Australian Government
Bureau of Meteorology

Tropical Cyclone Lucas

24 January – 3 February 2021

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31 August 2021

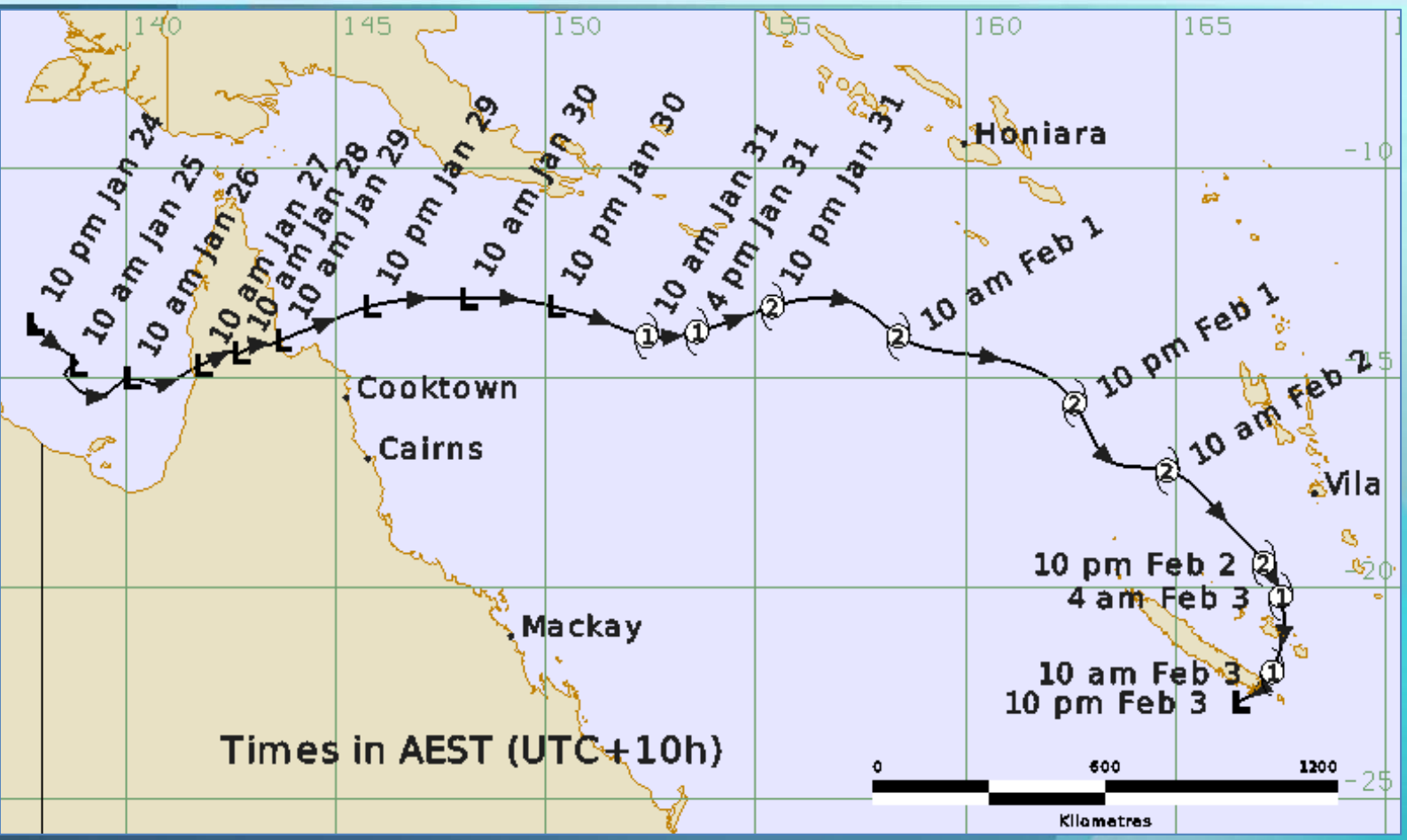

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Table of Contents

1. Summary 1
2. Meteorological Description 3
    2.1 Intensity analysis 3
    2.2 Structure 4
    2.3 Motion 4
3. Impact 12
4. Observations 13
5. Forecast Performance 14

1. Summary

Tropical Cyclone Lucas originated in the Gulf of Carpentaria moved east into the Coral Sea where it became a cyclone and reached category 2 intensity over open waters.

A tropical low began to develop in the western Gulf of Carpentaria on 24 January. The low moved eastwards and intensified slowly on 25 and 26 January. The low remained below tropical cyclone strength as it made landfall on western Cape York Peninsula coast at 1200 Universal Time Coordinated (UTC) 26 January or at 2200 Australian Eastern Standard Time (AEST) 26 January (AEST = UTC + 10 hours).

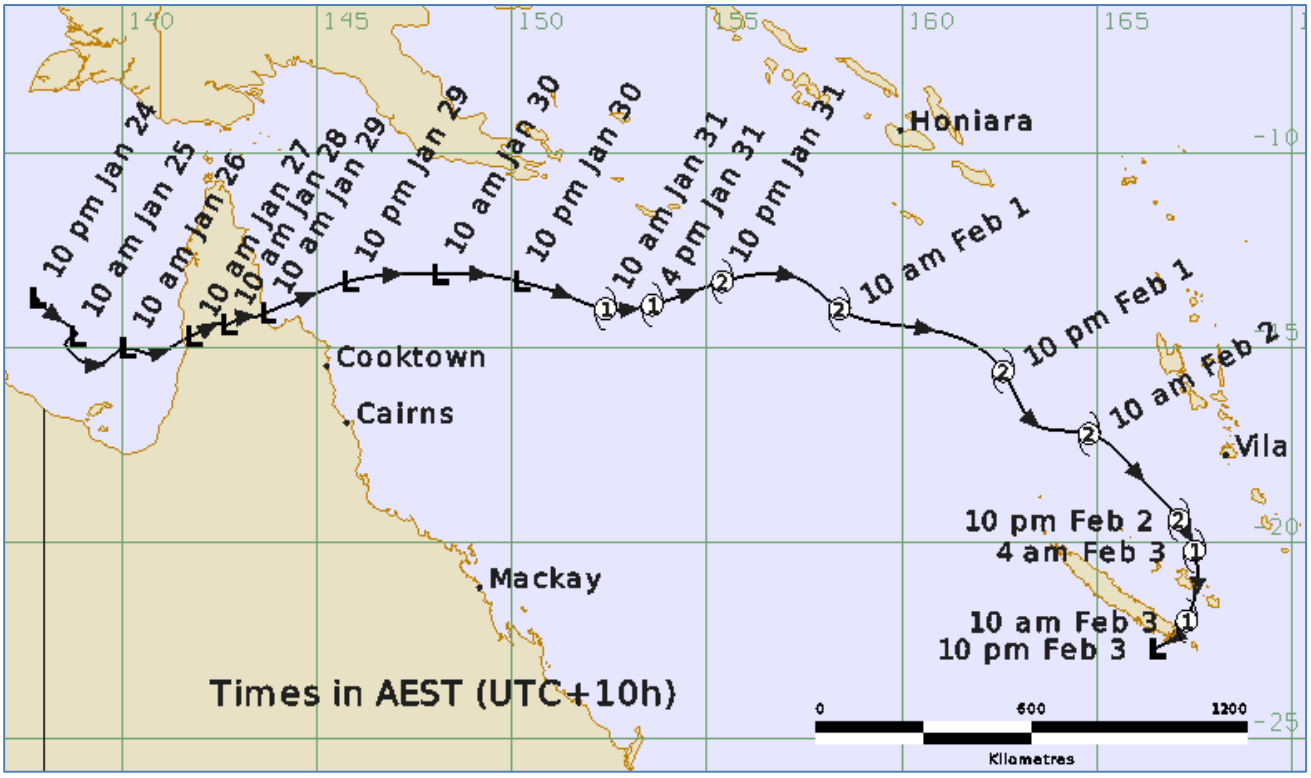
The low took two days to cross the Cape York Peninsula, during which it lost all its structure and cloud signatures. Once it moved over the northwest Coral Sea region, it began redeveloping due to favourable environment. The low reached tropical cyclone strength at 0000 UTC 31 January.

