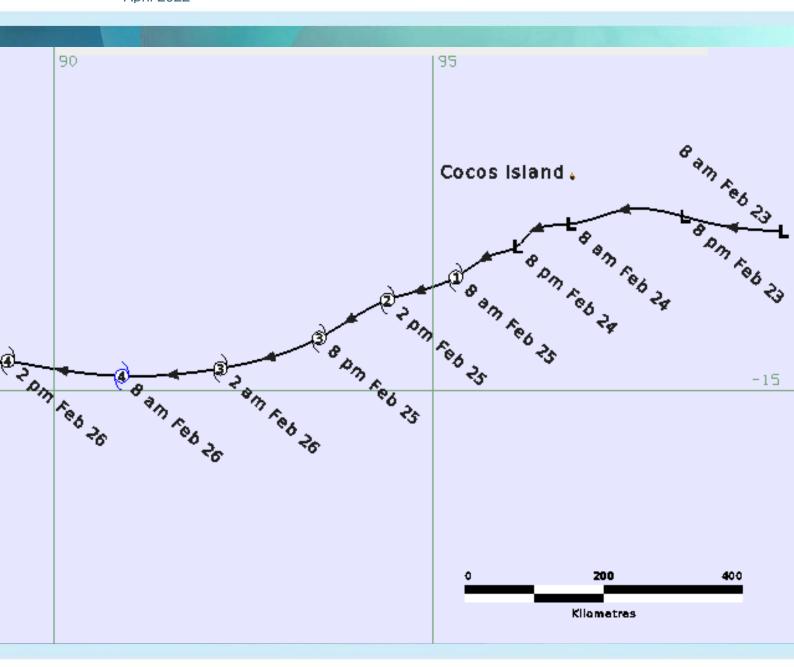


Severe Tropical Cyclone Vernon

23 - 26 February 2022

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1 Summary

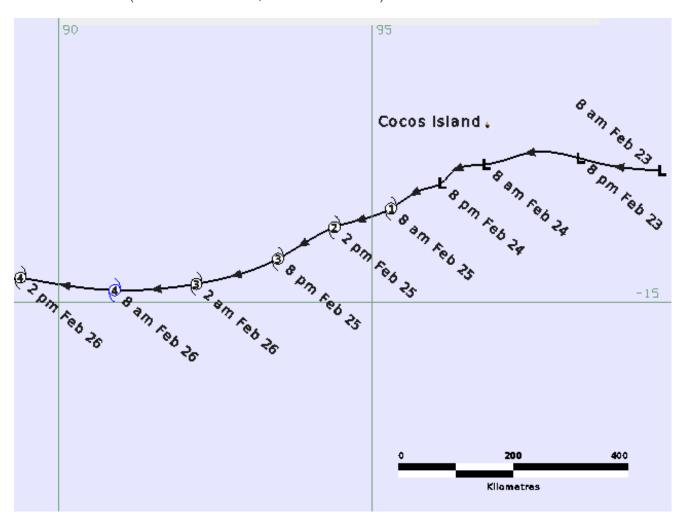
Severe Tropical Cyclone (STC) *Vernon* was a small tropical cyclone that rapidly intensified over open waters in the Indian Ocean before moving west of the Australian region and weakening.

A low formed in the Indian Ocean southwest of Christmas Island on 23 February and tracked to the west. Although initially inhibited by moderate easterly vertical wind shear, the circulation developed rapidly late on 24 February and throughout 25 February. The 24-hour change from a category 1 (40 knot (kn), (75 kilometre per hour (km/h)) system 25 to a category 4 (100 kn, 185 km/h) severe tropical cyclone between the 25 and 26 February was quite remarkable.

Vernon moved west of 90°E into La Reunion's area of responsibility by 0600 Universal Time Coordinated (UTC) (1400 Australian Western Standard Time (AWST)) (UTC=AWST+8 hours) 26 February and promptly weakened as it interacted with another circulation (23U) to the north. Indeed, these two circulations engaged in a Fujiwhara rotation that culminated in the two circulations merging.

There were no known impacts associated with Vernon.

FIGURE 1 Best track of Severe Tropical Cyclone *Vernon* 23-26 February 2022 (times in AWST, UTC+8 hours).



