ANNUAL SUMMARY

Air Stagnation Cases in the Eastern United States during 1984

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ABSTRACT

The number and location of stagnation days within the eastern United States, as estimated mainly from a surface geostrophic-wind criterion, is presented by month and for the year 1984. The number of "grid point days" of stagnation was considerably less in 1984 than in 1981 and 1983, and only slightly more than in 1982. Thus, 1984 must be considered a year with relatively little stagnation. The stagnation episodes that did occur were almost all in the Southeast.

1. Introduction

This is the fourth in a series of annual reviews of air stagnation cases in the United States east of 100°W. Presented are maps showing, by month and for the year 1984 as a whole, the number of stagnation days in this region, as well as the average number of stagnation days during the interval 1936–75. For comparison with recent results, a table gives the number of "grid point days" of stagnation by month and year for 1981, 1982, 1983 and 1984.

2. Procedures

The method used to delineate areas of stagnation basically involves determining those areas where, for at least four days, the surface geostrophic wind (as determined from the daily weather maps of the National Weather Service) is less than 8 m s^{-1}. Areas of stagnation, so obtained, were eliminated if fronts crossed through the region, there was a trace or more of precipitation or the wind at 500 mb exceeded 13 m s^{-1}. More details concerning the method used for evaluation of stagnation cases may be obtained from the first paper in this series (Korshover and Angell, 1982).

3. Discussion

Table 1 gives the dates of stagnation cases in 1984, and Figs. 1–7 show by month the number and location of stagnation days in 1984 (solid lines) in comparison with the average number and location of stagnation days based on the interval 1936–75 (dashed lines). There were no stagnation cases, as defined here, in January, February, March, April and July of 1984.

Stagnation during 11–14 and 18–23 May occurred in the usual location in southeastern United States (Fig. 1). The first episode was associated with a polar maritime high which moved across the United States from the Northwest to the East Coast, there becoming almost stationary. At 500 mb the flow was nearly zonal, with the area of stagnation considerably south of the main belt of westerlies. The second episode, on the other hand, was associated with a polar continental high which plunged southward from Hudson Bay and became stationary in the Southeast. In this case the stagnation occurred beneath a strong ridge at 500 mb.

Stagnation during 1–13 and 17–20 June and between 29 June and 2 July also occurred mostly in the Southeast, but centered slightly east of the usual location (Fig. 2). The first episode was again associated with a polar maritime high which moved across the United States from the Northwest to the East Coast, there becoming almost stationary. This stagnation episode was the longest since these reviews began in 1981. During the entire 13-day period, there was a 500 mb trough near the West Coast and a ridge near the East Coast with strong southwesterly flow over the central part of the country. The second episode was associated with a westward extension of the Bermuda High into the southeastern United States. The third episode resulted in the area of stagnation in Iowa, and was associated with a polar continental high which moved south from central Canada and became stationary west of the Great Lakes. Initially there was a pronounced 500 mb ridge over the central United States and troughs near the East and West Coasts, but this changed into a nearly zonal pattern as the episode ended.

Stagnation during 24–28 August occurred in two isolated pockets bracketing the usual location (Fig. 3). A polar continental high moved southeastward across the Great Lakes, but fairly rapid movement together with precipitation limited the area of stagnation. A 500 mb ridge was over the central United States and troughs over both coasts.

TABLE 1. Cases of stagnation in the eastern United States during 1984.

Dates	Duration (days)
11–14 May	4
18–23 May	6
1–13 June	13
17–20 June	4
29 June–2 July	4
24–28 August	5
6–9 September	4
17–26 September	10
2–6 October	5
11–15 October	5
23–27 November	5
14–20 December	7

Stagnation during 6–9 and 17–26 September occurred basically in the southeastern United States but with a band of stagnation extending westward into Texas, somewhat west and south of the usual location (Fig. 4). The first episode was associated with a polar continental high which moved southeastward from western Canada, and then became almost stationary with a center near New York City. A ridge of high pressure extended southwestward from this center to the Gulf of Mexico. Hurricane Diana, embedded in the easterly flow southeast of this ridge, caused damage along the Georgia and Carolina coasts at the end of this episode. There was a weak 500 mb trough over the Southeast during most of the period. The second relatively long episode was also associated with a polar continental high which moved slowly southeastward from western Canada. At the beginning of the stagnation episode this high covered almost the entire (contiguous) United States, and at 500 mb the westerlies were displaced far into Canada. Precipitation in the Great Lakes region limited the area of stagnation.

