

Preliminary Report
Hurricane Iris
22 August - 4 September 1995

Edward N. Rappaport
National Hurricane Center
2 November 2000 Update

Responding to a request and data from the director of Meteo-France-Guadeloupe, Roland Mazurie, the track and intensity of Iris were re-analyzed for the period when it was centered near the Lesser Antilles. It was determined that while reconnaissance aircraft tracked the dissipating original circulation center westward into the extreme eastern Caribbean Sea, radar and surface data showed a new center developing closer to deep convection just east of the islands. To account for this, minor changes (in bold below) have been coordinated between Mazurie, TPC's Jack Beven and the author to the position and pressure estimates at three best track times. The first two positions represent the geometric center between two weak circulation centers (the weakening original center and strengthening new center), while estimates at the third time reflect the new center as it becomes dominant. No changes were made to the estimated maximum wind speed.

Table 1

Track of Hurricane Iris, 22 August-4 September 1995 (updated)

Date/Time (UTC)	Position		Pressure (mb)	Wind speed (kt)	Stage
	Lat. (°N)	Lon. (°W)			
22/1200	13.2	49.3	1008	30	Tropical Depression
1800	13.3	50.6	1007	35	Tropical Storm
23/0000	13.7	51.8	1006	35	" "
0600	14.0	52.5	1004	40	" "
1200	14.5	53.0	998	55	" "
1800	15.0	53.4	991	75	Hurricane
24/0000	15.2	53.8	992	70	" "
0600	15.0	54.3	992	70	" "
1200	14.8	55.1	992	65	" "
1800	14.6	56.0	992	60	Tropical Storm
25/0000	14.5	56.8	995	55	" "
0600	14.3	57.8	996	55	" "
1200	14.2	58.8	999	55	" "
1800	14.2	59.8	998	50	" "
26/0000	14.0	60.3	1000	50	" "
0600	14.2	60.2	999	45	" "
1200	14.6	60.5	1000	45	" "
1800	14.9	61.0	1003	40	" "
27/0000	15.0	61.2	1006	35	" "
0600	15.6	61.2	1005	40	" "
1200	16.2	61.2	1002	45	" "
1800	17.0	61.9	995	50	" "

28/0000	17.8	62.0	993	55	"	"
0600	18.6	62.0	989	55	"	"
1200	19.4	62.1	985	60	"	"
1800	20.4	62.4	983	65	Hurricane	
29/0000	21.3	62.5	981	70	"	"
0600	22.0	62.5	974	80	"	"
1200	22.6	62.5	973	75	"	"
1800	23.1	62.3	975	70	"	"
30/0000	23.6	62.1	976	70	"	"
0600	23.8	61.8	977	70	"	"
1200	24.0	61.4	972	75	"	"
1800	24.2	60.8	971	75	"	"
31/0000	24.5	60.1	971	75	"	"
0600	24.7	59.6	971	75	"	"
1200	24.9	59.1	971	75	"	"
1800	25.0	58.9	968	85	"	"
1/0000	25.2	58.8	967	90	"	"
0600	25.5	58.8	965	95	"	"
1200	25.6	59.0	967	90	"	"
1800	25.7	59.7	969	85	"	"
2/0000	26.0	60.2	971	85	"	"
0600	26.6	60.2	973	85	"	"
1200	27.8	59.9	978	80	"	"
1800	29.1	59.7	983	75	"	"
3/0000	31.3	59.0	982	75	"	"
0600	34.2	58.6	982	75	"	"
1200	36.9	57.5	982	75	"	"
1800	39.2	55.5	985	70	"	"
4/0000	41.0	52.3	987	65	"	"
0600	43.1	49.4	990	60	Tropical Storm	
1200	45.0	46.0	995	60	Extratropical	
1800	47.1	42.0	997	55	"	"
5/0000	48.7	35.7	999	50	"	"
0600	48.9	28.1	998	50	"	"
1200	48.6	25.0	987	50	"	"
1800	48.5	21.5	979	55	"	"
6/0000	48.3	18.0	972	55	"	"
0600	48.0	14.2	967	60	"	"
1200	48.0	12.6	963	60	"	"
1800	48.2	11.1	960	65	"	"
7/0000	48.4	8.7	957	65	"	"
0600	48.9	6.9	962	65	"	"
1200	49.3	4.4	968	60	"	"

1/0600 25.5 58.8 965 95 Minimum Pressure
(as a tropical cyclone)

