

HURRICANE ELOISE

SEPTEMBER 13 - 24, 1975

National Hurricane Center, NOAA
Miami, Florida

METEOROLOGICAL HISTORY

The disturbance which spawned Eloise left the African west coast on September 6 as a rather unimpressive system on satellite pictures, although the Dakar, Senegal, upper air sounding gave evidence of a fairly strong cyclonic circulation at lower levels. The disturbance moved westward at an average speed of 13 knots during the next six days with satellite pictures and ship reports giving evidence of a very gradual increase in convection and organization.

The first sign that a weak depression had formed came early on the 13th when the Netherlands tanker GULF HANSA (PELP) reported northerly winds of 20 kt and seas up to 10 feet. Later that morning an Air Force reconnaissance aircraft located the center about 600 miles east of the Virgin Islands. Satellite pictures, ship, and reconnaissance reports during the next 48 hours confirmed a trend of slow intensification. A reconnaissance aircraft found that winds had reached tropical storm strength during the early morning hours of the 16th, and the first advisory on Eloise was issued by the San Juan Hurricane Warning Office at 6 AM AST. Previously, bulletins had been issued since the 13th warning the northern Leewards, Virgin Islands, and Puerto Rico of heavy rains and gusty winds to gale force.

Eloise strengthened rapidly and NOAA aircraft reported winds reached minimal hurricane force prior to its striking the northeast coast of the Dominican Republic late on the 16th. For the next 36 hours the center and much of the circulation was over land. Falling pressures to the northwest of Eloise were expected to keep the center north of the Dominican Republic and Cuba. However, the center tracked westward across extreme southeastern Cuba into the northwestern Caribbean Sea north of Jamaica.

The mountainous terrain of Hispaniola and Cuba caused Eloise to weaken to a minimal tropical storm with a marked decrease in associated rainfall by the time the center finally emerged over open water.

A favorable upper level flow pattern continued over the storm, as it had since the 13th, with anticyclonic outflow enhanced by a cold low traveling westward about 500 miles in advance. The lower level circulation had been distorted by the encounter with land and was also somewhat adversely affected by an approaching trough from the west. Even though the center was over the open, warm waters of the Caribbean Sea and rising pressure to the north were contribut-

ing to more favorable low level conditions, Eloise remained poorly organized until it approached the northeast coast of Yucatan late on the 20th with winds of gale force mainly in squalls northeast of the center. From the time the center approached the Dominican Republic until it moved into the central Gulf of Mexico, it varied from 40 to 60 miles in diameter. Reconnaissance reports and upper air soundings suggested a fairly large slope of the center with height from the surface prior to its reaching the Gulf of Mexico, and satellite pictures continually showed the heaviest convection well south and east of the center. Lack of reconnaissance and surface reports while the broad center was over the Dominican Republic, Cuba, and adjacent waters has led to more than normal uncertainty in the locations and intensities on the best track from the 17th at 00Z to 12Z of the 21st.

An approaching upper level trough in the westerlies caused Eloise to turn to the north after crossing the Yucatan peninsula just north of Cozumel, Mexico. This enhanced an already favorable outflow pattern aloft, while rising pressures around the storm had made low level conditions more favorable for intensification. Eloise began a steady strengthening north of the Yucatan peninsula, regaining hurricane force in the central Gulf of Mexico about 350 miles south of New Orleans on the morning of the 22d. The hurricane continued strengthening until landfall about midway between Fort Walton Beach and Panama City shortly after 8 AM EDT on the 23d. At that time it was moving north northeast at better than 20 knots, and had been monitored continuously by Air Force reconnaissance aircraft and National Weather Service radar at Pensacola, Apalachicola, and Slidell (New Orleans) during the last 12 hours prior to landfall.

The hurricane weakened rapidly after landfall as drier, colder air was drawn into its circulation. It was downgraded to a tropical storm by noon while over east central Alabama, a tropical depression by early evening while over eastern Tennessee, and lost all tropical characteristics by the time it reached extreme western Virginia on the morning of the 24th.

