

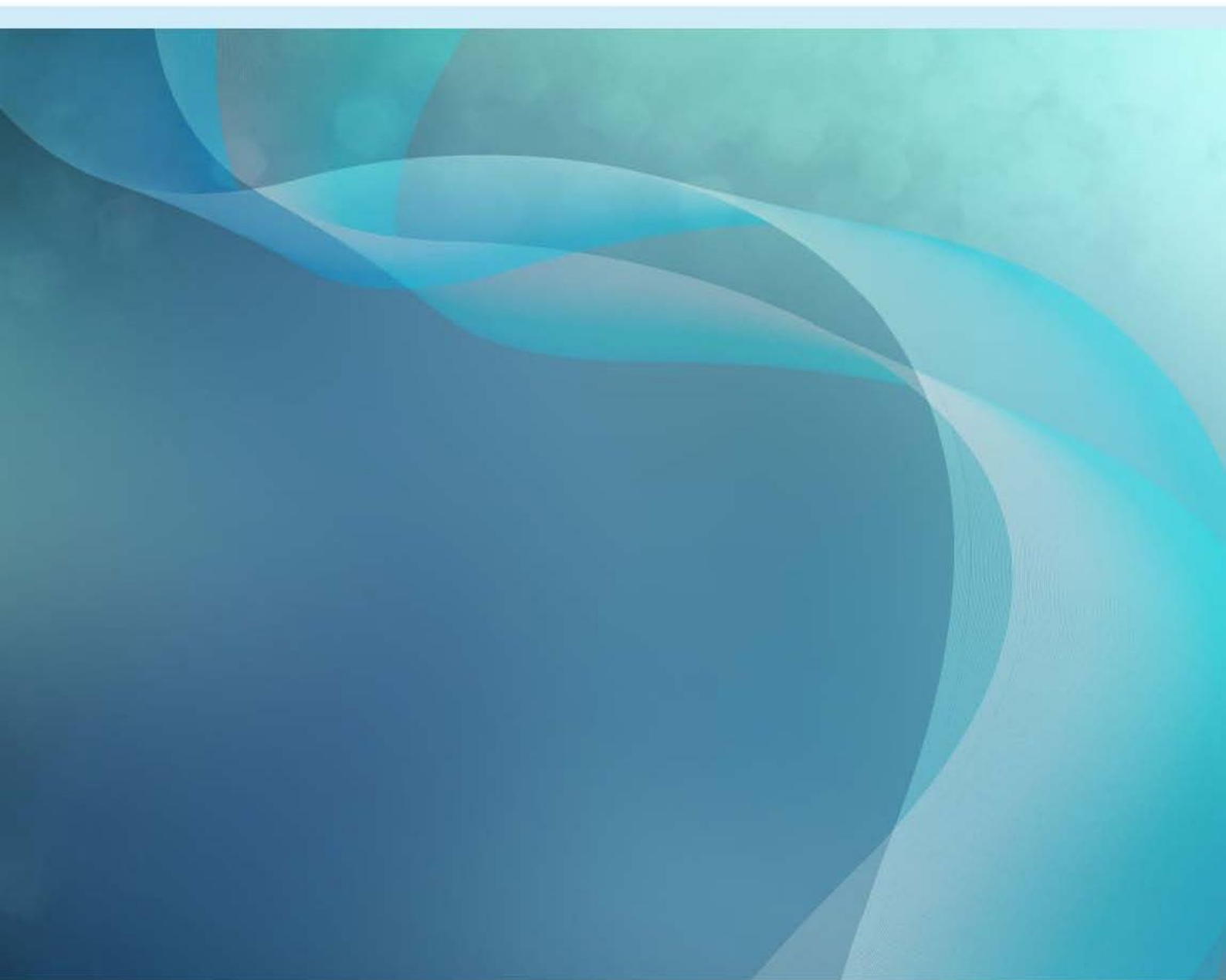


Australian Government
Bureau of Meteorology

Severe Tropical Cyclone *Gillian*

18 – 27 March 2014

March 2017



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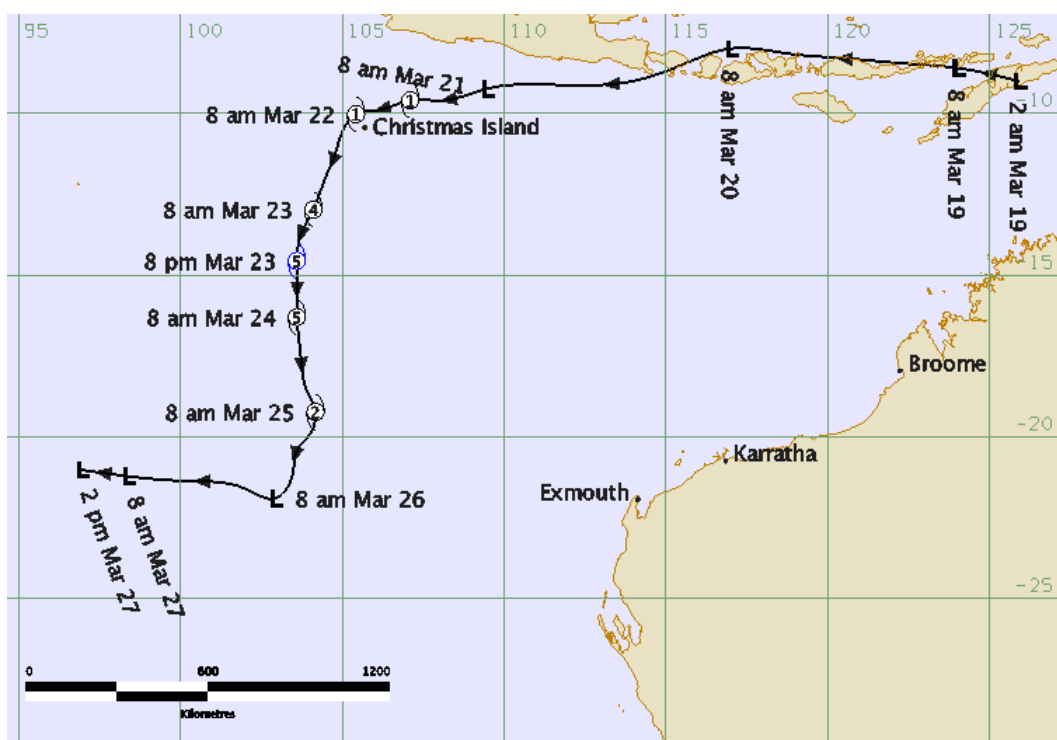
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1 Summary

A low formed over the eastern Arafura Sea on 6 March 2014 and developed into a tropical cyclone on 8 March. *Gillian* moved slowly around the Gulf of Carpentaria for about a week, weakening below tropical cyclone strength on 10 March. The low briefly re-developed into a tropical cyclone on the 14 -15 November before the remaining low moved north and then west passing to the north of the Northern Territory. The low tracked westward across the Indonesian Islands from 18 – 20 March. During 20 March the low moved in a west southwest direction over open water and intensified under favourable conditions. *Gillian* passed very close to Christmas Island on 22 March with the Island experiencing a period of near gales during the afternoon. A peak wind gust of 52 knots (kn) (96 kilometres per hour (km/h)) was recorded and 181 millimetres (mm) of rainfall was recorded in the 24 hours to 9 am Australian Western Standard Time (AWST) 22 March. There were reports of structural damage on the Island with several buildings incurring roof damage, power lines downed and trees felled.

Gillian turned south and rapidly intensified. The tropical cyclone reached a peak 10-minute mean wind intensity of 120 kn (222 km/h) at 1800 Universal Time Coordinated (UTC) 23 March (AWST = UTC + 8 hours). *Gillian* weakened quickly from this point as the vertical wind shear increased. The tropical cyclone weakened to below cyclone strength by 1800 UTC 25 March and the remaining low tracked to the west until it dissipated on 27 March.

FIGURE 1. Best track of *Gillian* 18 – 27 March 2014 (times in AWST, UTC+8).



