Tropical Cyclone Report
Hurricane Iris
4-9 October 2001

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Hurricane Iris was a small but severe Category Four hurricane that devastated southern Belize.

a. Synoptic History

The precursor of Iris was a poorly defined tropical wave that moved westward across the tropical Atlantic during the last days of September. A very hostile upper-level wind environment, caused by a large upper-level trough with an embedded low centered just to the northeast of the Lesser Antilles, prevailed over the Atlantic. As the tropical wave reached 50° W on the 3rd of October, the upper-low became detached from the trough and began to move toward the southwest over the eastern Caribbean Sea. This resulted in the development of an upper-level ridge over the tropical wave providing a more favorable environment for tropical cyclone formation. While this pattern was evolving, satellite imagery indicated an increase in the thunderstorm activity and a cyclonic rotation in the mid-levels. Gradually, a low-level cloud circulation became more pronounced on satellite imagery and was later confirmed by surface observations. It is estimated that a tropical depression with a poorly-defined center formed from this system about 85 n mi southeast of Barbados at 1200 UTC 4 October.

The depression moved toward the west and west-northwest through the southern Windward Islands, accompanied by squalls and significant (> 3 mb) 24-h pressure falls. It is estimated that the depression reached tropical storm status at 1200 UTC 5 October, about 240 n mi south-southeast of San Juan Puerto Rico. Although the cloud pattern continued to be impressive on satellite and was typical of a tropical storm, the low-level center was very poorly defined as indicated by several passes of a reconnaissance plane through the system. Only a gradual strengthening occurred during the following 12 to 18 hours and Iris became a hurricane very near the Barahona Peninsula, Dominican Republic at 1800 UTC 6 October.

The well-established middle-level ridge north of Iris became stronger and forced the tropical cyclone to move on a straight westward track. This allowed Jamaica to escape from the small core of Iris which passed just to its south during the morning of the 7th . Once Iris moved away from Jamaica and headed for Belize, it moved over a region where the upper-oceanic heat content was very high. As a result of favorable atmospheric and oceanic conditions, intensification began and the minimum pressure dropped from 990 mb to 950 mb in about 18 hours and the winds increased from 75 to 120 knots. Iris became a powerful Category Four hurricane on the Saffir/Simpson Hurricane Scale (SSHS) by 1200 UTC 8 October. Historically, a large number of hurricanes have become major hurricanes in this portion of the Caribbean Sea.

Near the time of the peak intensity, the hurricane hunter plane reported three small concentric eyewalls and an hour later the inner eyewall collapsed . The maximum winds then temporarily decreased to 115 knots. The hurricane moved on a track between the west and west-southwest and based on radar from Belize, Iris made landfall in southern Belize in the vicinity of

Monkey River Town around 0200 UTC 9 October. This location is about 60 n mi south of Belize City. Iris intensified just before landfall and the maximum winds peaked at 125 knots with a minimum pressure of 948 mb. Thereafter, Iris continued westward and weakened rapidly over the mountains of Central America. The low-level center could no longer be traced by 1800 UTC 9 October. Figure 1 shows a Iris near its peak intensity

b. Meteorological Statistics

Table 1 gives the "best track" positions and intensities of Iris at six-hourly intervals. Figure 2 shows a plot of this track. Figures 3 and 4 depict the curves of the maximum one-minute average (10 m above sea-level) wind speed and minimum sea-level pressure, respectively, as functions of time. The observations on which the curves are based are also plotted. These observations consist of data from reconnaissance flights, including dropwindsonde measurements as well as satellite-based Dvorak-technique estimates using satellite imagery by the Tropical Analysis and Forecast Branch (TAFB), Satellite Analysis Branch (SAB), and the U.S. Air Force Weather Agency (AFWA).

