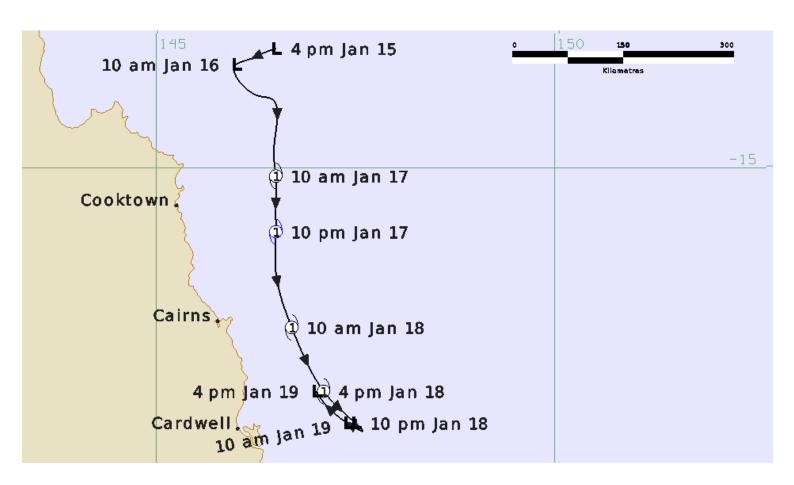


Tropical Cyclone Kimi

15-19 January 2021

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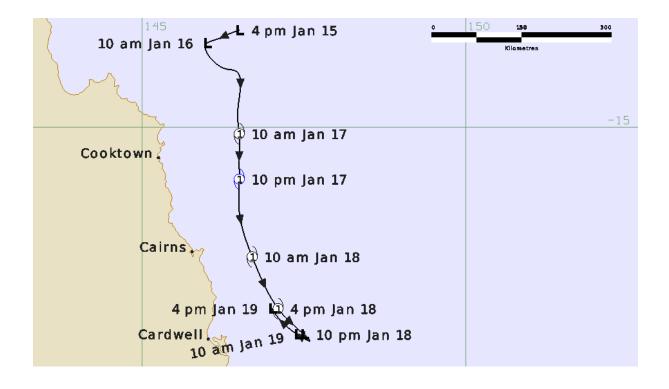
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1 Summary

Tropical Cyclone *Kimi* was a small, short-lived system in the Coral Sea that had no impact on mainland Australia (refer Figure 1). A low formed on 15 January about 250 kilometres (km) to the north northeast of Cooktown. The low moved slowly during 15 and 16 January but then increased in speed to the south as it developed into a tropical cyclone on 17 January. While it was located about 150 km to the north northeast of Cairns, *Kimi* reached a 10-minute peak intensity of 45 knots (kn) (85 kilometres per hour (km/h)) at 1200 Universal Time Coordinated (UTC) 17 January (2200 Australian Eastern Standard Time (AEST)) (AEST=UTC+10 hours). As *Kimi* continued to move south off the Queensland coast it began to weaken and decreased to below tropical cyclone intensity by 1200 UTC 18 January. The remains of the low drifted north near the coastline on 19 January and then dissipated There were no damage reports received.

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FIGURE 1 Best track of Tropical Cyclone *Kimi* 15 – 19 January 2021 (times in AEST, UTC+10).



2 Meteorological Description

2.1 Intensity analysis

During mid-January the monsoon remained active over northern Australia and this combined with an Equatorial Rossby Wave likely contributed to the development of *Kimi* in the Coral Sea. A low became evident on satellite imagery during 15 January and moved slowly in a generally southward direction. An Ocean Scatterometer-2 (OSCAT pass late on 15 January showed gales in southern quadrants under the deep convective cloud. By 1200 UTC 16 January Advanced Scatterometer (ASCAT) passes indicated gales were still present in southern quadrants but the gale radius had decreased in size. During the overnight period of 16 January, the Enhanced Infrared Imagery (EIR) improved from a central dense overcast pattern to a curved band pattern. ASCAT passes on 17 January (refer Figure 2) showed gales present around a small system and tropical cyclone strength was attained. Bougainville Reef to the southeast recorded a period of gales which peaked at 37 kn 10-minute mean wind. Subjective Dvorak lagged in intensity estimates at this time as a pattern was hard to apply to the cloud features.