Direct hit, defined as site within one Radius of Maximum Wind (RMW) to left or two RMW to right of cyclone center:

St. Lucia						
26/0000	14.0	60.3	1000	50	Tropical Storm	
Martinique						
26/1800	14.9	61.0	1003	40	Tropical Storm	

Guadeloupe and local islands (landfall)						
27/09-1200			1002-3	45		Tropical Storm
Montserrat, Antigua (landfall)						
27/1800	17.0	61.9	995	50		Tropical Storm
Barbuda (landfall)						
27/2300	17.7	62.0	993	55		Tropical Storm

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22 August - 4 September 1995

Edward N. Rappaport
National Hurricane Center
26 November 1995

a. Synoptic History

Iris formed from the first of four consecutive tropical waves to generate tropical cyclones (Iris, Humberto, Karen, and Luis) on their generally westward trek across the tropical eastern Atlantic Ocean. Iris' evolution was greatly influenced by two of those systems, Humberto and Karen.

The wave associated with the formation of Iris crossed the coast of Africa and began moving over the Atlantic Ocean on August 16th. Surface analyses showed a closed circulation around a 1009 mb pressure center located just south of Dakar. A day later, the circulation was evident in surface observations and satellite pictures near the Cape Verde Islands. Associated deep convection diminished on the 18th and 19th, but then gradually redeveloped. Dvorak technique T-numbers of 1.0 were assigned by the NHC Tropical Analysis and Forecast Branch (TAFB; TSAF in figures) on the 21st and both the TAFB and NESDIS Synoptic Analysis Branch indicated T-2.0 on the 22nd. From the satellite data it is estimated that the system became the 10th Atlantic tropical depression of the season at 1200 UTC on the 22nd, when located about 600 n mi to the east of the Lesser Antilles (Table 1 and Fig. 1). It became Tropical Storm Iris six hours later.

The cyclone took a jog to the northwest on the 23rd and quickly strengthened. The first reconnaissance flight into Iris took place that evening and found the system to be stronger than operational estimates based on satellite pictures (Figs. 2 and 3). The aircraft encountered 92 knot 10-second winds at a flight level of about 500 m, and a central pressure of 991 mb was reported. From this data, Iris is analyzed as a hurricane at 1800 UTC on the 23rd (Table 1).

Iris moved toward the west-southwest at about 10 knots on the 24th and 25th. The change in heading was probably a consequence of a Fujiwhara interaction between Iris and Humberto located about 750 n mi to the east--Humberto had developed from a depression on the 22nd to a 95-knot hurricane by late on the 24th.

On the 25th, Iris neared the Lesser Antilles. An upper-level cold low was centered then to the north of Puerto Rico. Westerly vertical wind shear occurred, separating deep convection from the low-level cloud center, disrupting the circulation, and slowing the general westward progress of the cyclone. Iris weakened back to tropical storm strength. Reconnaissance aircraft and radar data indicate a reformation of the center to the east of the former position while the system meandered for about a day before moving into the islands.

Steering currents ahead of a trough to the northwest then turned Iris generally toward the north-northwest on the 27th. On this track, Iris moved up the chain of Leeward Islands and strengthened as the shear decreased. Late on the 28th, Iris regained hurricane status over the south-central Atlantic.

Iris began a Fujiwhara interaction on the 30th, with Tropical Storm Karen to its southeast. The interaction swept the weaker Karen on a spiral path around, and then into, Iris where it was absorbed on September 3rd. The interaction could have contributed to Iris' erratic motion during this period (Fig. 1).

An eye appeared intermittently and the intensity of Iris fluctuated from August 29th through September 2nd. Iris reached its peak intensity of 95 knots several hundred miles to the southeast of Bermuda on the 1st. Iris then weakened, temporarily, in an environment of shear and relatively cool water. It dropped below hurricane strength and became extratropical while accelerating northeastward well to the southeast of Newfoundland on the 4th. It then turned eastward and deepened. The pressure fell from around 1000 mb to near 957 mb in about 48 hours. On the 7th, Iris battered western Europe as a powerful extratropical storm with sustained wind speeds near 65 knots.

b. Meteorological Statistics

The "best track" intensities were obtained from the data presented in Figs. 2 and 3. Those figures show estimated central pressure and maximum one-minute wind speed, respectively, versus time.

