Eastern North Pacific Hurricane Season of 1995

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ABSTRACT

The 1995 eastern North Pacific hurricane season is reviewed. The activity comprised 11 tropical cyclones, consisting of seven hurricanes, three tropical storms, and one tropical depression. Hurricane Ismael caused a large loss of life in the southern Gulf of California.

1. Introduction

The western hemisphere was a scene of stark contrasts in tropical cyclone activity during 1995. More tropical cyclones formed in the Atlantic hurricane basin than in the eastern North Pacific Ocean for the first time in 26 years (cf. Lawrence et al. 1998). In fact, while the Atlantic produced 19 tropical storms, its second largest total during the past 125 years, the total of 10 tropical storms in the eastern North Pacific Ocean ranks as the second *fewest* in the 30-yr period of routine satellite surveillance (1977 had 8 storms) and is 6 fewer than the average over that period. Of the 10 Pacific storms, 7 became hurricanes. There was also one tropical depression during May. It remained offshore.

Several other measures were indicative of reduced levels of activity in the eastern Pacific. The first storm formed rather late, in mid-June. The last storm dissipated in late September making 1995 the first year during the satellite era without an October eastern Pacific tropical cyclone. There were fewer than normal tropical cyclones in every month of the season.

Two persistent large-scale atmospheric anomalies appear consistent with the decreased number of storms. Figure 1 shows anomalously strong easterly vertical wind shear coinciding with the normal genesis area near 12°N, 100°W. This pattern was representative of both the average and many daily conditions and likely hindered tropical cyclone formation. A westerly wind anomaly at low levels (Fig. 2) contributed to the shear pattern. It was associated with an eastward shift of the zone of peak positive low-level convergence and vorticity from the climatological mean position over the eastern Pacific toward the southwestern Caribbean region. This pattern is also consistent with fewer than normal storms forming in the Pacific and enhanced activity over the western Caribbean region (cf. Lawrence et al. 1998).

In contrast to these atmospheric features, anomalies of sea surface temperature (not shown) were small and thought to be insignificant. In fact, when atmospheric conditions were conducive for development, the warm eastern Pacific waters allowed three of the 10 tropical storms to strengthen to category 4 status on the Saffir–Simpson hurricane scale (1-min wind speeds exceeding about 58 m s^{-1}).

Most of the tropical cyclones followed the climatologically favored west-northwestward track from offshore southwestern Mexico toward the relatively cool waters west of the Baja California peninsula (Fig. 3). However, three tropical cyclones adversely affected western Mexico. Flossie remained centered just offshore but seven people lost their lives in coastal areas on its eastern fringe. Henriette caused damage where it crossed southern Baja California but took no lives. A large loss of life was reported in association with Ismael's northward excursion through the southern Gulf of California. Another unusual aspect of the 1995 season was the relatively short tracks of the cyclones that remained offshore. Only one system, Hurricane Barbara, crossed 140°W, entering the central Pacific hurricane basin, and it dissipated shortly thereafter. No other tropical cyclone reached 130°W and no other hurricane progressed to 120°W. Table 1 provides additional information about the tropical cyclones.

2. Tropical cyclone tracks

The NOAA National Hurricane Center (NHC) tropical cyclone track database consists of a center position and two measures of intensity (the maximum 1-min sustained surface wind speed and the minimum sea level pressure). The parameters are estimated at 6-h intervals.

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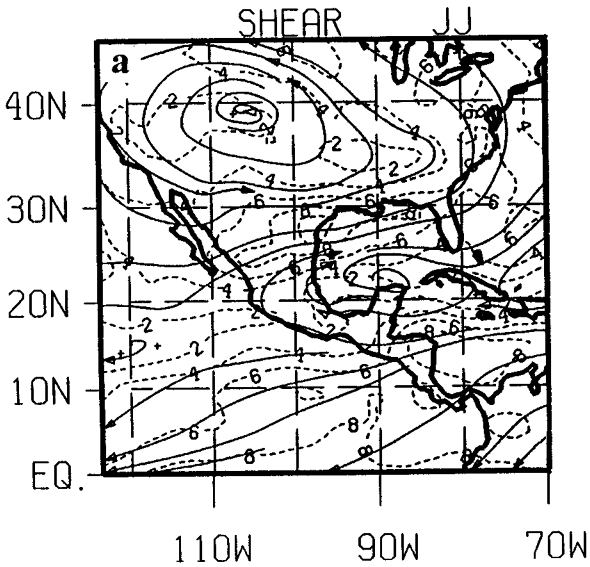

FIG. 1. Anomalies (m s^{-1}), from the 1975–95 mean, of the vertical shear of the horizontal wind (approximately 900 mb minus 200 mb) for (a) June and July and (b) August, September, and October 1995.

They are based on a poststorm analysis of data conducted by the NHC.[1] The primary sources for the analysis are the National Oceanic and Atmospheric Administration (NOAA) Tropical Analysis and Forecast Branch (TAFB; formerly Tropical Satellite Analysis and Forecast unit), the NOAA Synoptic Analysis Branch (SAB), and the Air Force Global Weather Central (AFGWC). These centers provided to the NHC real-time estimates of position and intensity by applying the Dvorak (1984) tropical cyclone analysis technique to imagery from the Geostationary Operational Environmental Satellites (*GOES-7* and *GOES-8*) and polar-orbiting satellites. Observations from ships and land stations supplemented these data. Figure 3 shows the 1995 tropical storm and hurricane tracks and indicates where these systems were located at tropical depression, tropical storm, and hurricane intensity.

[1] Track and "fix" data are contained in the Annual Hurricane Diskette Data Tabulation, available from the National Climatic Data Center, Federal Building, Asheville, NC 28801. Additional observations are contained in NHC Preliminary Reports found on the NHC Internet Web site at http://www.nhc.noaa.gov.