Lucas intensified quickly to a category two system that evening while continuing to move eastwards across the Coral Sea, south of the Solomon Islands. Lucas maintained category two intensity as it moved out of the Eastern Region [Longitude 160 degrees East] on 1 February.

The system began to weaken the next day as it turned south-eastwards across southern Vanuatu and crossed the southern tip of New Caledonia at 0000 UTC 3 February. Immediately, after encountering land, Lucas weakened below cyclone strength at 1800 UTC 3 February.

There was no impact from Tropical Cyclone Lucas to the Australian mainland or to coastal or island communities.

FIGURE 1. Best track of Tropical Cyclone Lucas 24 January – 1 February 2021 (times in AEST, UTC+10).



2. Meteorological Description

2.1 Intensity analysis

A tropical low began to form along the monsoon trough over the central Gulf of Carpentaria (GOC) on 24 January. The Advanced Scatterometer (ASCAT METOP-C) pass at 1245 UTC indicated an elongated area of light winds surrounded by 25 kn (46 km/h) on either side within 120 nm (222 km).

The ASCAT coverage over the GOC was excellent over the next two days, as the low moved eastwards and made landfall over the western Cape York Peninsula around 12 UTC 26 January. The highest Dvorak estimates were Data T-number (DT) 2.0 at 12 UTC 26 January, prior to landfall. The METOP-A ASCAT pass at 1130 UTC 26 January (Figure 2), indicated a small area of gales under the deep convection on the northern side of the low, just before it made landfall.

Following this, the low took two days to cross the Cape York Peninsula. Satellite and microwave images showed the system losing its structure and cloud signatures during this time. Once the low moved into the Coral Sea, it began to reorganise with deep convection developing near centre on 29 January. The low developed at a standard Dvorak rate reaching tropical cyclone intensity at 0000 UTC 31 January (Figure 3). The Advanced Microwave Scanning Radiometer 2 (AMSR2/RSS) pass at 0224 UTC 31 January confirmed the presence of gales covering more than halfway around the centre (Figure 4).

Lucas intensified quickly to a category two system that evening, well to the south of the Solomon Islands as shown in the METOP-A ASCAT pass at 0948 UTC 31 January (Figure 5). Lucas maintained category two intensity as it moved out of the Eastern Region [Longitude 160 degrees East] on 1 February. It attained a subjective Dvorak intensity of T4.0 before it moved into Nadi's area of responsibility (AOR).

Objective intensity estimates with Satellite Consensus (SATCON) reached 65 kn (12 km/h) (1-minute) as shown in Figure 8. The highest Cooperative Institute for Meteorological Satellite Studies (CIMMS) Advanced Dvorak Technique (ADT) estimate was T3.5 and NOAA ADT T4.6 between 0600 and 1200 UTC 1 February, while it was in Nadi's AOR.

The SSMI/S F-16 pass at 0735 UTC 1 February (Figure 6) showed a circular eye wall diameter of 22 nm (41 km). Lucas may have reached its maximum intensity around this time or in the next few hours. The next morning, the Special Sensor Microwave Imager/Sounder (SSMI/S) pass at 1720 UTC 1 February (Figure 7), showed a sheared Lucas with an exposed low level circulation centre (LLCC). The CIRA Multi-Model display showed the system peaking in intensity around this time while under a 20 kn (37 km/h) wind shear.

Lucas continued to weaken as it turned south-eastwards and moved across southern Vanuatu and southern tip of New Caledonia at 0000 UTC 3 February as a weak category 1 system. Immediately, after moving south of New Caledonia, Lucas weakened below cyclone strength at 1800 UTC 3 February.

2.2 Structure

Lucas was an asymmetric tropical cyclone with gale radius around 90 – 120 nm (167 – 222 km) in the northern semicircle and 40 – 60 nm (74 – 111 km) in the southern semicircle for all its life.

At its peak intensity, between 0600 – 1200 UTC 1 February, microwave pass SSMIS F17 showed a circular eye measuring 22 nm (41 km).

2.3 Motion

Lucas initially steered towards the east across the Gulf of Carpentaria under the influence of the monsoon flow and made landfall on the Cape York Peninsula coast as a tropical low.

Two days later, it moved into the Coral Sea, still under the influence of the monsoon flow. However, as the system deepened, it began to respond to the northwesterlies ahead of a quasi-stationary upper trough over eastern Australia.

The northwesterly steering became the dominant steering influence as the cyclone moved east of 160E. The cyclone reached its maximum intensity between 0600 – 1200 UTC 1 February, before increasing northwesterly shear began to impact the system (Figure 7).

The steering for the rest of the weakening Lucas was dominated by the sub-tropical ridge located to the northeast.

FIGURE 2. ASCAT pass at 1130 UTC 26 January showing a tiny area of gales under deep convection on the northern side of the tropical low as it made landfall.

