



Severe Tropical Cyclone Victoria
6 – 12 April 2013

A. Summary

During an active phase of the Madden-Julian Oscillation (MJO), a monsoonal low pressure system developed in the Indian Ocean, near 6°S 99°E on 6 April 2013. The low then moved to the southeast and developed into a tropical cyclone on 9 April, despite environmental conditions being only moderately favourable. *Victoria* rapidly intensified to Category 3, reaching peak intensity during 10 April.

Victoria moved at a reasonably fast and consistent pace towards the south southeast, passing between the Cocos Keeling Islands and Christmas Island. Overnight on 11 April, *Victoria* weakened rapidly below tropical cyclone intensity due to unfavourable conditions in the upper atmosphere and lower Sea Surface Temperatures (SSTs). The tropical cyclone had no direct impact on the Cocos Keeling Islands, Christmas Island, or the West Australian mainland.

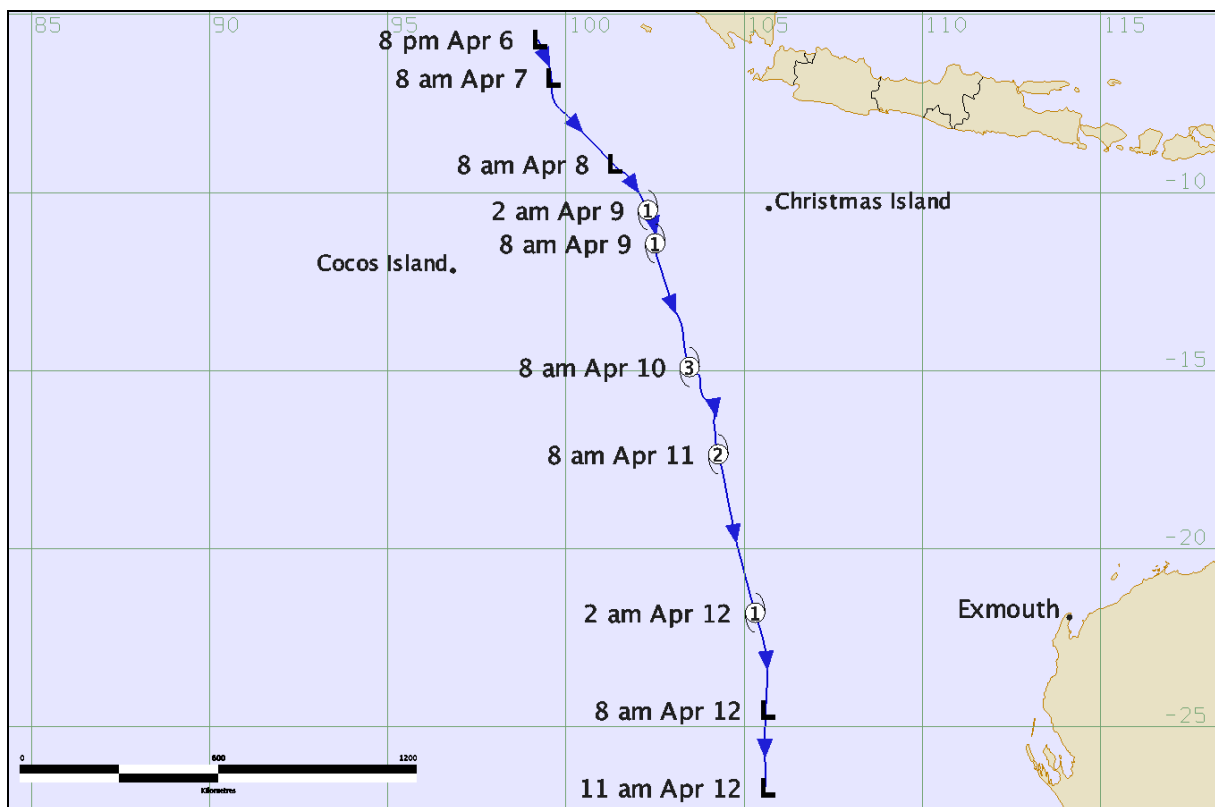


Figure 1. Best track of Severe TC *Victoria* (6 – 12 April 2013).