2 Meteorological Description

2.1 Intensity analysis

The existing tropical low moved west southwest away from the Indonesian Islands during 20 March. A Dvorak Data T-number (DT) number of 1.5 was assigned. By 21 March the tropical low showed considerable improvement in structure with deep convection organised into curved bands and good outflow aloft indicated on satellite images. Cooperative Institute for Meteorological Satellite Studies (CIMSS) vertical wind shear analyses indicated that shear had decreased to around 5 - 10 kn (10-18 km/h). DT numbers increased through the day to 3.0 but the Dvorak Final T-number (FT) was constrained to 2.5. The 0230 UTC 21 March Advanced Scatterometer (ASCAT) showed 25 - 30 kn (46-55 km/h) winds in the southern quadrants. *Gillian* reached tropical cyclone strength at 1200 UTC 21 March when it was located about 180 kilometres (km) east northeast of Christmas Island.

Gillian continued to intensify steadily and produced a period of near gale force winds at Christmas Island during the afternoon of 22 March. A maximum wind gust of 52 kn (96 km/h) was recorded at 0512 UTC (1312 AWST) 22 March when *Gillian* was located just to the west of the Island (refer Figure 2). The DT number at around this time had increased to 3.5.

The developing tropical cyclone was located over warm sea surface temperatures (SSTs) and in a low vertical wind shear environment. As a result, the development of *Gillian* was rapid over the next 36 hours. By 0930 UTC 22 March an eye had appeared on enhanced infrared (EIR) satellite imagery. Subjective Dvorak analyses reached a peak of DT 7.0 at 1800 UTC 23 March (refer Figure 3). From this point, *Gillian* weakened rapidly under increased west northwest vertical wind shear. During 24 March, the symmetric appearance of *Gillian* was eroded and convection became confined to southern quadrants. By 1800 UTC 25 March, *Gillian* weakened below tropical cyclone strength and the low level centre was steered westward until it dissipated on 27 March.

Figure 4 shows the intensity estimates for *Gillian* from various sources. Objective Advanced Dvorak Technique (ADT) intensity estimates agreed well with subjective estimates throughout *Gillian's* lifetime. CIMSS Advanced Microwave Sounding Unit (AMSU) underestimated the intensity compared to other techniques during the period 1200 UTC 23 March through to 1200 UTC 24 March, this caused the SATellite CONsensus (SATCON) estimates to be considerably lower than the other techniques.

2.2 Structure

Gillian initially had a radius of gales of 30 nautical miles (nm) (55 km) in northern quadrants and out to 60 nm (111 km) in the southwest quadrant. As the tropical cyclone moved to the west of Christmas Island, the gale radius expanded to 60 nm (111 km) in northern quadrants and 90 nm (167 km) in southern quadrants. During 23

March, the gale radius was symmetric at 90 nm (167 km). From 1200 UTC 23 March, the gale radius in the northern quadrants contracted to 60 nm (111 km). During the weakening of *Gillian* the southeast and southwest gale radii increased to 120 nm (222 km). The radius of maximum winds (RMW) decreased from 30 nm (55 km) to 10 nm (18 km) at *Gillian's* most intense.

2.3 Motion

Gillian was steered in a westerly direction across the Indonesian Islands from 18 to 21 March by the mid-level ridge to the south. During 21 March the ridge was eroded by an approaching mid-latitude mid-level trough and *Gillian* began to move first to the southwest and then to the south from 22 March. *Gillian* was steered south and then to the south southeast between the mid-latitude mid-level trough and the ridge located over Western Australia until it weakened to below tropical cyclone strength on 25 March. On 26 March, the remaining low level centre was steered to the west in the low level flow.

3 Impact

Gillian caused a period of near gale force winds with a peak wind gust of 52 kn (96 km/h) on Christmas Island during the afternoon of 22 March. 181 mm of rainfall was recorded in the 24 hours to 9 am AWST 22 March. There were reports of structural damage on the island with several buildings incurring roof damage, power lines downed and trees felled.

No impacts were recorded on the Australian mainland.

4 Observations

4.1 Wind

Christmas Island Automatic Weather Station (AWS) recorded gale force winds at times between 0500 – 0558 UTC 22 March. A peak wind gust of 52 kn (96 km/h) was recorded at the at 0512 UTC 22 March.

4.2 Pressure

Christmas Island AWS recorded a lowest pressure of 998.8 hPa 0444, 0445 and 0446 UTC 22 March.