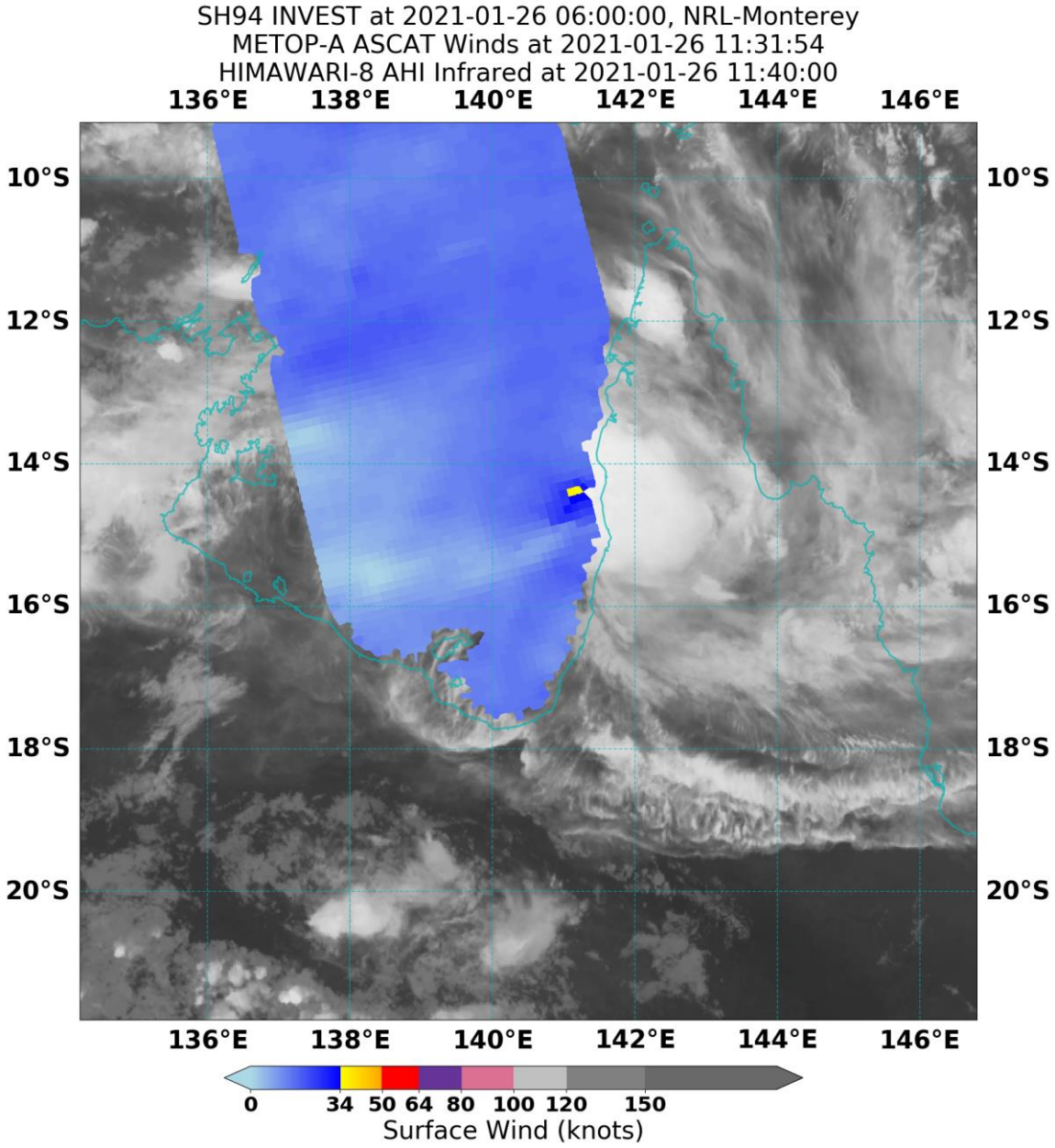


FIGURE 3. GMI microwave image at 0005 UTC 31 January as Lucas showed improved curvature and reached tropical cyclone strength.

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

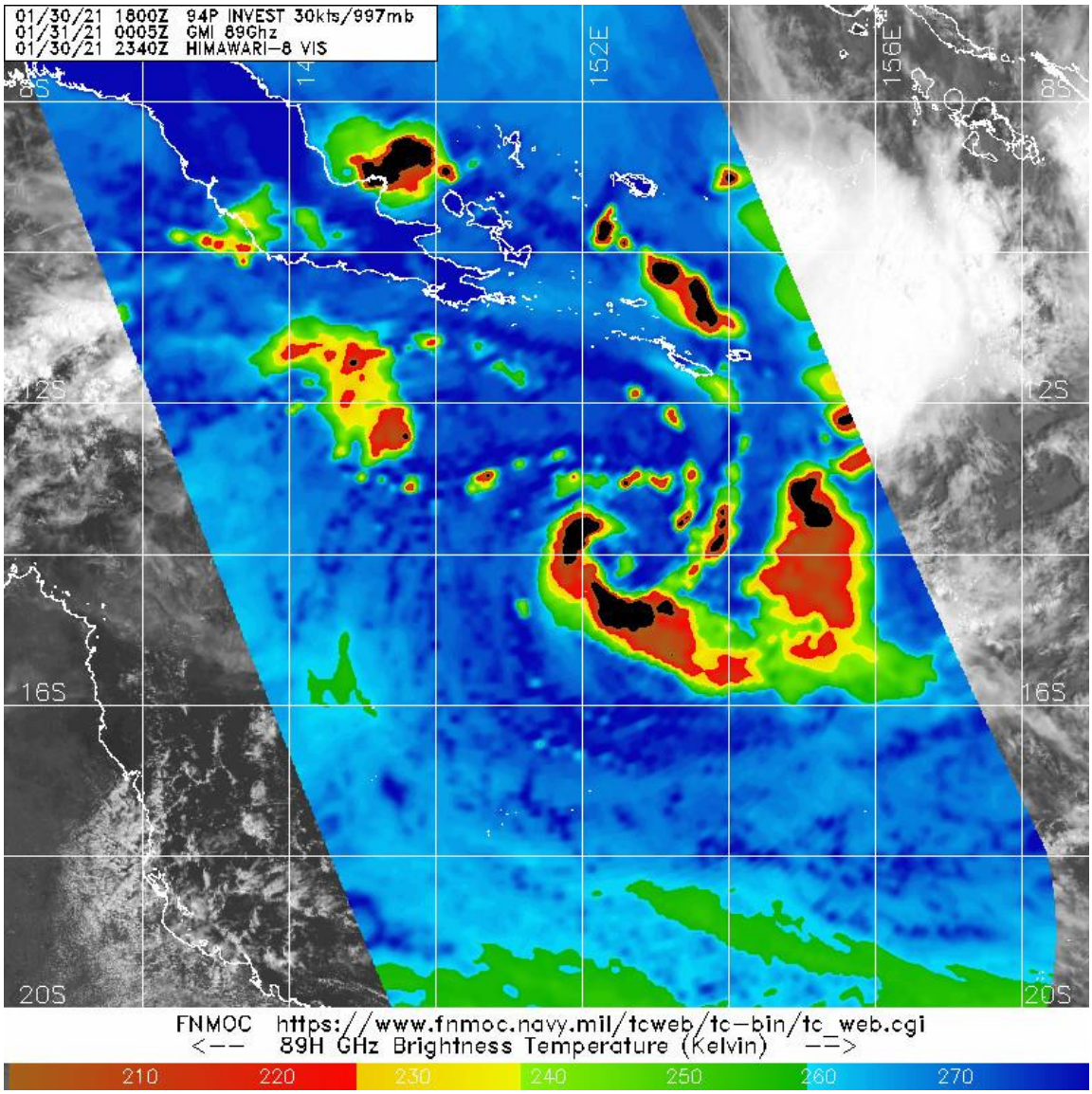


FIGURE 4. AMSR2/RSS radiometer wind distribution at 0224 UTC 31 January indicating presence of gales or stronger winds.