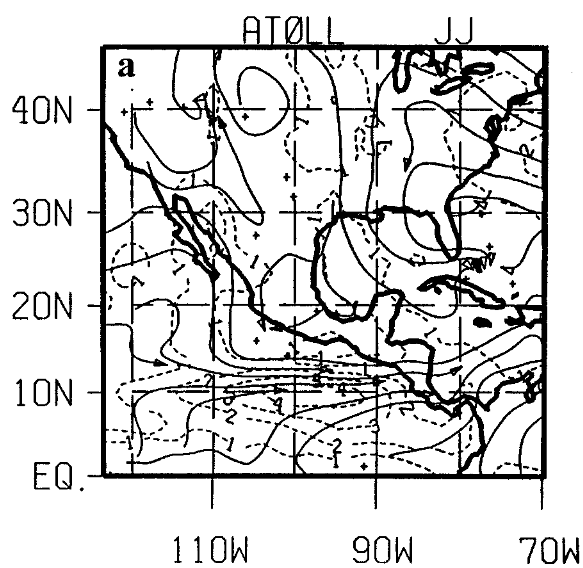

FIG. 2. Average low-level (approximately 900 mb) wind anomalies for (a) June and July and (b) August, September, and October 1995. Anomalies are 1995 minus 1975–95 averages in meters per second. ATOLL refers to analysis of the tropical oceanic lower layer.

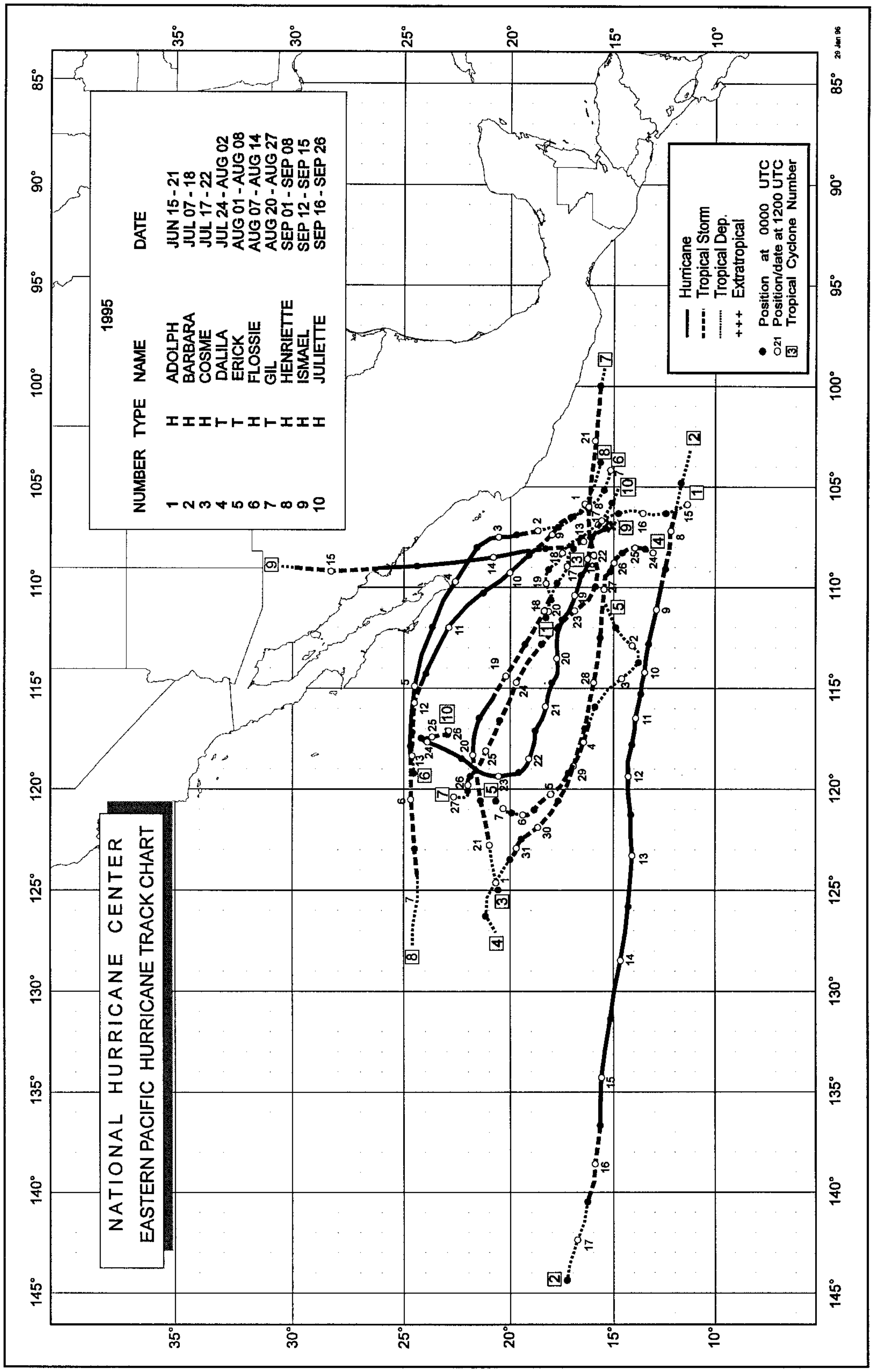

FIG. 3. Tropical storm and hurricane tracks for 1995.

TABLE 1. Eastern North Pacific hurricane season statistics for 1995.

Number	Name	Class*	Dates**	Maximum 1-min wind (m s^{-1})	Minimum sea level pressure (mb)
1	Adolph	H	15–21 Jun	59	948
2	Barbara	H	7–18 Jul	62	940
3	Cosme	H	17–22 Jul	33	985
4	Dalila	T	24 Jul–2 Aug	28	994
5	Erick	T	1–8 Aug	28	994
6	Flossie	H	7–14 Aug	36	978
7	Gil	T	20–27 Aug	28	993
8	Henriette	H	1–8 Sep	44	970
9	Ismael	H	12–15 Sep	36	983
10	Juliette	H	16–26 Sept	67	930

* T: tropical storm, wind speed 17–32 m s^{-1}. H: hurricane, wind speed 33 m s^{-1} or higher.

