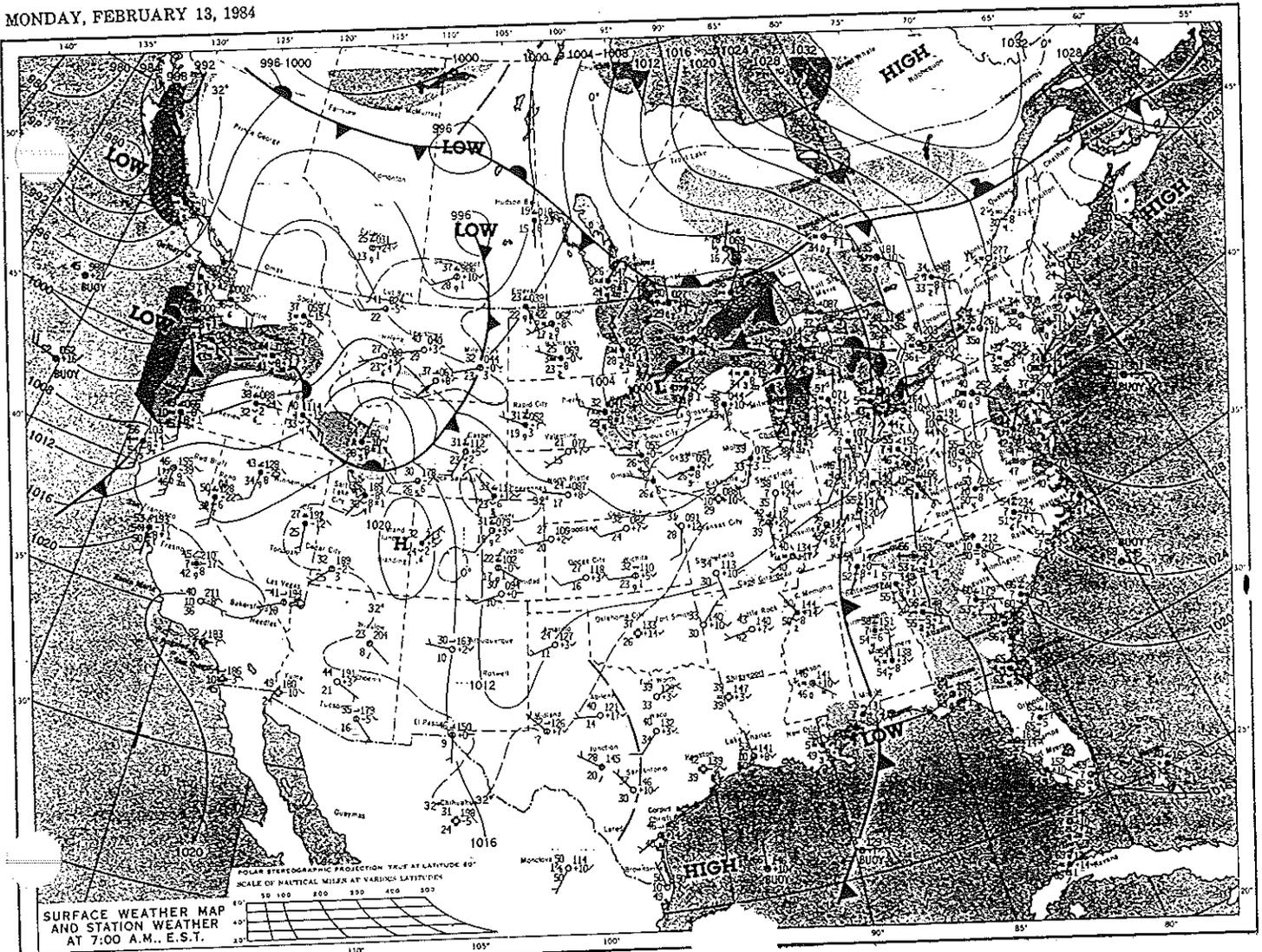


Fig. 7. Closed low, cold front, low level jet, SW flow aloft: 3 events.

MONDAY, FEBRUARY 13, 1984



SURFACE WEATHER MAP AND STATION WEATHER AT 7:00 A.M., E.S.T.

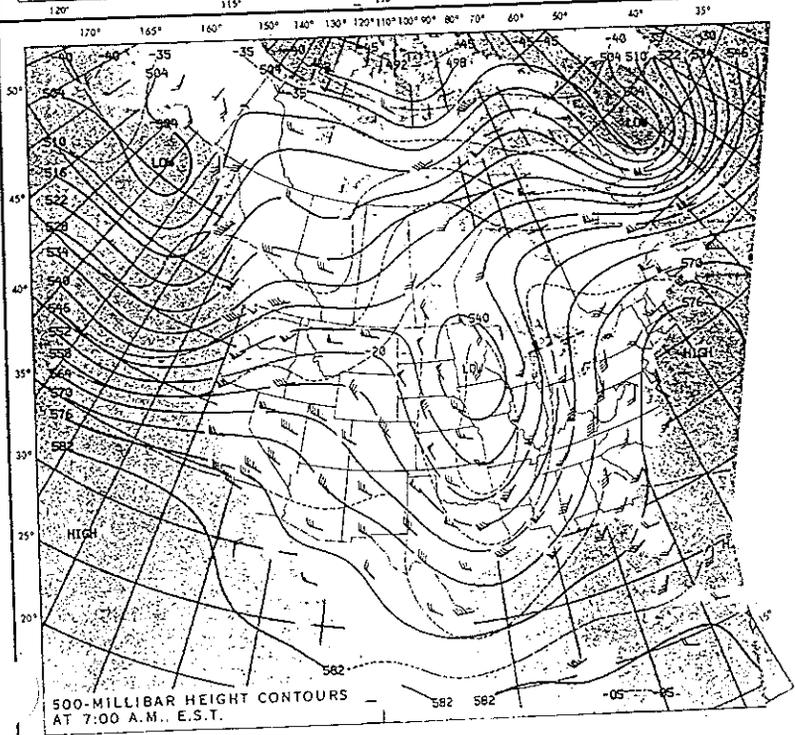


Fig. 8. Surface low, cold front, SW flow aloft: 2 events.

