Australian Government
Bureau of Meteorology

Tropical Cyclone Karim

5 – 11 May 2022

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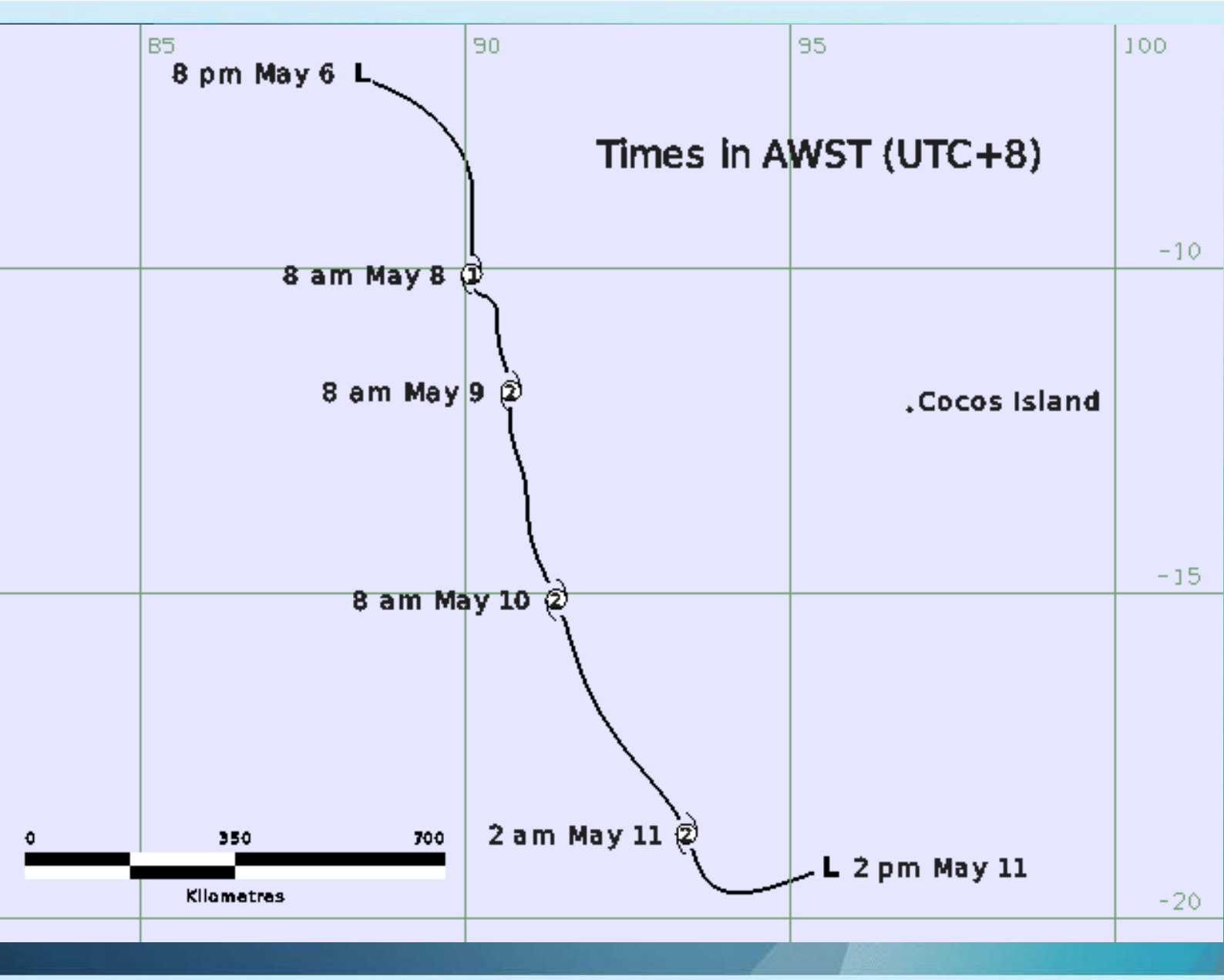

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1 Summary

A low formed in the central Indian Ocean during the 5 May. The system gradually developed and was named *Karim* on Saturday 7 May by the Regional Specialized Meteorological Centre (RSMC) La Reunion.