B. Meteorological Description

Intensity analysis

An active phase of the MJO combined with a monsoon trough to produce a tropical low pressure system near 6°S 99°E on 6 April. The low moved to the southeast and a Dvorak T-number (DT) 1.0 classification was assigned early on 8 April. The tropical low was affected

by about 20 knots (kn) (37 kilometres per hour (km/h)) of easterly wind shear but despite these unfavourable conditions *Victoria* continued to develop. Advanced SCATterometer (ASCAT) satellite passes at 0208 UTC (1008 WST) and 0303 UTC on 8 April showed 30 - 35 kn (55 – 65 km/h) winds in the southern quadrants where most of the convection was concentrated. The radius to maximum winds (RMW) was quite large at 60 nautical miles (nm) (111 kilometres (km)) during this time.

By 1800 UTC 8 April the system had reached Category 1 tropical cyclone strength. Subsequent microwave passes showed convection wrapping around the cloud system centre and a 2200 UTC 8 April Cooperative Institute for Research in the Atmosphere (CIRA) Advanced Microwave Sounding Unit (AMSU) pass estimated the 10-minute wind speed at around 45 kn (83 km/h). The 1800 UTC subjective DT was 2.5 but Final T- number (FT) was constrained to 2.0. The actual development of *Victoria* was likely to have been well ahead of subjective and objective Dvorak intensity estimates (refer Figure 5).

The wind shear over the tropical cyclone dropped to around 5 kn (10 km/h) during 9 April. *Victoria* was a small tropical cyclone and it intensified rapidly as conditions became more favourable. It reached Category 3 tropical cyclone strength with a peak 10-minute wind speed of 75 kn (139 km/h) at 0000 UTC 10 April. AMSU and Satellite Consensus (SATCON) 10-minute mean wind speed estimates were around 70 kn (130 km/h) at 2000 UTC 9 April and Advanced Dvorak Technique (ADT) was lower at around 60 kn (110 km/h) (refer Figure 5). An eye was visible in both infrared (IR) and visible (VIS) imagery during the morning of 10 April (refer Figure 4) and a subjective DT/FT of 5.0 was reached at 0600 10 April. Soon after the eye disappeared, *Victoria* weakened rapidly over the next 24 hours due to increased wind shear. Late on 10 April and early on 11 April, numerous SATCON 10-minute mean wind intensity estimates were around 40 kn (75 km/h) (refer Figure 5). An 0250 UTC ASCAT pass on 11 April showed around 45 kn (85 km/h) winds in the eastern quadrants but slightly weaker winds in the western quadrants (refer Figure 3) supporting the SATCON intensity estimates.

Victoria weakened rapidly overnight on 11 April as it moved over much cooler SSTs and a midlevel trough increased wind shear to 20-30 kn (35 – 55km/h) over the tropical cyclone. By 0000 12 April *Victoria* weakened below tropical cyclone intensity with no deep convection near the low level centre.

Motion

Initially *Victoria* was steered towards the south southeast by a combination of an amplifying mid-level trough to the southwest and a strong northwest flow (enhanced by the proximity of the Indonesian islands) to the north. As *Victoria* moved south away from Indonesia, it became trapped between the mid-level high to the east and the mid-level trough to the west which kept it moving in a south southeast direction.

Structure

Initially *Victoria* had a gale radius of around 130 nm in the south east quadrant and a large RMW of around 60 nm (110 km). As it intensified the gale radii became symmetric at around 70 nm (130 km) with a RMW of 10 nm. At peak intensity *Victoria* had an eye which could be identified in both IR and VIS imagery, the eye diameter was of the order of 10 nm (20 km). As *Victoria* weakened on 10 April, the gale radii expanded in the southern semicircle and the RMW began to increase. By late on 11 April, gales had contracted to the eastern semicircle and the RMW was around 50nm.

C. Impact

Victoria had no impact on the Cocos Keeling Islands, Christmas Island or the Western Australian mainland.

Table 1. Best track summary for Severe Tropical Cyclone *Victoria*

Refer to the Australian Tropical Cyclone database for complete listing of parameters.

