

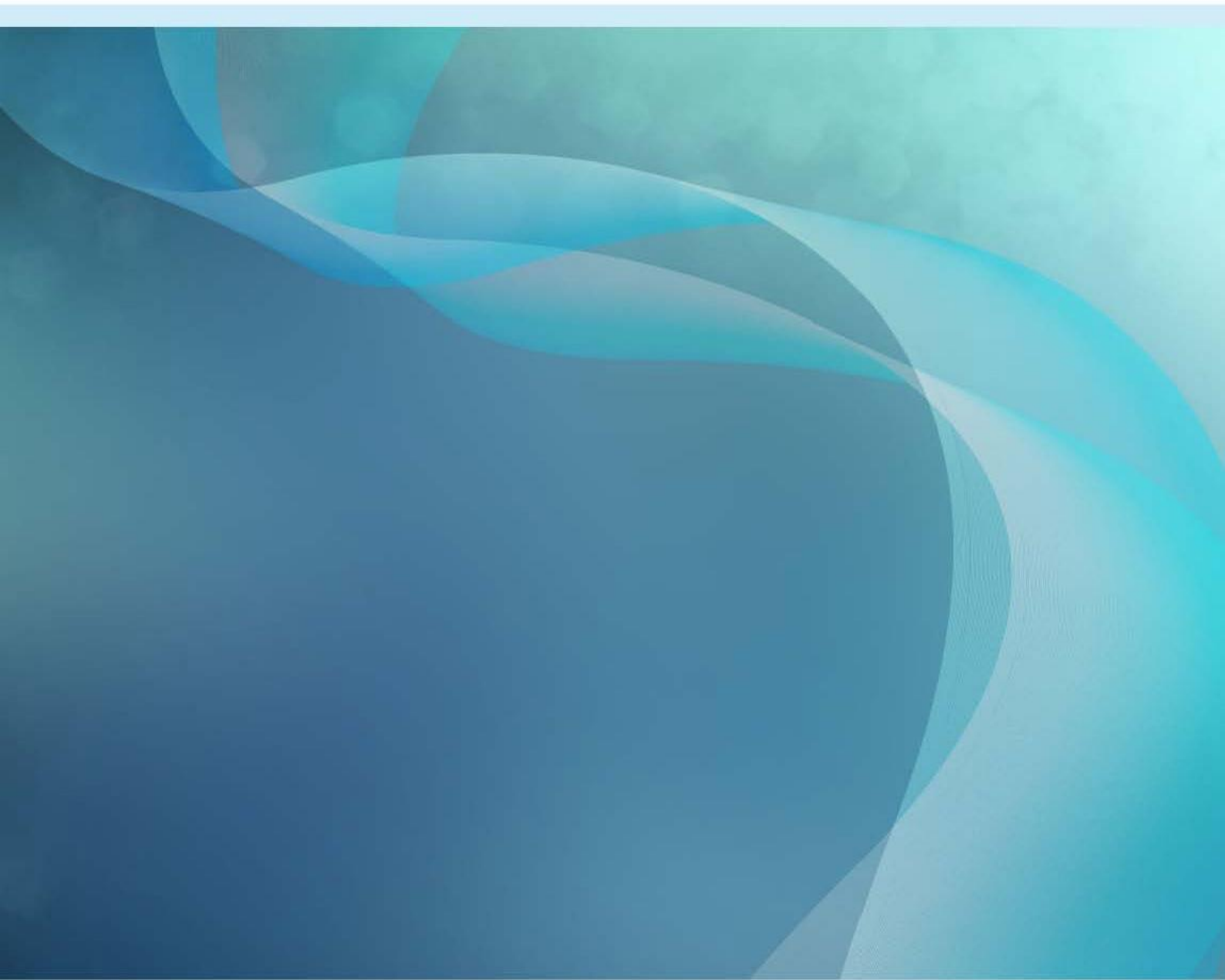


Australian Government
Bureau of Meteorology

Severe Tropical Cyclone *Bruce*

16 – 25 December 2013

February 2016



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1 Summary

A tropical low formed in an active monsoon trough approximately 500 kilometres (km) north northeast of the Cocos Keeling Islands during 16 December. The tropical low moved steadily to the southwest while slowly strengthening. The low reached tropical cyclone strength at 0000 Universal Time Coordinated (UTC) (0630 Cocos Central Time (CCT)=UTC+6.5 hours) 18 December.

