Atlantic Tropical Systems of 1975

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ABSTRACT

The 1975 hurricane season produced 113 "tropical systems", of which 28 acquired the closed circulation of a depression. Over half of these (61) originated over the African Continent. This is the most African systems observed since our annual summary began in 1968. African seedlings initiated five of the eight named Atlantic storms and thirteen of the sixteen East Pacific storms.

1. Introduction

This is the eighth consecutive year a seasonal disturbance summary has been attempted. We anticipated that knowledge gained during the GATE field program last summer might require some alterations in our counting procedures this year. However, apparently this is not so. The general philosophy of our counting method as outlined in previous articles (Simpson *et al.*, 1968, 1969) appears to be valid, although our understanding is certainly being updated and adjusted by GATE results. Several of these early conclusions have a direct bearing on our interpretations and are worthy of a few brief comments.

Simpson and Simpson (1975) found that the predominate cloud type in the "inverted V" pattern over the eastern Atlantic is altocumulus and altostratus rather than stratocumulus. They used recently developed dropwindsondes to define the flow pattern associated with the "inverted V" cloud feature, and found little evidence of a closed wind circulation at any level despite what at times appears to be closed spirals of cloud bands. This conclusion challenges the results of Burlutsky (1975), who used satellite pictures and movies to track what he interpreted to be numerous lows moving westward from Africa.

Burlutsky also found that cloud elements move across the legs of the "V." This confirms a result we noted several years ago. Fig. 1 shows a picture of an "inverted V" we observed on 27 July 1971. Cloud motion vectors have been superimposed on the picture. Even though the cloud elements move across the legs of the "V," there is a definite cyclonic turning of the flow across the axis of the "V." Since the level of maximum vorticity is generally around 700 mb or higher, we speculated that the influence of the mid-tropospheric flow on the preexisting low-level stratocumulus was minimal.

From the beginning we have acknowledged that the weakest element of our counting procedure has been the identification of disturbances in the ITCZ. Burpee (1975) found there were many circulations in the ITCZ that were completely independent of the trade wind waves. These circulations are usually very transient and have very little day-to-day continuity. Zipser (1975) described the formation of one ITCZ circulation that weakened within a few hours and Smith (1975) documented another rapidly dissipating cloud cluster that was associated with a low-level low. Martin (1975) found that the lifetime of most cloud clusters in the ITCZ was generally less than 24 to 36 hours. In our counting scheme, we do not include ITCZ disturbances unless their cloud clusters persist for at least 48 h. This means that we probably identify only the stronger ITCZ disturbances, but this is consistent with our desire to only document synoptic features whose time scale is days.

Hebert (1976) speculates that the tropics may be returning to normal. Residents within the Atlantic hurricane zone have enjoyed a relatively quiet period that extends back to 1971. During the last four years the breeding grounds for Atlantic hurricanes have been characterized by extensive upper-level westerlies and below-normal sea temperatures. Last year the magnitude and area of both anomalies decreased. The one exception is the eastern Carribean, where strong upper-level flow persisted and shielded the Antilles from strong storms.

2. Census of 1975 tropical systems

The results of the 1975 hurricane season census are given in Table 1 and several categories are summarized in Table 2 and Fig. 2. Table 1 describes the history of the 113 systems, giving the dates when they passed three key stations: Dakar, Senegal; Barbados; and San Andres Island. The table also lists the spawning date of seedlings that formed and weakened along the intertropical convergence zone (ITCZ) in the Atlantic, and the dates of formation of subtropical cyclones over