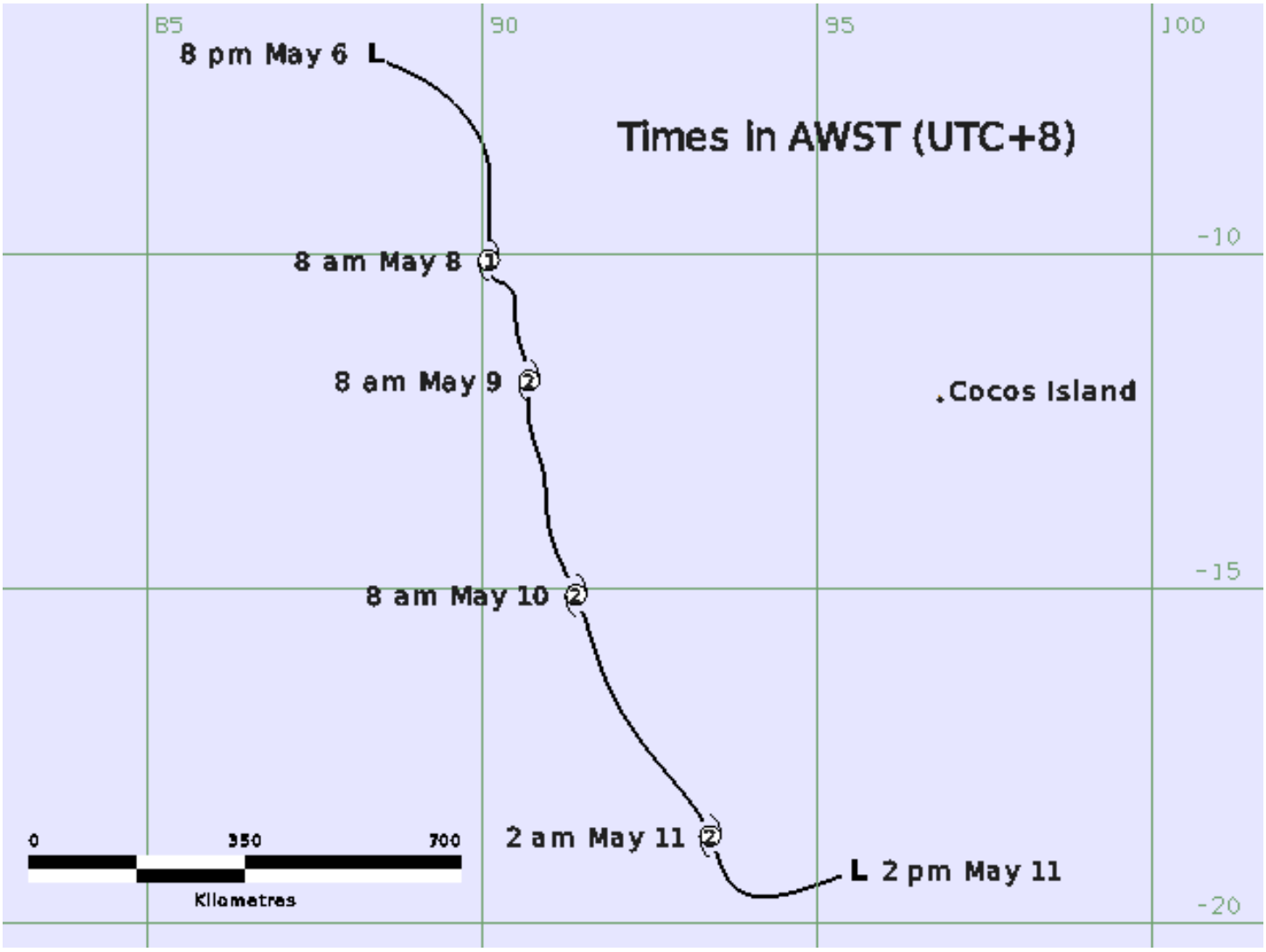
Karim tracked southeast and entered the Australian region on Sunday 8 May and intensified further reaching a category 2, 50 knots (kn) (95 kilometres per hour (km/h)), intensity at 0600 Universal Time Coordinated (UTC) 8 May (UTC=Australian Western Standard Time (AWST) - 8 hours). *Karim* maintain a category 2 intensity during the 9 May as the system track steadily southwards.