** Dates begin at 0000 UTC and include tropical depression stage.

3. NHC forecast accuracy

The NHC began operational forecasting of eastern North Pacific tropical cyclones in 1988. Every 6 h the NHC issues its ''official'' tropical cyclone track and intensity forecasts for periods extending to 72 h. The forecasts are evaluated using the track and intensity (5-kt resolution) dataset derived from NHC's poststorm analysis of all available information. Tables 2 and 3 show the 1995 average official track and intensity errors. They are comparable to the 1988–94 average errors.

4. Tropical storm and hurricane summaries

a. Hurricane Adolph, 15–21 June

Hurricane Adolph formed from a tropical disturbance that gradually became better organized off the southwest coast of Mexico. The disturbance was possibly associated with a westward moving tropical wave, but a lack of sufficient upper-air data and cloudiness makes it difficult to accurately track the wave from Central America into the eastern Pacific Ocean. Satellite imagery indicated increased banding features on 15 June and the disturbance became a tropical depression at 1200 UTC on this date. The depression was initially embedded within weak steering currents and drifted generally toward the north at about 3 m s^{-1}.

Deep convection increased near the center and the depression became Tropical Storm Adolph at 0000 UTC 16 June. At this time, Adolph was located over warm water and had a well-defined upper-level outflow pattern. The tropical cyclone rapidly strengthened into a hurricane by 0000 UTC 17 June when a ''banding-type'' eye appeared in satellite imagery. The government of Mexico issued a tropical storm warning and a hurricane watch at 0300 UTC 17 June from Punta Tejupan to Cabo Corrientes when Adolph was about 450 km from the coast of Mexico and moving northward near 3 m s^{-1}. The watch and warning were discontinued on 18 June, when it was forecast that the cyclone was going to move northwestward away from the mainland. The NHC has not received reports of casualties or damage related to Adolph.

Based upon Dvorak (1984) technique satellite intensity estimates, Adolph is estimated to have reached maximum 1-min winds of 59 m s^{-1} and a minimum pressure of 948 mb at 0600 UTC 18 June. The 3-h averages of objective intensity estimates peaked near this time when satellite imagery indicated a small and distinct eye embedded within very cold cloud tops.

Adolph began weakening when the upper-level environment became less favorable and when the cyclone moved over cooler water. On 19 June, the track of Adolph gradually turned toward the west. The cyclone weakened to a tropical storm by 1200 UTC on this date and to a tropical depression by 1200 UTC on the following day. Adolph dissipated on 21 June when the cyclone was centered about 550 km south-southwest of the southernmost tip of Baja California. At this time Adolph was characterized by a swirl of low clouds, no deep convection, and maximum winds near 10 m s^{-1}.

b. Hurricane Barbara, 7–18 July

Hurricane Barbara's formation appears to have been related to a weak tropical wave that crossed Dakar, Senegal, as a large swirl of low clouds on 24 June. Based heavily on extrapolation, the wave moved westward over the Atlantic and then over South America with little representation on satellite images or in rawinsonde data. The wave reached the eastern Pacific on 5 July. There, convection developed and gradually became organized. Satellite intensity estimates indicate that the westward-moving system became a tropical depression at 1800 UTC 7 July about 925 km south of Manzanillo, Mexico. The depression intensified and became Tropical Storm Barbara 12 h later.

The formation of an eye indicated strengthening and Barbara reached hurricane status at 0600 UTC 9 July. Rapid intensification followed and both objective and subjective Dvorak T numbers suggest that the winds increased to around 59 m s^{-1}. During that period, the hurricane was moving through an upper-level wind environment that was very favorable for intensification and over warm sea surface temperatures. Then, the well-defined eye disappeared from satellite images as fast as it formed, and Barbara weakened.

Barbara intensified again and redeveloped a distinct eye. It is estimated that the hurricane reached its maximum winds of 62 m s^{-1} and a minimum pressure of 940 mb at 0000 UTC 14 July (when Dvorak T numbers peaked at 7.0). Barbara remained a strong hurricane for several days while moving westward to the south of a distinct ridge of high pressure. It then moved over cooler waters and began to weaken. Barbara crossed 140°W as a tropical storm near 1800 UTC 16 July. Although it

TABLE 2. Official and CLIPER (climatology and persistence model) average track forecast errors (km) in the eastern Pacific during 1995 for a homogeneous sample that excludes extratropical, subtropical, and tropical depression stages.

	Forecast period (h)					
	0	12	24	36	48	72
1995 averages						
Official	20	71	141	205	257	313
CLIPER	20	76	153	227	295	424
Number of cases	186	186	166	146	126	90
1988–94 averages						
Official	24	71	131	194	257	367
CLIPER	24	76	141	215	290	417
Number of cases	1999	1994	1804	1606	1427	1108
1995 average departures (%) from 1988 to 1994						
Official	−16	0	8	6	0	−15
CLIPER	−16	0	8	5	2	2
1995 error range	0–161	0–313	0–424	20–733	29–994	20–780

was dissipating at 0000 UTC 18 July, a remnant swirl of low clouds was tracked westward for several days.

c. Hurricane Cosme, 17–22 July

This tropical cyclone is traced to a cloud cluster that moved across Central America on 10 and 11 July. Moving westward, the cluster showed signs of a low-level circulation by 15 July and it became a depression two days later, about 650 km south-southeast of the southern tip of Baja California.

The cyclone moved slowly toward the northwest from 17 to 20 July and gradually strengthened. A ship located about 110 km to the east of the center of Cosme at 1800 UTC 18 July reported a wind speed of 8 m s^{-1} and 1006.1-mb pressure. At this time, the TAFB and SAB wind speed estimate based on analyses of satellite pictures was 23 m s^{-1}. One might normally expect 18 m s^{-1} or higher wind speeds to extend out to 110 km from the center of a tropical storm, unless the cyclone is unusually small. However, Cosme was not tiny. These data provide an example of the uncertainty attending maximum wind speed estimates in a tropical cyclone. The estimated peak wind speeds in Cosme, 33 m s^{-1}, occurred two days later.