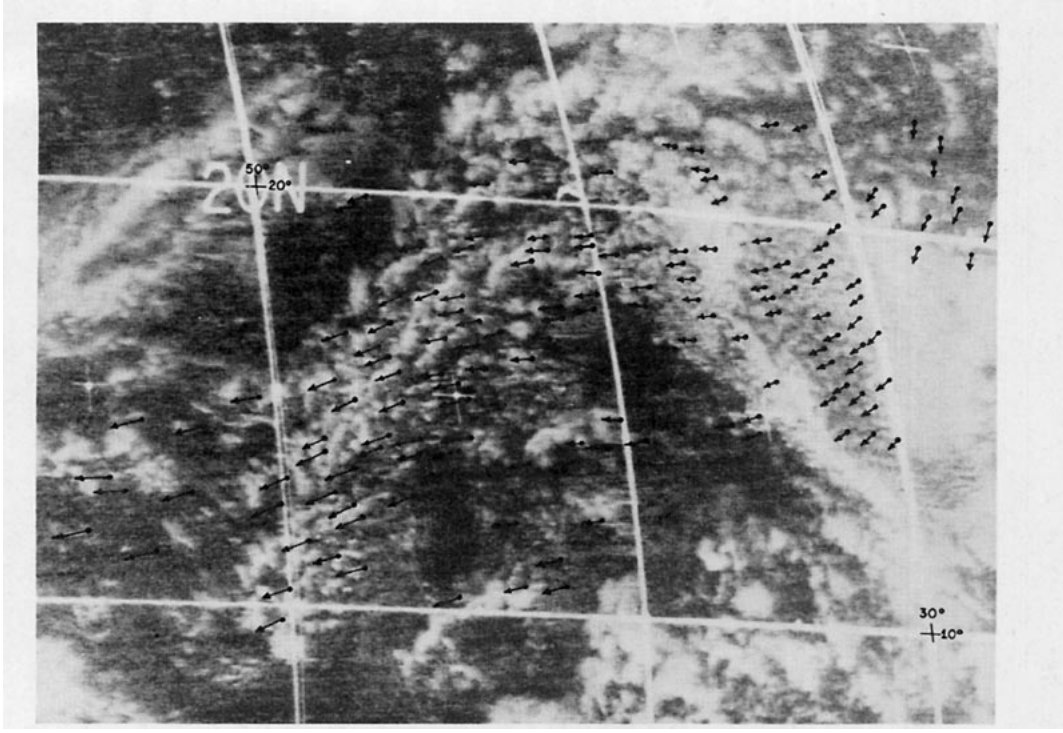

FIG. 1. Low-level cloud motion vectors superimposed on an ATS 3 picture of an "inverted V" cloud pattern. The picture was taken at 1500 GNT 27 July 1971.

the Gulf of Mexico and the Atlantic north of latitude 20°N. The Atlantic and eastern Pacific storms that were initiated by Atlantic seedlings are listed in the last four columns.

Table 2 summarizes the systems according to type and geographical area of formation. The numbers in parentheses indicate systems that were counted in a weaker stage of development. For example, Caroline and four of the six depressions that formed in the Gulf of Mexico were initiated by three African waves and two Caribbean ITCZ disturbances. Once again we see that nearly half of the systems were wave perturbations in the trades whose origin was over Africa. This observation has been true every year we have completed the survey and stresses the importance of Africa as a seed-bed for Atlantic disturbances.

Figure 2 tabulates the total number of systems passing Dakar, Barbados, and San Andres Island as well as the number that maintained their identity while traversing the Atlantic and Caribbean. Statistics are also presented on the seedlings that developed within four geographical areas: the Gulf of Mexico, the Caribbean Sea, and the subtropical and tropical Atlantic, where latitude 20°N has been used as a dividing line. Of the 61 African systems, 55 were tracked to the Caribbean and 37 all the way to the Pacific Ocean. Over the tropical Atlantic, 18 disturbances formed with 14 eventually passing through the Antilles. Another four were identified along the ITCZ and followed for at least 48 hours before dissipating. A total of 69 systems crossed the Antilles (55 from Africa plus 14 that formed in the Atlantic), of which 43 maintained their identity while traversing the Caribbean. The 21 disturbances that formed over the Caribbean added to the number from the Antilles resulted in 64 seedlings entered Central America.