On the 10 May *Karim* reached peak intensity of 60 kn (110 km/h), just below category 3 intensity. During the evening *Karim* began to weaken as the environment became unfavourable.

Early on the 11 May *Karim* transitioned to a subtropical system but still continued to produce storm force winds and gales aided by the strong pressure gradient between the system and a high pressure ridge to the south.

There were no known impacts associated with *Karim*, and there were no tropical cyclone advices issued for the Australian mainland or Islands.

FIGURE 1. Best track of Tropical Cyclone *Karim* 6-11 May 2022 (times in AWST, UTC+8 hours).



2 Meteorological Description

2.1 Intensity analysis

A low formed in the central Indian Ocean during 5 May. The system gradually developed and was named *Karim* on Saturday 7 May by RSMC La Reunion.

Karim tracked southeast and entered the Australian region on Sunday 8 May. Persistent convection slightly offset to the west under the influence of easterly shear. The intensity was determined to be 45 kn (85 km/h) with gales evident on the Soil Moisture Active Passive (SMAP) pass at 2355 UTC (refer Figure 2 (left)) around the system. *Karim* intensified further reaching a category 2 intensity at 0600 UTC 8 May, a second SMAP pass at a later time (Figure 2 (right)) showed storm force winds.

Karim maintained an intensity of 55 kn (100 km/h) during 9 May as the tropical cyclone tracked steadily southwards. Sea Surface Temperatures (SSTs) remained warm (27-29 degrees Celsius) with strong poleward outflow and moderate shear. The intensity plot for 9 May in Figure 4 indicates the estimated intensity is generally consistent with Cooperative Institute for Meteorological Satellite Studies (CIMSS) Advanced Dvorak Technique (ADT) and subjective DVORAK while the Satellite Consensus (SATCON) is higher at around 63-67 kn (117-124 km/h).

On 10 May the Advanced Scatterometer (ASCAT) METOP-B image showed 55 kn (100 km/h) around the time when *Karim* reached peak intensity of 60 kn (110 km/h), refer Figure 3. During the evening *Karim* began to weaken as an upper trough to the southwest increased the northwesterly shear and introduced dry air into the system.

Early on 11 May *Karim* transitioned to a subtropical system but still continued to produce storm force winds and gales aided by the strong pressure gradient between the low and a high pressure ridge to the south.

2.2 Structure

Karim entered the Australian region of responsibility, on 8 May, with gales extending to 120 nautical miles (nm) (222 km) in all quadrants except the northeast. Figure 2 (left image) shows the extent of gales around the system, and some gales to the north outside of the cyclone circulation, this was related to an outer convective band. Storm force winds to 50 nm (93 km) developed in the northwest quadrant during the afternoon and evening.

On 9 May *Karim*'s extent of gales were generally 80-90 nm (148-167 km) about the centre, though larger in the southwest quadrant 110 nm (204 km). The storm force wind radii became symmetric around the centre to 40 nm (74 km).

On 10 May *Karim* reached peak intensity. Figure 3 shows the asymmetric gale radii, 120 nm (222) in the NE and SW quadrants, and 90-100 nm (167-185km) elsewhere. The storm force wind radii ranged from 40-50 nm (74-93) in all but the northwest quadrant.

Karim transitioned into a subtropical cyclone during the 11 May. Gales were still evident around the system and expanded in the southwestern quadrant to 180 nm (333 km). Storm force winds were confined to 40-60 nm (74-111 km) in the western semicircle.

The radius of maximum winds was generally estimated at 25 nm (46 km).

