Australian Government
Bureau of Meteorology

Tropical Cyclone Dahlia

27 November – 4 December 2017

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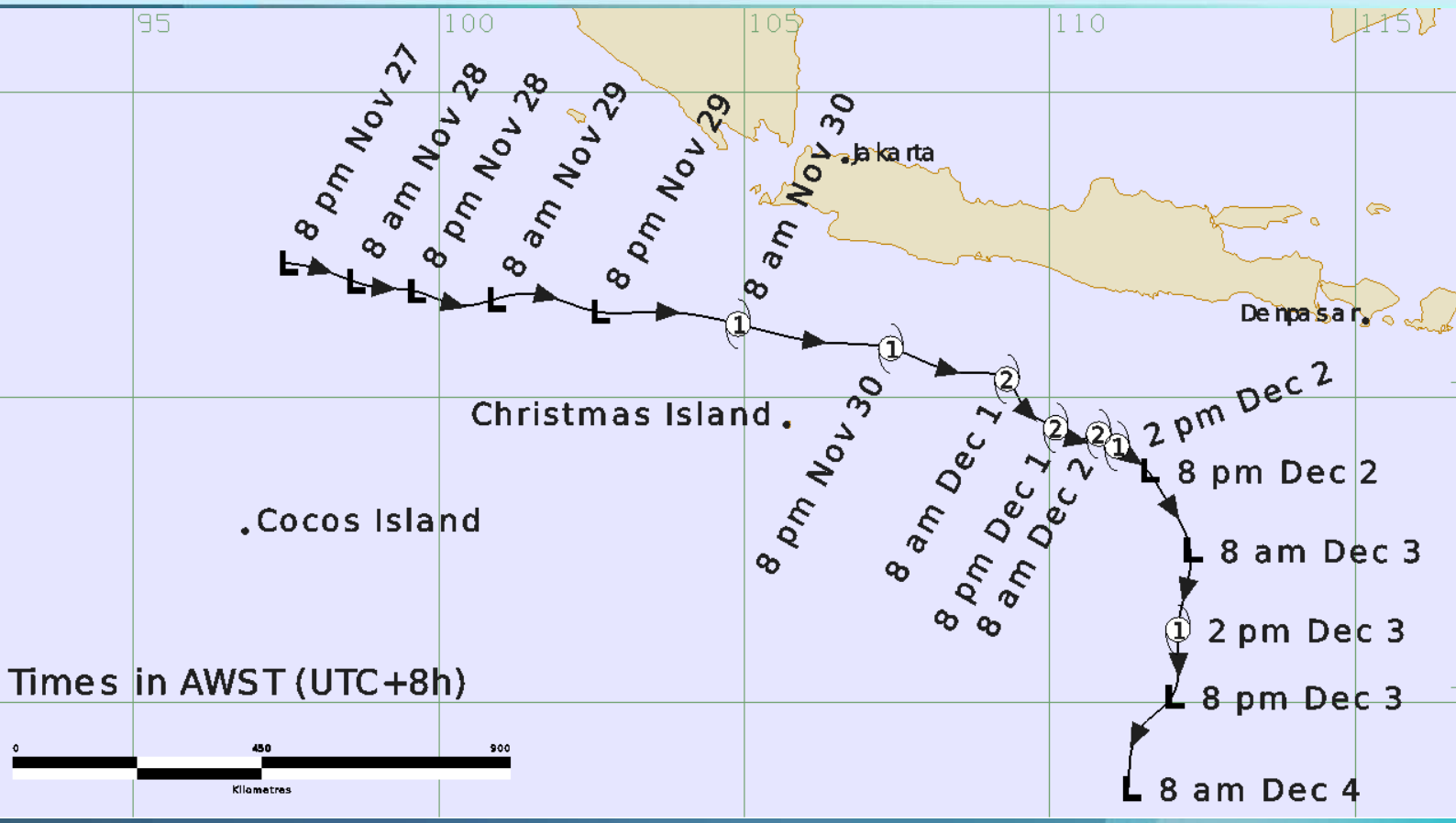

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1. Summary

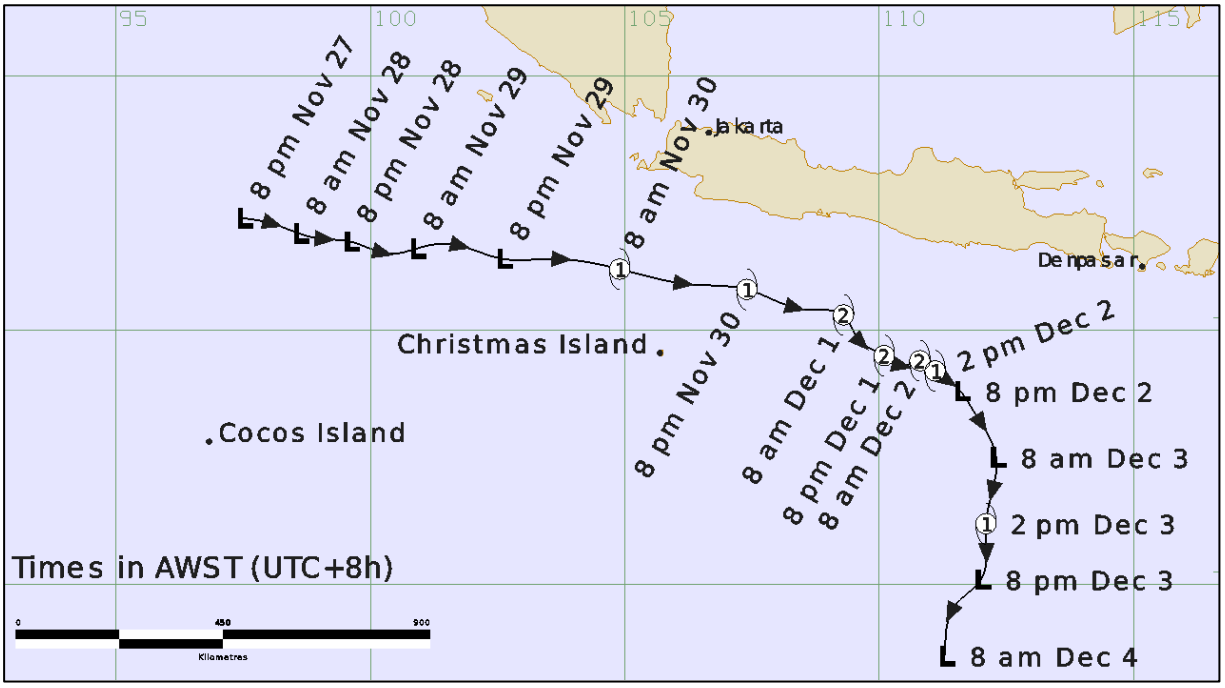
Tropical Cyclone Dahlia was an Indian Ocean tropical cyclone that reached category two intensity over waters south of Java prior to moving into the Australian region.