One unusual aspect of the 1975 season was the early appearance of a well-defined African wave that moved by Dakar on 14 May. The first African system of the season does not generally occur until late May or early June when the easterly subtropical jet becomes established across tropical Africa in the upper troposphere.

The depression tracks for the months June through December are shown in Fig. 3. The first three depressions formed in June over the southwestern Atlantic along old baroclinic zones. The third depression acquired tropical characteristics on 28 June and strengthened near Cape Hatteras, N. C., to become the first named storm of the season, Amy.

The last depression was an unusually late season development in December. A frontal wave formed east of Bermuda, started to move toward the northeast, then became trapped on the 9th and plunged rapidly southward while strengthening. Hebert (1976) lists this development as a subtropical storm. A second subtropical storm formed over the central Atlantic on 27 August, then developed a warm core on the 29th and was designated Doris.

Five of the depressions deserve special comment, the most significant being the system that formed over

TABLE 1. Summary of the tropical systems in 1975.*

Dakar Passage	Nature	Formed in Atlantic	Weakened Atlantic	Barbados Passage	Nature	Weakened Caribbean	Formed Caribbean	San Andres Passage	Nature	Formed Gulf of Mexico	Formed North Atlantic	Atlantic depression	Atlantic storm	Pacific depression	Pacific storm
May 14	Wave			May 19	Wave	5/20									
May 16	Wave			May 21	Wave	5/22									
							5/22	May 23	ITCZ						
May 18	Wave			May 24	Wave			May 27	Wave						
May 21	Wave			May 26	Wave			May 28	Wave					#1	Agatha
May 24	Wave			May 29	Wave	5/29									
							5/29	May 30	ITCZ						
May 26	Wave			May 30	Wave	6/1									
							6/2	June 3	ITCZ						
May 29	Wave			June 3	Wave			June 7	Wave						
June 1	Wave			June 6	Wave			June 9	Wave						
											6/6	#1			
		6/6		June 9	Wave	6/10									
							6/9	June 10	ITCZ						
June 6	Wave			June 11	Wave			June 14	Wave						
		6/12		June 14	Wave			June 17	Wave						
June 9	Wave			June 16	Wave			June 20	Wave						
		6/15		June 19	Wave			June 22	Wave						
June 13	Wave		6/18												
June 15	Wave			June 20	Wave			June 23	Wave					# 2	Bridget
June 18	Wave			June 24	Wave			June 26	Wave					# 3	Carolotta
		6/21	6/23												
June 22	Wave			June 26	Wave			June 28	Wave						
											6/24	# 2			
											6/27	# 3	Amy		
June 24	Wave			June 28	Wave			June 30	Wave						
June 26	Wave			July 1	Wave			July 3	Wave					# 5	Denise
June 28	Wave			July 3	Wave			July 6	Wave					# 6	Eleanor
											7/4	# 4			
		7/3		July 6	ITCZ	7/6									
July 3	Wave			July 7	Wave			July 10	Wave						
											7/12	# 5			
July 6	Wave			July 13	Wave			July 15	Wave	7/19		# 6			
		7/15		July 17	Wave	7/18									
July 13	Wave			July 20	Wave						7/24	# 7	Blanche		
July 15	Wave		7/20												

*Dep. indicates depression; stm, storm.

TABLE 1 (*continued*)