2.3 Motion

From 5-10 May *Karim* moved south to southeast over the open waters of the central Indian Ocean under the influence of a mid-level ridge to the east and a trough to the south. During 10 May *Karim* increased in speed due to the influence of the approaching upper trough. By early 11 May *Karim* became sheared as the upper trough moved over and the system evolved into a subtropical low that drifted quickly to the east and weakened.

FIGURE 2. Wind speed distribution from SMAP radiometer images: left at 2353 UTC 7 May and right at 1206 UTC 8 May.

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

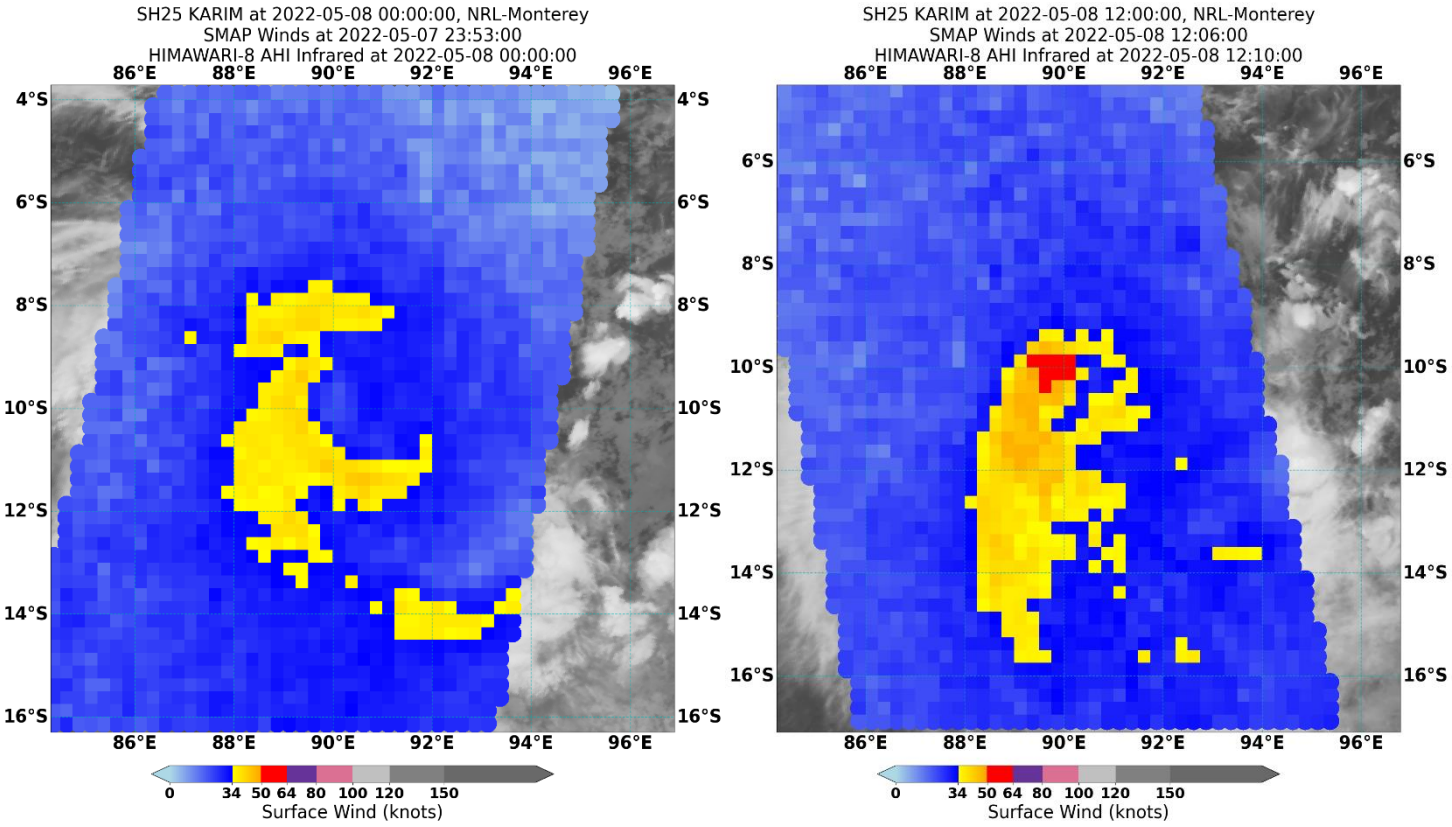


FIGURE 3. ASCAT-B at 0337 UTC 10 May where *Karim* is near peak intensity.