During its final days, Cosme turned toward the southwest, moved a little faster, and weakened. By 22 July, only a swirl of low clouds remained, located about 1600 km west-southwest of the southern tip of Baja California.

d. Tropical Storm Dalila, 25 July–2 August

The origin of Tropical Storm Dalila[2] can be traced to a tropical wave that moved westward from Africa to the tropical Atlantic Ocean on 11 July. The wave soon developed two areas of thunderstorm activity. One of these moved northwestward and showed signs of becoming a tropical depression before degenerating over the eastern Atlantic. The other, farther south, moved westward across the Atlantic and then the Caribbean Sea and Central America from 11 to 21 July.

Thunderstorms associated with the wave became more concentrated several hundred kilometers to the southwest of the Gulf of Tehuantepec on 23 July. Based on satellite pictures and surface analyses, it is estimated that this system became a tropical depression at 1200

[2] The name Dalilia was used in 1981 and 1988 and changed, perhaps inadvertently, to Dalila in operational documents prior to the 1995 season.

TABLE 3. Official wind speed forecast errors (m s^{-1}) in the eastern Pacific during 1995. Error is forecast minus observed.

	Forecast period (h)					
	0	12	24	36	48	72
1995 mean	−0.8	−1.1	−1.1	−1.4	−1.7	−1.5
1995 mean absolute	1.5	3.5	6.5	8.4	9.6	9.3
(No. of cases)	(184)	(184)	(165)	(145)	(125)	(89)
1990–94 mean	−0.5	−0.7	−1.2	−2.0	−2.7	−3.1
1990–94 mean absolute	1.5	3.6	6.1	8.2	9.5	11.2
1995 departure from 1990–94 mean absolute	−3%	−3%	+6%	+3%	+1%	−17%
1995 error range	−10 to +8	−15 to +10	−23 to +15	−26 to +26	−33 to +28	−36 to +23

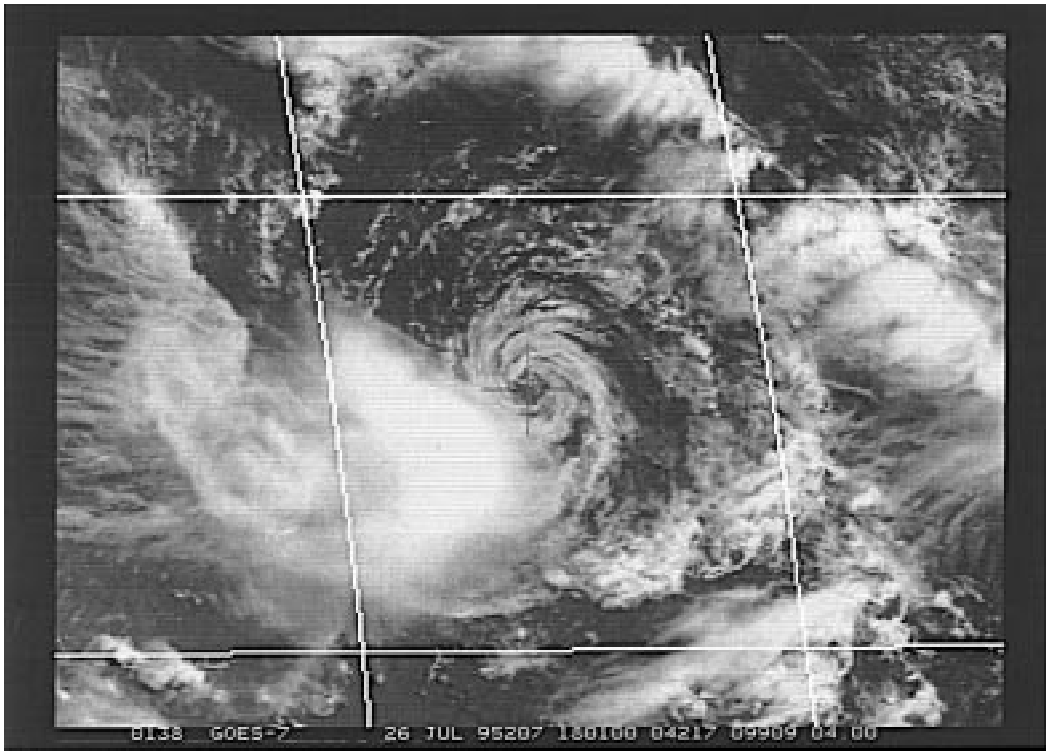

FIG. 4. *GOES-7* visible image at 1800 UTC 26 July 1995 showing Tropical Storm Dalila in an environment of easterly vertical wind shear.

UTC the next day. The cyclone was then in an environment of weak steering currents and, over the course of the following three days, moved slowly first toward the north-northeast and then toward the northwest. The low-level circulation was not confluent over the entire area; rather, satellite pictures and surface data indicated a fairly broad area of west-southwesterly winds to the south and southeast of the depression. Easterly shear, such as depicted in Fig. 4, was common during the 1995 season and in this case displaced the deepest convection up to 100 km to the west of the low-level cloud center. Only slight strengthening occurred and although the cyclone became a tropical storm on 25 July, it had wind speeds that the NHC estimates remained near 18 m s^{-1} through late on 27 July. The 0000 UTC 27 July satellite ''classifications'' provide an example of the range of early intensity estimates for Dalila. The AFGWC analysis suggested that the system had dissipated, whereas the estimates from TAFB and SAB indicated that Dalila was a tropical storm.