Dakar Passage	Nature	Formed in Atlantic	Weakened Atlantic	Barbados Passage	Nature	Weakened Caribbean	Formed Caribbean	San Andres Passage	Nature	Formed Gulf of Mexico	Formed North Atlantic	Atlantic depression	Atlantic storm	Pacific depression	Pacific storm
July 19	Wave			July 24	Wave	7/25									
		7/24		July 26	Wave	7/27									
							7/20	July 21	ITCZ					# 7	Francine
							7/21	July 22	ITCZ			# 8			
							7/24	July 25	ITCZ						
							7/27	July 29	ITCZ						
										7/28		# 9			
							7/30	July 31	ITCZ						
							8/1	Aug. 2	ITCZ					# 8	Georgette
July 23	Wave			July 31	Wave			Aug. 4	Wave						
July 27	Wave			Aug. 4	Wave			Aug. 7	Wave					# 9	Hilary
July 30	Wave			Aug. 5	Wave	8/7									
Aug. 2	Wave			Aug. 8	Wave	8/9									
							8/9	Aug. 10	ITCZ						
Aug. 4	ITCZ			Aug. 11	Wave			Aug. 13	Wave						
Aug. 6	Wave			Aug. 13	Wave			Aug. 15	Wave					#10	Ilsa
Aug. 10	Wave			Aug. 16	Wave			Aug. 20	Wave					#11	Jewel
		8/15		Aug. 17	ITCZ	8/18									
Aug. 13	Wave			Aug. 20	Wave			Aug. 24	Wave						
Aug. 15	Wave			Aug. 22	Dep.			Aug. 26	Dep.			#10	Caroline		
Aug. 20	Wave			Aug. 24	Wave			Aug. 28	Wave						
Aug. 23	Wave			Aug. 27	Wave			Aug. 30	Wave						
		8/25	8/29												
											8/27	#11 (S.T.)	Doris		
							8/31	Sep. 2	ITCZ	9/3		#12			
Aug. 26	Wave			Sep. 1	Wave			Sep. 5	Wave					#13	
Aug. 27	Wave			Sep. 3	Wave			Sep. 6	Wave						
		9/4		Sep. 5	ITCZ	9/6									
Aug. 30	Wave			Sep. 6	Wave			Sep. 9	Wave						
Sep. 2	Wave			Sep. 9	Wave			Sep. 12	Wave			#13		#14	Lily
Sep. 3	Dep.		9/6									#14			
							9/15	Sep. 16	ITCZ						
											9/11	#15			
Sep. 6	Wave			Sep. 14	Stm.			Sep. 19	Stm.			#16	Eloise	#15	Monica
		9/10	9/14												
Sep. 11	Wave			Sep. 18	Wave			Sep. 22	Wave					#16	Nanette
Sep. 14	Wave			Sep. 23	Stm.							#17	Faye		
Sep. 16	Wave		9/17												
							9/26	Sep. 28	ITCZ						

TABLE 1 (*continued*)

Dakar Passage	Nature	Formed in Atlantic	Weakened Atlantic	Barbados Passage	Nature	Weakened Caribbean	Formed Caribbean	San Andres Passage	Nature	Formed Gulf of Mexico	Formed North Atlantic	Atlantic depression	Atlantic storm	Pacific depression	Pacific storm
Sep. 18	Wave			Sep. 28	Stm.							#18	Gladys		
Sep. 21	ITCZ		9/22												
		9/25		Sep. 26	ITCZ			Sep. 30	Wave					#17	
							9/26	Sep. 28	ITCZ			#19			
Sep. 24	Wave		9/27												
							10/2	Oct. 3	ITCZ						
Sep. 26	Wave			Oct. 2	Wave			Oct. 5	Wave						
Sep. 29	ITCZ			Oct. 5	Wave			Oct. 9	Wave						
										10/1		#20			
											10/3	#21			
Oct. 1	Wave			Oct. 9	Wave			Oct. 12	Wave			#22			
Oct. 5	Wave			Oct. 13	Wave			Oct. 16	Wave					#18	Olivia
Oct. 8	Wave			Oct. 14	Wave			Oct. 18	Wave						
		10/14		Oct. 16	Dep.	10/17						#23			
		10/15		Oct. 18	Wave			Oct. 21	Wave						
Oct. 12	Wave			Oct. 20	Wave	10/21									
		10/18		Oct. 21	Wave			Oct. 25	Wave						
											10/23	#24	Hallie		
Oct. 17	Wave			Oct. 24	Wave			Oct. 28	Dep.			#25		#19	Priscilla
		10/22		Oct. 25	Wave	10/25									
Oct. 20	Wave			Oct. 28	Wave	10/29									
							11/1	Nov. 2	ITCZ						
Oct. 25	Wave			Oct. 31	Wave			Nov. 3	Wave						
Oct. 27	Wave			Nov. 2	Wave			Nov. 5	Wave						
Oct. 30	ITCZ			Nov. 4	Wave			Nov. 8	Wave			#26			
		11/3		Nov. 7	Wave	11/8									
Nov. 3	Wave			Nov. 8	Wave	11/9									
Nov. 5	Wave			Nov. 11	Wave	11/12									
							11/10	Nov. 11	Wave					#20	
Nov. 10	Wave			Nov. 18	Wave	11/18									
							11/14	Nov. 15	ITCZ						
Nov. 14	Wave			Nov. 21	Wave	11/21									
Nov. 19	Wave			Nov. 24	Wave	11/24									
							11/16	Nov. 19	Wave						
							11/18	Nov. 22	Wave						
		11/21	11/25												
											11/29	#27 (S.T.)			
											12/9	#28			