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

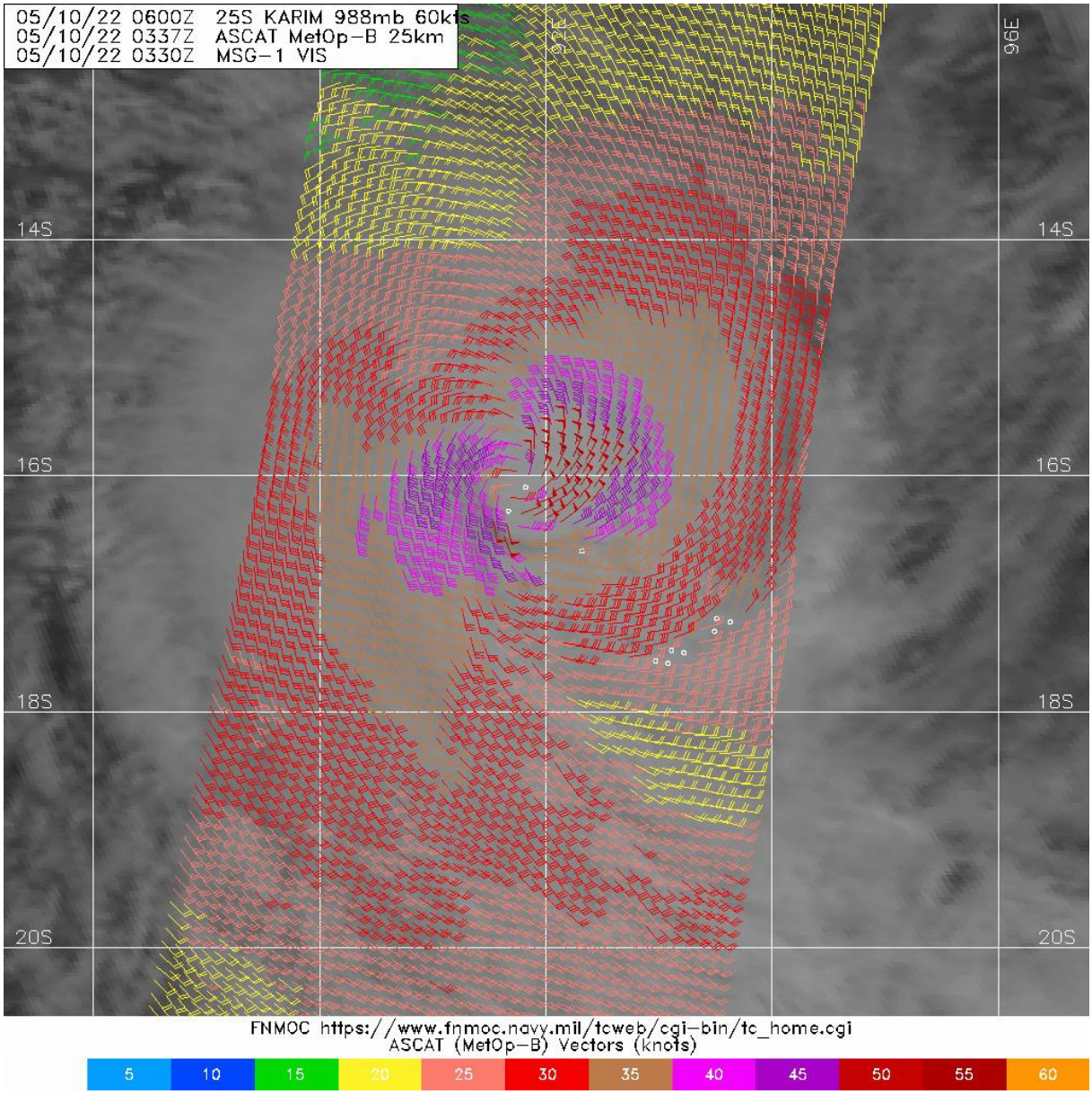
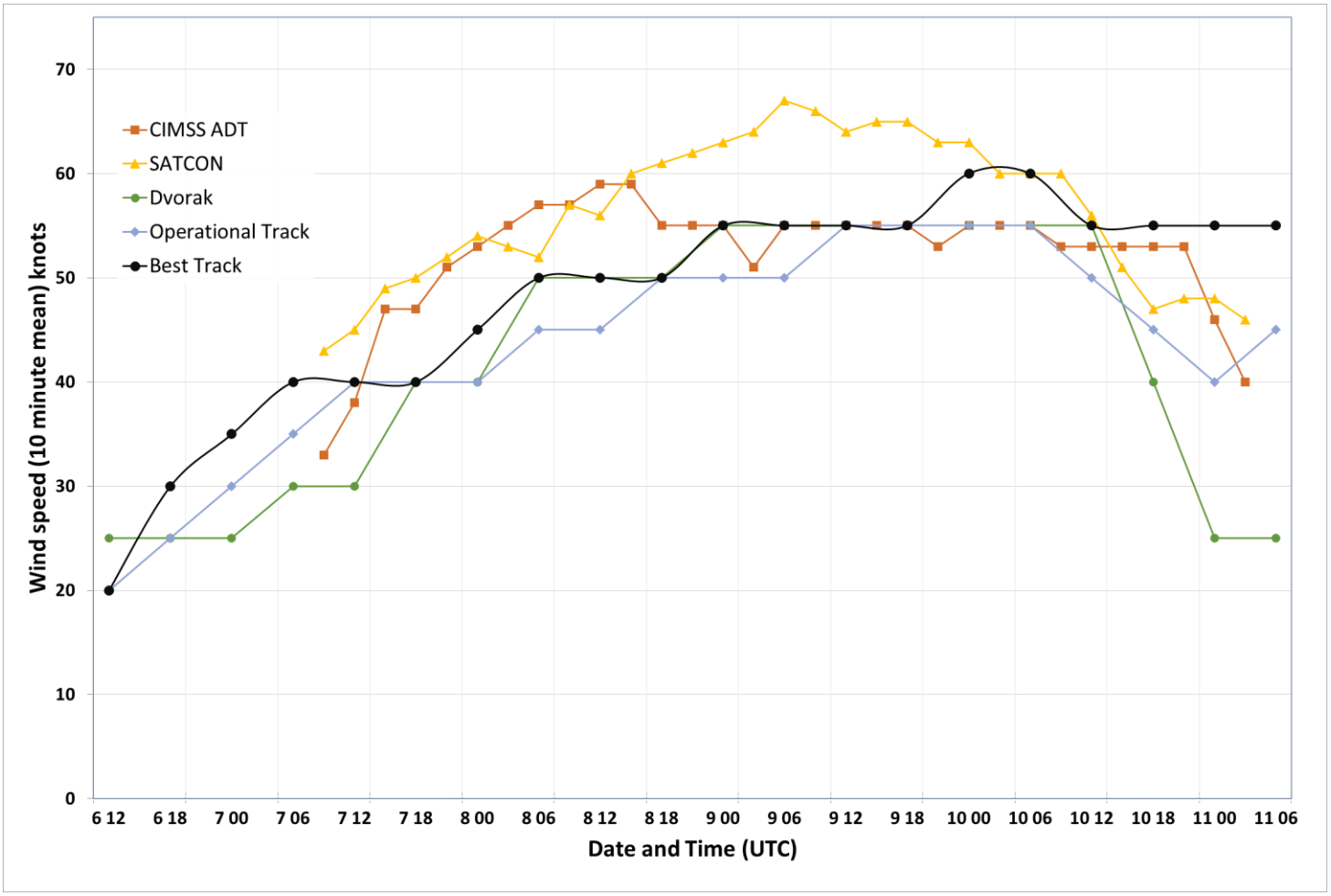


FIGURE 4. Plot of objective and subjective intensity estimates for TC *Karim.*



3 Impact

There were no known impacts from this cyclone.