Stagnation during 2–6 and 11–15 October occurred in the southeastern United States slightly south of the usual location (Fig. 5). The first episode was again associated with a polar continental high from western

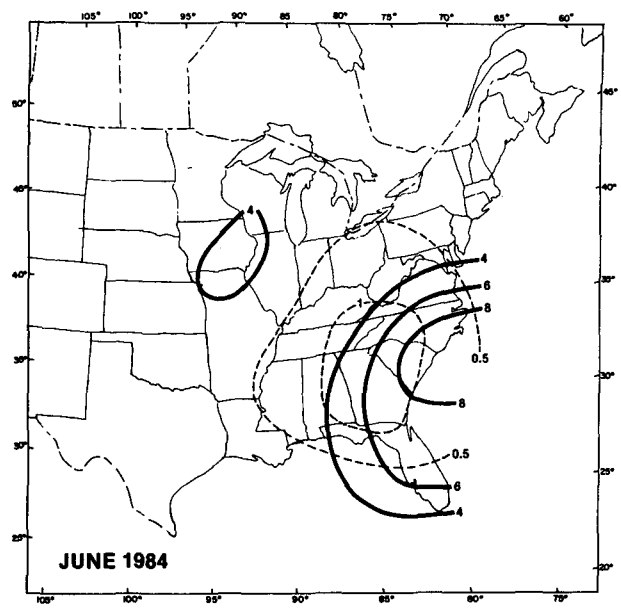

FIG. 2. As in Fig. 1, but for June.

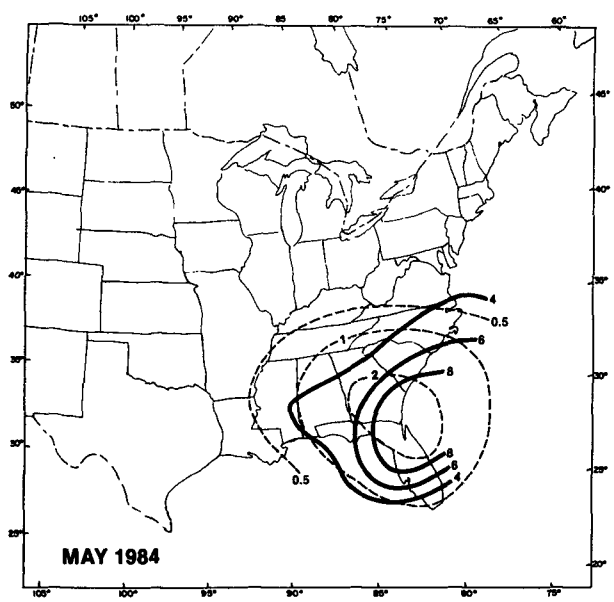

FIG. 1. Number of stagnation days in May 1984 (solid lines) in comparison with the May average of stagnation days during the interval 1936–75 (dashed lines).

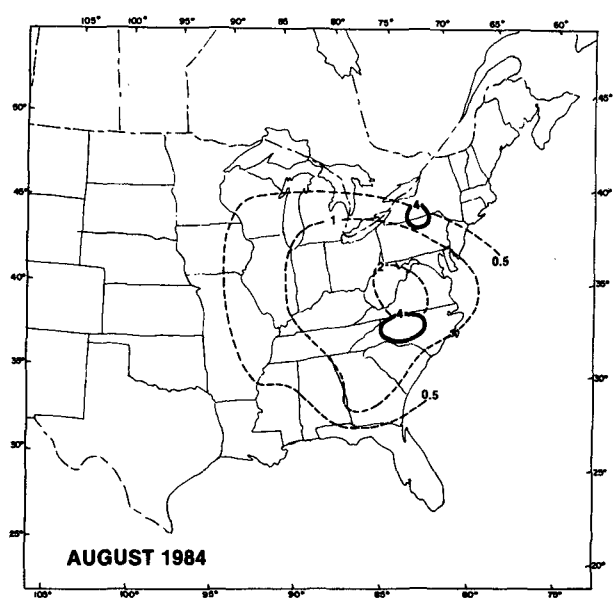

FIG. 3. As in Fig. 1, but for August.