A tropical low formed in late November north of Cocos Islands and north of the Australian region (10°S). It tracked to the east-south-east, passing to the north of Christmas Island and south of Java. It was named Dahlia late on 29 November by Indonesia's Meteorological agency Badan Meteorologi, Klimatologi, dan Geofisika (BMKG). It met the Australian definition of being a tropical cyclone requiring gales to extend more than halfway around the centre on 30 November. Dahlia then intensified, reaching a peak of category 2 intensity prior to crossing 10°S and into the Australian area of responsibility on 1 December.

Dahlia weakened as it moved to the south-east on 2 December, briefly re-intensifying on 3 December before weakening further on 4 December over waters well to the north-west of the Pilbara coastline.

There were no known impacts from the cyclone.

Figure 1. Best track of Tropical Cyclone Dahlia 27 November – 4 December 2017 (times in AWST, UTC+8).



2. Meteorological Description

2.1 Intensity analysis

Figure 1 shows the track of Dahlia and Figure 2 is a plot of objective and subjective intensity estimates during the lifetime of the cyclone. A low formed in the monsoon trough in the Indian Ocean south-west of Sumatra and to the north of the Australian area of responsibility (north of 10S). Strong easterly wind shear hampered its development in the early stages, offset by the inflow of the monsoonal flow to the north.

Deep convection improved about the centre during 29 November primarily to the west of the centre. It was named Dahlia at 12 UTC 29 November by Indonesia's Meteorological agency Badan Meteorologi, Klimatologi, dan Geofisika (BMKG). Gales were evident in the strengthening monsoonal flow north-east of the centre on ASCAT passes at 1409 UTC and 1453 UTC 29 November. However, gales were not estimated to extend more than halfway around the centre until 0000 UTC 30 November at which point it met the Australian definition of being a tropical cyclone. ASCAT passes at 0158 and 0253 UTC indicated gales to the north-east and west of the centre as shown on the ASCAT-A pass in Figure 3.

The easterly wind shear gradually reduced during 30 November allowing deep convection to extend to the east of the centre. Dahlia reached peak intensity of 50 kn (category 2) at 0000 UTC 1 December. Figure 4 shows the SSMIS 91 GHz microwave image at 2240 UTC 30 November with a defined eye. Figure 5 is the ASCAT-A pass showing a small area of 50 kn north-east of the centre. Figure 6 is the visible image at 0220 UTC 1 December, showing a well-defined circulation.

Dahlia moved south of 10°S by 0600 UTC 1 December into the Australian area of responsibility. Although the vertical wind shear remained reasonably low, the deep convection eased somewhat, being mostly north of the centre. The area of deep convection persisted through the night until 0000 UTC 2 December, following which it rapidly dissipated during the afternoon. The system was downgraded to a tropical low at 1200 UTC 2 December.

Deep convection once again developed to the north and south of the centre from 0000 UTC 3 December and wrapped around the low centre between 0300 and 0600 UTC 3 December, as indicated on the visible image in Figure 7. The system was upgraded to a cyclone status at 0600 UTC 3 December. Soon after, the deep convection weakened once more and the system was downgraded to a tropical low at 1200 UTC 3 December.

2.2 Structure

The strongest winds occurred in the north-east quadrant during the lifetime of TC Dahlia assisted by the monsoonal flow, as demonstrated in Figures 3 and 5. The radius of gales extended to 70-90 nm (130-165 km) in northern quadrants and to 30-60 nm (55-110 km) in southern quadrants.

The deep convection was initially constrained west of the circulation by strong easterly winds shear until this reduced during 30 November. Deep convection was then more evident north of the circulation but reduced dramatically on 2 December. During 3 November deep convection resumed around the circulation for a period before easing overnight and being constrained to south of the centre on 4 December.

The radius of maximum winds (RMW) was on the order of 20-30 nm (35-55 km) throughout its period at tropical cyclone intensity.

2.3 Motion

The circulation moved to the east-south-east from formation to 1 December owing to the influence of the monsoonal flow to the north. Dahlia then took a more southeasterly track on 1 December and then to the south by 3 December as the mid-level ridge that strengthened to the east dominated the steering. The remnants of Tropical Cyclone Cempaka to the south-west of Dahlia also affected the steering somewhat, delaying the turn to the south.

Figure 2. Plot of objective and subjective intensity estimates for Dahlia.