FRIDAY, NOVEMBER 1, 1985

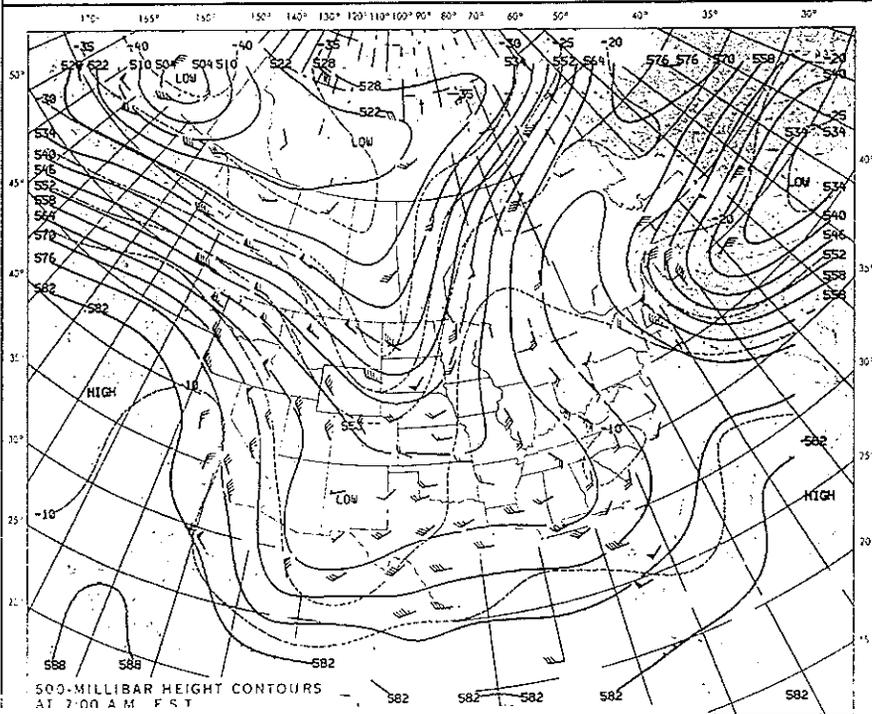
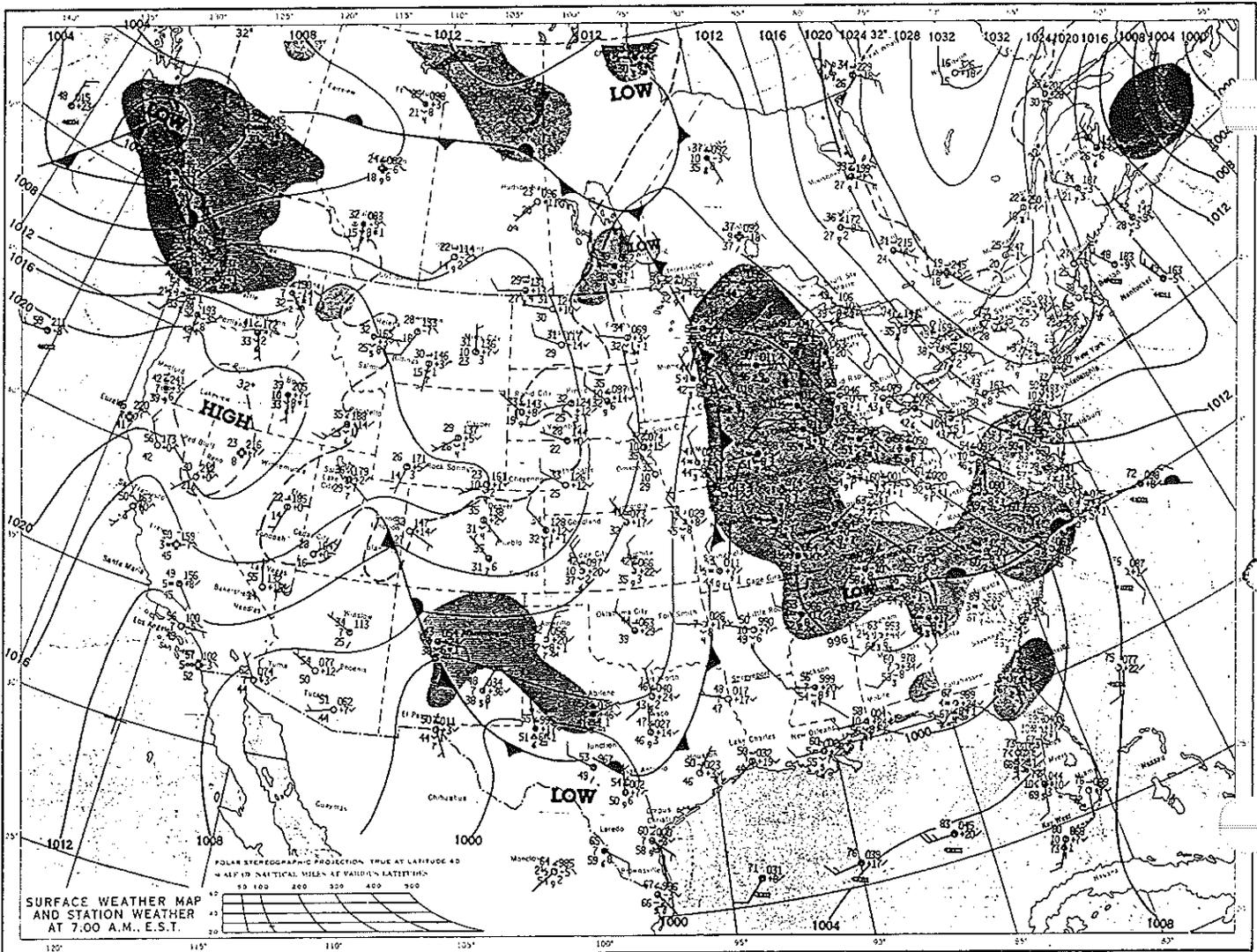


Fig. 9. Low level jet, deep SW flow: 2 events.