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

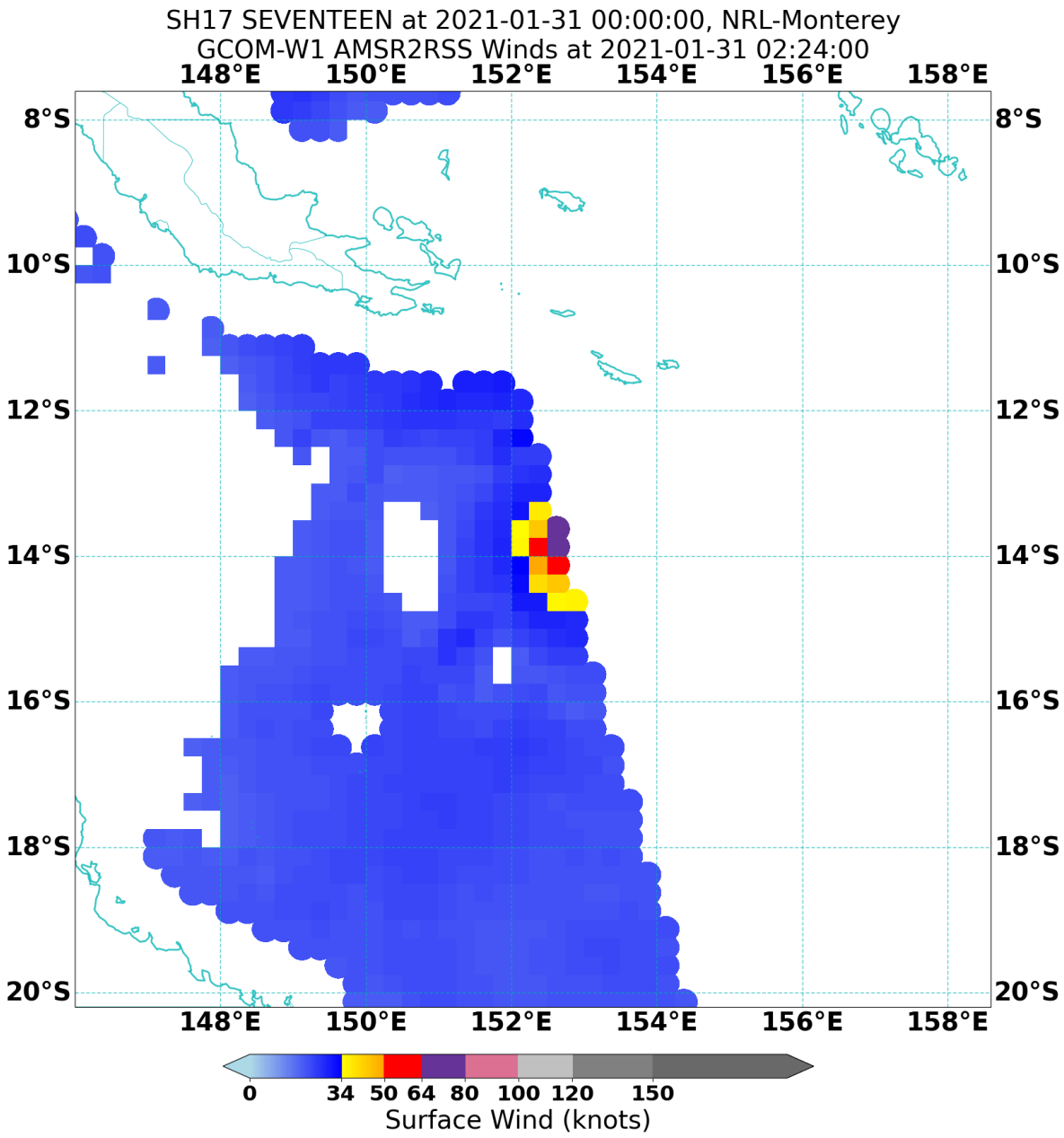


FIGURE 5. METOP-A ASCAT pass at 0948 UTC 31 January.