The broad environment was favourable for development and Kimi continued to improve during the day. Kimi was visible on the Cairns radar and this showed a closed circulation with a complete eye wall by around 1200 UTC 17 January when Kimi reached a peak 10-minute mean wind intensity of 45 kn (85 km/h)(refer Figure 3). A plot of both subjective and objective intensity estimates is provided in Figure 4. Objective guidance was only available from 0300 UTC 17 January. The objective estimates from the Satellite Consensus (SATCON) and the Advanced Dvorak Techniques were overestimating the intensity of Kimi, this is likely due to the small size of Kimi which objective techniques generally perform poorly on. Kimi began to weaken under increased northwesterly shear, from 2000 UTC the Cairns radar signal became an open curved band and intensity had decreased to 40 kn by 0000 UTC 18 January. By 1200 UTC 18 January ASCAT passes showed that Kimi had weakened below tropical cyclone strength. It had lost most of its circular structure and there were gales present only to the southeast of the remaining low-level circulation where deep convection persisted. By 0000 UTC 19 January a weak low-level centre was clearly visible on satellite imagery with deep convection confined to the southeast of the centre, refer Figure 5. OSCAT-2 passes later on 19 January confirmed there was no longer any circulation present.

2.2 Structure

Kimi was a very small tropical cyclone, the radius to maximum winds (RMW) was 10 nautical miles (nm) (18 kilometres (km)). This increased to 15 nm (28 km) just before it weakened below tropical cyclone strength. Gale radii was 100 nm (185 km) in the southeast quadrant and 60 nm (111 km) in the southwest quadrant initially which decreased to range from 20 nm (35 km) in the northwest quadrant to 45 nm (85 km) in the southeast quadrant at its most intense.

2.3 Motion

In the early stages *Kimi* was under the influence of a very weak steering pattern with a mid-level ridge to the east and a mid-level circulation of another tropical low to the west, consequently Kimi drifted slowly for a day or two. Southward movement increased on 17 January under when the influence of the mid-level ridge to the east became more dominant. During 18 January a short-wave trough approached from the southwest which increased vertical wind shear, as a result the deeper convection became separated from the low-level centre. The weak exposed centre was then steered northwest by the lower-level southeasterly winds.

FIGURE 2. ASCAT pass at 2246 UTC 16 January showing *Kimi* had developed into a tropical cyclone with gales in all quadrants of the small system.

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

FIGURE 3. SSMIS microwave at 0918 UTC 17 January, near peak intensity.

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

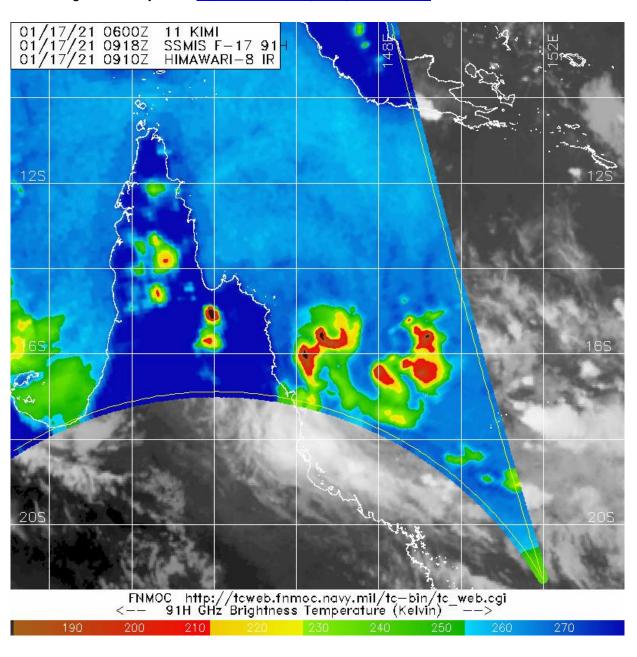


FIGURE 4. A plot of objective and subjective intensity for Tropical Cyclone *Kimi*.