MONDAY, MARCH 18, 1991

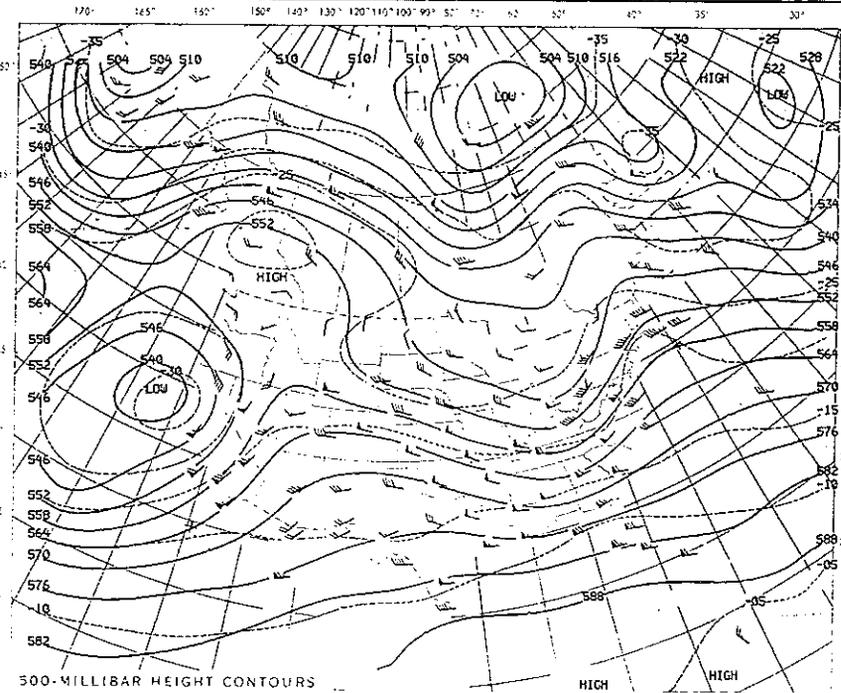
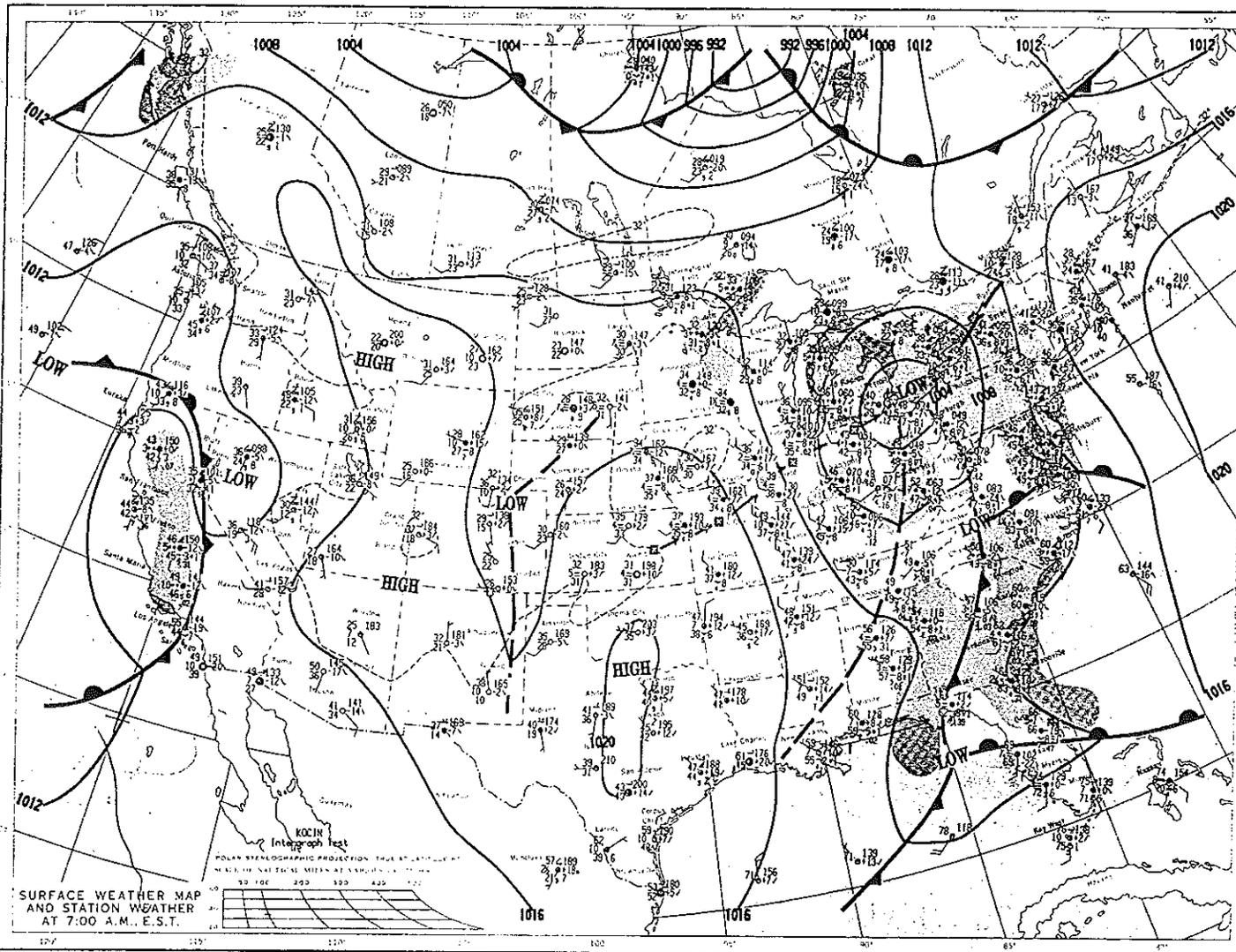


Fig. 10. Surface low, frontal system, low level jet: 1 event.