Year	Month	Day	Hour UTC	Pos. Lat. S	Pos. Long. E	Position Accuracy nm	Max wind 10min knots	Max gust knots	Central Pressure hPa	Rad. of Gales nm (NE/SE/SW/NW)	Rad. of storm force winds (NE/SE/SW/NW)	Radius Max. Wind (RMW)
2013	4	6	12	5.7	99.2	60	15	45	1008			
2013	4	6	18	6.1	99.4	60	15	45	1008			
2013	4	7	00	6.8	99.6	60	20	45	1008			
2013	4	7	06	7.8	100	60	20	45	1006			
2013	4	7	12	8.2	100.4	60	25	45	1004			
2013	4	7	18	8.7	100.9	60	30	45	1001			
2013	4	8	00	9.2	101.3	60	35*	50	998	0/130/60/0		60
2013	4	8	06	9.4	101.6	60	35*	50	997	0/130/60/0		60
2013	4	8	12	9.9	102.0	20	35*	50	997	0/130/60/0		60
2013	4	8	18	10.5	102.3	25	35	50	997	60/130/60/60		40
2013	4	9	00	11.4	102.5	25	40	55	996	60/130/60/60		20
2013	4	9	06	12.4	102.7	15	45	65	993	90		15
2013	4	9	12	13.3	103.1	10	55	75	987	70	40	10
2013	4	9	18	14.1	103.3	10	65	90	979	70	40	10
2013	4	10	00	14.9	103.5	10	75	105	971	70	40	10
2013	4	10	06	15.4	103.8	15	75	105	968	70/90/90/70	30	15
2013	4	10	12	15.8	104	20	75	105	970	70/90/90/70	30	20
2013	4	10	18	16.4	104.2	20	65	90	976	70/90/90/70	30	25
2013	4	11	00	17.4	104.3	25	55	75	987	30/70/70/30	0/40/0/0	35
2013	4	11	06	18.8	104.6	30	45	65	993	30/70/70/30		40
2013	4	11	12	20.2	104.9	30	40*	55	996	0/70/70/0		50
2013	4	11	18	21.8	105.3	40	35*	50	999	0/70/70/0		50
2013	4	12	00	24.5	105.6	60	30	45	1003			

*System not a tropical cyclone as gales do not wrap more than half way around the centre.