A low pressure center identifiable as the remnant of Eloise was no longer discernable by late on the 24th. However, the moisture brought northward by the hurricane combined with an old frontal system over the northeastern United States to produce heavy

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rainfall and serious flooding until skies cleared on the 27th.

METEOROLOGICAL DATA DEATHS, DAMAGE ESTIMATES

1. Northern Leeward Islands, Virgin Islands, Puerto Rico, Dominican Republic, and Haiti.

The primary effects of Eloise in these areas was flooding resulting from torrential rains and consequent deaths and damages. Total storm rainfall amounts ranged from 5-10 inches from St. Kitts and St. Martin westward across St. Croix to Puerto Rico with amounts of 10-20 inches common over eastern and southwestern Puerto Rico. The greatest total reported was 26.7 inches near Sabana Grande in southwest Puerto Rico. Lesser amounts of 1-3 inches fell at St. Thomas and other northern Leeward Islands. No storm totals are available from Hispaniola but incomplete rainfall observations and satellite pictures indicate torrential rains occurred over the eastern and southern portions of the Dominican Republic and southern Haiti.

River and flash floods and landslides caused most of the deaths in this area. Press accounts report 18 deaths in southern Haiti and 7 deaths in the Dominican Republic. There were 34 confirmed deaths in Puerto Rico. Property damage in Puerto Rico is estimated in excess of \$60 million with no estimates elsewhere.

The strongest winds were north of the center and remained offshore from Puerto Rico and the Dominican Republic. St. Croix had a gust to 45 knots. Ponce and Mayaguez in Puerto Rico, had gusts to 35 kt. The maximum sustained wind of 45 knots was reported from Cape Engano on the northeastern tip of the Dominican Republic.

2. Extreme southeastern Bahamas, Cuba, Jamaica, Cayman Islands, northeast Yucatan.

Eloise weakened throughout most of the period it was affecting these areas. In addition, satellite pictures indicated most of the heavier rainfall missed the land areas. A squall of 45 knots occurred on Cayman Brac during the afternoon of the 19th. Sustained winds of 40 knots were reported along the southeast coast of Cuba on the 18th. There were no other reports of high winds, and no deaths or significant damage reports from this region.

3. United States.

a. Southeast.

Eloise strengthened until reaching the coast with the minimum pressure of 955 mb observed at Destin, FL. The maximum sustained surface winds during Eloise's lifetime were estimated to be 110 knots, also

at landfall, although flight level winds reported by reconnaissance aircraft at 700 mb were somewhat higher.

The highest sustained winds along the coast were not measured as most wind measuring equipment failed. However, a gust to 135 knots was observed on a 98-foot tower located 13 miles offshore from Panama City. Winds of hurricane force were reported from Fort Walton Beach to Panama City and northward into extreme southeastern Alabama. Gales were reported from the southeastern Louisiana delta to Cedar Key, FL, and northward over most of Alabama and western Georgia to extreme southeastern Tennessee.

Preliminary measurements indicate hurricane tides of 12-16 feet above normal occurred from just east of Fort Walton Beach to south of Panama City. Tides of 6-12 feet were reported eastward to Port St. Joe with 3-5 feet elsewhere in the gale warning area, and 2-3 feet along the Florida west coast from Naples northward to Cedar Key.

Preliminary reports indicate 10 or more tornadoes occurred from northwestern Florida to western North Carolina, causing no deaths and only minor damage.

Rainfall amounts ranged from 4 to 8 inches from extreme southeastern Louisiana to the Panama City area and northeastward to the western Carolinas. The greatest total reported was 14.9 inches at Eglin Air Force Base, FL.

There were four storm related deaths, although none occurred as a direct result of the winds or storm surge during the passage of Eloise. Most of the estimated \$100-150 million damage occurred along the 25-mile Panama City Beach Strip, mainly as a result of the high tides undermining the beachfront structures.

Approximately 100,000 residents from southeastern Louisiana to northwestern Florida evacuated before Eloise reached the coast.

b. Northeast.