4 Observations

There were no observations during this event.

TABLE 1. Best track summary for Tropical Cyclone *Karim* 6-11 May 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. **sub-tropical from 00 UTC 11 May.

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
2022	5	6	1200	7.0	88.4	40	20	45	998	0/0/0/0	0/0/0/0	-
2022	5	6	1800	7.1	88.5	40	30	45	998	0/0/0/0	0/0/0/0	-
2022	5	7	0000	7.2	88.7	25	35*	50	997	0/0/0/90	0/0/0/0	-
2022	5	7	0600	7.6	89.4	35	40*	55	995	90/0/0/90	0/0/0/0	-
2022	5	7	1200	8.7	90.1	20	40*	55	994	90/0/0/90	0/0/0/0	-
2022	5	7	1800	9.4	90.1	25	40	55	992	90/0/120/90	0/0/0/0	40
2022	5	8	0000	10.1	90.1	25	45	65	988	0/120/120/120	0/0/0/0	35
2022	5	8	0600	10.3	90.1	25	50	70	983	90/120/130/120	0/0/0/50	25
2022	5	8	1200	10.5	90.4	25	50	70	984	90/120/130/100	0/0/0/50	25
2022	5	8	1800	11.0	90.5	30	50	70	982	90/90/130/100	0/0/0/50	25
2022	5	9	0000	11.9	90.7	25	55	75	986	80/80/110/90	40/0/0/40	25
2022	5	9	0600	12.5	90.7	30	55	75	985	80/80/110/90	40/40/40/40	25
2022	5	9	1200	13.2	90.9	25	55	75	982	80/80/110/90	40/40/40/40	25
2022	5	9	1800	14.1	91.0	20	55	75	982	100/120/120/90	40/40/40/40	25
2022	5	10	0000	15.1	91.4	20	60	85	984	120/120/120/90	50/50/50/0	25
2022	5	10	0600	16.5	91.9	20	60	85	985	120/100/120/90	50/50/40/0	25
2022	5	10	1200	17.7	92.7	15	55	75	987	120/100/130/90	50/50/40/0	25
2022	5	10	1800	18.7	93.4	30	55	75	989	90/120/160/90	0/0/60/0	25
2022	5	11	0000	19.4	93.7	25	55**	75	992	90/120/180/90	0/0/60/40	-
2022	5	11	0600	19.2	95.6	25	55**	75	992	90/120/180/90	0/0/60/40	-

5 Forecast Performance

Official tropical cyclone forecasts were issued from 8-11 May. Ocean wind warnings commenced at 1850 UTC 7 May as *Karim* enter the Australian area of responsibility. The ocean wind warnings ceased on the 0717 UTC 11 May. The tropical cyclone information bulletin commenced 1849 UTC 8 May and was cancelled at 0615 UTC 11 May when there was confidence that the system had weakened below tropical cyclone intensity.

The accuracy figures for tropical cyclone *Karim* below and in Figure 5 show that both the forecast position and intensity errors versus the five-year average out to 72 hour forecast range. The intensity forecasts had slightly higher errors than the five-year average for the first 48 hours, in part based on underestimating the intensity during the early stages of development and underestimating the strength of the system as it was transitioning to a subtropical system. The forecast position accuracy was better than the five-year average.