A deep-layer anticyclone then developed to the north of the storm. Dalila accelerated to 6 m s^{-1}, initially heading toward the west-northwest and then the northwest. The shear decreased and the storm reached its peak intensity of 28 m s^{-1} on 28 July. Dalila weakened upon moving over cooler water southwest of the Baja California peninsula. It stopped generating deep convection late on 31 July and dissipated on 2 August.

e. Tropical Storm Erick, 1–8 August

A tropical wave that crossed from the west coast of Africa to the eastern tropical Atlantic Ocean on 17 July was the precursor to Erick. This system showed some organization on satellite images over the eastern Atlantic on 18–19 July, but convection diminished during the ensuing three days, making the system difficult to track on satellite pictures. Rawinsonde data at 700 mb indicated that the wave entered the extreme eastern Caribbean Sea on 23 July, and the associated shower activity increased slightly that day over the Windward Islands. The system continued westward over the Caribbean, and thunderstorms increased over the western Caribbean on 26 July. Surface observations showed a wind shift in the Caribbean in the vicinity of 81°W, presumably related to this wave.

On 27 July, the wave crossed Central America. Over the next two days, a disorganized area of deep convection, associated with the wave, moved westward over the Pacific waters just to the south of Mexico. The cloudiness and thunderstorms became more consolidated a few hundred kilometers south of Manzanillo on 30 July, and Dvorak classifications on the system were initiated at 0900 UTC 31 July. By 1800 UTC 1 August, visible satellite pictures showed distinct evidence of low-level rotation, and it is estimated that this system became a tropical depression at that time, while centered about 850 km south of the southern tip of Baja California.

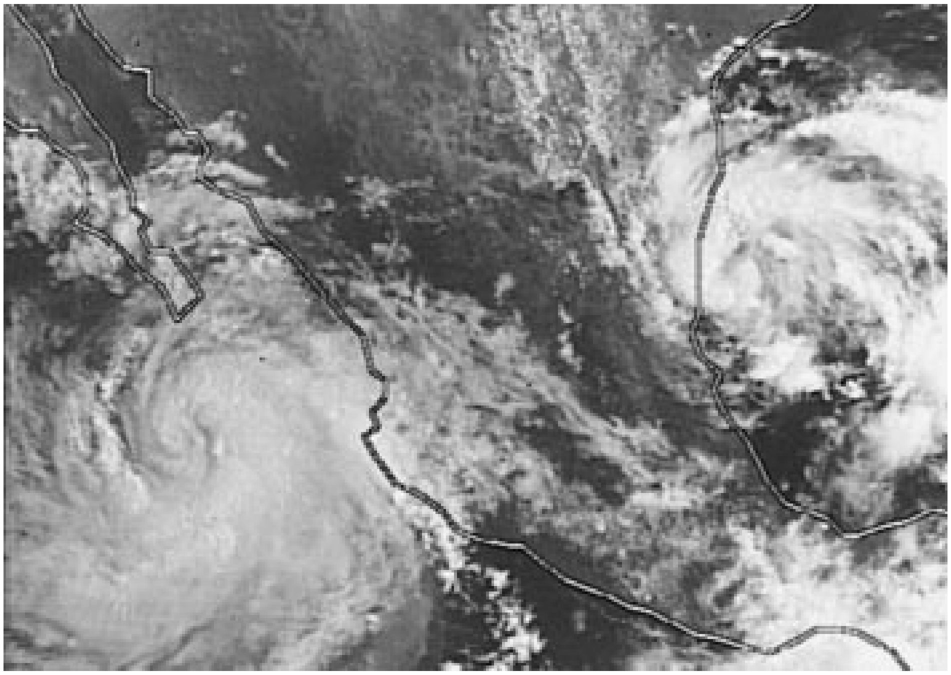

FIG. 5. *GOES-8* visible image at 1445 UTC 10 August 1995 showing eastern North Pacific Hurricane Flossie near its peak intensity centered just offshore from the west coast of Mexico and Atlantic Tropical Storm Gabrielle making landfall on the east coast of Mexico.

After formation, the tropical cyclone moved generally southwestward for about 24 h and then turned to a northwestward heading. Easterly shearing was occurring over the area, and strengthening proceeded at a slow pace. It was not until 0600 UTC 4 August that analysis of satellite pictures indicated that the cyclone reached tropical storm strength. After becoming a storm, Erick moved west-northwestward with gradual intensification. The cyclone continued to be influenced by modest easterly shear and the intensity leveled off near 28 m s^{-1} by 0000 UTC 5 August. A weakening trend was under way by 1200 UTC that day. The midtropospheric ridge to the north of the storm began to break down and Erick gradually turned northward, toward cooler water, and steadily weakened. By 1200 UTC 6 August, the system had weakened to a depression. After drifting east-northeastward, Erick dissipated around 0600 UTC 8 August.

f. Hurricane Flossie, 7–14 August

Some tropical cyclones in the eastern North Pacific appear to develop in close association with tropical waves. Others, like Hurricane Flossie, are apparently generated in a different, ''monsoonlike'' mode of formation in which tropical waves may not be the primary forcing. Hurricane Flossie formed within a large, deep cyclonic circulation and low pressure area that dominated the weather in the tropical eastern North Pacific Ocean near the end of the first week of August. The southern and southeastern part of this area was defined by a long zone of west-southwesterly winds and by cloudiness in the eastern part of the ITCZ, which had pivoted northward through the Gulf of Tehuantepec (toward Tropical Storm Gabrielle in the western Gulf of Mexico).

The large circulation was well developed by 7 August when thunderstorm activity began to increase and become focused several hundred kilometers southwest of Acapulco (perhaps in association with a tropical wave analyzed in the vicinity). Surface pressures were already low across the region as implied by a ship observation of 1004.0 mb taken near Acapulco at 0000 UTC 7 August. Based primarily on surface analyses, this system is estimated to have become a tropical depression at 1200 UTC that day.

The intensity implied by satellite images lagged the estimates derived from surface reports. Satellite analysts at the TAFB and SAB had Dvorak T numbers of 2.0 (15 m s^{-1}) at 0000 UTC 9 August. However, observations from ships imply that the cyclone was likely of tropical storm strength. For example, two ships then had pressures in the 996–999-mb range. It is estimated that the depression became Tropical Storm Flossie at 1800 UTC 8 August.