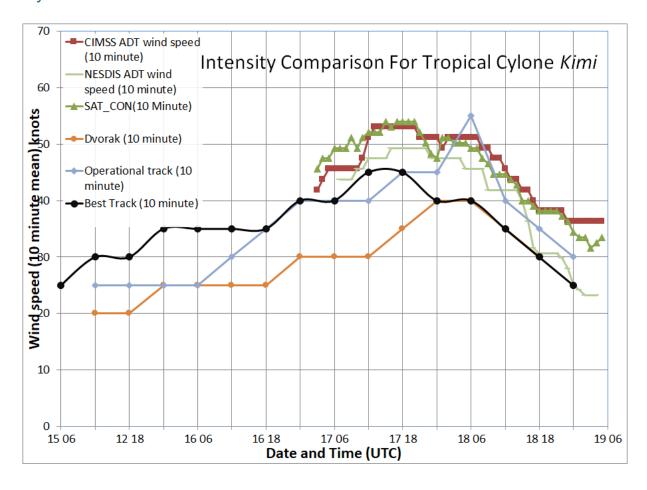
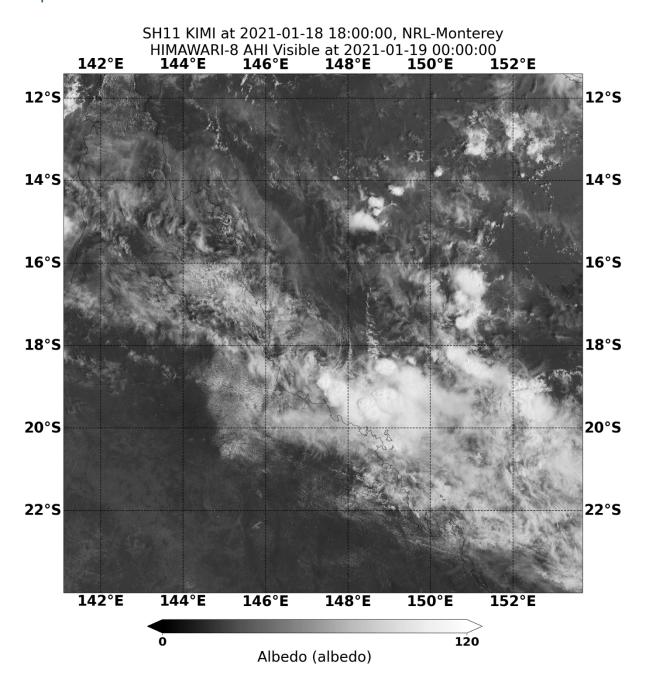


FIGURE 5 Visible image from 0000 UTC 19 January showing an exposed low-level centre.



3 Impact

There were no reported impacts from Tropical Cyclone *Kimi* on the Australian mainland.

4 Observations

4.1 Wind

Bougainville Reef Automatic Weather Station (AWS)

Gale force winds were recorded between 2335 UTC 16 January and 0029 UTC 17 January. Maximum 10-minute mean wind recorded was 37 kn (68 km/h) at 2351 and 2352 16 January. Maximum 3-second wind gust recorded was 43.9 kn (81 km/h) at 2335 and 2347 UTC 16 January.

Arlington Reef Automatic Weather Station (AWS)

Gale force winds were recorded between 2047 – 2237 and 2303 - 2306 UTC 17 January.

Maximum 10-minute mean wind recorded was 38 kn (70 km/h) at 2113 and 2114 17 January.

Maximum 3-second wind gust recorded was 45.9 kn (85 km/h) at 2209 UTC 17 January.

Myrmidon Reef AWS (Australian institute of Marine Science)

Gale force winds were recorded between 1300 – 1340 UTC 18 January.

Maximum 10-minute mean wind recorded was 38 kn (70 km/h) at 1300 and 1320 UTC 18 January.

Davies Reef AWS (Australian institute of Marine Science)

Gale force winds were recorded at 1340 UTC 18 January.

Maximum 10-minute mean wind recorded was 35 kn (65 km/h) at 1340 UTC 18 January.

4.2 Pressure

Bougainville Reef AWS

The lowest mean sea level pressure recorded was 1001.6 hectoPascals (hPa) at 0609 UTC 17 January.

Arlington Reef Automatic AWS

The lowest mean sea level pressure recorded was 1000.9 hPa at 2107 and 2108 UTC 17 January.



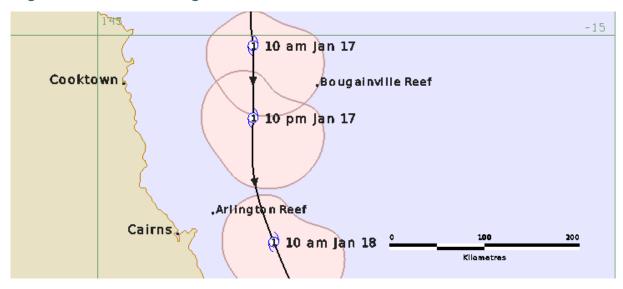


Figure 6b. Track with gale extent and observation sites.