2 Meteorological Description

2.1 Intensity analysis

A low developed in the Indian Ocean southwest of Christmas Island on 23 February. Although somewhat inhibited by moderate easterly vertical wind shear, deep convection became more organised overnight into 24 February supported by strong poleward upper-level outflow. The ongoing moderate shear constrained intensification somewhat during 24 February and a Hai Yang 2B (HY-2B) scatterometer pass at 1200 UTC confirmed that gales were yet to develop.

Subsequently, the circulation appeared to fight back against the shear and the centre moved under the deep convective cloud. Tropical cyclone intensity is estimated at 0000 UTC 25 February. The visible image in Figure 2 at 0100 UTC showed the centre now under an improving central dense overcast (CDO) pattern. An HY-2B pass at 2327 UTC 24 February and an Advanced Scatterometer (ASCAT) pass at 0320 UTC 25 February (Figure 3) indicated gales more than halfway around the centre.

Further intensification was extremely rapid and by 1000 UTC 25 February an eye appeared on microwave imagery and briefly emerged on Infrared (IR) imagery around 1200 UTC, suggesting *Vernon* had reached category three (severe) intensity. The Advanced Microwave Scanning Radiometer 2 (AMSR2) microwave imagery in Figure 4 shows a strong eye pattern. The 10-minute mean wind peak intensity is estimated at 0000 UTC 26 February at 100 kn (185 km/h) (category 4), based upon the Dvorak intensity estimate of a Data T number of 6.0 using an eye pattern. The rapid intensification and peak intensity estimate were supported by objective methods shown in Figure 5.

After *Vernon* moved west of 90°E into La Reunion's area of responsibility, it was affected by the interaction with another circulation to the north (23U) and rapidly weakened. This was supported by objective methods in Figure 5.

2.2 Structure

The absence of strong monsoonal flow to the north resulted in the circulation being small throughout its lifetime. Moderate easterly vertical wind shear resulted in deep convection primarily to the west of the centre in the developing stages. Gales initially occurred northwest of the centre at 1800 UTC 24 December. The low-level ridge to the south enhanced winds on the southern side of the system. Gales are estimated at only 30-40 nm (55-75 km) to the north and 50-65 nm (92-120 km) to the south. The radius of maximum winds was estimated initially at 10 nm (18 km) decreasing to just 5 nm (8 km) during the most intense stage.

2.3 Motion

Vernon was steered to the west southwest by a mid-level ridge to the south. By the time Vernon crossed 90°E it was moving to the northwest as it interacted with a circulation (23U) further to the north. Indeed, these two circulations engaged in a Fujiwhara rotation that culminated in the two circulations merging.

FIGURE 2. Visible image at 0100 UTC 25 February 2022.

Image courtesy NRL: https://www.nrlmry.navy.mil/TC.html

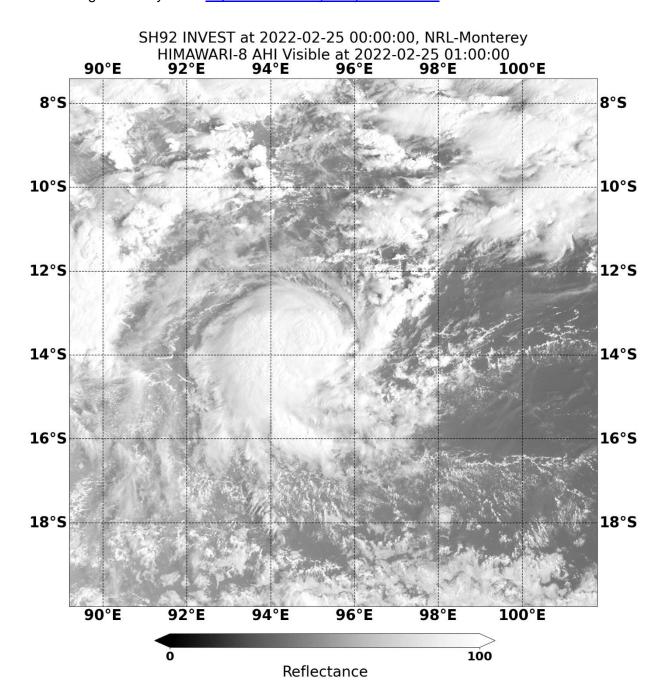


FIGURE 3. ASCAT-C pass at 0320 UTC 25 February showing gales around the centre which confirmed tropical cyclone intensity.