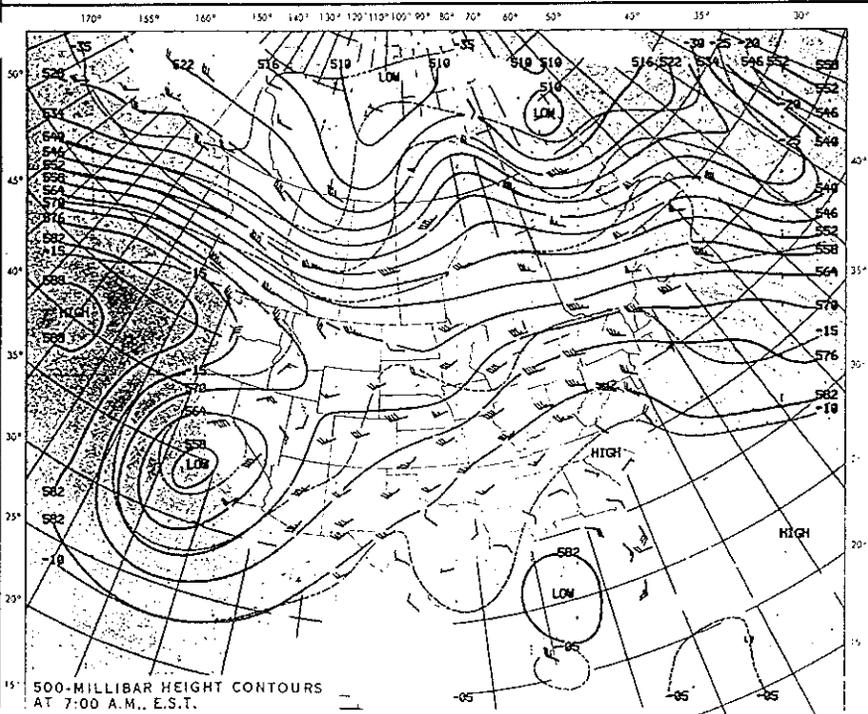
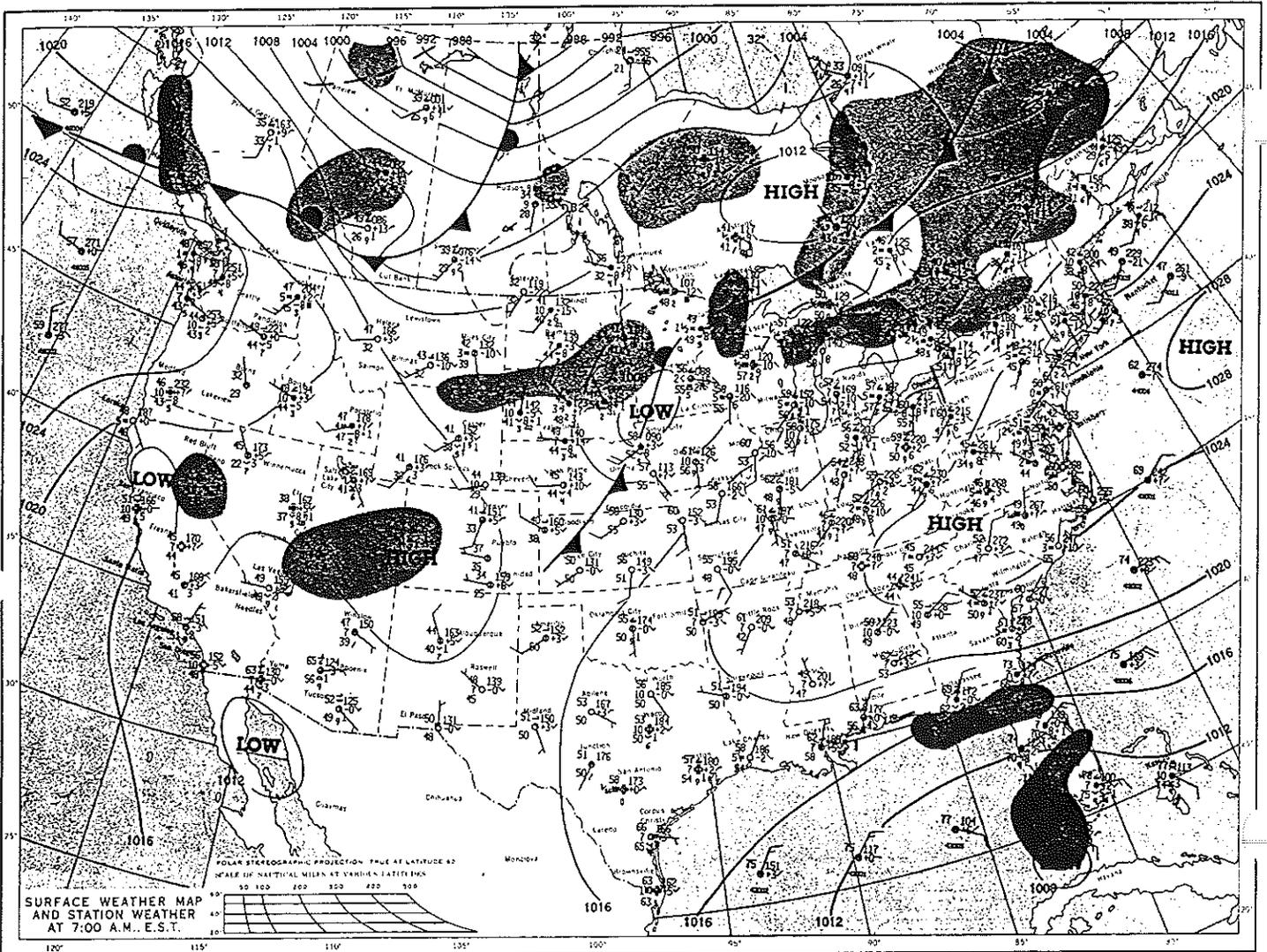


Fig. 11. Closed low, SW flow aloft: 1 event.

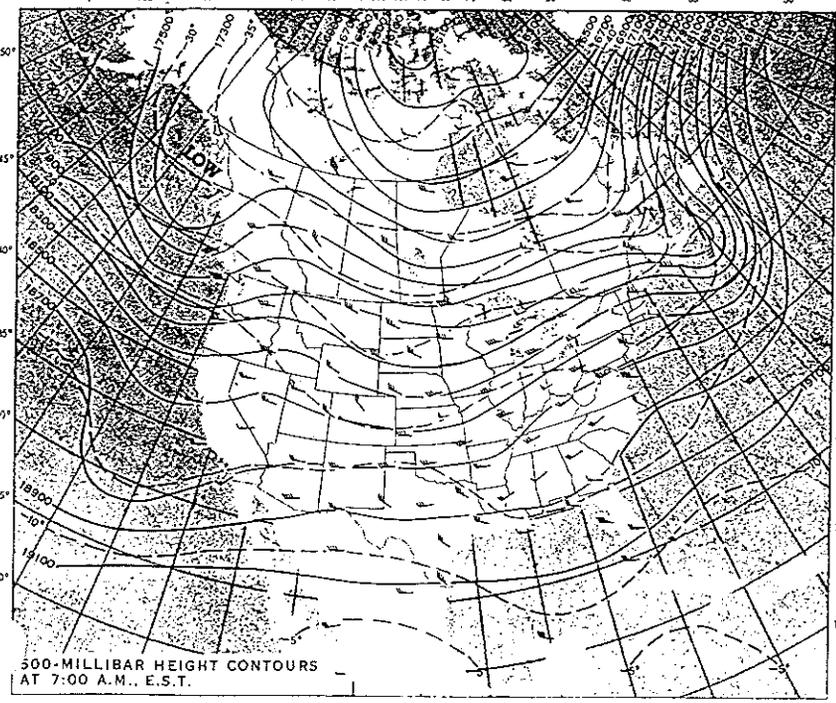
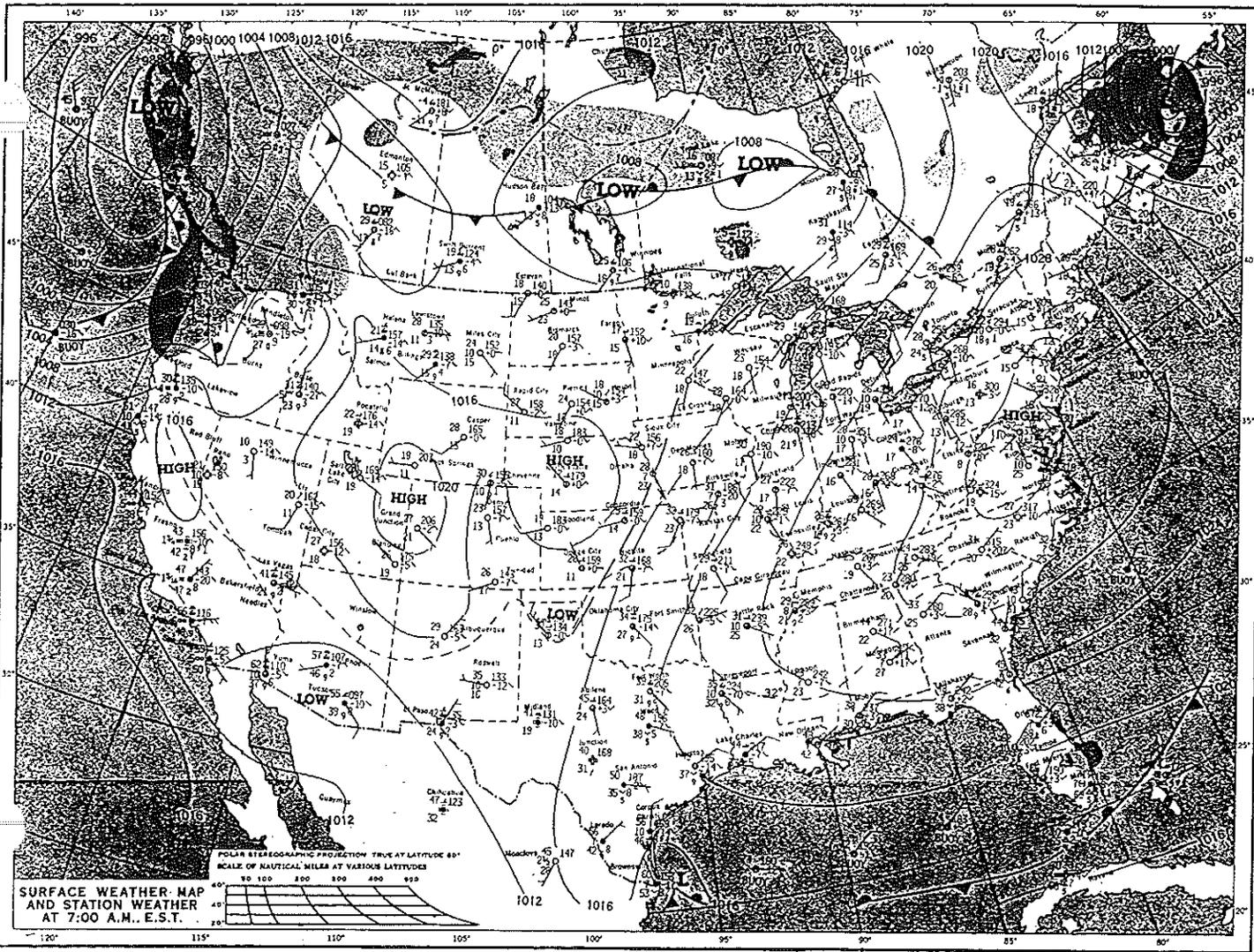