4.3 Rainfall

Christmas Island AWS recorded 181 mm of rainfall in the 24 hours to 9 am Australian Western Standard Time (AWST) 22 March

5 Forecast Performance

The accuracy figures for *Gillian* were very close to the five year mean over 120 hours.

The accuracy statistics obtained by comparing the forecast positions against the best track positions for *Gillian* are

	0	06	12	18	24	36	48	72
Absolute error (km)	28	58	81	89	101	133	175	286
RMS error (km)	46	75	98	103	114	156	196	322

Figure 5 is a plot of the accuracy figures for *Gillian* compared to the five year mean.

TABLE 1. Best track summary for Severe Tropical Cyclone *Gillian*

Refer to the Australian Tropical Cyclone database for complete listing of parameters. WST is UTC + 8 hours.

Year	Month	Day	Hour UTC	Pos. Lat S	Pos. Long. E	Pos. Ac. c. n mi	Max Wind 10 min kn	Max gust kn	Cent. Pres. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RM W n mi
2014	03	18	1800	9.0	125.9	60	30	45	1009			
2014	03	19	0000	8.6	124.0	60	25	45	1009			
2014	03	19	0600	8.4	122.2	60	20	45	1009			
2014	03	19	1200	8.3	120.5	60	20	45	1009			
2014	03	19	1800	8.1	118.7	60	20	45	1009			
2014	03	20	0000	8.0	117.0	60	20	45	1009			
2014	03	20	0600	8.5	115.5	60	20	45	1009			
2014	03	20	1200	9.0	114.0	60	25	45	1008			
2014	03	20	1800	9.1	111.7	45	25	45	1008			
2014	03	21	0000	9.2	109.4	35	30	45	1005			
2014	03	21	0600	9.6	108.1	30	30	45	1004			
2014	03	21	1200	9.6	107.1	30	35	50	1001	30/40/60/30		30
2014	03	21	1800	9.9	106.1	15	40	55	998	30/40/40/30		20
2014	03	22	0000	10.0	105.4	10	45	65	993	30/40/60/30		20
2014	03	22	0600	10.4	105.1	10	50	70	987	30/40/60/30	30	15
2014	03	22	1200	11.2	104.8	10	60	85	981	45/60/60/40	30	15

Year	Month	Day	Hour UTC	Pos. Lat S	Pos. Long. E	Pos. Acc. n mi	Max Wind 10 min kn	Max gust kn	Cent. Pres. hPa	Rad. of gales (NE/SE/SW/NW)	Rad. of storm (NE/SE/SW/NW)	RM W n mi
2014	03	22	1800	12.2	104.4	10	70	100	976	70	30	15
2014	03	23	0000	13.0	104.1	10	90	125	959	90	40	15
2014	03	23	0600	13.8	103.7	10	95	135	951	90	40	15
2014	03	23	1200	14.6	103.6	10	110	155	934	60/90/90/60	40	10
2014	03	23	1800	15.4	103.6	10	120	170	927	60/90/90/60	40	10
2014	03	24	0000	16.3	103.6	10	115	160	933	60/90/90/60	40	10
2014	03	24	0600	17.0	103.7	15	105	145	940	60/90/90/60	40	15
2014	03	24	1200	17.7	103.7	15	90	125	959	60/90/90/60	25/40/40/25	25
2014	03	24	1800	18.4	103.8	20	80	110	965	60/90/90/60	30/40/40/30	30
2014	03	25	0000	19.2	104.2	20	55	75	986	60/120/120/60	0/40/40/0	35
2014	03	25	0600	19.9	104.0	15	50	70	989	30/120/100/30	0/0/55/0	50
2014	03	25	1200	20.5	103.6	15	35	50	1000	30/120/60/30		50
2014	03	25	1800	21.1	103.5	10	30	45	1003			
2014	03	26	0000	21.9	102.9	10	30	45	1003			
2014	03	26	0600	21.6	102	15	30	45	1003			
2014	03	26	1200	21.4	101.2	10	30	45	1003			
2014	03	26	1800	21.3	99.8	15	30	45	1004			
2014	03	27	0000	21.2	98.4	15	30	45	1004			

Year	Month	Day	Hour UTC	Pos. Lat S	Pos. Long. E	Pos. Acc. n mi	Max Wind 10 min kn	Max gust kn	Cent. Pres. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RM W n mi
2014	03	27	0600	21.0	96.9	15	25	45	1007			

FIGURE 2. TRMM microwave pass at 0401 UTC 22 March 2014 during the early stages of *Gillian*'s re-development.