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

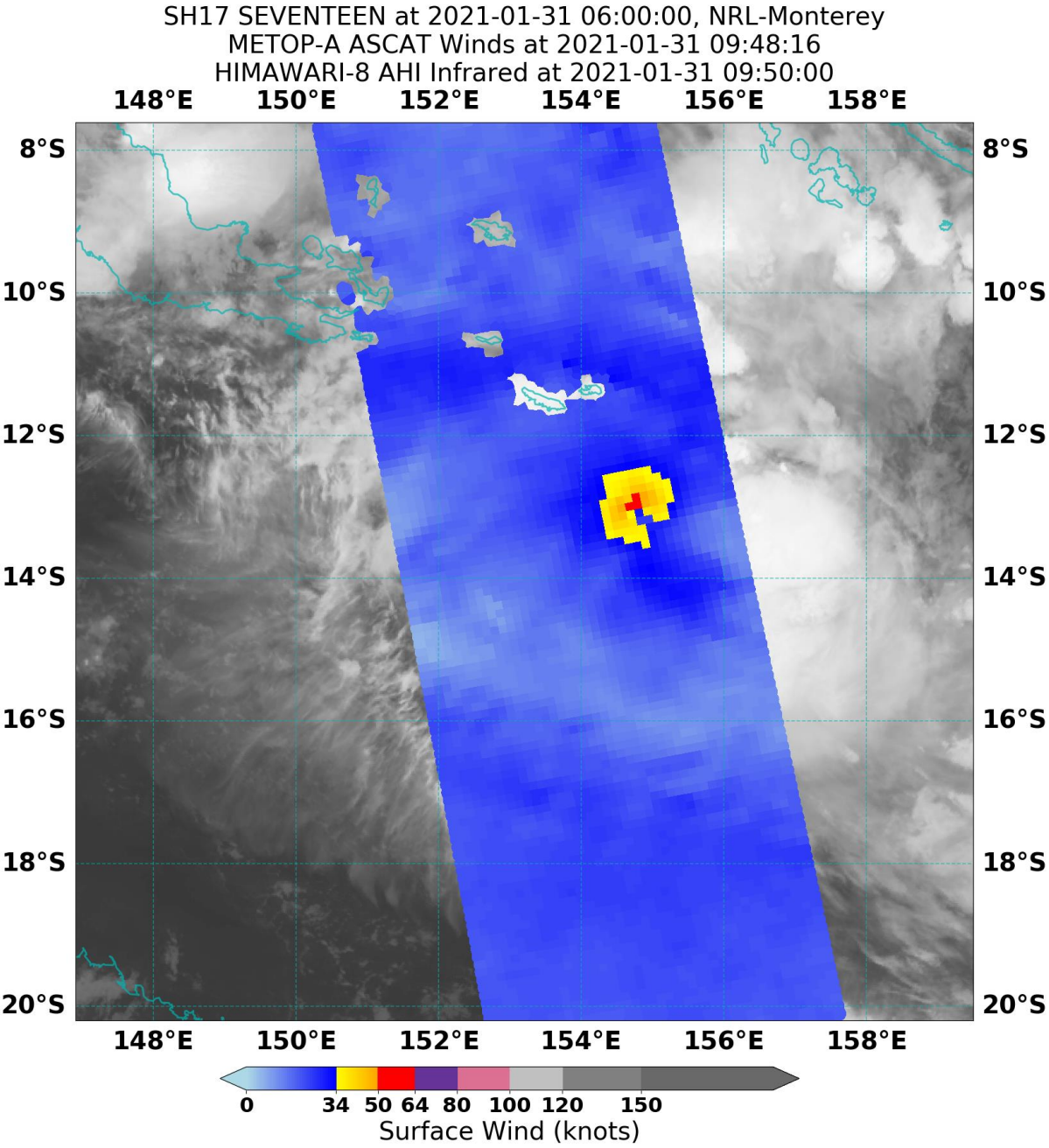


FIGURE 6. SSMIS image at 0735 UTC 01 February as Lucas reached peak intensity, just east of 160E.

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

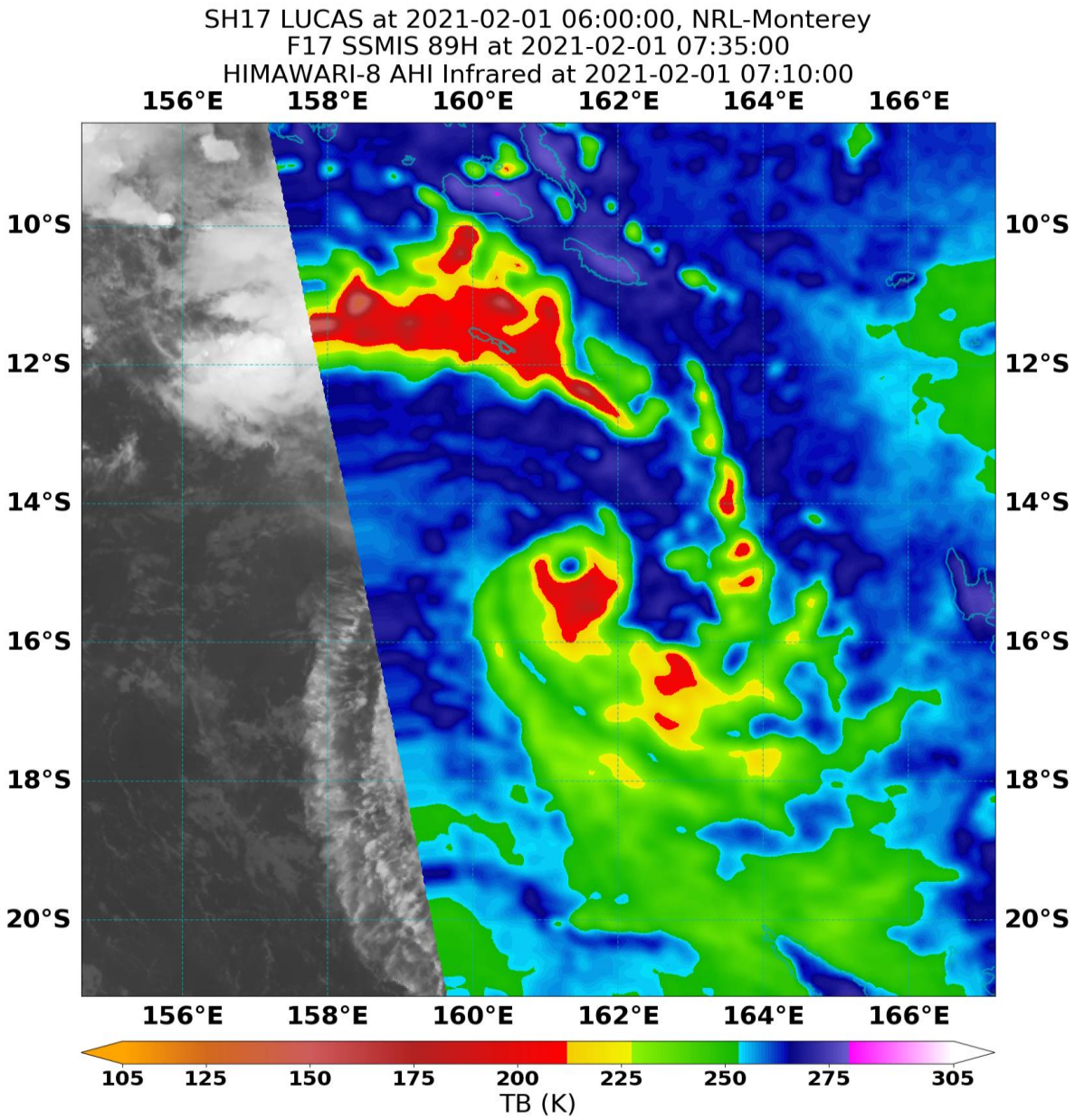


FIGURE 7. SSMI/S F-16 microwave image at 1720 UTC 01 February showing Lucas low level centre (marked with an x) sheared to the north of the deep convection.