	0	6	12	18	24	36	48	72	96	120
Position Absolute error (km)	23	35	50	56	56	84	105	82	-	-
Intensity Absolute error (kn)	5.0	5.0	4.6	6.3	7.7	10.0	13.6	15.0	-	-
Sample Size	15	14	13	12	11	9	7	3	-	-

FIGURE 5 a. Position accuracy figures for Tropical Cyclone *Karim*

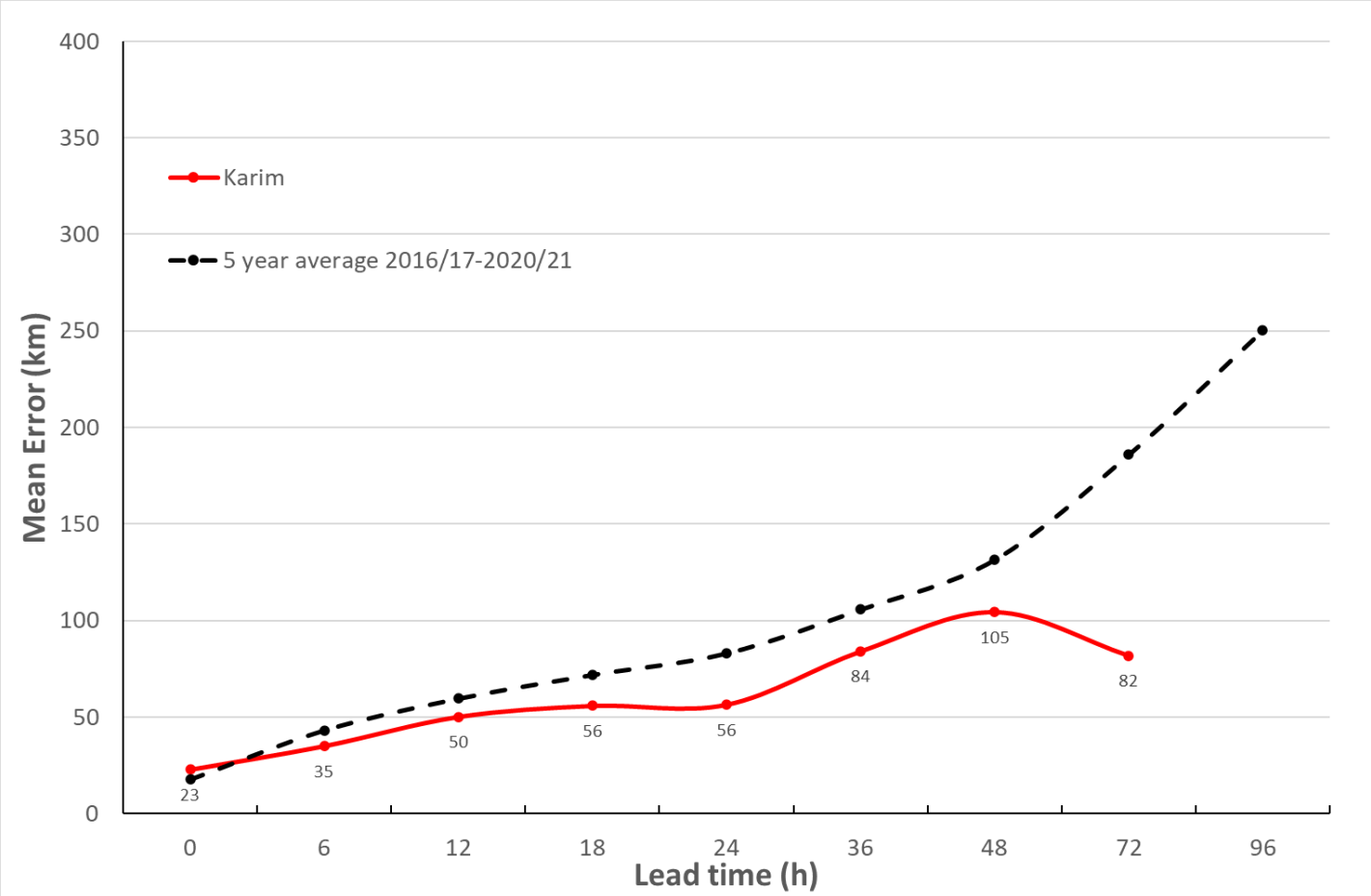


FIGURE 5 b. Intensity accuracy figures for Tropical Cyclone *Karim.*