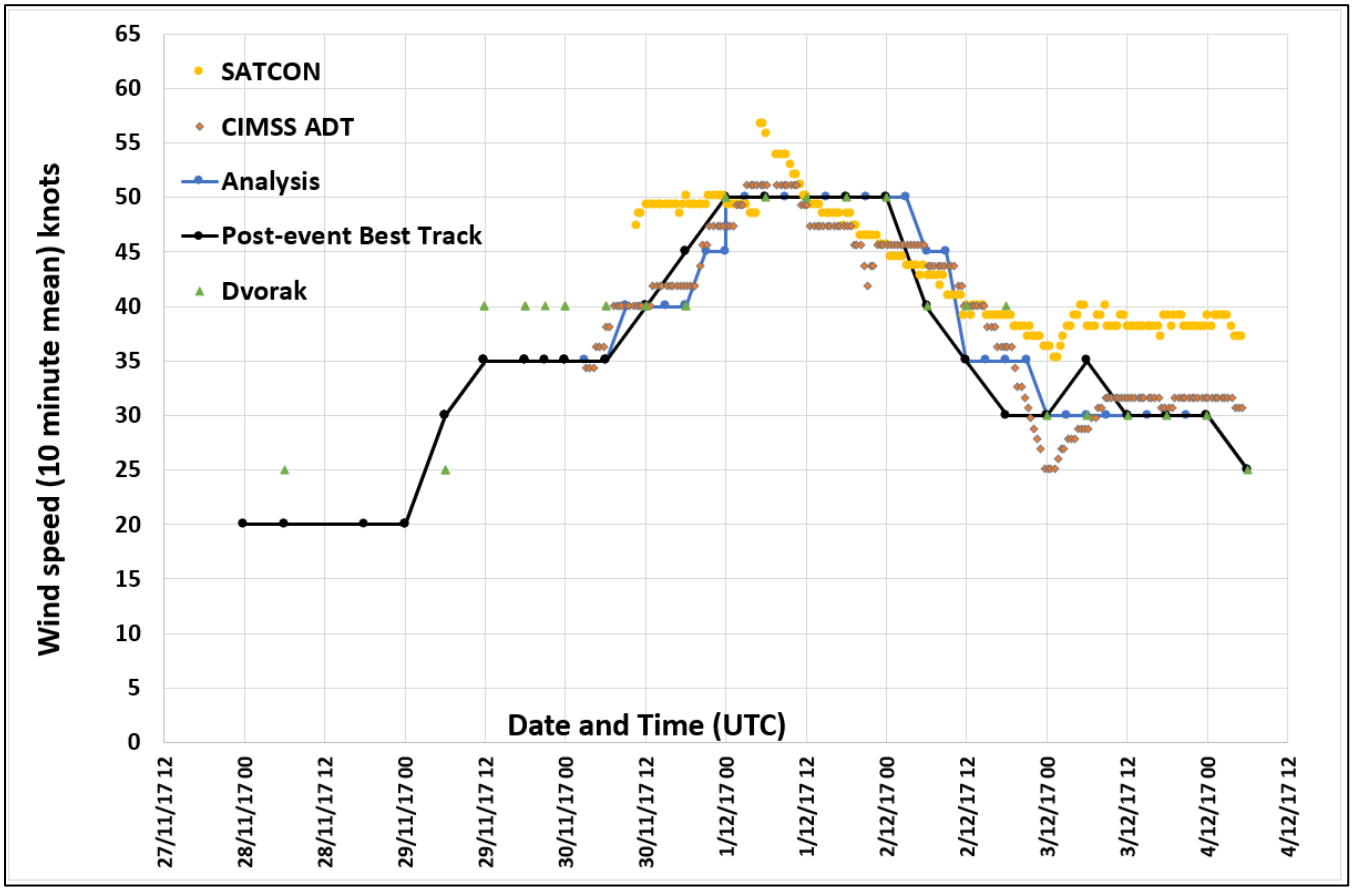


Figure 3. ASCAT-A surface winds (in detail) at 0158 UTC 30 November near the time the system reached tropical cyclone intensity and showing gales to the north and west of the centre.

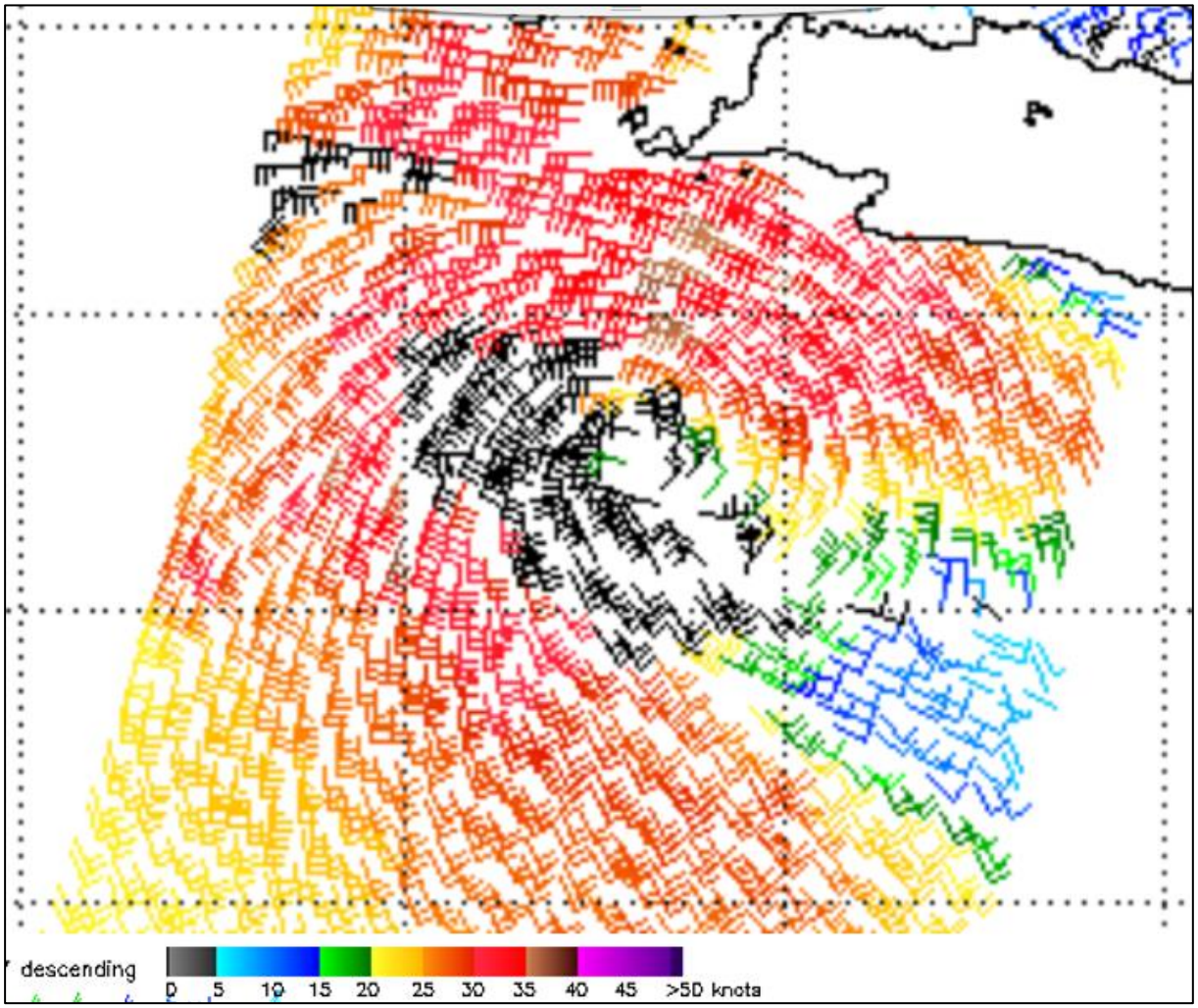


Figure 4. SSMIS 91 GHz microwave image at 2240 UTC 30 November, when Dahlia at peak intensity.