Iris was characterized by the small diameter of its core. The first reconnaissance into the system had difficulties in closing the circulation, not only because it was poorly defined but also because the center of circulation was very small. Furthermore, despite the good organization of the cloud pattern on satellite, the surface center was so small and poorly defined that the reconnaissance plane had to climb to 850 mb to" fix" it on the 5th about 1800 UTC. Extrapolated minimum pressure at that time was 1004 mb with flight-level winds to near 64 knots. A post-analysis of pressure, wind and Dvorak classifications suggests Iris reached tropical storm status earlier than indicated in the advisories. Iris was upgraded to a hurricane at 1800 UTC 6 October, based on reports from a reconnaissance plane of a 1500-foot flight level peak wind of 82 knots and the presence of a closed eyewall near that time. A couple of hours later a GPS dropsonde launched from an Air Force plane indicated that surface winds peaked at 75 knots. Iris was upgraded to Category Four Hurricane with 120 knots at 1200 UTC 8 October based on a 134-knot wind reduced from 700-mb. Because the eye was so small, dropsondes never hit the true center. The 954 mb reported by the drop was then adjusted to 950 mb. After an eyewall replacement cycle and a temporary weakening, Iris re-intensified and the winds peaked at 125 knots with a minimum pressure of 948 mb. This is based on a 127-knot surface winds measured by a dropsonde combined with satellite objective T-numbers between 6.5 and 7.0 on the Dvorak scale for about 3 hours. The maximum winds recorded at Belize was a gust of 106 mph on Carmen Davis station in Big Creek at 16.5° N 88.4° W at 0200 UTC 9 October.

c. Casualty and Damage Statistics

Because Iris core was small the damage was concentrated within a 60 n mi wide area mainly through the southern portion of Belize. According to the *Belize Times* the areas hardest hit by Iris were Monkey River Town, where the eye made landfall, and the towns of Placencia, and Independence with a 8 to 15 feet surge. The newspaper noted "Iris showed no mercy and proceeded to smash to smithereens everything in her path". The storm destroyed many houses in Placencia, and most of the houses at Monkey River Town seem to have been demolished by the hurricane. In addition to 3 people killed in the Dominican Republic by the tropical cyclone, the 120-foot boat "M/V Wave Dancer", with 28 people on board, capsized near Big Creek, a deep water port to the west of Placencia. Twenty people are feared dead. Eleven bodies have been recovered and eight survived. Another boat, "The Vendera", also reportedly capsized with people on board, but information on this vessel has not been confirmed. Some newspaper reports indicate

that the death toll could be 50 or more but the Belize government confirms 20 dead, all associated with the “Wavedancer” The banana crop was totally destroyed. Reports from the *Miami Herald* indicate that at least 8 people were killed by flash flooding in Guatemala. Probably the exact number of deaths will not be known but it appears that the total number is 31 associated with Iris. A total of $66.2 million in damage has been reported by the Government of Belize. There are no reports of damage from Honduras.

d. Forecast and Warning Critique

Table 2 displays the official track and selected model errors for Iris. The official errors were 34, 73,123,177 and 292 n mi for the 12, 24, 36, 48 and 72 h forecasts. These numbers indicate that with the exception of the 12 and 24 h periods, the forecasts were worse than the past 10-yr average. Not only were the official forecasts worse than long-term averages but several models performed much better than the official forecast at all times as indicated by bold letters in Table 4. These official track errors are unusually large for westward moving systems in the deep tropics. They appear to be related to the speed and not the storm’s direction of motion. Most of the official forecasts assumed that the steering currents would weaken and, consequently, Iris would slow down. On the contrary, Iris continued at the same speed and moved even faster just before landfall. Iris was always forecast to continue westward through the Caribbean Sea, posing a threat to the Caribbean Sea region and not to the United States. Table 3 shows a compilation of watches and warnings.

On average, the intensity of Iris was underestimated and the largest errors occurred during the rapid intensification phase. This is common because these peaks in intensity are usually not possible to forecast with the currently. The Ships intensity forecast model also underestimated the intensity but a couple of forecasts indicated that 3 or more of the 5 conditions for rapid intensification were satisfied. Nevertheless, it was stated in the advisories that Iris had the potential to become a dangerous hurricane Category 3 or higher over the northwestern Caribbean Sea.