Bruce began to accelerate to the west southwest and crossed into La Reunion's area of responsibility (AOR) just after 1800 UTC 19 December with an intensity of 85 knots (kn) (157 kilometres per hour (km/h)). *Bruce* continued to intensify in La Reunion's AOR and reached a 10-minute mean wind peak intensity of 120 kn (220 km/h) on 20 and 21 December. The tropical cyclone turned to the south as it came under the influence of a mid-latitude trough and weakened below tropical cyclone strength on 25 December in the central Indian Ocean.

Bruce produced a period of gales at the Cocos Keeling Islands between 0350 and 0800 UTC 18 December as it passed approximately 200 km to the northwest. The strongest recorded wind gust was 47 kn (87 km/h) at 0518 UTC 18 December. The islands recorded 68.8 millimetres (mm) of rain in the 24 hours to 9am CCT 18 December with a further 56.2mm to 9am CCT 19 December. There were no reports of damage from the Cocos Keeling Islands during this event.

1.1 Intensity analysis

A tropical low became evident near 8.2°S 98.7°E around 0600 UTC 16 December in an active monsoon trough. The tropical low was steered in a southwest direction as it slowly intensified, reaching tropical cyclone strength at 0000 UTC 18 December when it was located about 200 km to the north northwest of the Cocos Keeling Islands. Early on 18 December microwave imagery showed a broad circulation with cold, deep convection wrapping mostly around the centre (refer Figure 2). The cloud structure improved over the next 24 hours and an eye pattern could be applied by 0000 UTC 19 December. *Bruce* crossed into La Reunion's AOR just after 0000 UTC 20 December with an intensity of 85 kn (157 km/h). *Bruce* continued to intensify in the La Reunion AOR and reached a peak intensity (ten-minute mean wind speed) of 120 kn (220 km/h) on 20 and 21 December before it weakened to below tropical cyclone strength on 25 December in the central Indian Ocean.

The intensity of *Bruce* was determined by considering intensity estimates from objective and subjective techniques plotted in [Figure 3](#). Objective Advance Dvorak Technique (ADT) and Satellite Consensus (SATCON) intensity estimates were very similar to subjective Dvorak (refer [Figure 3](#)).

1.2 Structure

Bruce had a gale radii of 60 nautical mile (nm) in the northern quadrants which increased to 120 nm in the southeast quadrant. As the tropical cyclone intensified the gale radii increased to 120 nm in the northern quadrants and 150 nm in the southern quadrants, extending as far as 180 nm in the southwest quadrant. The radius of maximum winds (RMW) were initially around 30 nm, decreasing to 15 nm as *Bruce* intensified.

1.3 Motion

Initially the tropical low was located well north of the mid-level ridge and was steered toward the west southwest. *Bruce* crossed into LA Reunion's AOR on 20 December and continued tracking to the west southwest under the influence of a stronger mid-level ridge to the south of the cyclone. A mid-level trough amplified to the southwest of the cyclone during 21 December and on 22 December *Bruce* began to move first to the south and then the southeast before it weakened in the central Indian Ocean.

2 Impact

Bruce had no impact on the Cocos Keeling Islands or mainland Australia.

3 Observations

Gales were recorded on the Cocos Keeling Island's between 0350 and 0800 UTC 18 December. A maximum 10-minute mean wind of 37 kn (68 km/h) with a peak 3 second wind gust of 47 kn (87 km/h) was recorded at 0517 UTC 18 December.

Cocos Keeling Island Automatic Weather Station (AWS) recorded a minimum pressure of 998.6 Hectopascals (hPa) at 0830 UTC 18 December.

Cocos Keeling Island AWS recorded 68.8mm of rain in the 24 hours to 9am CCT 18 December with a further 56.2mm to 9am CCT 19 December.

4 Forecast Performance

The accuracy statistics obtained by comparing the forecast positions against the best track positions for *Bruce* are shown below. [Figure 4](#) is a plot of the accuracy figures for *Bruce* compared to the five year mean.

Forecast Hour	0	06	12	18	24	36	48	72
Absolute error (km)	30	47	61	71	75	87	94	73
RMS error (km)	33	57	72	78	84	91	99	88

TABLE 1. Best track summary for *Bruce*

Refer to the Australian Tropical Cyclone database for complete listing of parameters. Please note STC *Bruce* moved into the La Reunion AOR on 19 December.