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

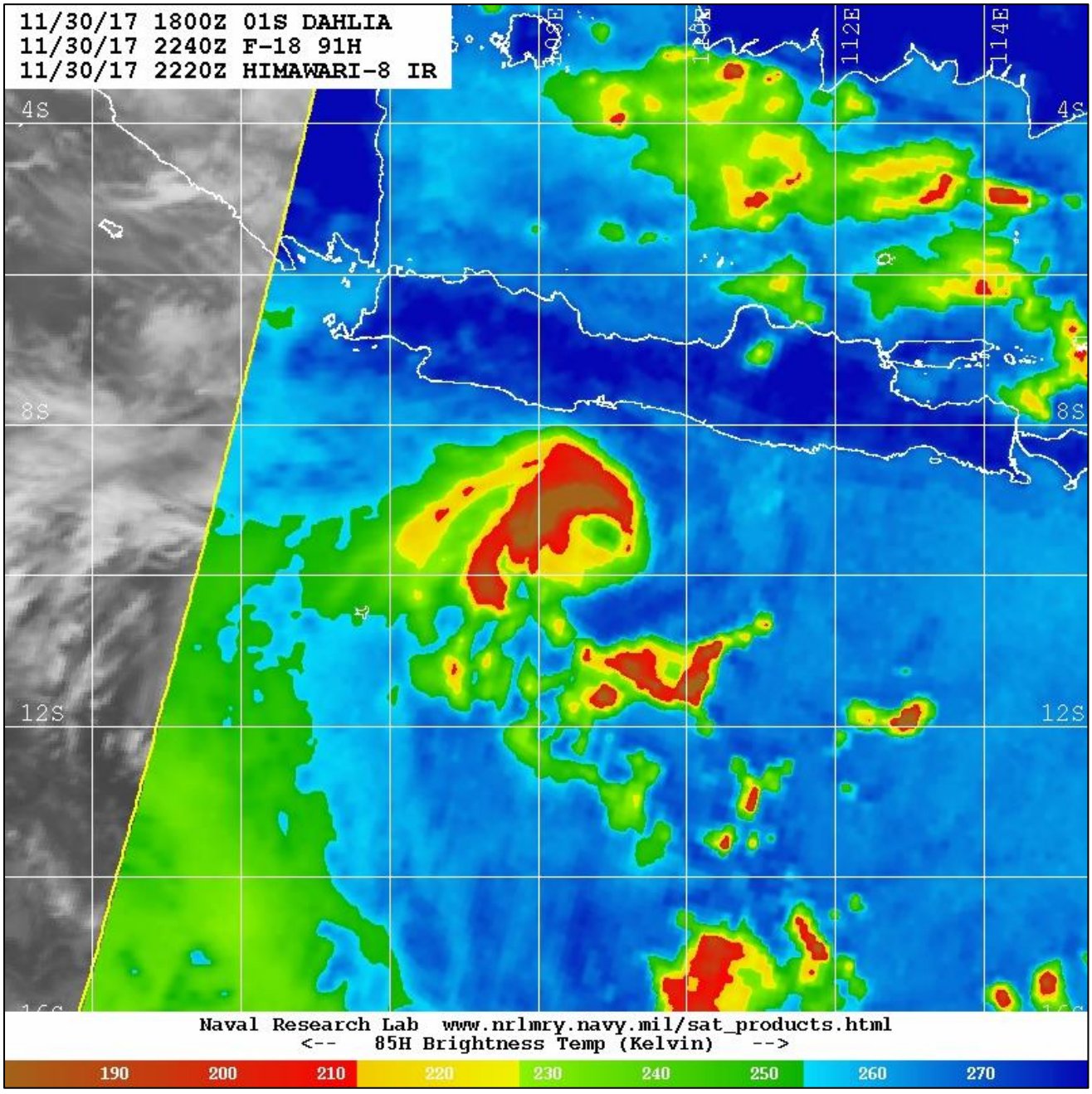


Figure 5. ASCAT-A surface winds (in detail) at 0136 UTC 1 December showing maximum winds 50 kn north-east of the centre.