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Table 1. Best track for Hurricane Iris, 4-9 October 2001.

Date/Time (UTC)	Latitude (°N)	Longitude (°W)	Pressure (mb)	Wind Speed (kt)	Stage
04 / 1200	12.3	58.2	1011	25	tropical depression
04 / 1800	12.8	59.9	1010	30	"
05 / 0000	13.4	61.4	1010	30	"
05 / 0600	14.0	63.0	1010	30	"
05 / 1200	14.8	64.5	1008	35	tropical storm
05 / 1800	15.5	66.0	1005	45	"
06 / 0000	15.7	67.7	1001	50	"
06 / 0600	16.0	69.0	998	55	"
06 / 1200	16.5	70.5	998	55	"
06 / 1800	16.9	72.2	992	65	hurricane
07 / 0000	16.9	74.0	993	75	"
07 / 0600	16.9	75.3	989	75	"
07 / 1200	17.3	77.0	989	75	"
07 / 1800	17.4	78.9	991	75	"
08 / 0000	17.3	80.6	988	80	"
08 / 0600	17.2	82.3	963	90	"
08 / 1200	17.1	84.0	950	120	"
08 / 1800	16.8	86.0	950	115	"
09 / 0000	16.5	88.0	948	125	"
09 / 0600	16.2	89.9	1005	60	tropical storm
09 / 1200	16.2	91.9	1004	30	tropical depression
09 / 1800					dissipated
09/ 0200	16.3	88.4	948	125	landfall near Monkey River Town, Belize
09 / 0000	16.5	88.0	948	125	minimum pressure

Table 2. Preliminary forecast evaluation (heterogeneous sample) for Hurricane Iris, 4-9 Oct. 2001. Forecast errors for tropical storm and hurricane stages (n mi) are followed by the number of forecasts in parentheses. Errors smaller than the NHC official forecast are shown in bold-face type.

Forecast Technique	Forecast Period (h)				
	12	24	36	48	72
CLIP	35(13)	78(12)	153(10)	238(8)	429(4)
GFDI	40(14)	71(12)	**117**(10)	**157**(8)	**152**(4)
LBAR	39(13)	83(12)	162(10)	241(8)	367(4)
AVNI	41(10)	**70**(8)	**112**(6)	**147**(3)	**225**(2)
BAMD	**29**(14)	**65**(12)	128(10)	188(8)	**290**(4)
BAMM	**26**(14)	**46**(12)	**91**(10)	**143**(8)	**228**(4)
BAMS	34**(**14)	**64**(12)	123(10)	**175**(8)	**265**(4)
NGPI	49(13)	84(12)	135(10)	**174**(8)	311(4)
UKMI	40(10)	**71**(9)	**92**(7)	181(3)	X
GUNS	34(10)	**57**(9)	**96**(7)	**144**(3)	X
NHC Official	34(14)	73(12)	123(10)	177(8)	292(4)
NHC Official (1991-2000 mean)	44 (2049)	82 (1835)	118 (1646)	151 (1475)	226 (1187)

Table 3. Watch and warning summary for Hurricane Iris, 4-9 October 2001.