Fig. 12. Stationary front: 1 event.

APPENDIX

I. Cases

Following are details of the 62 cases, including the location of the heavy rainfall, heaviest rainfall amount (inches), and brief descriptions of the surface and 500 mb maps. The number of each event coincides with the location shown on the map following the descriptions.

1. Feb 22, 1975 Interior of central Florida—3.10
Surface: A stationary front was running from east to west across central Florida.
500 mb: High pressure was centered over eastern Cuba. A closed low was over the Arizona/New Mexico border. SW flow over the Florida peninsula.
2. Apr 11-12, 1975 Interior of north central Florida—3.51
Surface: A front moved slowly from north into south central Florida, with a closed low along the front in the northeast Gulf of Mexico.
500 mb: Nearly zonal WSW/W flow over the peninsula with a low level jet.
3. Apr 6, 1976 Daytona Beach—3.83
Surface: Nearly stationary front over central Florida with a closed low over the central Gulf of Mexico.
500 mb: A low amplitude trough over the central Gulf of Mexico with a WSW flow and low level jet over central Florida.
4. Dec 14, 1976 Daytona Beach—3.03
Surface: A stationary front ran from east to west across the southern tip of the Florida peninsula.
500 mb: A low amplitude trough was over the north central Gulf of Mexico causing a strong WSW flow.
5. Nov 24, 1977 Titusville—4.70
Surface: A poorly defined slow moving cold front ran from New York to Tennessee to Texas. Central Florida was in an E/SE flow.
500 mb: A trough ran from Louisiana to western Cuba. Florida in a SW/W flow.
6. Nov 29, 1977 Melbourne—4.43
Surface: Central Florida was in an E flow with a stationary front over central Mississippi, Alabama, and Georgia.
500 mb: A high amplitude trough ran from NE into New Mexico. Central Florida in a S/SSW flow.

7. Dec 9, 1977 West central Florida—3.88
Surface: A S/SSE flow over central Florida ahead of a fast moving cold front.
500 mb: Strong nearly zonal WSW flow.
8. Jan 20, 1978 Weeki Wachee—3.92
Surface: A fast moving NNE/SSW cold front was off the Florida Atlantic coast with a NW flow over the peninsula.
500 mb: A nearly zonal WSW flow with a low level jet max over north central Florida.
9. Mar 3, 1978 Ocala—3.14
Surface: An ENE/WSW cold front over the peninsula with a closed low over the NE Gulf of Mexico.
500 mb: A trough ran from Wisconsin to the western Gulf of Mexico. WSW flow over central Florida with a low level jet.
10. Jan 12, 1979 East central—4.70
Surface: An occluded system over the peninsula with a closed low over the north central Gulf of Mexico.
500 mb: A trough from Mississippi into the central Gulf of Mexico with a strong SW flow over central Florida.
11. Mar 6, 1979 Brooksville—3.62
Surface: A slow moving NNE/SSW cold front over the Florida peninsula.
500 mb: A trough ran from Michigan to Kentucky to Louisiana. A strong SW flow over central Florida.
12. Nov 2, 1979 Daytona Beach—3.66
Surface: A slow moving NNE/SSW cold front over central Florida.
500 mb: SW flow with a broad trough from Hudson Bay into the northern Gulf of Mexico.
13. Dec 7, 1979 Venice—3.12
Surface: A slow moving NE/SW cold front.
500 mb: A high amplitude trough ran from the central U.S. into northern Mexico. A SW flow with a low level jet over central Florida.
14. Jan 26, 1980 Ocala—3.28
Surface: A stationary front ran from New Orleans to near Cape Romano. Central Florida under a SSE flow.
500 mb: A high amplitude trough over the SW U.S. Central Florida in a SW flow with a low level jet.