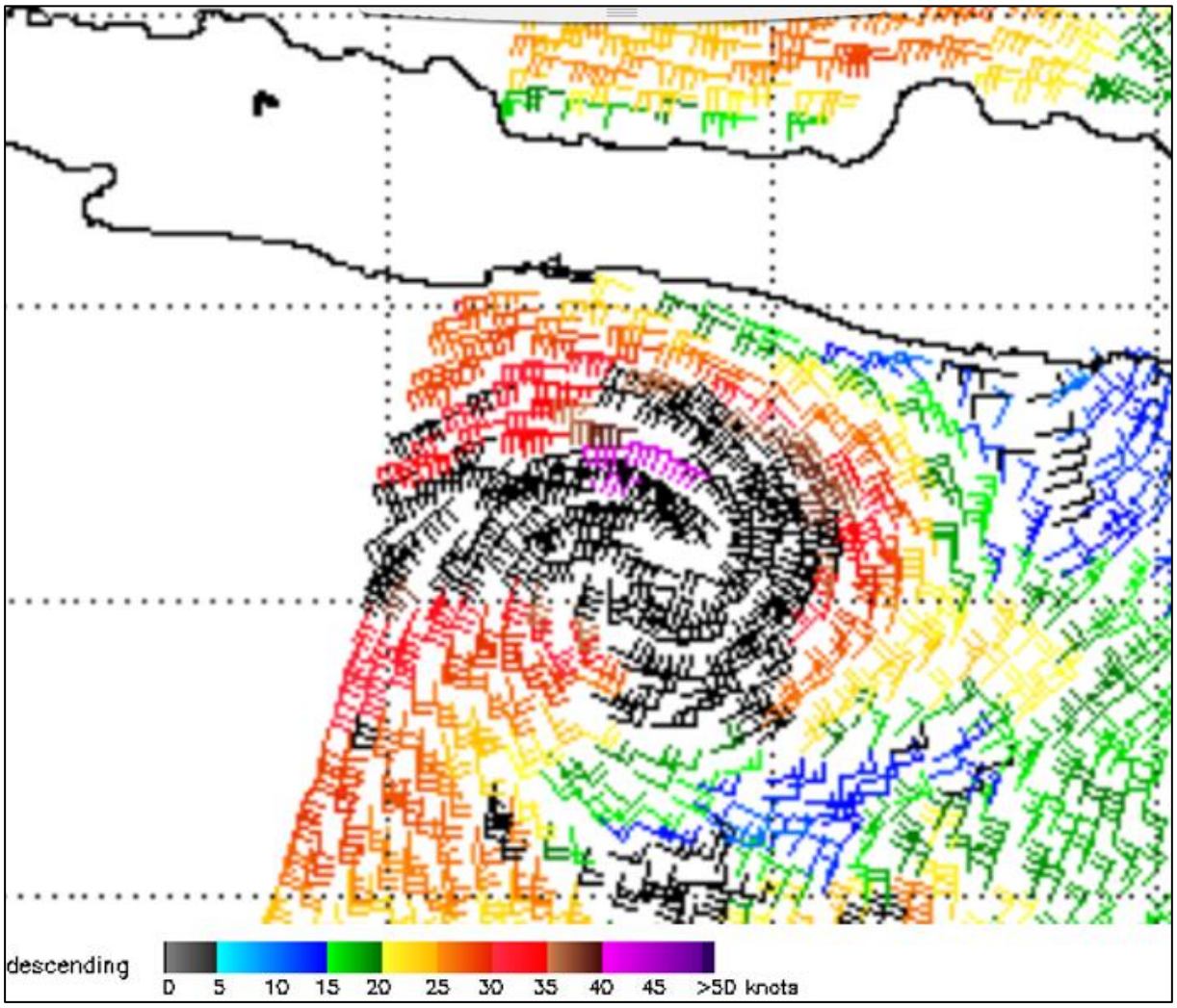


Figure 6. Visible image at 0220 UTC 1 December, showing Tropical Cyclone Dahlia near peak intensity as it moves into the Australian region of responsibility (south of 10°S).

Image courtesy of NOAA: https://manati.star.nesdis.noaa.gov/datasets/ASCATData.php