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

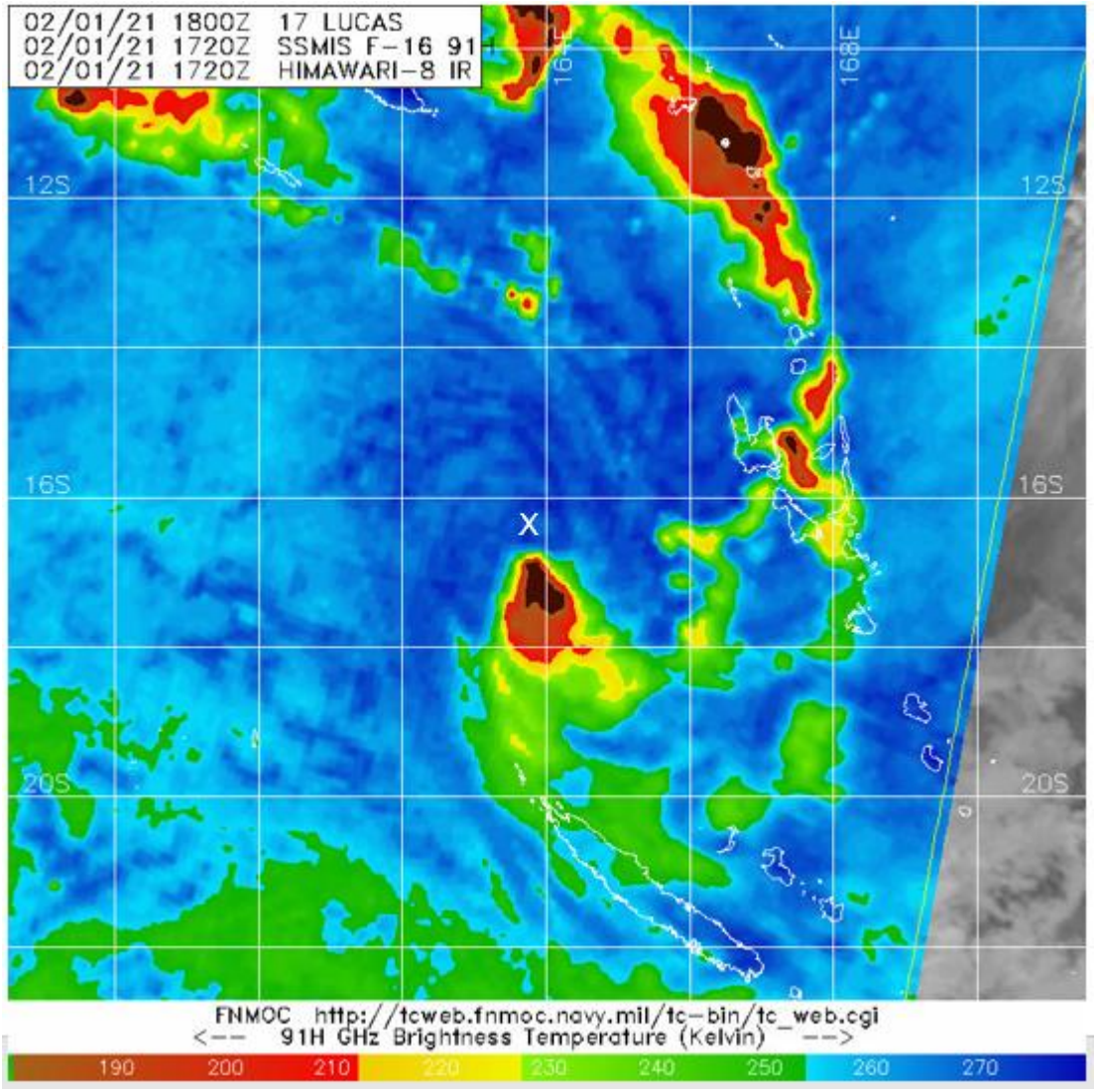
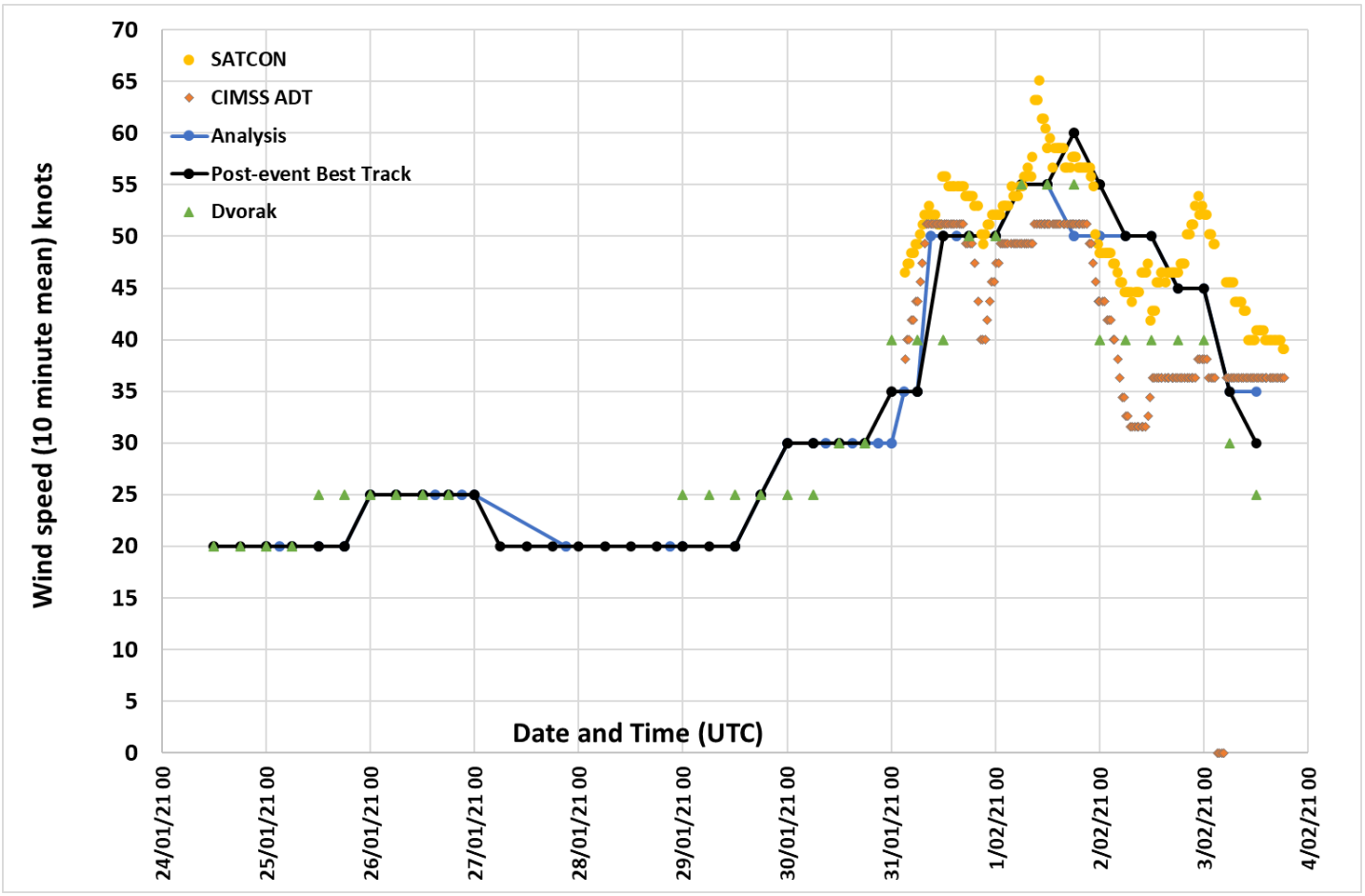


FIGURE 8. Plot of objective and subjective intensity estimates for Tropical Cyclone Lucas.