(image courtesy of NOAA NRL: <http://www.nrlmry.navy.mil/>)

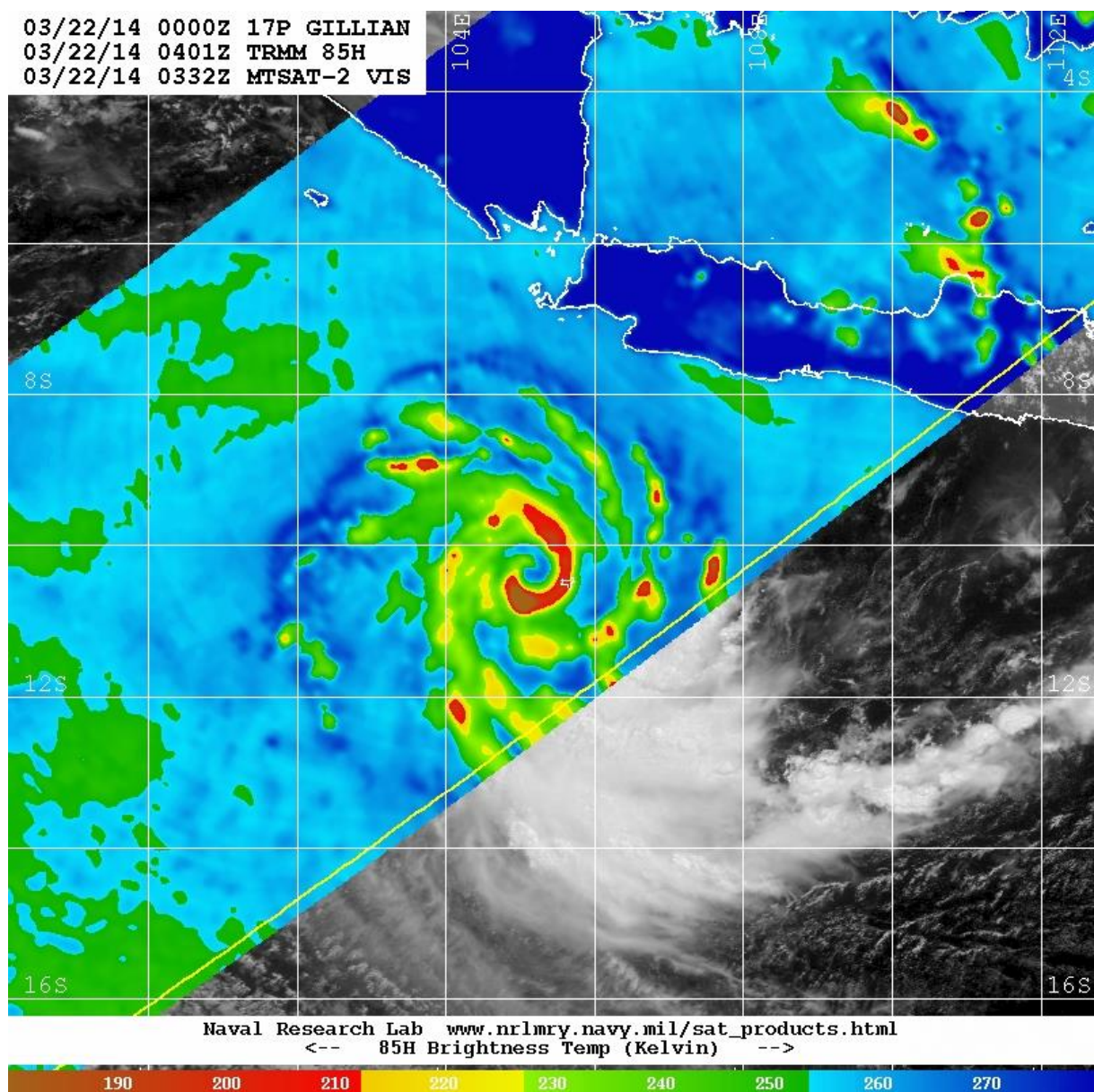


FIGURE 3. MTSAT 1632 UTC 23 March EIR image showing *Gillian* near peak intensity.