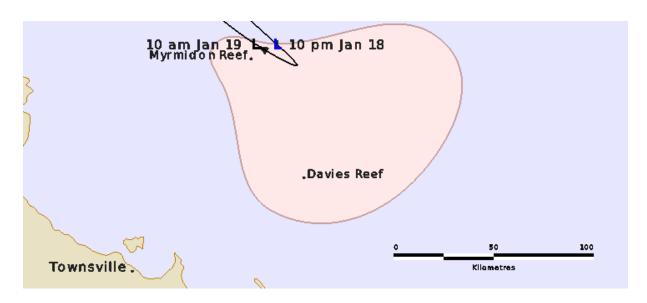


TABLE 1. Best track summary for Tropical Cyclone *Kimi* 15 – 19 January 2021.

Refer to the Australian Tropical Cyclone database for complete listing of parameters. Note: UTC is AEST - 10 hours. *Denotes system has gales but not a tropical cyclone at this time.

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
2021	01	15	06	13.5	146.5	30	25	45	1004			
2021	01	15	12	13.6	146.3	30	30	45	1002			
2021	01	15	18	13.6	146.1	30	30	45	1000			
2021	01	16	00	13.7	146.0	30	35	50	1000	0/100/60/0		
2021	01	16	06	14.1	146.3	30	35	50	998	0/100/60/0		
2021	01	16	12	14.1	146.4	30	35	50	998	0/40/50/0		
2021	01	16	18	14.8	146.5	20	35	50	998	0/40/50/0		
2021	01	17	00	15.1	146.5	14	40	55	995	20/45/30/20		10
2021	01	17	06	15.4	146.5	15	40	55	994	20/45/30/20		10
2021	01	17	12	15.8	146.5	10	45	65	991	20/45/30/30		10
2021	01	17	18	16.3	146.5	10	45	65	990	20/45/30/30		10
2021	01	18	00	17.0	146.7	10	40	55	996	20/45/30/30		12
2021	01	18	06	17.8	147.1	10	40	55	996	20/45/30/30		15
2021	01	18	12	18.2	147.5	30	40	55	996	0/55/20/0*		
2021	01	18	18	18.3	147.6	20	30	45	1001			
2021	01	19	00	18.2	147.4	10	25	45	1005			
2021	01	19	00	17.8	147.0	10	25	45	1004			

5 Forecast Performance

Official tropical cyclone forecasts were issued from 0000 UTC 17 January to 1800 UTC 18 January. The position accuracy figures were poorer than the 5-year average at all lead times greater than 6 hours. Some model guidance suggested *Kimi* would remain weak and be steered by the low-level flow, others forecast *Kimi* to intensify (to an intensity stronger than it actually attained) and be steered by mid to upper-level flow. This produced very different track results for each model which resulted in larger forecast position errors than usual.

The intensity accuracy was also poorer than the 5-year average for similar reasons given above, model guidance varied greatly with some intensifying *Kimi* and others keeping it weak. All figures at lead times greater than 24 hours should be treated with caution as there are less than 6 members in the sample size.

The accuracy figures for Tropical Cyclone are shown in the table below and in Figures 7 a and b.

	00	06	12	18	24	36	48
Position Absolute error (km)	10	33	73	115	165	251	316
Intensity Absolute error (kn)	4	7	9	14	17	7	2
Sample Size	8	8	8	7	6	<mark>4*</mark>	<mark>2*</mark>

^{*}Sample size less than 6

FIGURE 7 a. Position accuracy figures for Tropical Cyclone Kimi.

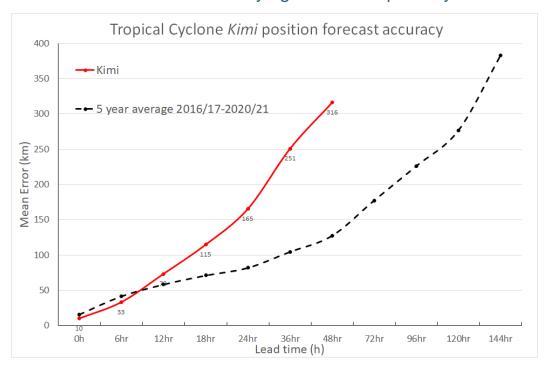


FIGURE 7 b. Intensity accuracy figures for Tropical Cyclone Kimi.