3. Impact

TC Lucas had little or no impact over the far northern Cape York Peninsula as it made landfall as a tropical low in its early stages of development.

4. Observations

No significant observations of wind, pressure, rainfall or storm surge was recorded for the event over the Australian mainland or over island communities.

5. Forecast Performance

Official forecast tracks were issued from 0000 UTC 25 January to 0000 UTC 27 January while in the Gulf of Carpentaria, and then from 0000 UTC 29 January to 0600 UTC 1 February.

A Tropical Cyclone Watch was first issued for the western Cape York Peninsula early on 26 January and continued until the morning of 27 January for the low to possibly reach tropical cyclone intensity.

The accuracy figures for Tropical Cyclone Lucas in the table below and in Figures 9a (track) and 9b (intensity show:

1. Track forecasts were close to the long-term average for T+48h, but then were less accurate at longer lead times. The large errors at long lead times can be attributed to the early forecasts before developing into a tropical cyclone when forecast track was further south than the observed track at longer lead times.
2. The intensity forecasts were close to the long-term average at all lead times.

	0	6	12	18	24	36	48	72	96	120
Position Absolute error (km)	8	51	74	88	101	128	172	280	538	869
Intensity Absolute error (kn)	0.2	2.4	3.2	4.7	6.2	9.8	12.8	19.1	17.0	18.0
Sample Size	21	21	21	21	21	21	21	18	12	11

FIGURE 9 a. Position accuracy figures for Tropical Cyclone Lucas.

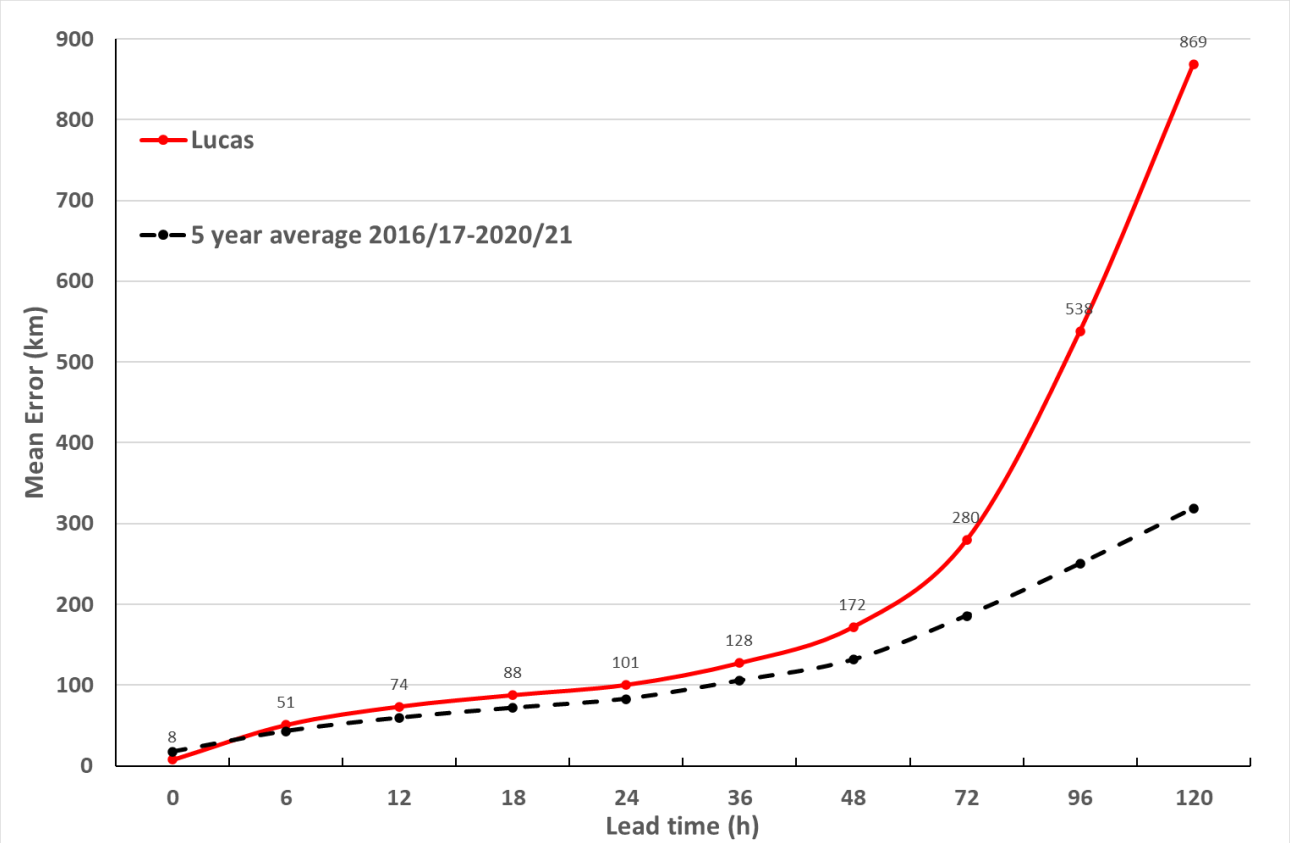


FIGURE 9 b. Intensity accuracy figures for Tropical Cyclone Lucas.