(image courtesy of NOAA NRL: <http://www.nrlmry.navy.mil/>)

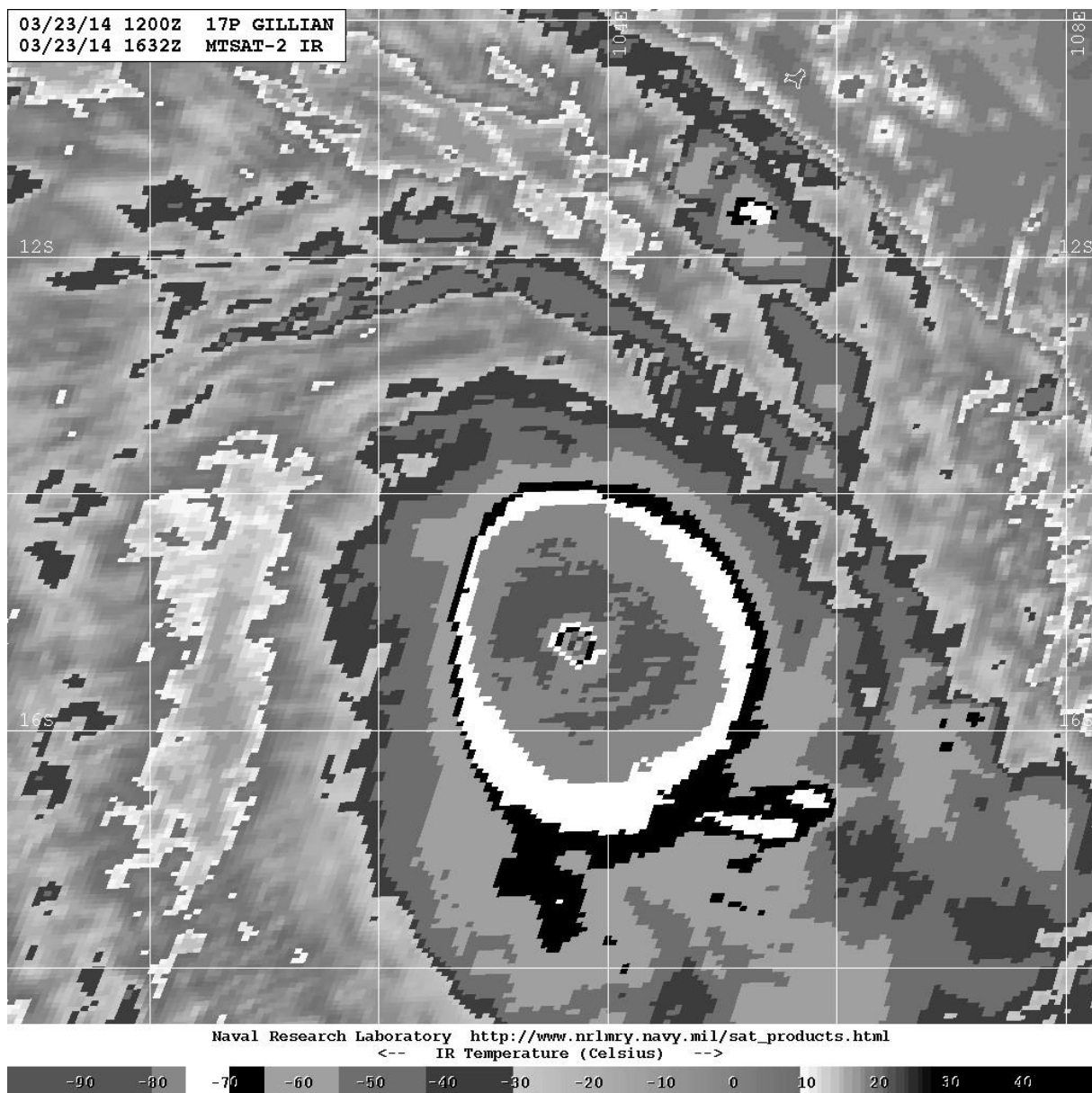


FIGURE 4. Comparison of objective and subjective intensity analysis techniques.