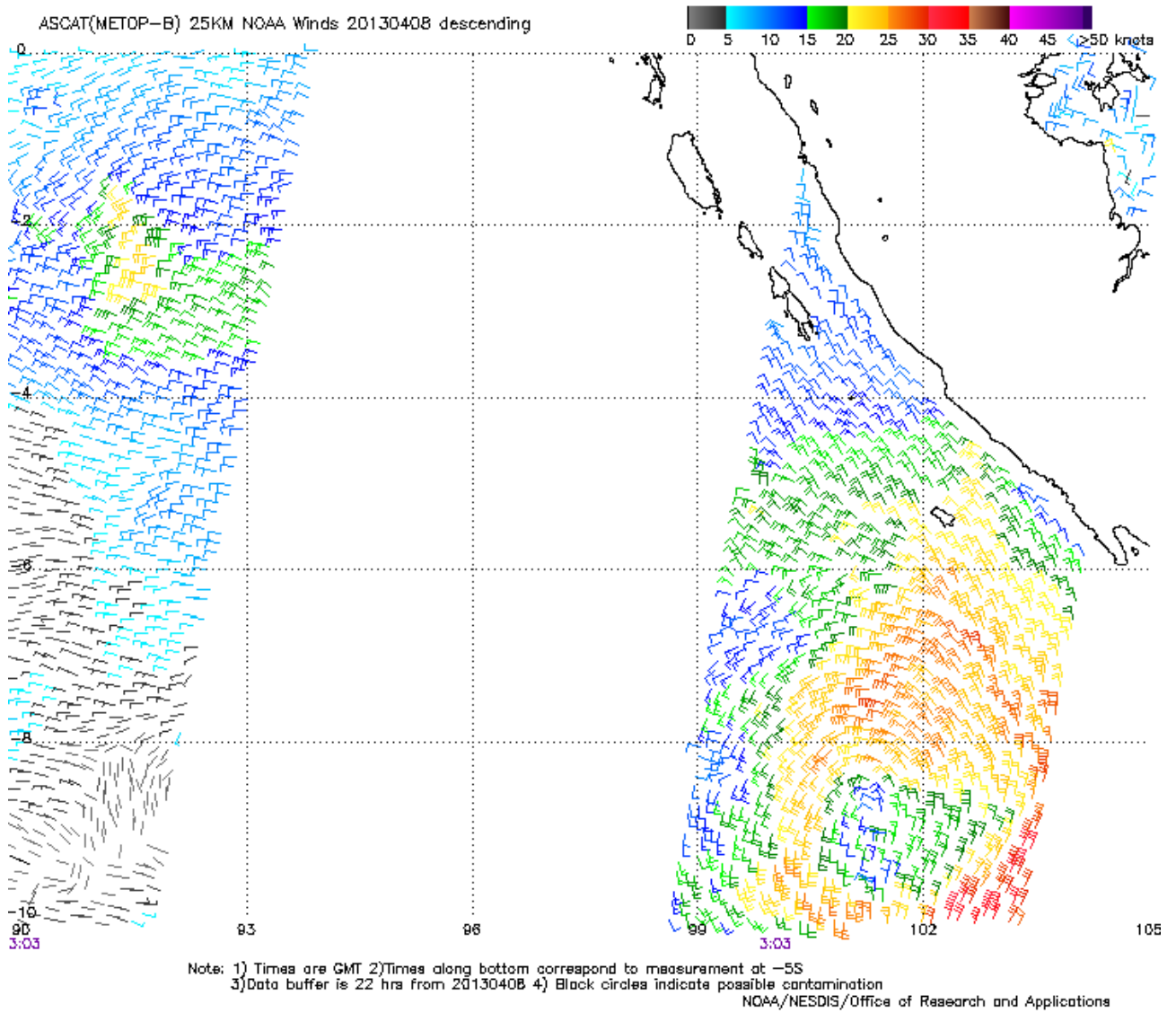


Figure 2. ASCAT pass 0303 UTC 08 April 2013.

(image courtesy of NOAA US NOAA <http://manati.orbit.nesdis.noaa.gov/datasets/OSCATData.php/>)