TABLE 2. Summary of 1975 tropical systems according to type and geographical area of formation. The numbers in parentheses indicate systems that were counted in a weaker stage.

	Africa	Tropical Atlantic	Subtropical Atlantic	Caribbean	Gulf of Mexico	Total
Waves	56	10	0	3	0	69
ITCZ	4	8	0	18	0	30
Depression	1	(5)	11 (2)	(3)	2(4)	14 (14)
Named storms	0	(1)	(7)	0	(1)	(9)
	61	18 (6)	11 (9)	21 (3)	2 (5)	113 (23)

the northeastern Gulf of Mexico on 28 July. This depression moved west-northwest and made landfall in southern Mississippi on 29 July spreading torrential rains over the coastal sections.

Rainfall amounts of 15 to 20 inches were reported in northwest Florida and 5 inches or more in southeastern Louisiana, the southern portions of Mississippi and Alabama, and southwestern Georgia. The rain fell during a 3-day period, 29–31 July.

In the coastal sections, several homes were flooded along Pensacola Beach, the sewage system on Santa Rosa Island overflowed into the bay, numerous streets and roads were closed due to high water, and a 1000 ft stretch of bank along the Intercoastal Waterway collapsed between Pensacola and Panama City. Choctawhatchee Bay was reported to be the highest it had been in 20 years at Ft. Walton Beach as water overflowed bulkheads and flooded several buildings. Damage was estimated near 8.5 million dollars in northwest Florida, where 22 homes were destroyed and 500 damaged.

Another mid-October depression played havoc with the rehabilitation programs in North Florida. Residents of the Florida panhandle were still in the midst of clean up operations in the aftermath of Hurricane Eloise, and this depression caused additional misery. Rainfall amounts ranged from 10 inches over southeastern Louisiana to 6 inches in the Florida panhandle. Tides up to 4 ft above normal, wind gusts of 45 mph, and at least two tornadoes were observed in northwestern Florida.

Two other depressions were approaching storm strength as they moved inland near Tampico, Mexico. If either one had remained over the waters of the Gulf for another day, winds would probably have acquired storm strength. Reconnaissance aircraft measured winds near 50 mph on July 26th just a few hours before that depression moved inland. The second depression caused 35 mph winds at Tampico on September 7th.

The final near miss occurred on 9 and 10 November. Reconnaissance aircraft measured winds of 35 to 40 mph and a central pressure of 1004 mb in a depression as it moved through the Yucatan Channel. It appeared a tropical storm was going to form over the Gulf of Mexico, then the circulation pattern changed. The system was forced southward and weakened.

Fig. 4 summarizes the source of eastern Pacific named storms. As we have observed in earlier years, most of the storms are initiated by seedlings whose origin is on the Atlantic side of Central America. African systems play a very important role in the development of eastern Pacific storms.