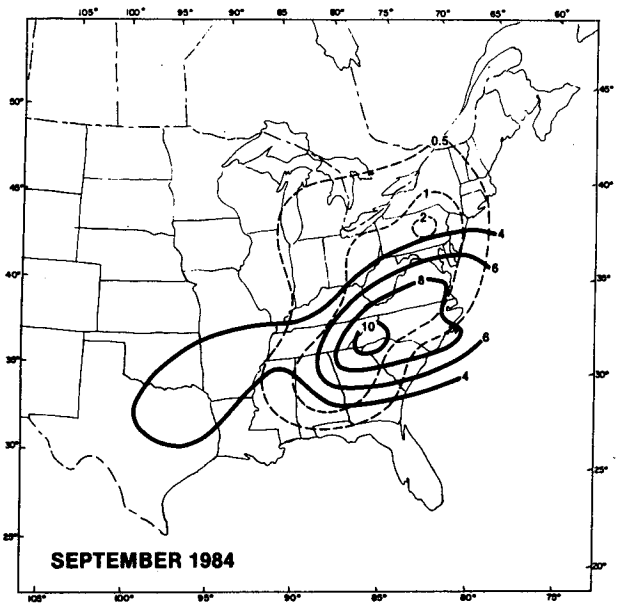

FIG. 4. As in Fig. 1, but for September.

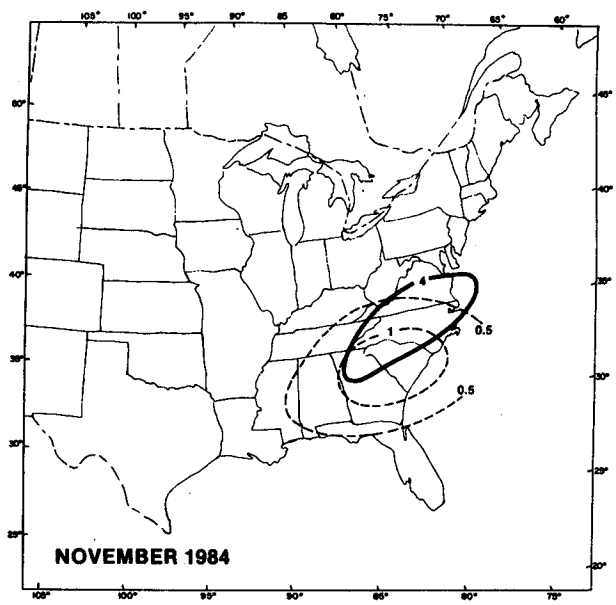

FIG. 6. As in Fig. 1, but for November.

Canada which became stationary in the southeastern United States. Three days before the start of this episode, tropical storm Isidore moved up the East coast. At 500 mb there was a weak ridge over the stagnation region and a low over the Southwest. The second episode was associated with a polar continental high which moved south from Hudson Bay before becoming nearly stationary in the Great Lakes region. Precipitation limited the area of stagnation to the Southeast. At 500 mb a large ridge extended from the eastern United States into the Arctic.

Stagnation during 23–27 November occurred in the middle Atlantic states, slightly north of the usual location (Fig. 6). This episode was also associated with a polar continental high which moved south from Hudson Bay and became stationary in the eastern United States. Stagnation occurred beneath a 500 mb ridge separating lows over Southern California and Florida.

Stagnation during 14–20 December occurred in the usual location in the Southeast, but was of unusually long duration for this time of year (Fig. 7). This episode

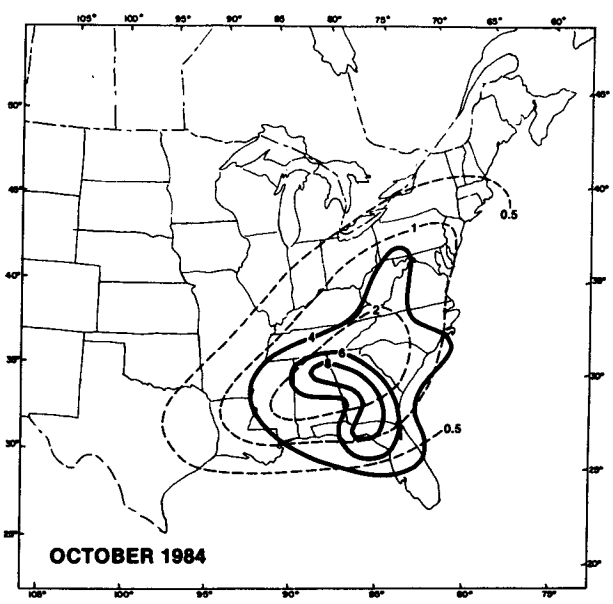

FIG. 5. As in Fig. 1, but for October.