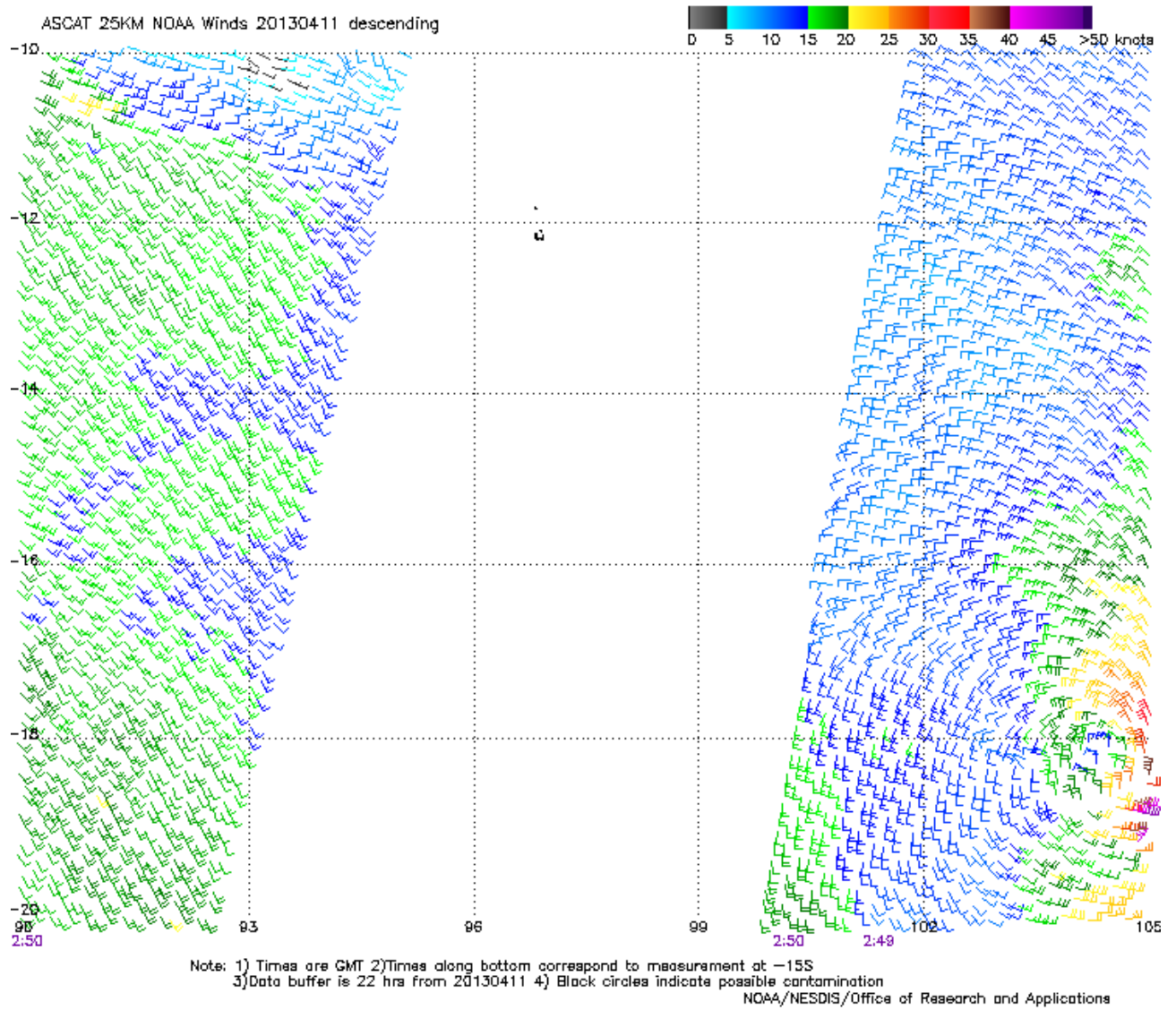


Figure 3. ASCAT pass 0250 UTC 11 April 2013.
(image courtesy of NOAA NRL: <http://www.nrlmry.navy.mil/>)

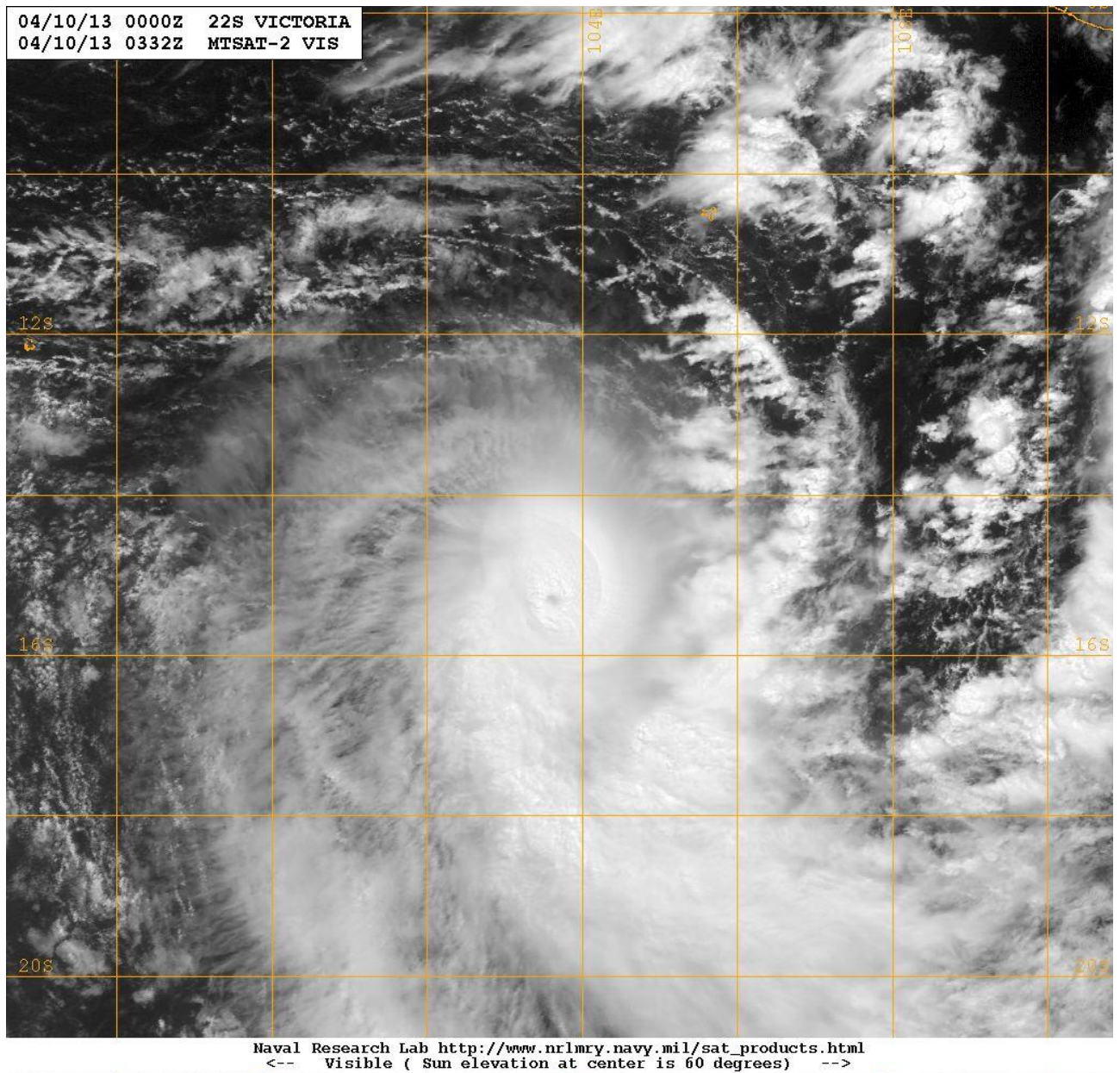


Figure 4. Visible image at 0332 UTC 10 April of *Victoria* near peak intensity.
(image courtesy of NOAA NRL: <http://www.nrlmry.navy.mil/>)