3. Comparison with other years

Table 3 compares the tropical systems in 1975 with averages determined over the previous seven years within several categories. The total number of systems in 1975 was slightly higher than the previous seven-year average. It is also interesting to note that the totals in almost every category were the highest observed during the period of record. There is no obvious explanation for the across the board increase in 1975.

TABLE 3. Results of 1975 compared with the previous seven years.

	1968	1969	1970	1971	1972	1973	1974	7-year average	1975
Total systems (all types)	107	105	85	103	113	95	96	101	113
Dakar systems	57	58	54	56	57	56	52	56	61
Barbados systems	59	44	53	56	56	58	58	55	69
San Andres systems	40	43	45	58	49	54	52	49	64
Depressions	19	28	24	23	24	24	25	24	28
Named storms	7	13	7	12	4	7	7	8	8
Subtropical storms	?	?	?	?	4	1	4		2

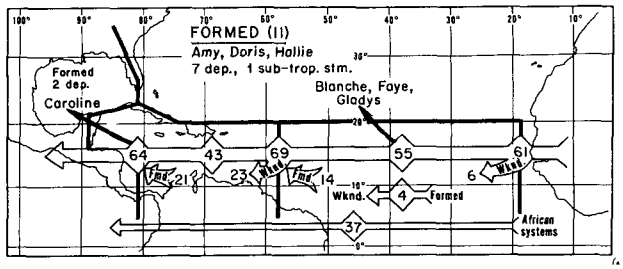

FIG. 2. Summary of tropical disturbances that passed three key stations (Dakar, Barbados, and San Andres) in 1975 and those maintaining their identity while crossing the Atlantic and Caribbean.

Last year Frank (1974) introduced a simple parameter that seems to be useful in describing the overall character of the hurricane season. This is computed by forming the ratio of the number of depressions of tropical origin to the total number of depressions. The 1975 value has been added in Fig. 5 and we observed a continuation of the regime that has persisted for the past four years. Low values of this ratio indicate a high number of baroclinic depressions; we have observed this to be associated with anomalous baroclinic conditions over the tropics.

The story of the 1975 hurricane season is well summarized in Table 4, in which we see that half of the