The ship *Pallas Athena* reported 34-40 knot winds at 1200 UTC on September 1 while located about 100 n mi to the south-southeast of the center of Iris. This was the only ship report of wind speeds 34 knots or greater received by the NHC for the tropical cyclone phase of Iris.

The only available observation of sustained tropical storm force winds in Caribbean islands came from Desirade (just east of Guadeloupe) where a 45 knot (2-min) wind and 54 knot gust occurred. Highest reported gusts elsewhere reached 49 knots at Martinique, 40 knots at Antigua, 37 knots at Dominica, and 36 knots at St. Kitts. The lowest pressure reported from the northeastern Caribbean area was 999 mb at Antigua.

The primary meteorological event caused by Iris in the Caribbean islands was heavy rain. The totals were particularly large in Martinique where Ducos (La Manzo) had 17.72 inches for the event, with 16.18 inches falling in 24 hours. Other peak rainfall rates in Martinique included 1.89 inches in 30 minutes, 3.01 inches in 1 hour and 4.61 inches in 2 hours at Trois Ilets, Vauclin, and Ducos, respectively. An average of 6 inches of rain fell on Antigua.

c. Casualty and Damage Statistics

Four deaths occurred on Martinique, two each in two homes affected by mud slides. An early media summary indicated a death on Guadeloupe.

Few damage reports have been received at the NHC. There was extensive flooding in low-lying areas and destruction of banana trees on Antigua. Similar damage likely occurred on neighboring islands.

d. Forecast and Warning Critique

Iris and Humberto were poorly initialized, or not initialized, in the Aviation model during the period when Iris approached the Lesser Antilles. Consequently, the Aviation model tracking algorithm (AVNI) failed to produce a forecast many times. The poor initialization also led to bad forecasts by some of the track models. Some of the models showed Iris immediately turning to a northward track--as much as two or three days too soon. Other models (like the statistical-dynamical A90E, which strongly weighs persistence of heading for short-term forecasts) correctly showed Iris reaching the Caribbean Islands, but then incorrectly indicated that the cyclone would continue moving generally westward into the eastern Caribbean Sea.

Table 2 shows average track forecast errors for the NHC official forecast and for the objective guidance. NHC average track errors were near to, and slightly smaller than, the most recent 10-year averages. The average official error at 72 hours was smaller than the average error associated with any model.

NHC intensity forecast errors were larger than normal for two period of relatively large intensity change--when Iris weakened while nearing the Caribbean and again when the cyclone intensified upon leaving that area.

Table 3 lists the tropical storm and hurricane watches and warnings issued in association with Iris.

Acknowledgments

Contributions to this report were made by the meteorological services of Antigua and Martinique.

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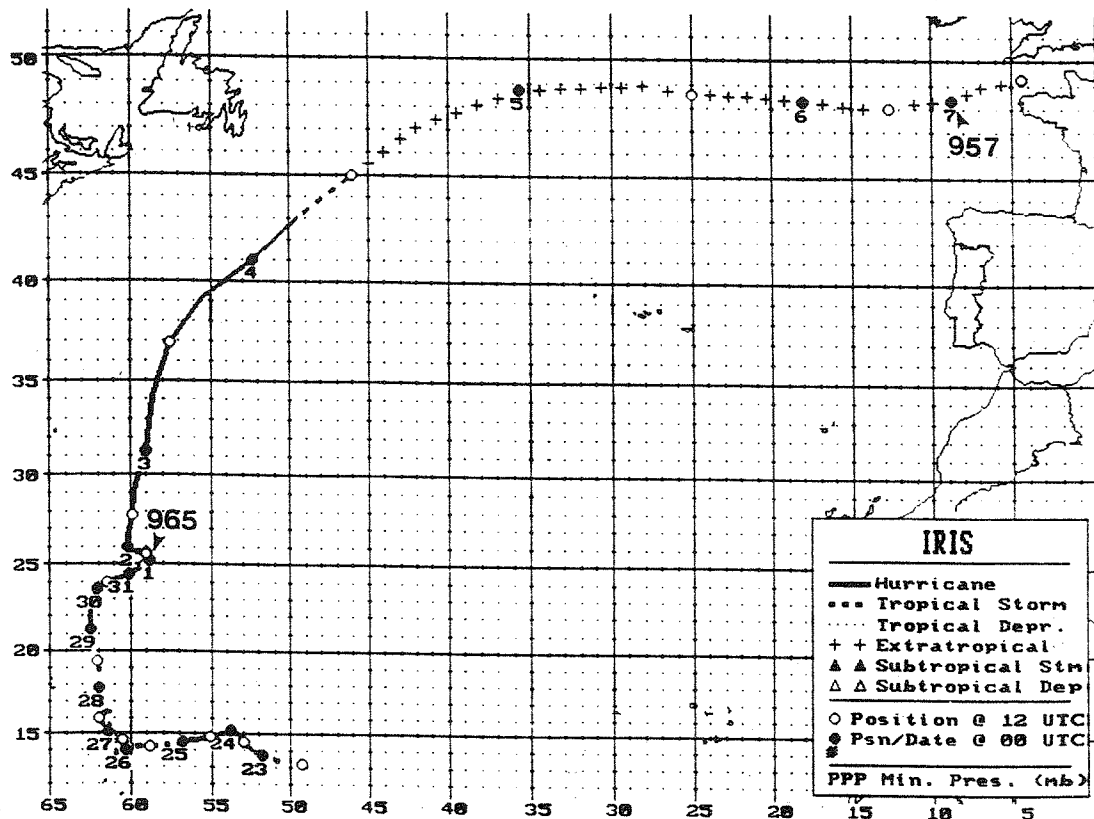