Date/Time (UTC)	Action	Location
5/1500	Tropical Storm Warning issued	Dominican Republic(DR), from Isla Saona to Cabo Beata
5/1500	Tropical Storm Watch issued	west of Cabo Beata to Anse D Hainault, Haiti
5/2100	Hurricane Warning issued	Barahona to Anse D Hainault
5/2100	Tropical Storm Watch issued	Jamaica
6/0300	Hurricane Watch issued	Cuba for the provinces of Guantanamo to Camaguey and for Jamaica
6/0600	Tropical Storm Warning discontinued	east of Punta Palenque to Isla Saona
6/0900	Tropical Storm Warning issued	Jamaica
6/1500	Hurricane Warning issued	Jamaica and for the provinces of Granma, Santiago de Cuba, and Guantanamo, Cuba
6/1500	Hurricane Watch issued	Cayman Islands
6/2100	Tropical Storm Warning discontinued	Palenque to Barahona, DR
7/0200	Hurricane Warning issued	Cayman Islands
7/0300	All Warning discontinued	Dominican Republic
7/0900	All Warnings discontinued	Haiti
7/1500	Hurricane Watch issued	Cabo Catoche southward, Yucatan
7/1500	All Warnings discontinued	Cuba
7/1800	Hurricane Watch issued	for Belize from Belize City northward
7/2100	Tropical Storm Warning/Hurricane Watch	north coast of Honduras and adjacent islands from Limon westward
7/2100	Hurricane Warning discontinued	Jamaica
8/0000	Hurricane Watch extended	Belize City southward
8/0300	Hurricane Warning issued	east coast of Belize
8/0300	Tropical Storm Warning/Hurricane Watch issued	Guatemala Caribbean coastline

8/0900	Hurricane Warning issued	Honduras from Limon westward including adjacent islands and Guatemala Caribbean coastline
8/0900	Hurricane Warning discontinued	Cayman Islands
8/1500	Tropical Storm Warning	Felipe Carrillo Puerto southward, Yucatan.
8/2100	Hurricane Watch discontinued	Mexico from Cabo Catoche southward
9/0900	All Warnings discontinued	Mexico, Belize, Guatemala ahd Honduras

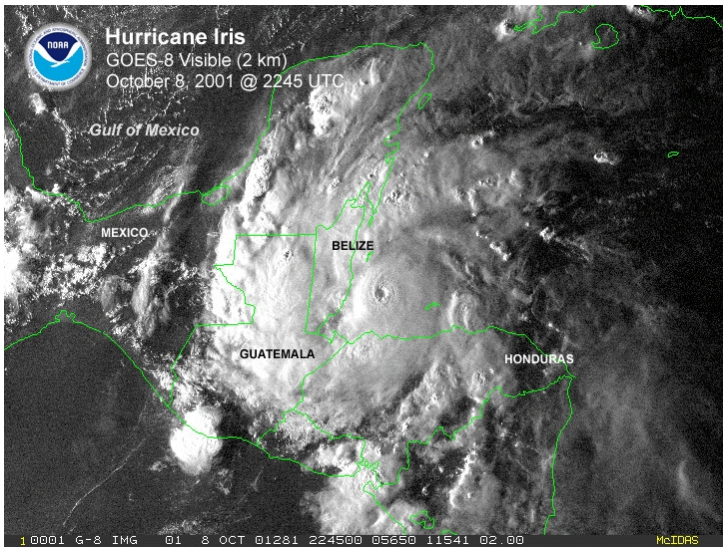

Fig. 1. Visible satellite imagery of Hurricane Iris near the time of peak intensity.