15. Apr 5, 1980 Lisbon—4.08
Surface: A fast moving ENE/WSW cold front over south Florida. Central Florida in a N/NW flow.
500 mb: Strong W flow with a hint of cyclonic shear in the wind field.
16. Nov 15, 1980 NW central, coastal—3.55
Surface: T.S. Jeanne over the northwest Gulf of Mexico. Central Florida in a SE flow.
500 mb: A high amplitude trough over the SW U.S. A trough in the wind field over the west Florida panhandle. Strong SW flow over central Florida.
17. Feb 8, 1981 W central, interior central—3.74
Surface: A slow moving cold front was over north Florida. Central Florida under a S/SE flow.
500 mb: A trough extended from Wisconsin to Louisiana. Central Florida had a W flow with a low level jet.
18. Feb 19, 1981 Brooksville—4.48
Surface: E flow over central Florida with a trough over extreme S Florida.
500 mb: A broad trough over the SE U.S. A trough in the wind field along the Florida Gulf Coast. A W/WSW flow over central Florida.
19. Nov 5, 1981 Myakka River State Park—3.10
Surface: A tropical system was south of Cuba. Central Florida was in an E flow.
500 mb: A trough extended from Iowa to Louisiana into the northern Gulf of Mexico. A SW flow over central Florida.
20. Dec 27-28, 1981 North central—4.39
Surface: A stationary front was over north drifting into north central Florida. Central Florida in a S flow.
500 mb: Strong WSW/SW flow.
21. Feb 16, 1982 NW central—6.00
Surface: A warm front extended from a low in East Texas into Arkansas, to north Alabama to north Georgia. A cold front extended from the low south along the Texas Gulf Coast. A squall line was in west Mississippi ahead of the cold front.
500 mb: A high amplitude trough ran from Minnesota into Texas. Central Florida in a SW flow.

22. Mar 6, 1982 Inverness/Vero Beach—4.15
Surface: A closed low was over southeast Georgia. A stationary front ran from South Carolina to Georgia into the Florida panhandle.
500 mb: A trough extended from Iowa to New Mexico. Central Florida in a strong SW flow.
23. Mar 29, 1982 S central—4.20
Surface: A stationary front was off the southern tip of the Florida peninsula. A trough was along the Atlantic coast from North Carolina into north central Florida.
500 mb: A high amplitude trough was over the Southwest U.S. A trough extended from east Kentucky to northwest Florida. Central Florida in a strong W flow.
24. Apr 8-10, 1982 N central, interior and east—11.72
Surface: A nearly stationary front over the peninsula.
500 mb: Nearly zonal W or WSW flow with a low level jet.
25. Nov 4, 1982 Vero Beach—4.98
Surface: A closed low was over South Carolina. A cold front trailed from the low to northwest Florida and into the eastern Gulf of Mexico. A squall line was ahead of the front.
500 mb: A closed low was over Wisconsin. A trough extended from the low into East Texas. A ridge was over the North Atlantic. Central Florida was in a SSW flow.
26. Nov 16, 1982 Fort Pierce—3.19
Surface: A stationary front was off the south tip of the Florida peninsula. High pressure centered over Maryland. Central Florida in an ENE flow.
500 mb: Nearly zonal WNW flow.
27. Feb 2, 1983 W central—3.62
Surface: A closed low was over southern Indiana. A cold front extended from this low to a Jacksonville-Ft. Myers line.
500 mb: A closed low was near St. Louis. A trough extended from the low into the central Gulf of Mexico. Central Florida was in a SW flow with a low level jet max over northwest Florida.

28. Mar 8, 1983 Venice—3.42
Surface: A closed low was over Lake Michigan, and a cold front trailed from this low to the Florida panhandle then into the western Gulf of Mexico. A trough was over the peninsula from Melbourne to Ft. Myers. High pressure was over SE Florida and the Bahamas, and central Florida was in a S to SE flow.
500 mb: A trough extended from Minnesota into central Alabama and Georgia. Central Florida was in a W to SW flow with low level jet.
29. Apr 23, 1983 N central—4.50
Surface: Closed lows over Mississippi and the Florida panhandle were connected by an occluded front. A warm front extended from the panhandle into north Florida, Georgia, and the South Carolina coast. A cold front ran from near Panama City into the central Gulf. Central Florida in a S to SE flow.
500 mb: A low was over southern Arkansas. Central Florida had a WSW flow with a low level jet max.
30. Dec 11-12, 1983 Daytona Beach and Sanford—3.65
Surface: A closed low was over Northeast Georgia. A cold front extended from north Georgia to Savannah to Daytona Beach to Sarasota into the southwest Gulf of Mexico. A squall line was over southeast Florida ahead of the front.
500 mb: A high amplitude trough extended from Indiana to north Florida into the south central Gulf of Mexico. Central Florida in a SW flow with a low level jet max.
31. Dec 15, 1983 Myakka River State Park—3.34
Surface: A slow moving cold front extended from near Vero Beach to near Fort Myers.
500 mb: A broad trough extended from the lower Mississippi Valley into the central Gulf of Mexico. Central Florida in a SW flow with a low level jet.
32. Dec 17, 1983 Bartow—3.33
Surface: A stationary front was across central Florida.
500 mb: A trough in the wind field over the east Gulf of Mexico. SW flow over central Florida.