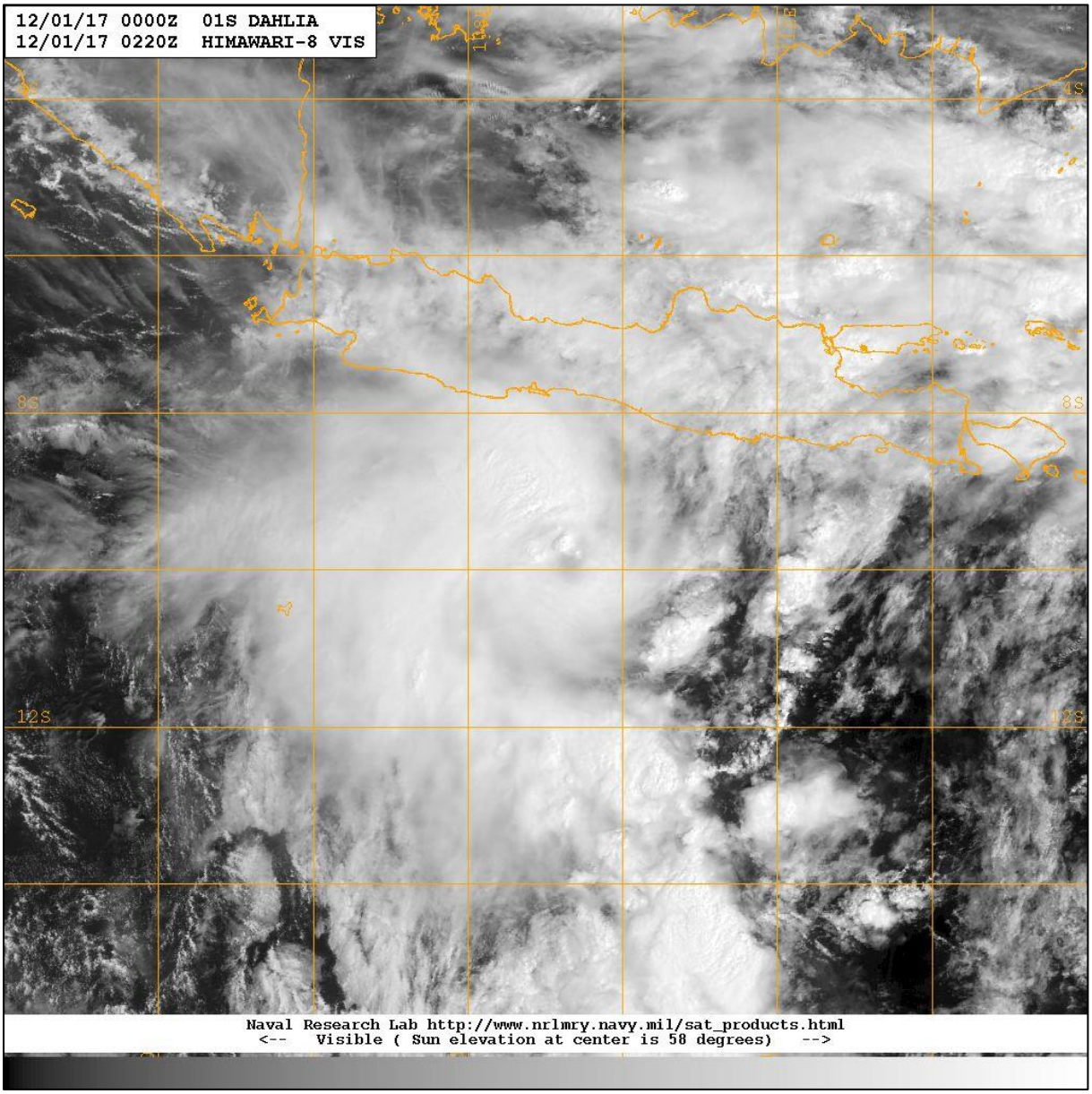
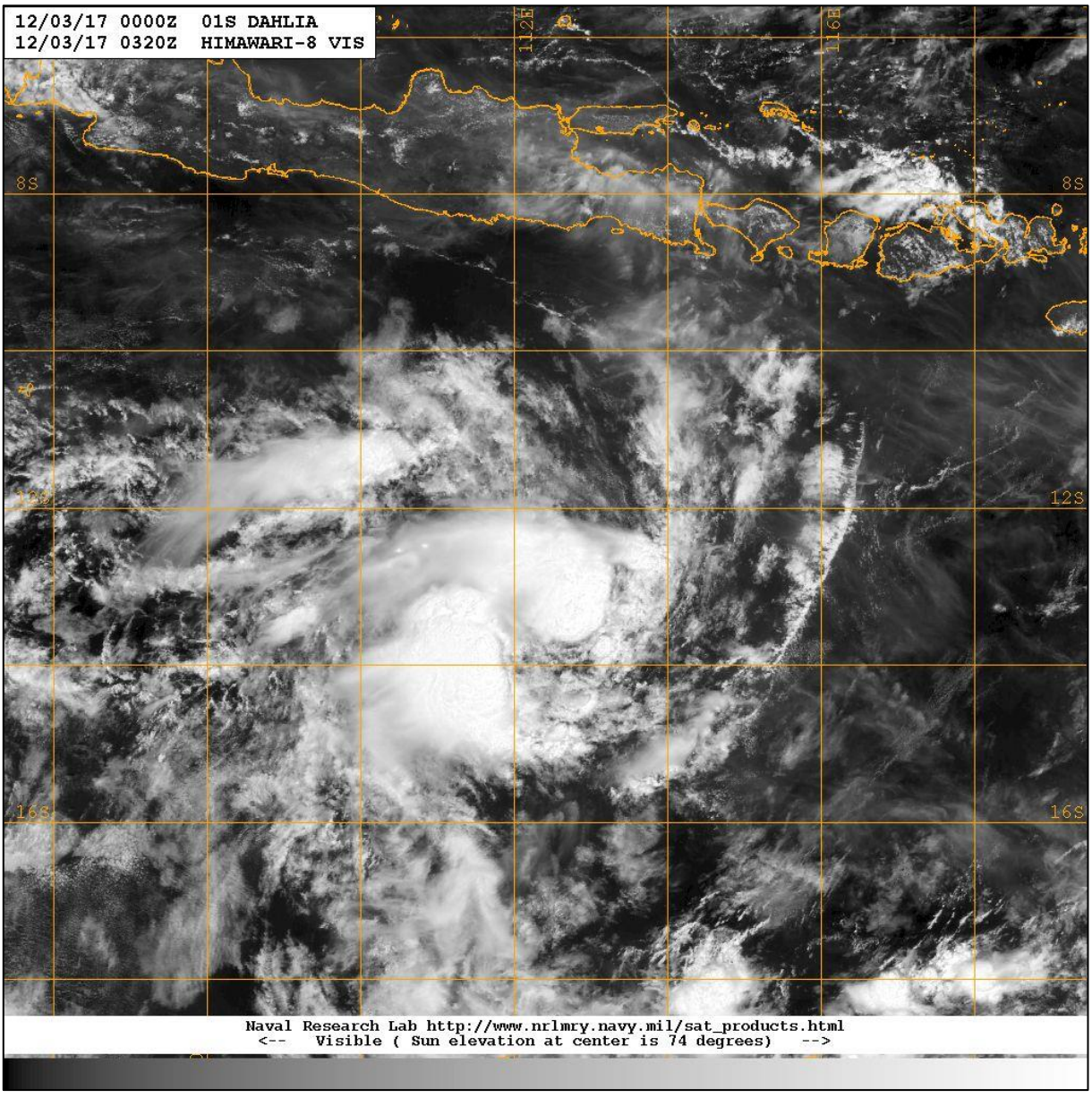


Figure 7. Visible image at 0320 UTC 3 December, showing renewed deep convection signifying redevelopment.

Image courtesy of NOAA: https://manati.star.nesdis.noaa.gov/datasets/ASCATData.php



3. Impact

There were no known impacts from Tropical Cyclone Dahlia.

4. Observations

There were no known surface observations associated with Tropical Cyclone Dahlia as it passed through the Australian region.

TABLE 1. Best track summary for Tropical Cyclone Dahlia 27 November – 4 December 2017.

Refer to the Australian Tropical Cyclone database for complete listing of parameters and track from 9 to 24 March. Note: UTC is AWST - 8 hours.
*Not at tropical cyclone intensity using Australian definition as gales in two or less quadrants.