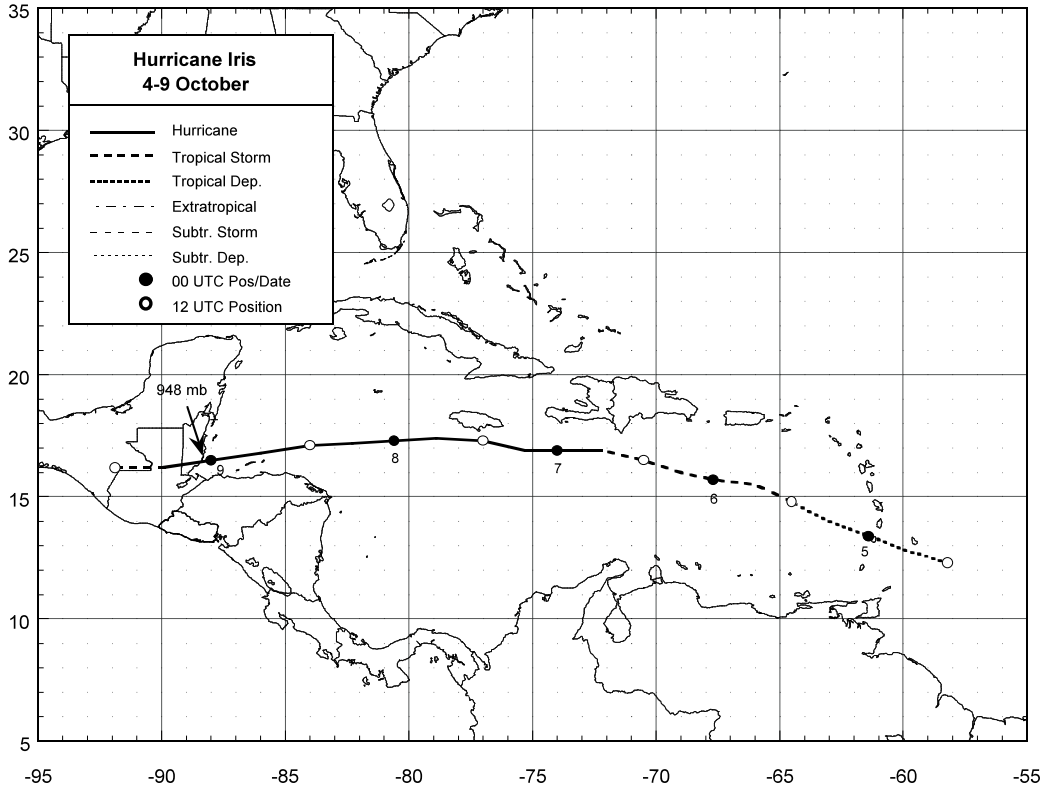

Fig .2. Best track positions for Hurricane Iris, 4-9 October, 2001.