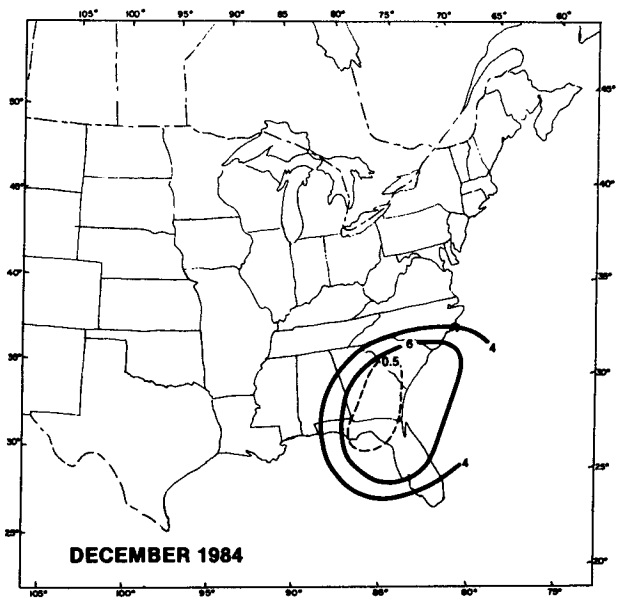

FIG. 7. As in Fig. 1, but for December.

was associated with a polar maritime high which moved eastward across the southern states and became stationary near the East Coast. During this episode, a low at 500 mb over the Southwest resulted in strong southwesterly winds extending from Mexico to New England, and the stagnation occurred to the southeast of this belt of strong winds.

4. Summary

Figure 8 shows that the pattern of stagnation in the eastern United States during 1984 (solid lines) was fairly typical of the 40-year mean (dashed lines), though in 1984 the region of maximum stagnation at the North Carolina–South Carolina border was northeast of the mean location in central Georgia and the stagnation pattern was elongated toward Florida.

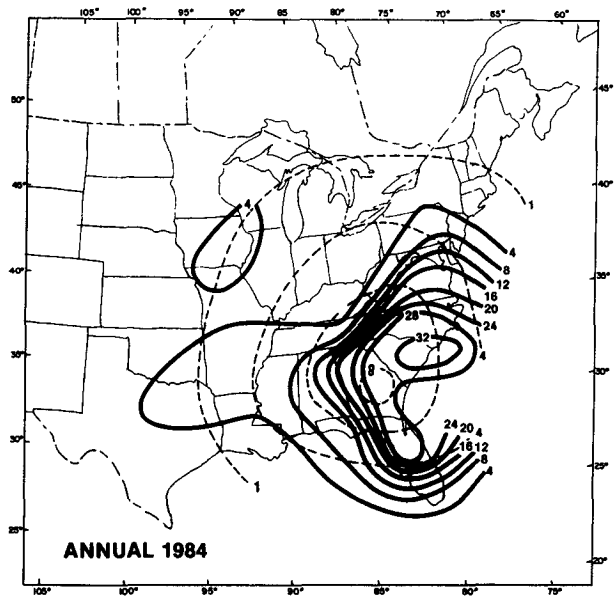

FIG. 8. Number of stagnation days in 1984 (solid lines) in comparison with the annual average of stagnation days during the interval 1936–75 (dashed lines).

TABLE 2. Number of grid point days of stagnation by month for the years 1981–84, obtained by summing the number of days of stagnation at 2° lat–2° long grid points.

	1981	1982	1983	1984
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	22	0	58	0
May	89	100	0	98
June	40	42	127	145
July	45	0	80	0
August	412	104	136	12
September	222	114	317	156
October	180	151	119	128
November	104	70	28	37
December	0	0	0	71
Year	1114	581	865	647

Table 2 presents by month and year the number of "grid point days" of stagnation obtained by summing over the eastern United States the number of days of stagnation at 2° lat–2° long grid points during the years 1981–84. In the eastern United States the year of greatest stagnation is indicated to be 1981, with nearly twice the stagnation days of 1982. The number of stagnation days in 1983 is approximately halfway between 1981 and 1982, and the number of stagnation days in 1984 is only slightly greater than in 1982. Thus, based on the criteria used here, 1984 was a year of below average stagnation, particularly in the summer months. Furthermore, the stagnation episodes that did occur were nearly all in the Southeast.

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