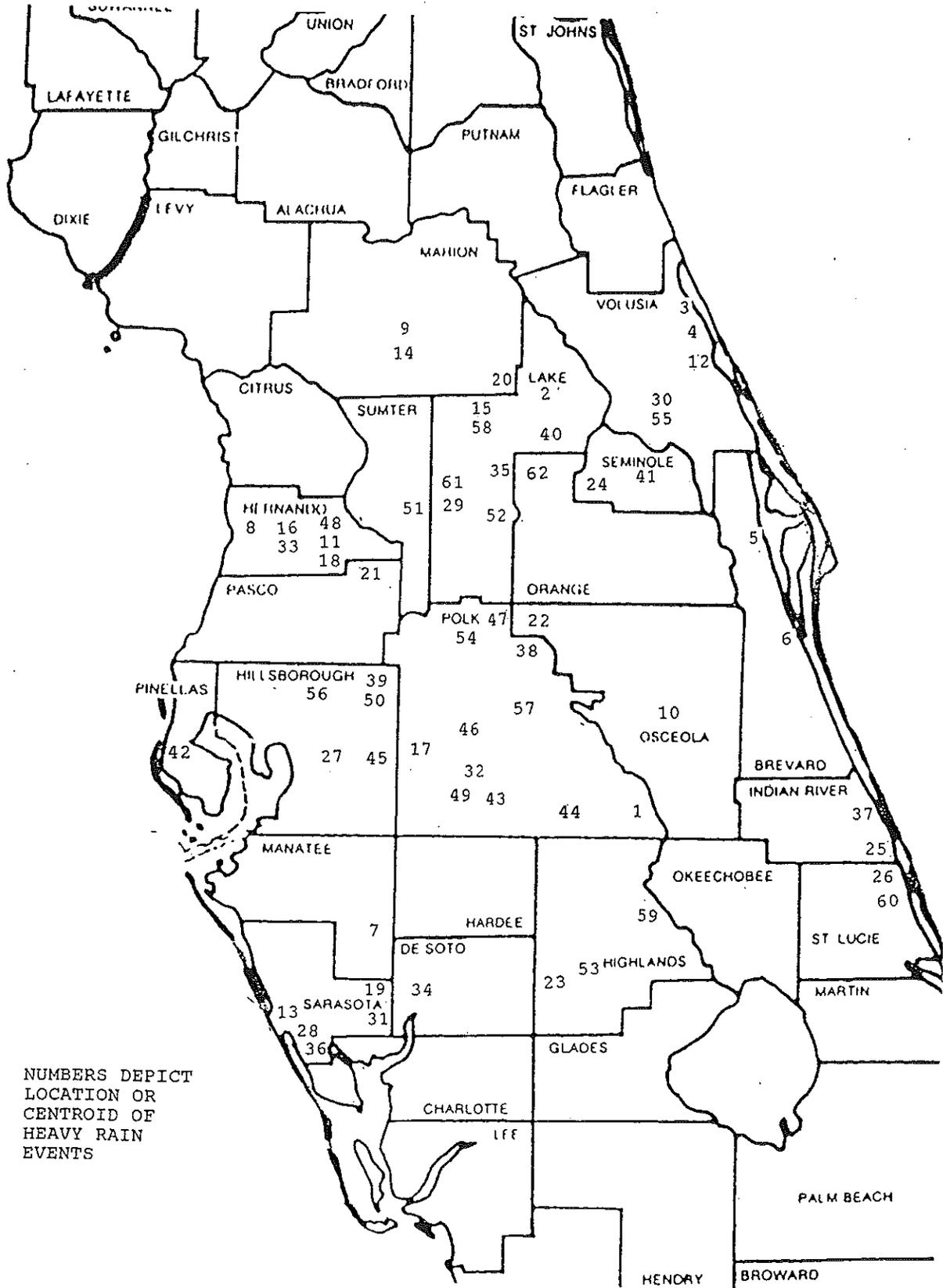
33. Feb 13-14, 1984 NW central—3.85
Surface: A N/S oriented cold front moves from the central Gulf of Mexico to the Atlantic coastal waters. A low develops in North Carolina.
500 mb: A trough extends into East Texas from a low in Minnesota. Trough moves to a Lake Superior to Georgia line with some negative tilt. Central Florida in a W flow.
34. Mar 13, 1984 S central and SW central—4.68
Surface: A trough extended from the central Gulf of Mexico into central Florida.
500 mb: Nearly zonal with a strong WSW flow.
35. Apr 3-4, 1984 N central—4.00
Surface: A closed low was over the central Gulf of Mexico with a N/S oriented cold front. A warm front extended from the low into central Florida.
500 mb: A strong SW flow over central Florida with a low level jet into north Florida.
36. Apr 10, 1984 Venice—3.35
Surface: A closed low near South Carolina trailed a cold front across south central Florida into the southeast Gulf of Mexico.
500 mb: Nearly zonal W flow over central Florida with a low level jet max over south Florida.
37. Nov 21-22, 1984 E central—4.33 in
Surface: A stationary front over the Florida Straits developed a low on 11/22. East coast of Florida in a NE to NNE flow.
500 mb: A trough from west Kentucky into East Texas moved to a North Carolina to Florida panhandle to central Gulf of Mexico position by 11/22. A SW flow over central Florida strengthened with a low level jet max over west central Florida on 11/22.
38. Mar 21-22, 1985 N central interior—4.06
Surface: Closed low and a frontal system tracked across the eastern Gulf of Mexico, Florida and the southeast U.S.
500 mb: A low moved from East Texas into western Kentucky. A SW flow over central Florida became WSW on 3/22. Low level jet max over central Florida through the period.

39. Nov 1, 1985 Hillsborough River S.P.—3.80
Surface: A warm front extended from Tennessee into North Carolina. Central Florida in a SSW flow.
500 mb: A trough extended from near Kansas City to southeast Alabaa to south Florida. A WSW to SW flow with a low level jet max over south Florida.
40. Jan 9-10, 1986 N central, interior and east—4.90
Surface: An E/W oriented stationary front was across the Florida Straits, trailing into a low in the central Gulf of Mexico. Central Florida in a NE flow.
500 mb: Strong WSW flow.
41. Jan 12, 1986 Sanford—3.12 in
Surface: High pressure was centered over the Texas coast. Central Florida in a N flow.
500 mb: A low was centered over the north central Gulf of Mexico, and a trough trailed to near Brownsville. Central Florida in a strong SW flow.
42. Mar 15, 1986 St. Petersburg—3.00
Surface: An E/W oriented stationary front was over north Florida.
500 mb: A broad trough in the wind field was over Louisiana and the central Gulf of Mexico. Central Florida was in a SW flow with a low level jet.
43. Dec 24, 1986 Interior central—3.96
Surface: A cold front extended from Atlanta to St. Petersburg into the southeast Gulf of Mexico. A squall line ran from Melbourne to Pensacola.
500 mb: A low was centered over west Tennessee with a negatively tilted trough running into the eastern Gulf of Mexico. Central Florida in a SW flow with a low level jet.
44. Mar 6-7, 1987 Central Florida—3.75
Surface: High pressure centered over the Mid Atlantic states on 3/6 put central Florida in an E flow. A closed low developed over the south central Gulf of Mexico on 3/7 with a warm front into south Florida.
500 mb: A low was over north Mississippi with a trough into the west Gulf of Mexico, central Florida in a SW/WSW flow on 3/6. Low deepens on 3/7, strong S flow develops.

45. Mar 26-27, 1987 Central interior and west—4.25
Surface: 3/26-A stationary front ran from North Carolina to near Tallahassee into the central Gulf of Mexico. Florida in a SSE flow. 3/27-Lows develop on the front N of Mobile. A squall line extended from near Ft. Myers into the eastern Gulf of Mexico.
500 mb: 3/26-A trough was over the Southwest U.S. and high pressure was centered south of Cuba. A WSW to WNW flow over central Florida with a low level jet. 3/27-The trough moves into West Texas. Flow over central Florida becomes W and weakens.
46. Mar 29-30, 1987 Central interior and west—5.40
Surface: An E/W oriented stationary front was over central Florida. A NNE/SSW oriented cold front moved into the panhandle on 3/30.
500 mb: A trough was over the Southwest U.S. and flow over central Florida was WSW. The trough increased in amplitude on 3/30, flow over central Florida became SW with a low level jet max.
47. Nov 3-4, 1987 Interior central—5.68
Surface: A closed low near Key West moved to a point offshore from FMY on 11/4. ENE flow became ESE on 11/4.
500 mb: Low over the central Gulf of Mexico weakened and moved into the East Gulf. A SSE flow became SSW by 11/4.
48. Nov 10, 1987 Brooksville—5.77
Surface: A closed low was over South Carolina, with a cold front trailing to Tallahassee then into the east Gulf of Mexico.
500 mb: A trough extended from Michigan to west Kentucky to East Texas. A SW flow over central Florida with a low level jet.
49. Nov 18, 1987 Interior central—3.60 in
Surface: A slow moving cold front extended from Maryland to Tallahassee to the east Gulf of Mexico.
500 mb: A trough extended from west Kansas into South Carolina. Central Florida was in a WSW flow.
50. Jan 10, 1988 Hillsborough River S.P.—3.80
Surface: An ENE/WSW oriented stationary front was over the Keys and Florida Straits, central Florida in a N flow.
500 mb: A trough extended from west New York into South Texas, central Florida in a strong W/WSW flow.