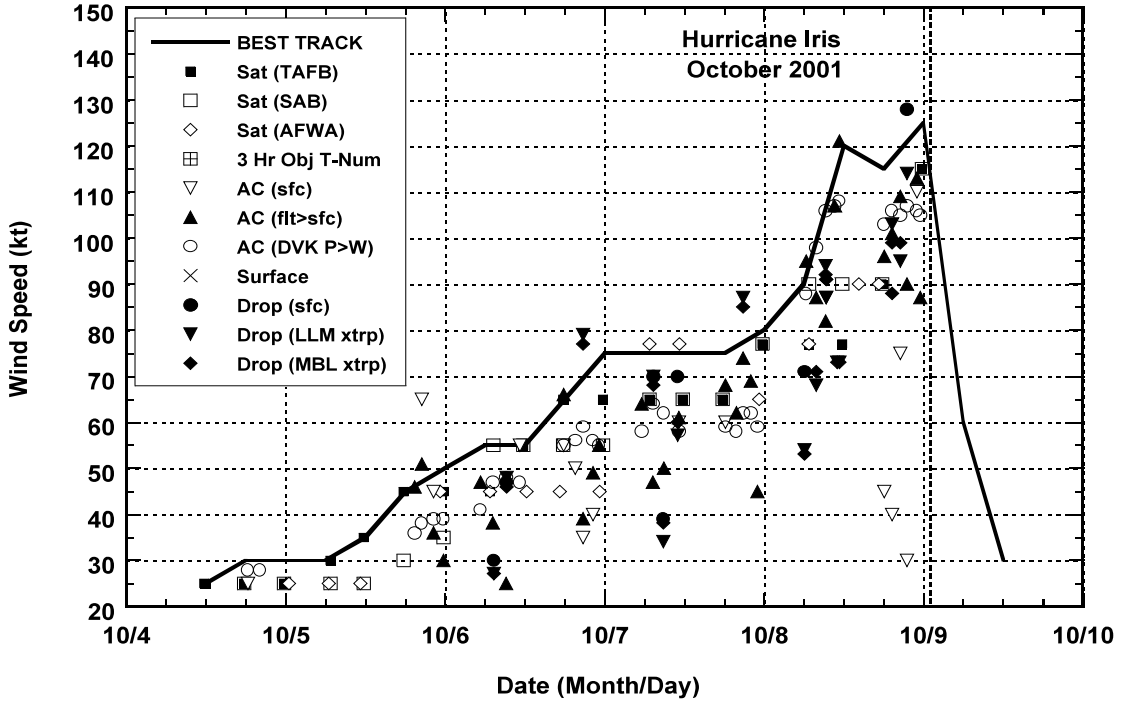

Figure 3. Best track maximum sustained surface wind speed curve for name/dates, and the observations on which the best track curve is based. Aircraft observations have been adjusted for elevation using 90%, 80%, and 80% reduction factors for observations from 700 mb, 850 mb, and 1500 ft, respectively. Dropwindsonde observations include actual 10 m winds (sfc), as well as surface estimates derived from the mean wind over the lowest 150 m of the wind sounding (LLM), and from the sounding boundary layer mean (MBL). Dashed line indicates the time of landfall.

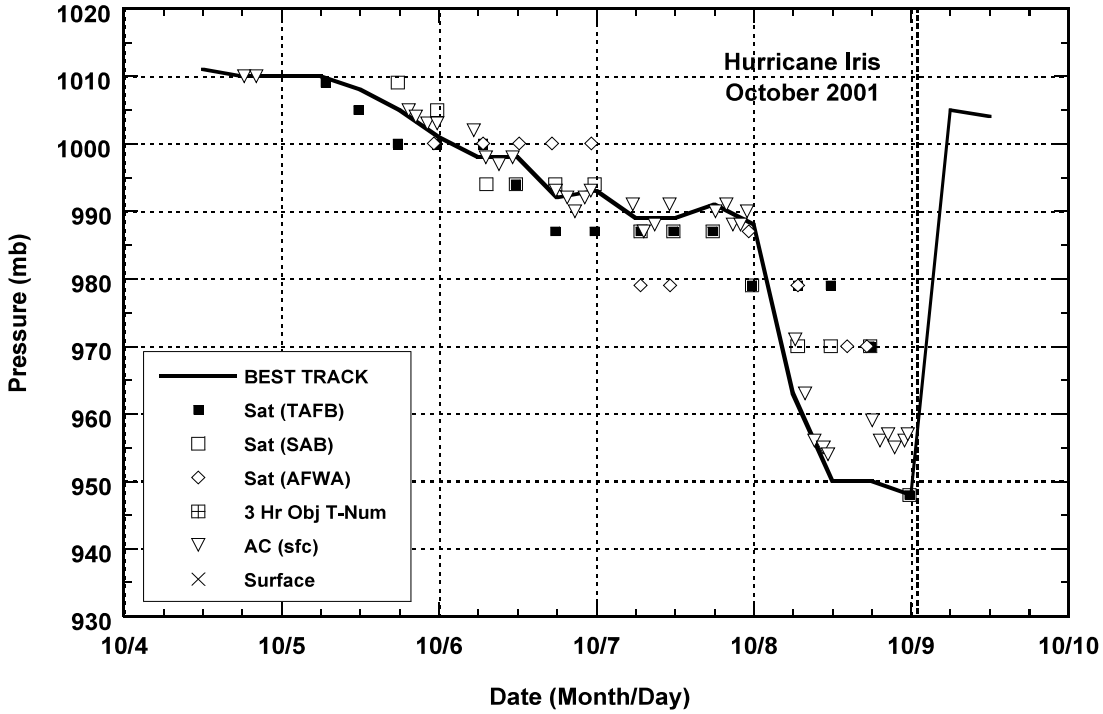

Figure 4. Best track minimum central pressure curve for Hurricane Iris, 4-9 October 2001, and the observations on which the best track curve is based. Vertical dashed line indicates the time of landfall.