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
2017	11	27	1200	7.8	97.5	40	20	45	1002	0/0/0/0	0/0/0/0	-
2017	11	27	1800	7.9	98.1	40	20	45	1002	0/0/0/0	0/0/0/0	-
2017	11	28	0000	8.1	98.6	40	20	45	1002	0/0/0/0	0/0/0/0	-
2017	11	28	0600	8.2	99.0	30	20	45	1000	0/0/0/0	0/0/0/0	-
2017	11	28	1200	8.3	99.6	30	20	45	1000	0/0/0/0	0/0/0/0	-
2017	11	28	1800	8.5	100.4	30	25	45	999	0/0/0/0	0/0/0/0	-
2017	11	29	0000	8.4	100.9	25	25	45	999	0/0/0/0	0/0/0/0	-
2017	11	29	0600	8.4	101.7	25	30	45	999	0/0/0/0	0/0/0/0	-
2017	11	29	1200	8.6	102.6	25	35*	50	998	70/0/0/70	0/0/0/0	-
2017	11	29	1800	8.6	103.5	25	35*	50	998	70/0/0/70	0/0/0/0	-
2017	11	30	0000	8.8	104.9	20	35	50	996	70/0/30/70	0/0/0/0	30
2017	11	30	0600	9.1	106.3	20	40	55	993	80/0/30/80	0/0/0/0	30
2017	11	30	1200	9.2	107.4	20	40	55	992	80/30/30/80	0/0/0/0	30
2017	11	30	1800	9.6	108.6	20	45	65	990	70/30/30/70	0/0/0/0	30
2017	12	1	0000	9.7	109.3	15	50	70	987	90/50/60/80	30/0/0/30	25
2017	12	1	0600	10.2	109.6	20	50	70	987	90/50/60/80	30/0/0/30	20
2017	12	1	1200	10.5	110.1	20	50	70	987	90/50/60/80	30/0/0/30	20
2017	12	1	1800	10.7	110.5	30	50	70	987	90/50/60/80	30/30/0/0	20
2017	12	2	0000	10.6	110.8	30	50	70	988	90/0/30/80	30/0/0/30	20
2017	12	2	0600	10.8	111.1	30	40	55	993	90/0/30/80	0/0/0/0	25
2017	12	2	1200	11.2	111.6	30	30	45	999	0/0/0/0	0/0/0/0	-
2017	12	2	1800	11.5	111.8	30	30	45	1000	0/0/0/0	0/0/0/0	-
2017	12	3	0000	12.5	112.3	20	30	45	998	0/0/0/0	0/0/0/0	-
2017	12	3	0600	13.8	112.1	20	35	50	998	50/0/30/50	0/0/0/0	25
2017	12	3	1200	14.9	112.0	30	30	45	1000	0/0/0/0	0/0/0/0	-
2017	12	3	1800	15.4	111.5	30	30	45	1000	0/0/0/0	0/0/0/0	-
2017	12	4	0000	16.4	111.3	30	30	45	1002	0/0/0/0	0/0/0/0	-

5. Forecast Performance

Official tropical cyclone forecasts were issued from 0000 UTC 28 November to 1200 UTC 3 December. There were no tropical cyclone advices (Watch or Warning) issued.

Overall, computer models had lower skill than normal for the circulation. In part this is due to the difficulty in resolving Tropical Cyclone Cempaka that preceded Dahlia in a similar area, and to another weaker circulation in the region, and also due to the small size of the circulation. Some model runs merged the remnants of Cempaka into Dahlia and then intensified the system. Aside from the difficulty in resolving the intensity, most of the guidance suggested that Dahlia would take a faster and more southerly track from 1 December. The European Centre for Medium Range Forecasting (ECMWF) model was the most skillful model during this event.

The accuracy figures for Dahlia in the table below and in Figures 8 and 9 show that the forecast position was close to the five-year average initially but was worse at time periods from 18h lead time. The intensity forecast errors were close to or a little above the five-year average.

	0	6	12	18	24	36	48	72	96	120
Position Absolute error (km)	15	48	71	98	131	189	244	368	479	577
Intensity Absolute error (kn)	1.9	5.5	7.9	10.8	12.6	15.0	13.3	15.5	20.8	7.5
Sample Size	21	21	21	20	19	17	15	11	7	3

Figure 8. Position accuracy figures for Tropical Cyclone Dahlia.

Note: no data presented for 120h lead time as insufficient data.