Figure 1. Track of Hurricane Iris.

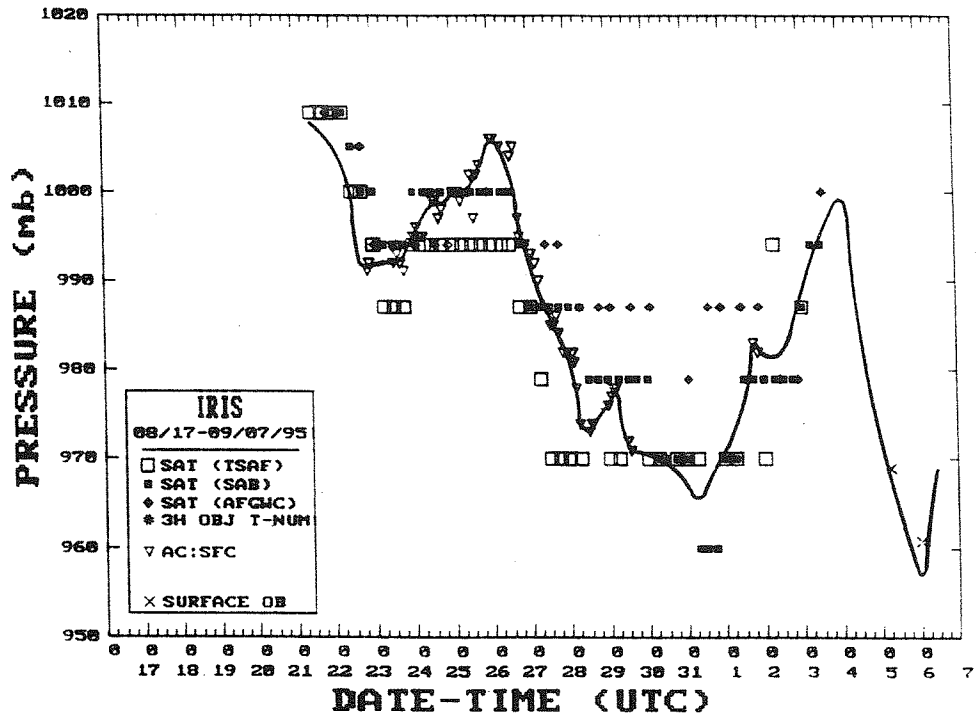


Figure 2. Central pressure curve for Hurricane Iris, August - September 1995.