51. Jan 25, 1988 N central, W and interior—3.18
Surface: A closed low was over the Florida panhandle, with a frontal system extending into the peninsula and east Gulf of Mexico.
500 mb: A high amplitude trough extended from Minnesota into the west Gulf of Mexico. Central Florida had a SW flow with a low level jet.
52. Mar 13, 1988 Clermont—3.30 in
Surface: A NE/SW cold front extended from west North Carolina to east Florida panhandle to the central Gulf of Mexico. An E/W oriented trough was over central Florida.
500 mb: Nearly zonal W flow over central Florida with a low level jet.
53. Nov 4, 1988 Archbold—3.00
Surface: A closed low was over the Apalachee Bay, trailing a warm front into north central Florida, a cold front into the east Gulf of Mexico. An ENE/WSW oriented squall line was over the Southeast Gulf.
500 mb: A trough extended from the Dakotas into the central Gulf of Mexico. Central Florida was under a strong SW flow.
54. Nov 22-23, 1988 Central Florida—9.27
 Tropical Storm Keith crossed central Florida from the east Gulf of Mexico to the Atlantic.
55. Jan 22, 1989 N central, E and interior—5.67
Surface: Low pressure centers east of Cape Canaveral, over southwest Florida, and over the central Gulf were connected by a series of fronts and troughs over the south Florida peninsula and coastal waters.
500 mb: Low pressure center south of Apalachicola, central Florida in a strong SSW flow.
56. Feb 23, 1990 W central—3.51
Surface: A cold front ran from northeast Ohio into the central Gulf of Mexico. A NE/SW oriented trough was over central Florida.
500 mb: A high amplitude trough ran from Chicago to the west Gulf of Mexico. Central Florida in a SW flow with a low level jet.

57. Mar 30, 1990 Lake Alfred—3.05
Surface: A stationary front and trough system were over N Florida and the panhandle. Central Florida was in a SE flow.
500 mb: A negatively tilted trough ran from Louisiana into the south central Gulf. Central Florida was in a WSW flow.
58. Jan 1, 1991 Lisbon—3.43
Surface: An ENE/WSW oriented stationary front was across Central Florida.
500 mb: A weak trough ran from south Florida into east Cuba. Central Florida was in a WSW/SW flow.
59. Jan 16, 1991 S central interior—3.98
Surface: A cold front ran from Cincinnati to Tallahassee into the east Gulf of Mexico. There was a S flow over the peninsula.
500 mb: A broad trough was over the central U.S. Central Florida had a SW flow with a weak trough in the wind field and a low level jet.
60. Feb 2-3, 1991 SE central coast—3.10
Surface: An ENE/WSW oriented stationary front was over south Florida and the Keys. A NE flow over central Florida became ENE on 2/3.
500 mb: A trough was over the Southwest U.S. with a ridge over the SE. The WSW flow became WNW on 2/3.
61. Mar 18-19, 1991 N central—3.63
Surface: A closed low was over the Northeast Gulf. A warm front extended from the low across central Florida, and a cold front extended into North Carolina.
500 mb: Nearly zonal WNW flow over central Florida with a low level jet max.
62. Apr 23-24, 1991 N central interior—3.75
Surface: A stationary front ran through north Florida and the panhandle, with a low near Panama City. Central Florida was in a S/SW flow.
500 mb: There was a strong, nearly zonal W flow over central Florida with a trough in the wind field.



II. Significant Synoptic Features

"X" in a column in this table represents presence of a significant synoptic feature. A notation of "40+" in the low level jet column indicates 500 mb wind between 40 and 50 kt.

	Surface Low	Low Level Jet	Frontal System	Cold Front	Southwest Flow
Feb 22, 1975			x		x
Apr 11, 1975	x	x		x	x
Apr 6, 1976	x	x	x		x
Dec 14, 1976		40+	x		x
Nov 24, 1977				x	x
Nov 29, 1977					x
Dec 9, 1977		40+		x	x
Jan 20, 1978		x			x
Mar 3, 1978	x	x		x	x
Jan 12, 1979	x	40+	x		x
Mar 6, 1979		40+		x	x
Nov 2, 1979				x	x
Dec 7, 1979		x		x	x
Jan 26, 1980		x	x		x
Apr 5, 1980		40+		x	x
Nov 15, 1980		40+			x
Feb 8, 1981		x		x	x
Feb 19, 1981					x
Nov 5, 1981					x
Dec 27, 1981		40+	x		x
Feb 16, 1982					x
Mar 6, 1982	x	40+	x		x
Mar 29, 1982		40+	x		x
Apr 8, 1982		x	x		x
Nov 4, 1982	x			x	x
Nov 16, 1982			x		
Feb 2, 1983		x		x	x
Mar 8, 1983		x		x	x

	Surface Low	Low Level Jet	Frontal System	Cold Front	Southwest Flow
April 23, 1983	x	x	x		x
Dec 11, 1983	x	x	x		x
Dec 15, 1983		x		x	x
Dec 17, 1983			x		x
Feb 13, 1984	x			x	x
Mar 13, 1984		40+			x
Apr 3, 1984	x	x	x		x
Apr 10, 1984	x	x		x	x
Nov 21, 1984	x	x	x		x
Mar 21, 1985	x	x	x		x
Nov 1, 1985		x			x
Jan 9, 1986	x		x		x
Jan 12, 1986		40+			x
Mar 15, 1986		x	x		x
Dec 24, 1986		x		x	x
Mar 6, 1987	x		x		x
Mar 26, 1987	x	x	x		x
Mar 29, 1987		x	x		x
Nov 3, 1987	x				x
Nov 10, 1987	x	x	x		x
Nov 18, 1987				x	x
Jan 10, 1988		40+	x		x
Jan 25, 1988	x	x	x		x
Mar 13, 1988		x		x	x
Nov 4, 1988	x	40+	x		x
Nov 22, 1988	Tropical Storm Keith				
Jan 22, 1989	x	40+	x		x
Feb 23, 1990		x		x	x
Mar 30, 1990			x		x
Jan 1, 1991			x		x
Jan 16, 1991		x		x	x
Feb 2, 1991			x		x
Mar 18, 1991	x	x	x		
Apr 23, 1991	x	40+	x		x

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