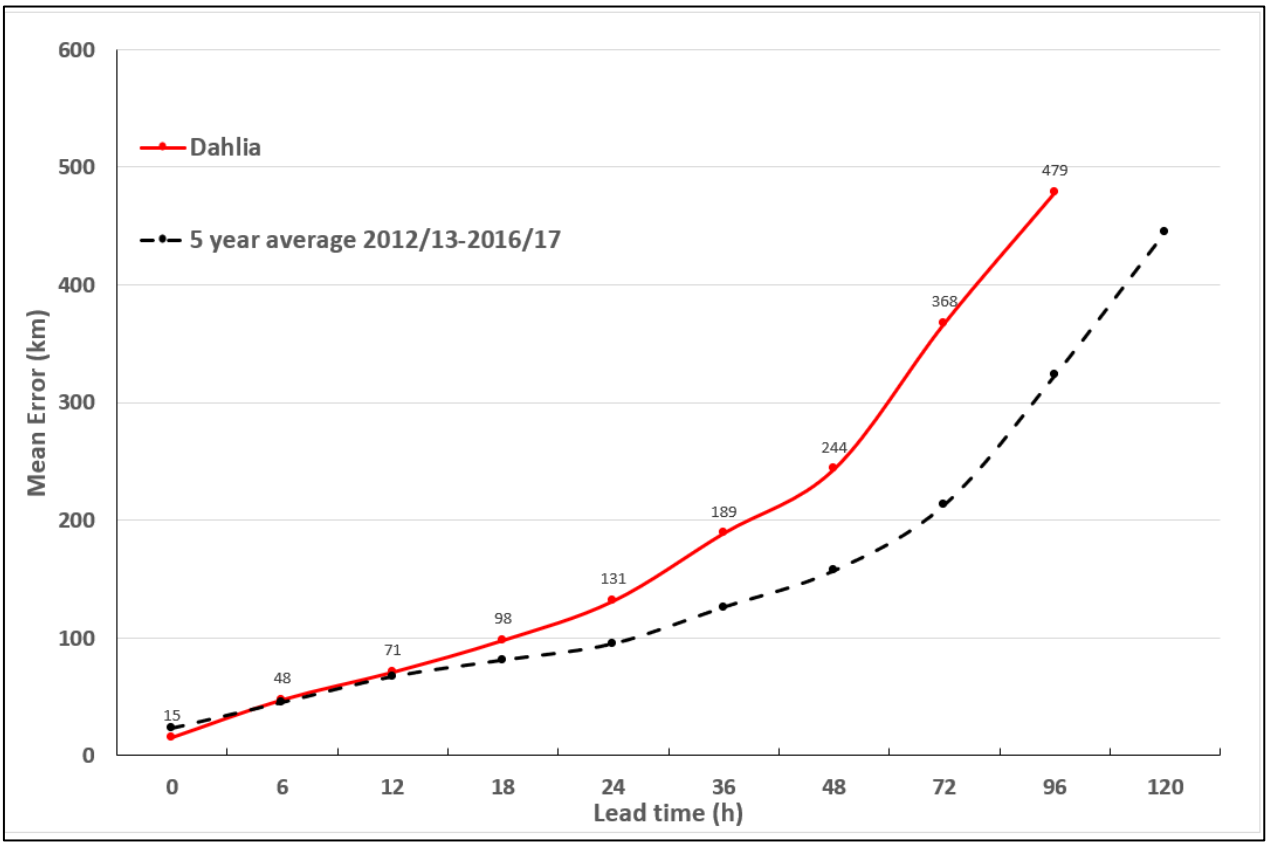
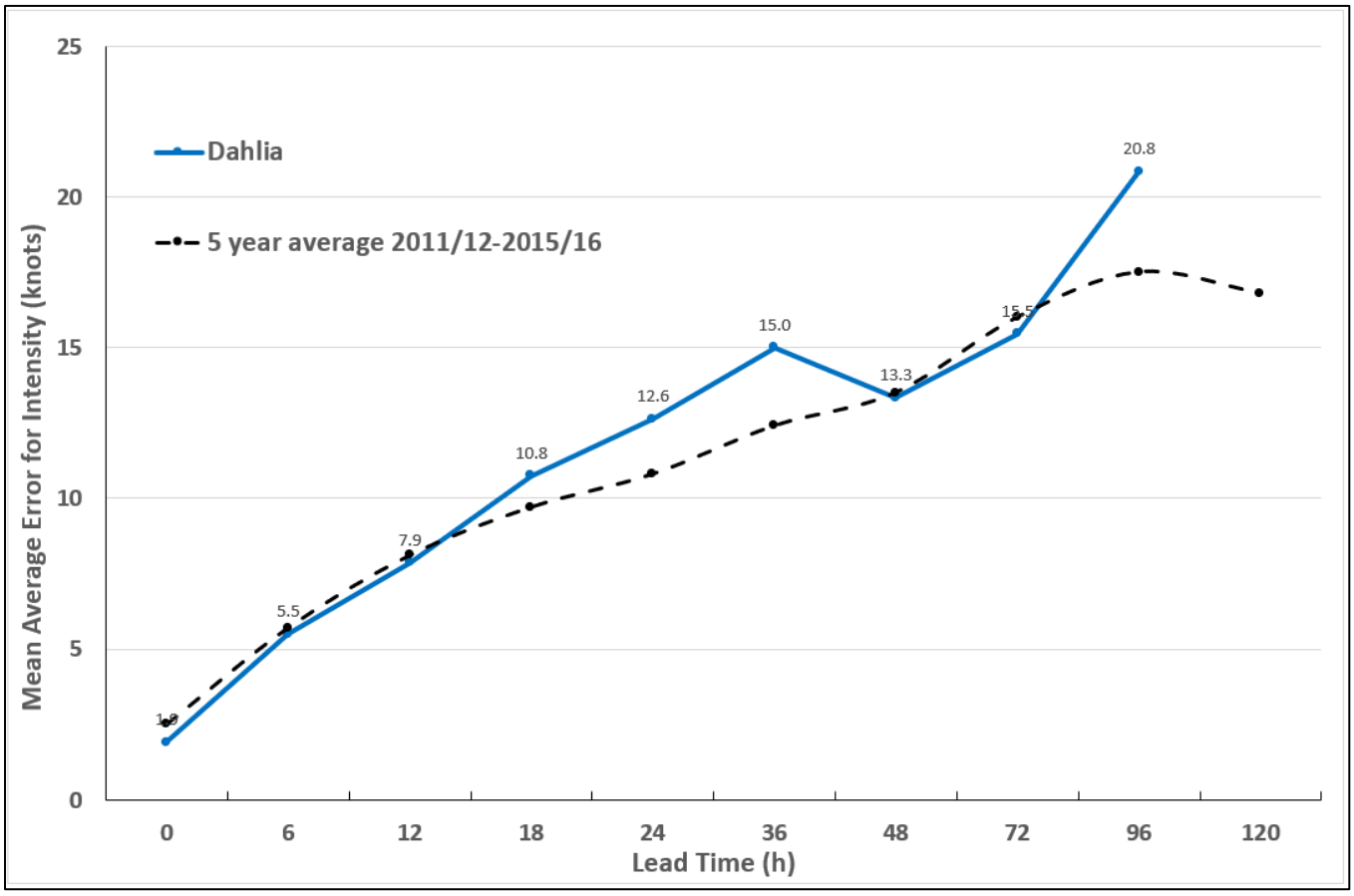


Figure 9. Intensity accuracy figures for Tropical Cyclone Dahlia.

Note: no data presented for 120h lead time as insufficient data.



6. Appendix: List of abbreviations

ADT	Advanced Dvorak Technique	km/h	kilometres per hour
ACST	Australian Central Standard Time	kn	knot
AEST	Australian Eastern Standard Time	LLCC	low level cloud centre
AMSR2	Advanced Microwave Scanning Radiometer	MET	Model Expected T-number
ASCAT	Advanced Scatterometer	METOP	Meteorological Operational Satellite
ATMS	Advanced Technology Microwave Sounder	MJO	Madden-Julian Oscillation
AWS	automatic weather station	mm	millimetres
AWST	Australian Western Standard Time	MSLP	mean sea level pressure
C	Celsius	nm	nautical mile
CI	Current intensity	NOAA	National Oceanic and Atmospheric Administration
CIMSS	Cooperative Institute for Meteorological Satellite Studies (USA)	NRL	Navy Research Lab (USA)
CIRA	Cooperative Institute for Research in the Atmosphere (USA)	PAT	Pattern T-number
EIR	Enhanced InfraRed	RH	relative humidity
ERC	eyewall replacement cycle	RMW	radius of maximum winds
FNMOC	Fleet Numerical Meteorology and Oceanography Centre (USA)	RSMC	Regional Specialised Meteorological Centre
FT	Final T-number	SAR	Synthetic Aperture Radar
GCOM	Global Change Observation Mission	SATCON	satellite Consensus
GHz	Gigahertz	SMAP	Soil Moisture Active Passive
GMI	Global Precipitation Measurement Microwave Imager	SMOS	Soil Moisture and Ocean Salinity
h	hour	SSMIS	Special Sensor Microwave Imager/Sounder
hPa	hectopascal	TC	Tropical Cyclone
HSCAT	Hai Yang 2 Scatterometer (HY-2B, HY-2C)	TCWC	Tropical Cyclone Warning Centre
km	kilometres	UTC	Universal Time Co-ordinated