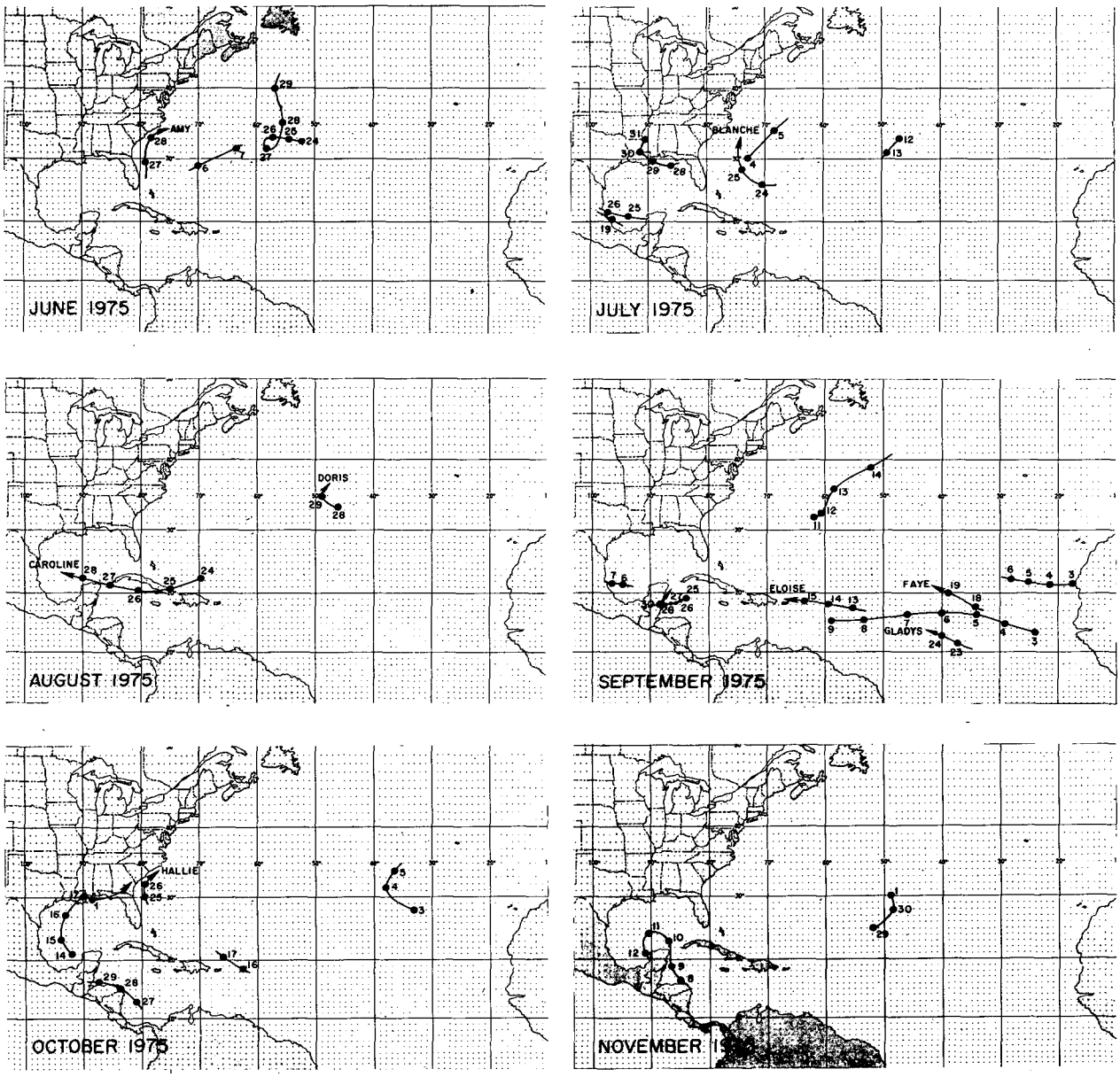

FIG. 3. Tracks of 1975 depressions.

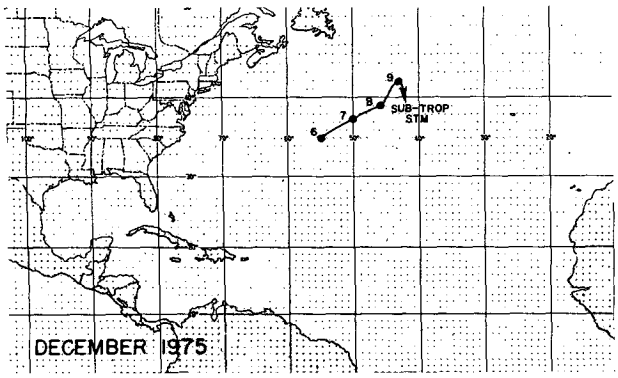

FIG. 3 (*continued*)

depressions (14) were initiated by baroclinic seedlings. In the table, the 1975 results can be compared with the averages for the past eight years; however, a more meaningful comparison can be made by dividing the past eight years into two four-year periods. The years from 1967 to 1970 were characterized by normal storm activity, while a lull has been observed during the period 1971 to 1974. Even though there is little difference in the total number of depressions, there is a very significant difference in the character of the disturbances that initiated the depressions. During the four-year normal period, two-thirds to three-fourths of the depressions were spawned by tropical-type seedlings, and subtropical cyclones were not very common. But during the last four years, over half of the depressions were initiated by baroclinic disturbances and subtropical cyclones were much more frequent. The character of the season is directly related to the amount of activity in the subtropical latitudes.

Another perspective of the season is shown in Table 5, which compares the monthly incidents of depressions with the past 8-year average. The number of

TABLE 4. Summary of the type of seedling that initiated Atlantic named storms and depressions during 1975 compared with annual averages from previous years.