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)	RMW n mi
2013	12	16	0600	8.2	98.7	45	20	45	1005			
2013	12	16	1200	8.4	98.0	30	25	45	1005			
2013	12	16	1800	8.6	97.9	30	25	45	1004			
2013	12	17	0000	8.9	97.7	30	25	45	1003			
2013	12	17	0600	9.0	97.6	30	25	45	1002			
2013	12	17	1200	9.3	97.3	20	25	45	1003			
2013	12	17	1800	9.9	96.8	20	30	45	1001			
2013	12	18	0000	10.5	96.0	20	40	55	994	60		30
2013	12	18	0600	11.0	95.2	20	45	65	991	60/90/120/60		30
2013	12	18	1200	11.4	94.5	20	50	70	988	60/90/120/60	40	30
2013	12	18	1800	11.6	93.6	20	60	85	981	90/120/120/120	40	20
2013	12	19	0000	11.9	92.8	20	65	90	976	120/150/150/120	60	20
2013	12	19	0600	12.1	92.1	20	70	100	972	120/150/150/120	60	20
2013	12	19	1200	12.6	91.2	20	80	110	964	120/150/150/120	40/60/90/40	20
2013	12	19	1800	12.9	90.3	10	85	120	959	120/150/180/120	40/60/90/40	20

Figure 1. Best track of Bruce 2013 (times in UTC, CCT is UTC +6.5 hours).

Please note STC *Bruce* moved into the La Reunion AOR on 19 December.