Image courtesy NRL: https://www.nrlmry.navy.mil/TC.html

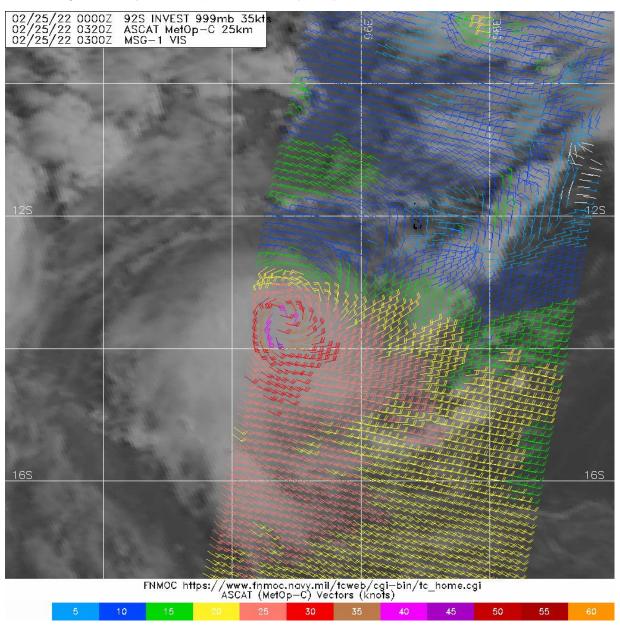


Figure 4. AMSR2 89GHz microwave image at 1910 UTC 25 February near peak intensity.

Image courtesy NRL: https://www.nrlmry.navy.mil/TC.html

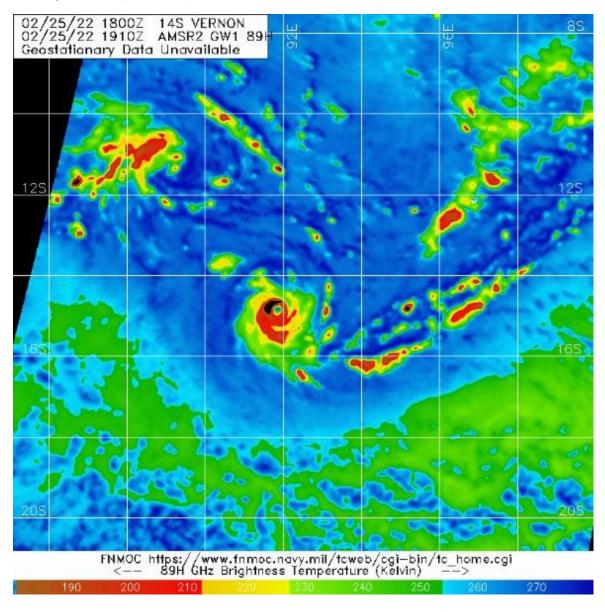
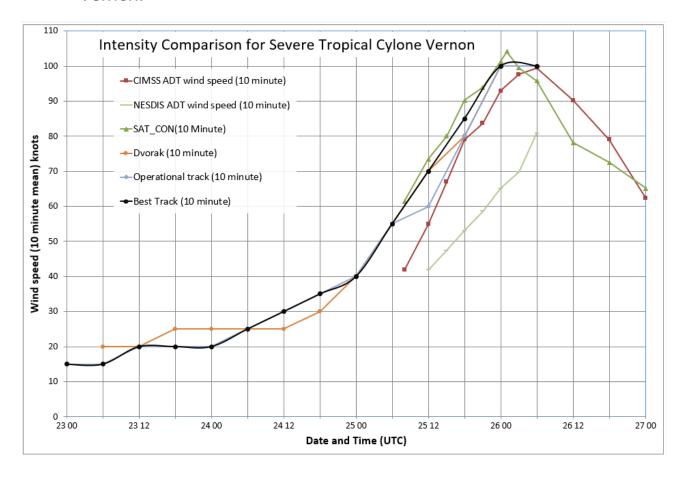


FIGURE 5. Plot of objective and subjective intensity estimates for STC *Vernon*.