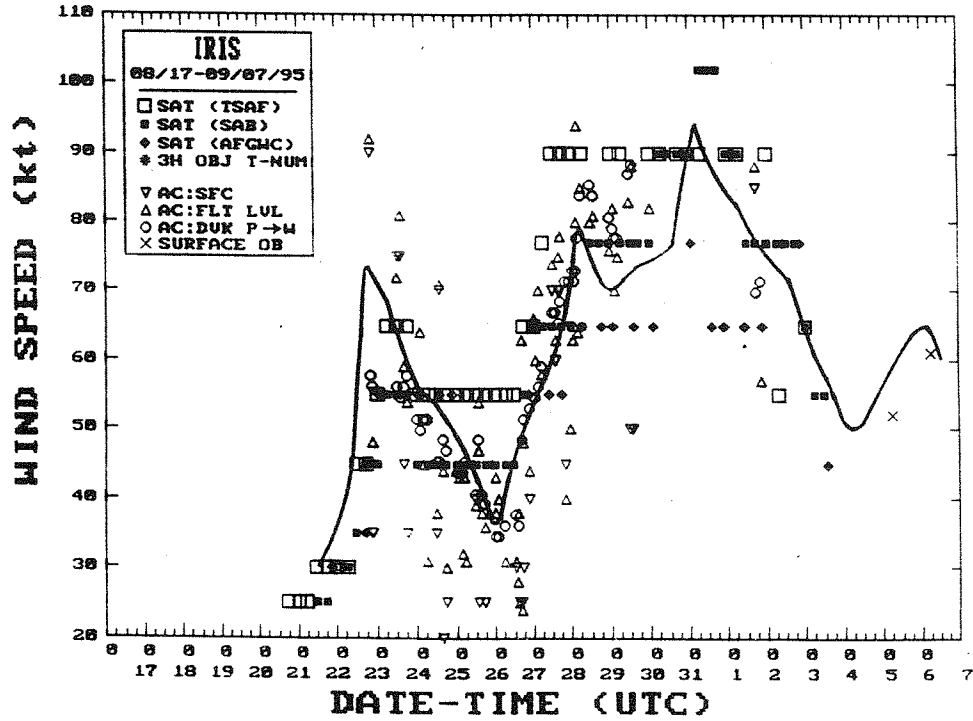


Figure 3. Maximum one-minute wind speed curve for Hurricane Iris, August - September 1995. Not all aircraft observations sampled the maximum wind speed.

Table 2

Hurricane Iris track forecast verification
Heterogeneous sample

(Errors in nautical miles for tropical storm
and hurricane stages with number
of forecasts in parenthesis)

Forecast Technique	Period (hours)				
	12	24	36	48	72
GFDI	50 (48)	96 (46)	150 (44)	210 (42)	343 (38)
GFDL*	53 (24)	87 (23)	125 (22)	172 (21)	284 (19)
VBAR*	47 (48)	94 (46)	140 (44)	189 (42)	341 (38)
BAMD	53 (49)	95 (47)	143 (45)	192 (43)	303 (39)
BAMM	59 (49)	111 (47)	163 (45)	212 (43)	309 (39)
BAMS	64 (49)	121 (47)	176 (45)	230 (43)	327 (39)
A90E	47 (49)	88 (47)	132 (45)	175 (43)	284 (39)
AVNI	80 (38)	139 (36)	202 (34)	254 (32)	318 (28)
CLIP	56 (49)	124 (47)	204 (45)	280 (43)	395 (39)
NHC Official	52 (49)	97 (47)	145 (45)	186 (43)	275 (39)
NHC Official (1985-94 10-yr average)	50	98		194	296

* Not available until after forecast was issued

Table 3

Hurricane Iris watch and warning summary

Date/Time (UTC)	Action	Region
25/0300	Tropical Storm Watch issued	Dominica, Antigua, Barbuda and St. Kitts
25/1000	Tropical Storm Watch issued	Barbados and St. Vincent
25/1500	Tropical Storm Warning issued	All islands from the Grenadines and Barbados northward through Anguilla and St. Martin
25/1500	Tropical Storm Watch issued	Remainder British Virgin Islands
26/0300	Tropical Storm Warning discontinued	Barbados, St. Vincent and the Grenadines
26/2100	Tropical Storm Warning issued	Remainder British Virgin Islands
26/2100	Tropical Storm Warning discontinued	St. Lucia
26/2100	Tropical Storm Watch issued	U.S. Virgin Islands
27/0900	Tropical Storm Warning discontinued	Martinique
27/1800	Tropical Storm Warning discontinued	Dominica
28/0600?	Tropical Storm Warning discontinued	Guadeloupe
28/1200	Tropical Storm Watch discontinued	U.S. Virgin Islands and Guadeloupe
28/1200	Tropical Storm Warning discontinued	St. Martin and St. Barthelemy
28/1500	Tropical Storm Warning discontinued	Remaining areas
01/1930	Tropical Storm Watch issued	Bermuda
03/0600	Tropical Storm Watch discontinued	Bermuda