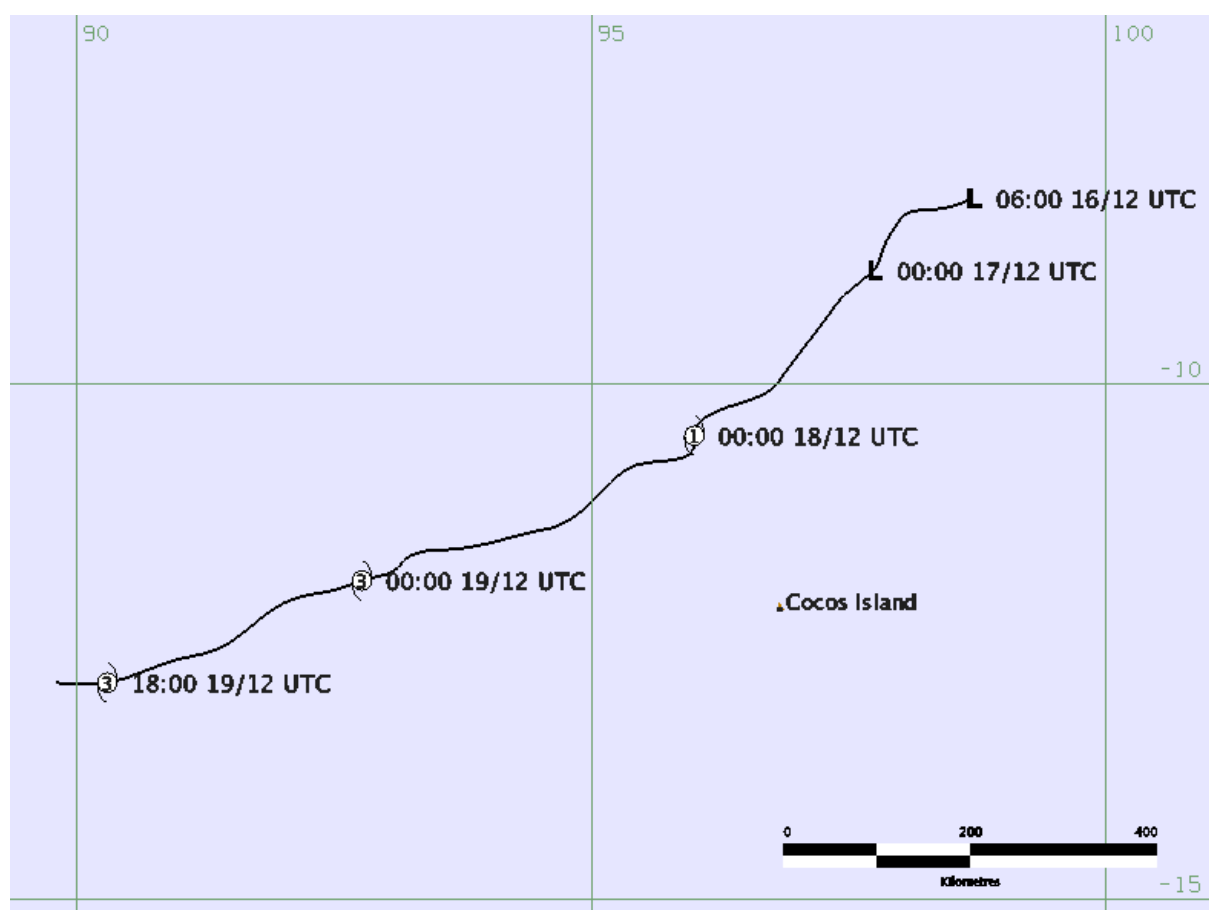


Figure 2. 91 GHz SSMIS image of *Bruce* 2345 UTC 17 December 2013.

Image courtesy of https://www.fnmoc.navy.mil/tcweb/cgi-bin/tc_home.cgi

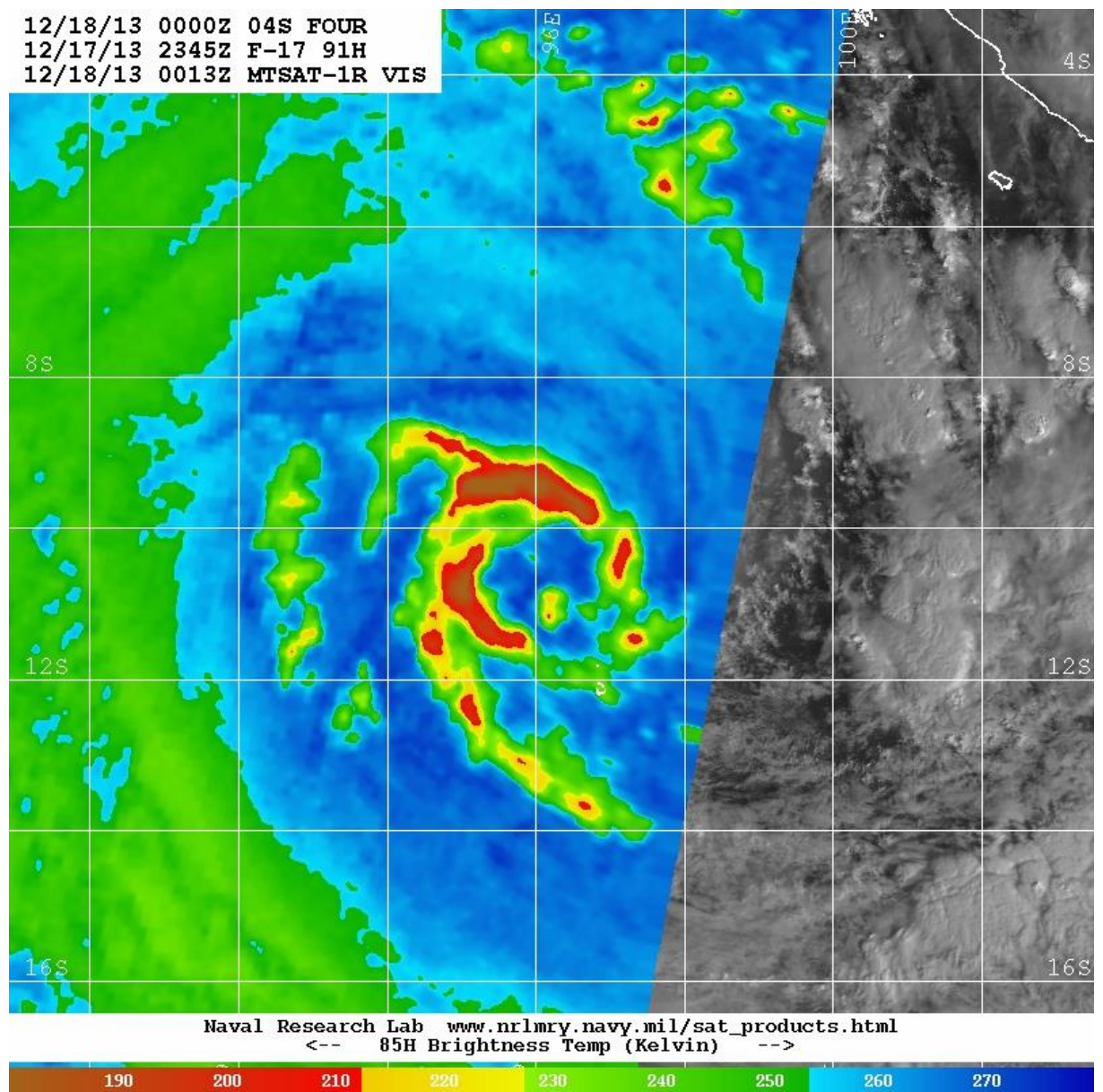


Figure 3. Comparison of objective and subjective intensity estimates during Bruce.