3 Impact

There were no impacts from this cyclone.

4 Observations

There were no observations during this event.

TABLE 1. Best track summary for Severe Tropical Cyclone *Vernon* 23-26 February 2022.

Refer to the Australian Tropical Cyclone database for complete listing of parameters and track. Note: UTC is WST - 8 hours.

*not at tropical cyclone intensity.

Year	Month	Day	Hour UTC	Pos. Lat. S	Pos. Long. E	Pos. Acc. nm	Max Wind 10min kn	Max gust kn	Cent. Press. hPa	Rad. of gales (NE/SE/ SW/NW)	Rad. of storm (NE/SE/ SW/NW)	RMW n mi
2022	02	23	00	12.9	99.6	25	15	45	1006	-	-	-
2022	02	23	06	12.8	98.7	20	15	45	1004	-	-	-
2022	02	23	12	12.7	98.3	30	20	45	1004	-	-	-
2022	02	23	18	12.6	97.6	30	20	45	1002	-	-	-
2022	02	24	00	12.8	96.8	25	20	45	1002	-	-	-
2022	02	24	06	12.9	96.3	25	25	45	1000	-	-	-
2022	02	24	12	13.1	96.1	20	30	45	998	-		-
2022	02	24	18	13.2	95.8	25	35*	50	996	0/0/0/40	-	-
2022	00	25	00	13.5	95.3	20	40	55	994	0/50/50/40	-	10
2022	02	25	06	13.8	94.4	20	55	75	989	30/50/50/40	15/25/25/20	10
2022	02	25	12	14.3	93.5	20	70	100	976	30/50/50/40	15/25/25/20	8
2022	02	25	18	14.7	92.2	15	85	120	964	30/50/50/40	20/30/30/20	5
2022	02	26	00	14.8	90.9	15	100	140	950	40/65/65/40	20/30/30/20	5
2022	02	26	06	14.6	89.4	15	100	140	950	40/65/65/40	20/30/30/20	5

5 Forecast Performance

Official tropical cyclone forecasts were issued from 24-26 February.

The accuracy figures for Tropical Cyclone *Vernon* below and in Figure 6 show that both the forecast position and intensity errors were higher than the five-year average at all time steps.

Forecast positions were north of the actual track. This was due in part to models having a weaker system steered by lower-level winds than the actual strong system that extended much higher into the troposphere and had a slightly different steering depth. The rapid intensification was not forecast. This was influenced by the weaker model guidance and the forecasters assessment that moderate wind shear would limit development. Note: the small number of data points at +36 and +48h are not plotted.

	00	06	12	18	24	36	48	72	96	120
Position Absolute error (km)	12	48	85	127	183	270	359	-	-	-
Intensity Absolute error (kn)	2.5	11.3	20.7	29.2	37	51.7	60	-	-	-
Sample Size	8	8	7	6	5	3	1			

FIGURE 6 a. Position accuracy figures for Severe Tropical Cyclone *Vernon.*

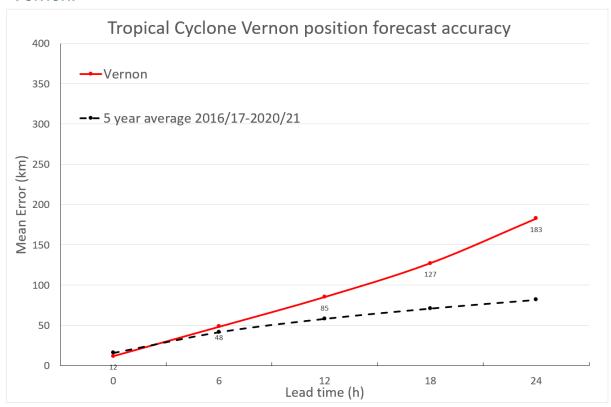


FIGURE 6 b. Intensity accuracy figures for Severe Tropical Cyclone *Vernon.*