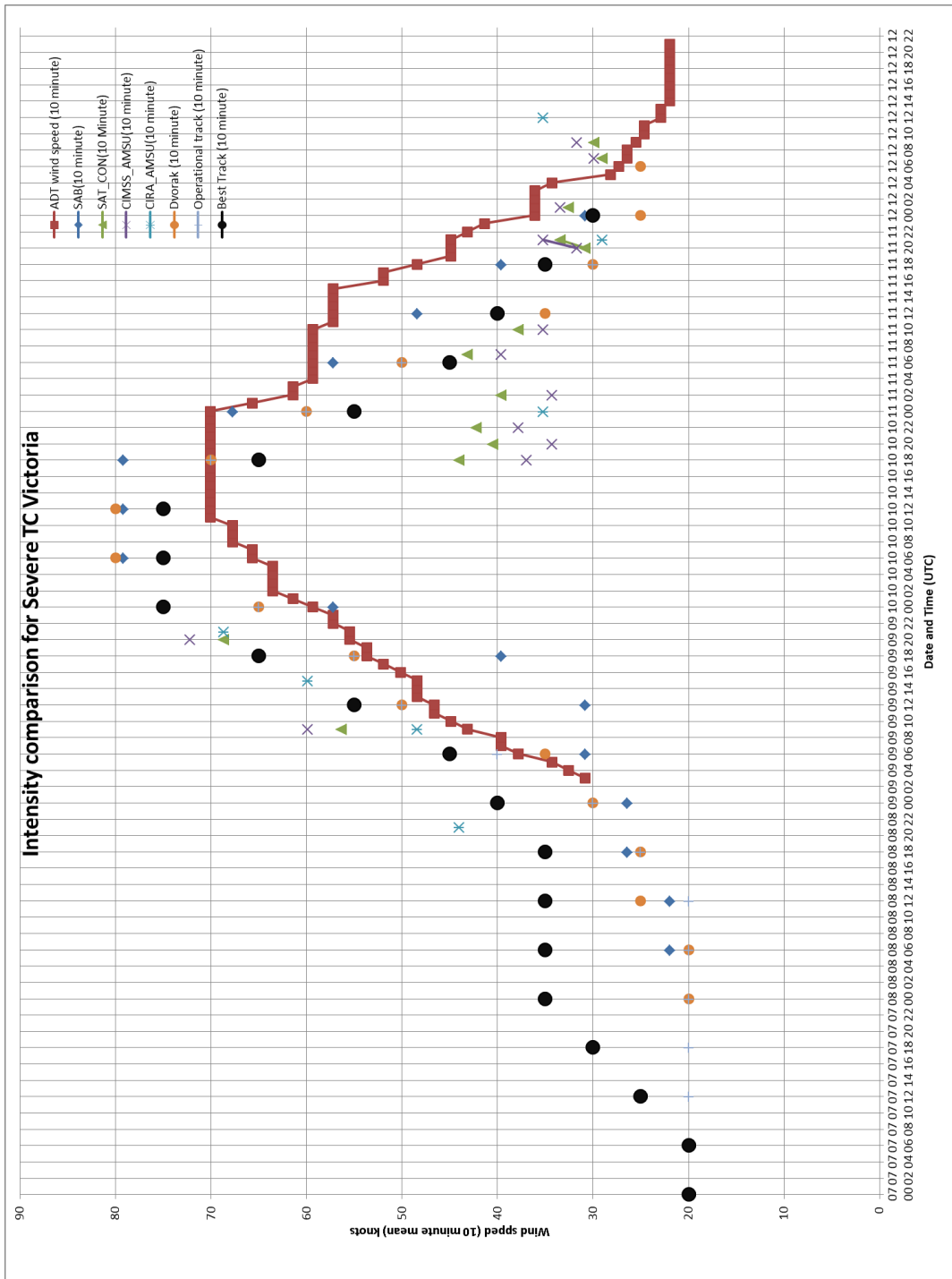


Figure 5. Comparison of objective and subjective intensity analysis techniques.