A low pressure center identifiable as the remnants of Eloise was no longer apparent late on the 24th. However, the combination of the moisture brought northward by Eloise and a stagnant frontal zone produced rainfall amounts of 4-10 inches over a large area from northern Virginia and Maryland through Delaware and New Jersey, into the eastern half of Pennsylvania, and southeastern and south central New York state.

Major flooding took place on the Chemung, Susquehanna, Potomac, and Shenandoah rivers with flash floods along smaller rivers and streams.

The 17 deaths in the area were mostly drown-

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ings. Damages are estimated at 300 million dollars with the bulk of it occurring as crop and road damage.

FORECASTS AND WARNINGS

Warnings of flooding from heavy rains were given for Puerto Rico and the Virgin Islands 24 hours or more in advance. Hurricane warnings for the Dominican Republic were issued less than 12 hours in advance because of the rapid intensification of Eloise.

Although hurricane warnings were issued 24 hours in advance for the Gulf coast area devastated by Eloise, and the forecast error for landfall was about the average for land-

falling U.S. storms/hurricanes, the rather early mention of a landfall point led to some mis-interpretation of the warnings, and a subsequent delay in action on evacuation.

Eloise generated hurricane tides somewhat higher than previous numerical and empirical techniques had indicated for a hurricane of this strength. The peak surge rose rapidly, lasting about 30 minutes. The presence of sand dunes in the landfall area may have contributed to some of these effects, but further study is needed before any definite conclusions can be made. There is little doubt, however, that the erosion of the sand dunes led to much of the destruction along the beaches.

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Preliminary Best Track

DATE	TIME GMT	POSITION		WIND (KT)	PRESSURE (MB)	STAGE		
		LATITUDE	LONGITUDE					
9/13	0600Z	17.5	54.1	25	1009	Tropical Depression		
	1200Z	17.6	55.2					
	1800Z	17.7	56.3					
9/14	0000Z	17.8	57.3		1009			
	0600Z	17.9	58.3					
	1200Z	18.0	59.4					
	1800Z	18.1	60.5					
9/15	0000Z	18.3	61.7		1007			
	0600Z	18.5	62.8					
	1200Z	18.8	63.8				30	
	1800Z	18.9	64.8					
9/16	0000Z	19.0	65.6	35	1002	Tropical Storm		
	0600Z	19.2	66.7	45		Hurricane		
	1200Z	19.4	67.5	55				
	1800Z	19.5	68.4	65				
9/17	0000Z	19.6	69.2		997	Tropical Storm		
	0600Z	19.7	70.2		60		1000	
	1200Z	19.7	71.2		55			
	1800Z	19.8	72.2		50			
9/18	0000Z	19.9	73.3	45				
	0600Z	19.9	74.5					
	1200Z	19.9	75.7	40				
	1800Z	20.0	77.0					
9/19	0000Z	20.0	78.2	35				
	0600Z	19.9	79.1					
	1200Z	19.9	79.8					
	1800Z	19.8	81.0					
9/20	0000Z	19.8	82.2		1006			
	0600Z	19.8	83.4					
	1200Z	19.9	84.6					
	1800Z	20.0	85.5					
9/21	0000Z	20.2	86.4	40	1001			
	0600Z	20.8	87.1	45				
	1200Z	21.4	87.8	50				
	1800Z	22.4	88.5	55			995	
9/22	0000Z	23.6	88.9	60	993	Hurricane		
	0600Z	24.8	89.4	65			986	
	1200Z	25.8	89.5	75			980	
	1800Z	26.5	89.4	85				
9/23	0000Z	27.3	88.5	95	968			
	0600Z	28.4	87.3	105			958	
	1200Z	30.2	86.3	110			955	
	1800Z	33.0	85.7	55			982	Tropical Storm
9/24	0000Z	35.5	84.3	30	999	Tropical Depression		
	0600Z	36.5	83.5	20			1004	Extratropical
	1200Z	37.0	82.5					
	1800Z	37.5	81.5					
LANDFALL		30.4N	86.2W	at 23/1215Z				