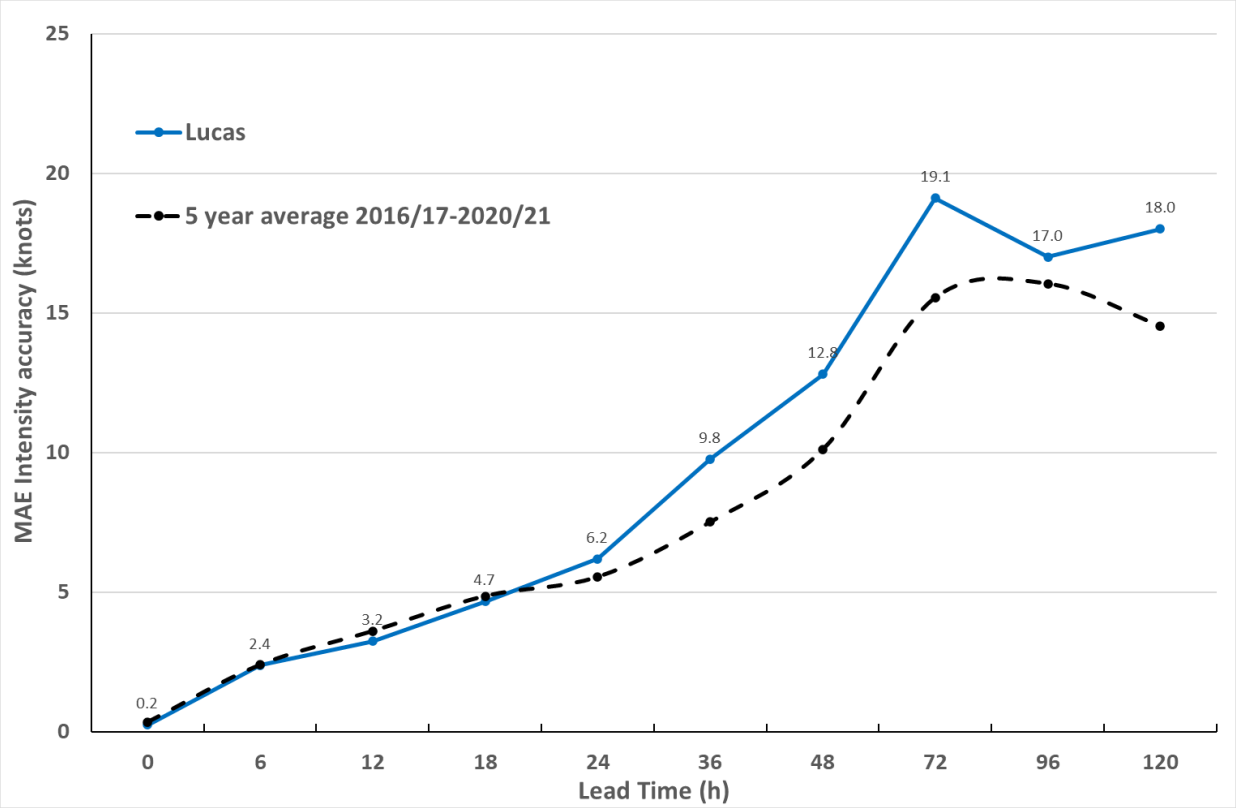


TABLE 1. Best track summary for Tropical Cyclone Lucas.

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

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 nm
2021	1	24	1200	13.7	137.8	30	20	40	1003	0/0/0/0	0/0/0/0	-
2021	1	24	1800	14.2	138.3	25	20	40	1003	0/0/0/0	0/0/0/0	-
2021	1	25	0000	14.7	138.8	20	20	40	1003	0/0/0/0	0/0/0/0	-
2021	1	25	0600	14.8	138.6	20	20	40	999	0/0/0/0	0/0/0/0	-
2021	1	25	1200	15.3	138.9	25	20	40	1000	0/0/0/0	0/0/0/0	-
2021	1	25	1800	15.4	139.5	25	20	45	1000	0/0/0/0	0/0/0/0	-
2021	1	26	0000	15.0	140.1	30	25	45	1000	0/0/0/0	0/0/0/0	-
2021	1	26	0600	15.1	140.5	30	25	45	999	0/0/0/0	0/0/0/0	-
2021	1	26	1200	15.1	141.0	30	25	45	999	0/0/0/0	0/0/0/0	-
2021	1	26	1800	14.9	141.4	30	25	45	999	0/0/0/0	0/0/0/0	-
2021	1	27	0000	14.7	141.8	20	25	45	1000	0/0/0/0	0/0/0/0	-
2021	1	27	0600	14.6	142.0	20	20	45	998	0/0/0/0	0/0/0/0	-
2021	1	27	1200	14.5	142.2	30	20	45	1001	0/0/0/0	0/0/0/0	-
2021	1	27	1800	14.4	142.4	40	20	45	1000	0/0/0/0	0/0/0/0	-
2021	1	28	0000	14.4	142.7	40	20	45	1000	0/0/0/0	0/0/0/0	-
2021	1	28	0600	14.3	142.9	40	20	45	998	0/0/0/0	0/0/0/0	-
2021	1	28	1200	14.2	143.2	40	20	45	1000	0/0/0/0	0/0/0/0	-
2021	1	28	1800	14.2	143.4	40	20	45	1002	0/0/0/0	0/0/0/0	-
2021	1	29	0000	14.1	143.7	40	20	45	1002	0/0/0/0	0/0/0/0	-
2021	1	29	0600	13.7	144.7	40	20	42.5	1002	0/0/0/0	0/0/0/0	-
2021	1	29	1200	13.3	145.8	40	20	40	1002	0/0/0/0	0/0/0/0	-
2021	1	29	1800	13.1	147.2	20	25	45	998	0/0/0/0	0/0/0/0	-
2021	1	30	0000	13.1	148.1	30	30	45	998	0/0/0/0	0/0/0/0	15
2021	1	30	0600	13.1	149.0	30	30	45	998	0/0/0/0	0/0/0/0	15
2021	1	30	1200	13.3	150.2	30	30	45	997	0/0/0/0	0/0/0/0	15
2021	1	30	1800	13.7	151.5	30	30	45	997	0/0/0/0	0/0/0/0	15
2021	1	31	0000	14.0	152.4	20	35	50	997	60/40/40/60	0/0/0/0	15
2021	1	31	0600	13.9	153.6	30	35	50	994	60/60/40/60	0/0/0/0	20
2021	1	31	1200	13.3	155.4	30	50	70	991	80/80/40/80	30/30/30/30	15
2021	1	31	1800	13.3	157.5	25	50	70	990	90/80/50/100	30/30/30/30	15
2021	2	1	0000	14.0	158.4	25	50	70	985	120/90/50/100	30/30/30/30	15
2021	2	1	0600	14.5	160.5	25	55	75	985	120/90/60/120	30/30/30/30	25
2021	2	1	1200	15.6	162.6	35	55	75	980	120/120/90/120	40/40/40/40	25
2021	2	1	1800	17.0	163.5	50	60	85	975	120/120/90/120	40/40/40/40	30
2021	2	2	0000	17.2	164.8	60	55	75	985	120/90/90/90	40/40/40/40	30
2021	2	2	0600	18.3	166.1	30	50	70	980	80/160/190/70	40/40/40/40	30
2021	2	2	1200	19.4	167.1	60	50	70	980	120/90/90/90	40/40/40/40	30
2021	2	2	1800	20.2	167.5	60	45	65	987	120/90/90/90	0/0/0/0	30
2021	2	3	0000	22.0	167.3	60	45	65	987	120/130/120/90	0/0/0/0	30