Flossie moved toward the northwest at 2–5 m s^{-1} for most of its 7-day existence, steered by the flow around a deep-layer-mean anticyclone. During that period, a northeasterly vertical wind shear gradually abated and very cold cloud tops then developed. Flossie reached hurricane strength on 10 August and its peak intensity,

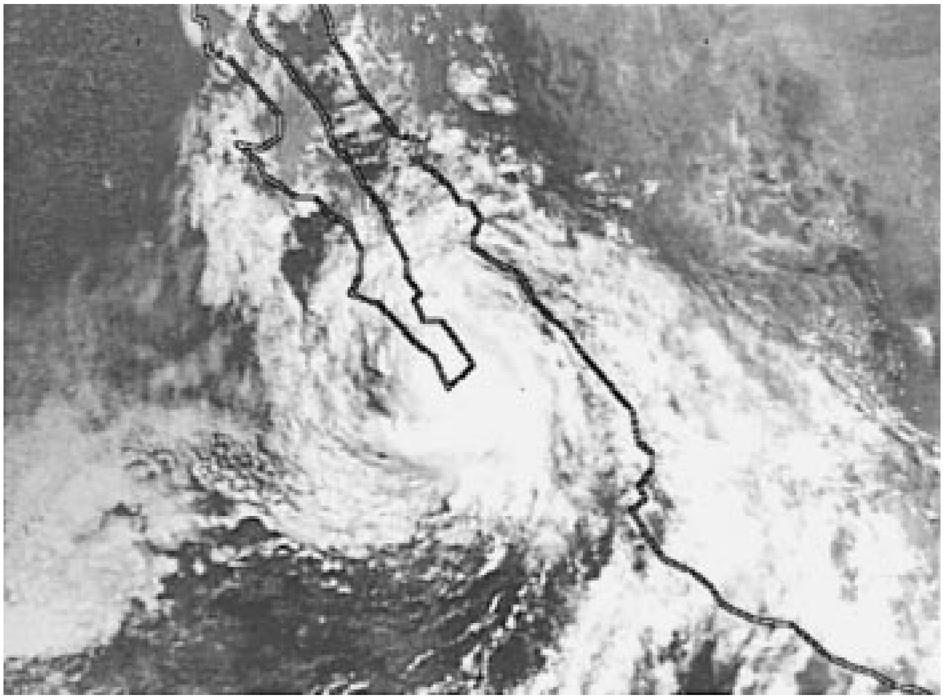

FIG. 6. *GOES-8* visible image at 1445 UTC 4 September 1995 showing Hurricane Henriette near peak intensity with cyclone center making landfall near Cabo San Lucas, Mexico.

36 m s^{-1}, was maintained for about 24 h beginning at 1200 UTC that day. An embedded warm spot appeared in satellite pictures and the center of circulation made its closest approach to land, passing about 120 km to the southwest of the southern tip of the Baja California peninsula (Fig. 5).

Although the center remained offshore, gusty winds and locally heavy rain buffeted the southwestern coast of Mexico, including the southern Baja California peninsula. Tropical storm warnings were then in effect for those areas. Cabo San Lucas, Baja California, had 18 m s^{-1} winds (over 10-min) and a gust to 25 m s^{-1} at 0300 UTC 11 August. Nearby San Jose del Cabo had a gust to 28 m s^{-1} according to amateur radio reports. The *El Nuevo Herald* newspaper reported five lives lost in Puerto Vallarta and Mazatlan. Amateur radio reports stated that two people drowned in Cabo San Lucas. No quantitative estimates of damage have been received at the NHC.

When the center of Flossie bypassed the peninsula, weakening ensued over cooler waters. The cyclone dropped below hurricane strength on 12 August and turned westward. It was a depression on 13 August and dissipated the following day.

g. Tropical Storm Gil, 20–27 August

This tropical storm formed from an area of disturbed weather that gradually became organized in the Gulf of Tehuantepec. The disturbance could have been associated with a tropical wave, though it is difficult to track this weather system back to the coast of Africa. The system consisted of a low- to middle-level circulation with deep convection that was moving slowly westward along the southern coast of Mexico on 19 August. It is estimated that it became a tropical depression at 1800 UTC the following day, while centered about 185 km to the southeast of Acapulco.

The ship *Chevron Pacific,* located just to the northwest of the tropical cyclone, reported a 23 m s^{-1} wind speed at 0600 UTC 21 August (when satellite estimates implied maximum wind speeds of 13–18 m s^{-1}). The ship data is the basis for estimating that the cyclone became Tropical Storm Gil about 6 h earlier.

Gil moved toward the west away from the coast of Mexico during the following couple of days. It then turned toward the northwest and reached its estimated maximum wind speed of 28 m s^{-1} and minimum pressure of 993 mb at 1800 UTC 24 August. Thereafter, the tropical cyclone moved over cool waters and gradually weakened.

h. Hurricane Henriette, 1–8 September

This hurricane formed from a tropical wave that moved westward across the west coast of Africa on 15 August. The wave traversed the Atlantic, the Caribbean, and Central America and reached the eastern North Pacific Ocean by 29 August. Over the next few days it acquired considerable deep convection and a low-level