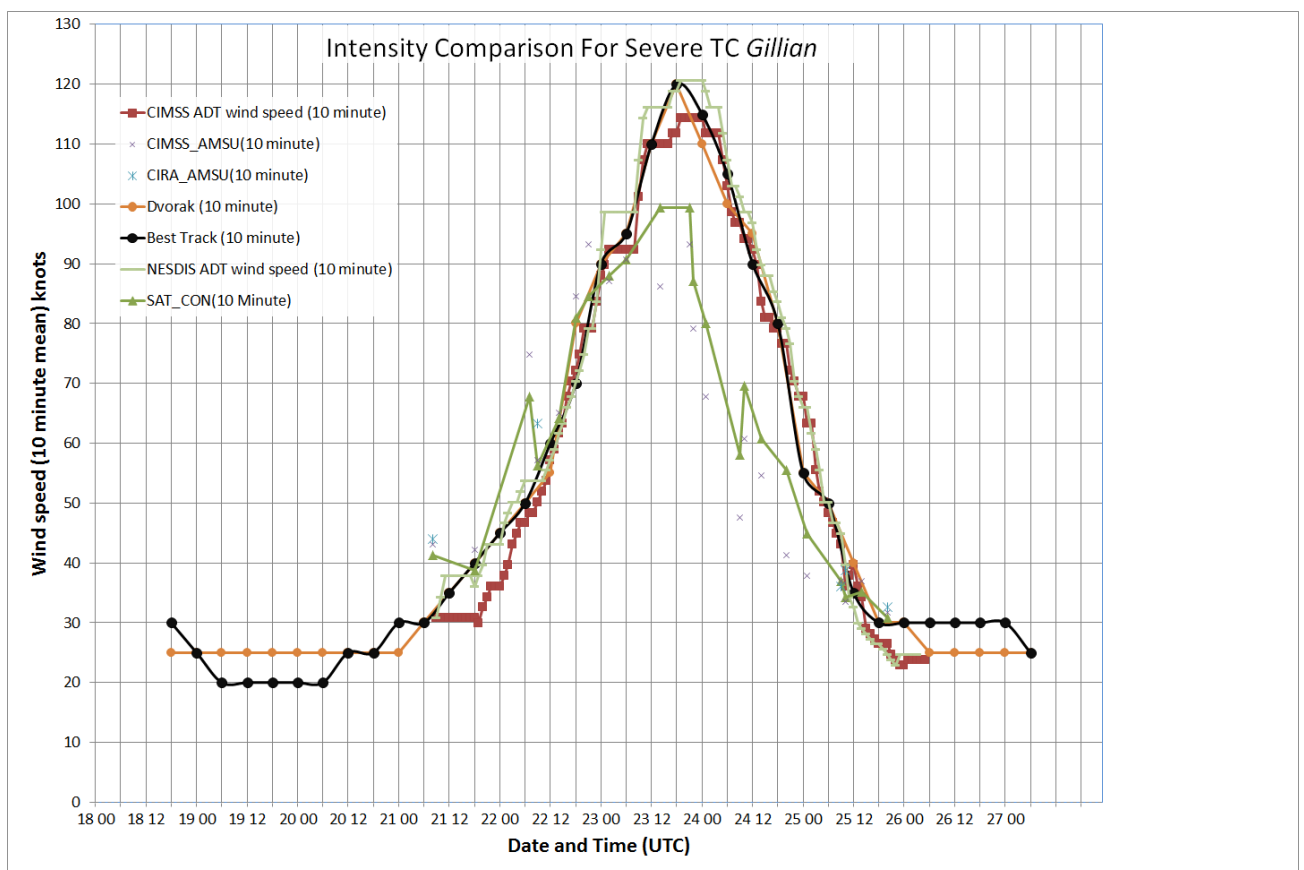


FIGURE 5. Plot of accuracy statistics for *Gillian*.