Year	Tropical: African systems	Tropical: Disturbance	Baroclinic: Upper Troposphere	Baroclinic: Lower Troposphere	Totals
		Named storms			
1975	5	0	0	3	8
Average 1967–1974	4.0	2.0	1.0	1.0	8.0
Average 1967–1970	4.2	2.8	1.0	0.8	8.8
Average 1971–1974	3.8	1.2	1.5	1.2	7.8
		Depressions			
1975	11	3	3	11	28
Average 1967–1974	10.5	4.0	4.0	6.5	25.0
Average 1967–1970	12.8	5.0	3.2	4.5	25.5
Average 1971–1974	7.8	2.8	4.7	8.7	24.0

August depressions was significantly below normal, while the number of early and late season depressions were above normal. This is consistent with the observation that conditions over the tropics in 1975 were abnormally baroclinic. A southward displacement of the westerlies favors baroclinic cyclonic activity over the subtropical latitudes during the spring and fall and discourages typical tropical development during the peak of the hurricane season. Even though both the magnitude and area of the anomalous upper westerlies and cool water temperatures decreased some last summer, conditions over the tropics remained more baroclinic than normal in 1975.

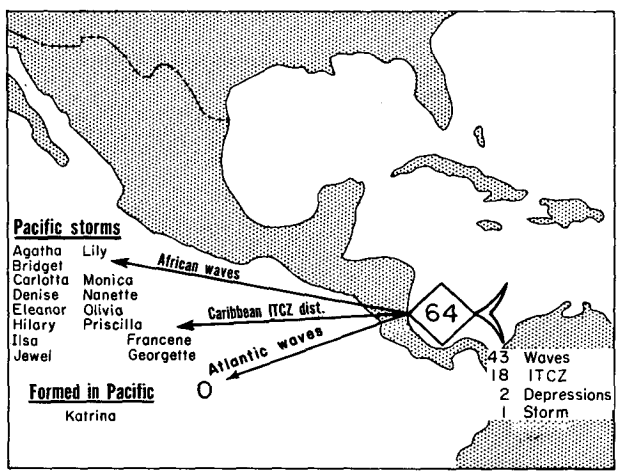

FIG. 4. Summary of the type of seedlings that initiated east Pacific storms in 1975.

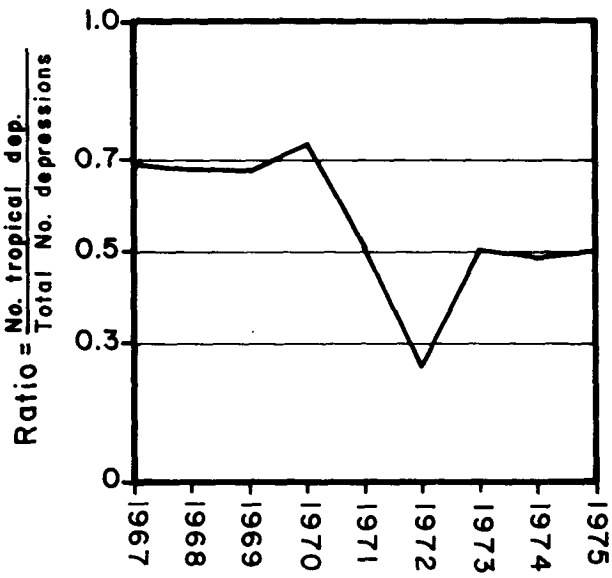

FIG. 5. Ratio of the number of depressions of tropical origin to the total number of depressions, 1967 to 1975.

TABLE 5. Number of depressions that formed each month compared with monthly averages determined over the 8-year period 1967 through 1974.

	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Total
1975	1	1	2.5	3.5	6.0	7.5	4.0	0.5	0	26
Average (1967–74)	0	0	3	6	2	8	6	2	1	28

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