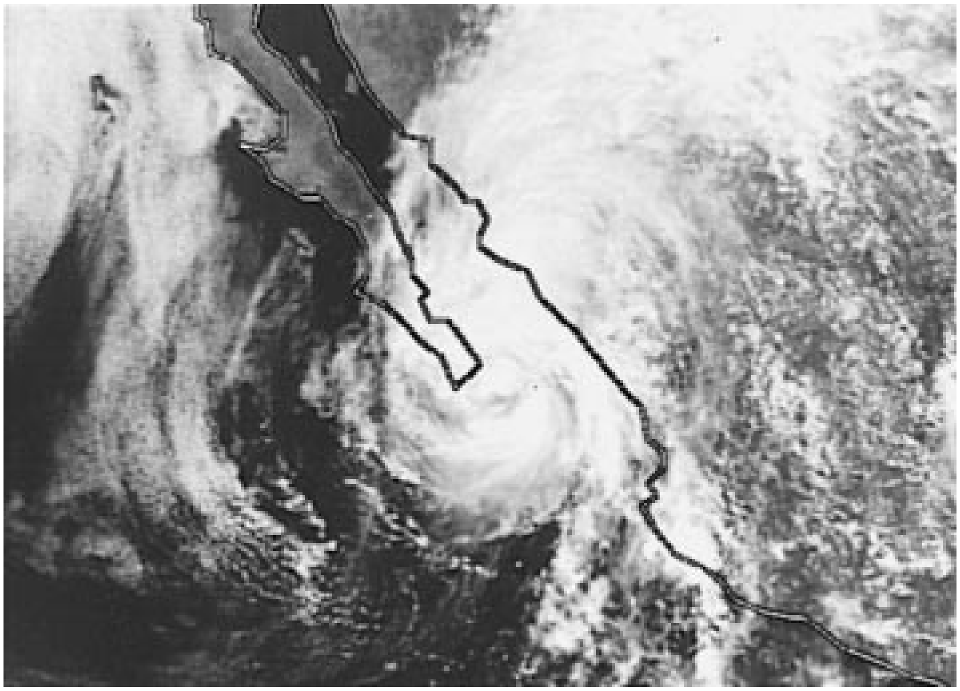

FIG. 7. *GOES-8* visible image at 1745 UTC 14 September 1995 showing Hurricane Ismael near its peak intensity.

circulation. It became a tropical depression on 1 September while centered about 275 km off the southwest coast of Mexico.

The depression moved northwestward and then northward during the next two days and its forward speed decreased from 5 to 2 m s^{-1}. It strengthened to a tropical storm on 2 September and to a hurricane on 3 September, while its center moved within 185 km of the mainland near Puerto Vallarta. The ship *Arco Sag River* reported 36 m s^{-1} winds, from 0300 to 0500 UTC 3 September, while located about 35 km northeast of the center.

Henriette turned back toward the northwest and accelerated to 7 m s^{-1}. A tropical storm watch, issued by the government of Mexico for Baja California south of La Paz at 2100 UTC 2 September, was upgraded to a hurricane watch at 0430 UTC 3 September and to a hurricane warning at 2100 UTC 3 September. The hurricane warning was then extended northward to 25°N at 0900 UTC 4 September. A well-defined eye had formed by then, and the hurricane is estimated to have reached its peak intensity of 44 m s^{-1} at 1200 UTC 4 September when the northern eyewall moved over the southern tip of the peninsula (Fig. 6). Heavy road damage (from storm surge flooding) occurred in the state of Baja California Sur and 800 people were forced from their homes, according to Mexican officials. Agriculture was adversely affected. Up to 250 mm of rain may have occurred, based on estimates from satellite imagery. No deaths have been reported.

By 5 September, the track of the hurricane was turning toward the west and Henriette moved away from land. The cyclone gradually weakened over the next three days. There was only a swirl of low clouds left to track by 7–8 September, about 1700 km west of Baja California.

i. Hurricane Ismael, 12–15 September

Hurricane Ismael's precursor, a tropical disturbance consisting of a poorly organized area of cloudiness and showers, was seen in satellite images to be centered about 275 km south of the Pacific coast of Guatemala on 9 September. The disturbance moved slowly west-northwestward for the next couple of days without signs of development. On 12 September, a cloud system center became evident in satellite imagery, and analysts began Dvorak-technique classifications at 1200 UTC on this day.

Convective banding became organized and the system gained tropical depression status at 1800 UTC 12 September, about 550 km to the south-southwest of Manzanillo, Mexico. The depression initially moved toward the northwest near 4 m s^{-1}. Deep convection increased near the center, and satellite intensity estimates suggest that the depression strengthened into Tropical Storm Ismael at 0000 UTC 13 September. The storm turned more toward the north, apparently in response to a mid- to upper-level low observed in water vapor imagery (not shown) over Baja California.

Upper-level outflow became well established, and deep convection continued to develop on 13 and 14

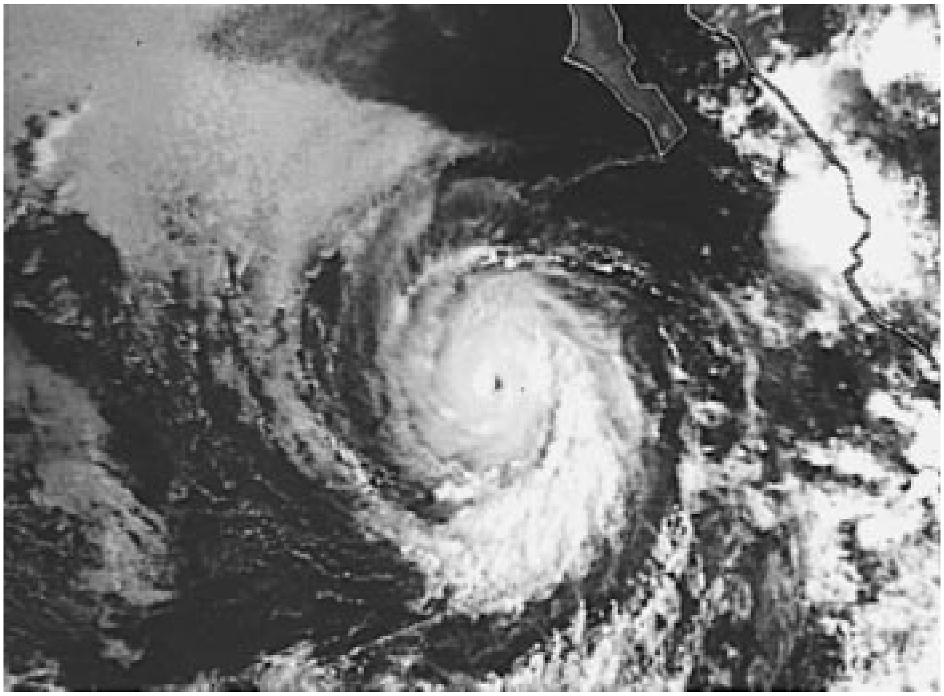

FIG. 8. *GOES-8* visible image at 1445 UTC 20 September 1995 showing Hurricane Juliette, the year's strongest eastern North Pacific tropical cyclone, near its peak intensity.