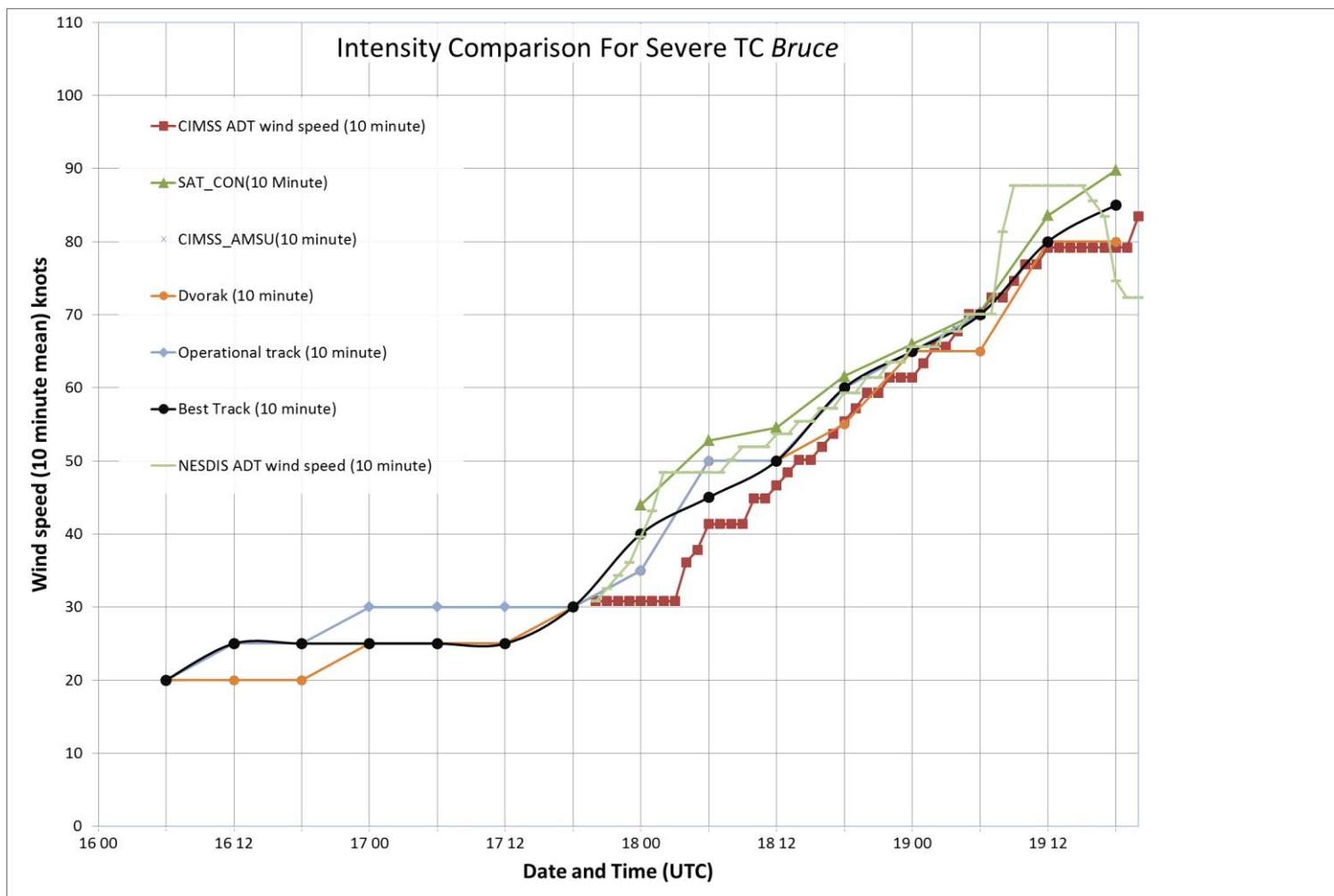


Figure 4. Accuracy statistics for Bruce