September. It is estimated that Ismael strengthened into a hurricane while centered about 450 km south-southeast of the southern tip of Baja California at 0600 UTC 14 September.[3] On 14 September, a poorly defined eye became visible in satellite pictures and Ismael is estimated to have reached its maximum intensity of 36 m s^{-1} (Fig. 7).

Forward motion of the hurricane increased to 9 m s^{-1} on 14 September while the hurricane was steered by the mid- to upper-level trough to the west and a deep-layer-mean ridge to the east. Tropical storm and hurricane watches and warnings were issued for portions of the west coast of mainland Mexico and southern Baja California. The center of Ismael moved up the southern Gulf of California and made landfall near 0400 UTC 15 September in the vicinity of Topolobampo, Mexico. Newspapers reported 105 deaths and several more missing in that area in association with Ismael. A report from the government of Mexico placed the number of deaths at 57. Many of those who died were on fishing boats that encountered strong winds and high seas in the Gulf of California. The Associated Press reported thousands homeless as a result of the hurricane and about 5000 ''rickety houses'' destroyed. Some of the worst damage was in the village of Topolobampo, Mexico, located a few kilometers to the south of Los Mochis. Houses and telephone poles were knocked down in Los Mochis, but no deaths were reported there.

The tropical cyclone weakened rapidly when the circulation moved over the Sierra Madre of northern Mexico, and it dissipated by 0000 UTC 16 September. However, as seen in Fig. 7, considerable moisture from Ismael spread northeastward ahead of the cyclone center. The moisture moved over the southwestern United States and then eastward through the mid-Atlantic states.

j. Hurricane Juliette, 16–26 September

Juliette can be traced back to a tropical wave that exited western Africa on 31 August. This wave followed the wave from which Hurricane Luis formed over the eastern Atlantic Ocean. The upper-level outflow (and possibly subsidence) to the east of Luis apparently inhibited development of the trailing wave while it moved westward across the Atlantic. Even though the cloud pattern associated with this wave was not well defined, continuity (using a westward motion of 6° longitude per day) puts the wave axis near Panama on 11 September.

The wave crossed Central America on 12 September, and it caused increased thunderstorm activity in the vicinity of the Gulf of Tehuantepec on 13 September and near 100°W on 14 September. Late on 15 September (2330 UTC), when the system was near 103°W, the cloud pattern became sufficiently organized so that an

[3] As noted for other storms, intensity estimates based on satellite data can be disparate. For Ismael, the intensity estimates from one of the satellite analysis units never exceeded 23 m s^{-1}.

initial Dvorak-technique classification was performed. The development trend continued, and based on Dvorak-scale intensity estimates of T2.0, it is estimated that the weather system became a tropical depression about 500 km to the south of Manzanillo, Mexico, at 1800 UTC 16 September.

The tropical cyclone was rather small in size, with a central area of deep convection only 90–180 km in diameter. Based on Dvorak-technique estimates, tropical storm intensity was reached at 1200 UTC 17 September. Further strengthening at a rapid rate occurred and Juliette is inferred to have reached hurricane strength by 1200 UTC 18 September, when satellite images revealed that an eye was forming. Continued rapid development took place and within 6 h Juliette's eye was well defined.

A narrow, weak, deep-tropospheric ridge centered to the north of the strengthening hurricane steered Juliette slowly in a general west-northwestward direction. On 19 September, satellite imagery suggested that the strengthening trend practically ceased and maximum winds leveled off near 54 m s^{-1}. On that day it is possible that northeasterly winds in the upper-level environment of Juliette interfered with the cyclone's outflow aloft. However, on 20 September, as Juliette turned toward the west, further intensification occurred. A fairly symmetrical mass of very cold cloud tops was seen around the eye on infrared satellite pictures (a visible picture is shown in Fig. 8). At 1200 UTC 20 September, Juliette reached its peak intensity. A subjective Dvorak T number of 6.5 and 3- to 6-h mean objective T numbers between 6.5 and 7.0 were noted and are consistent with estimated maximum winds of 67 m s^{-1}—making Juliette the strongest eastern North Pacific hurricane of 1995.

Later on 20 September, as a gradual weakening trend set in, the hurricane turned back to the west-northwest and slowed from 5 to 3 m s^{-1}. This general motion continued for the next couple of days. By 1200 UTC 22 September, maximum winds were down to 44 m s^{-1}. Satellite images during the previous 24 h or so indicated the presence of concentric eyewalls, and that the inner eyewall gave way to an outer wall. This resulted in a large eye, about 130 km in diameter. Around 0000 UTC 23 September, the eye shrank to about half that size, and a minor restrengthening, back to 46 m s^{-1}, was noted. These intensity changes are roughly consistent with an eyewall replacement cycle (e.g., Willoughby et al. 1982).

Steering currents around a midtropospheric low in the vicinity of 27°N, 130°W caused the hurricane to turn northward on 23 September. The low opened up into an eastward-moving trough the next day. The associated winds steered Juliette north-northeastward with forward speed increasing to 5 m s^{-1}. Although significant weakening by strong vertical wind shear and cold ocean waters was expected, a tropical storm watch was issued as a precautionary measure for a portion of Baja California because some of the track forecast models predicted the cyclone to move over that peninsula.

The shearing and low sea surface temperatures took their toll, and Juliette weakened to a tropical storm late on 24 September. By 0000 UTC 25 September, the storm consisted of a swirl of lower-tropospheric clouds, devoid of deep convection. With the influence of upper-level steering removed, the dissipating cyclone's motion became a south to southeastward drift. Juliette weakened to a depression around 0000 UTC 26 September and, later that day, the then-meandering tropical cyclone dissipated.

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