



**Tropical Low AU1011\_01U (*Anggrek*)**  
30 October – 5 November 2010

Linda Paterson  
Perth Tropical Cyclone Warning Centre  
Bureau of Meteorology  
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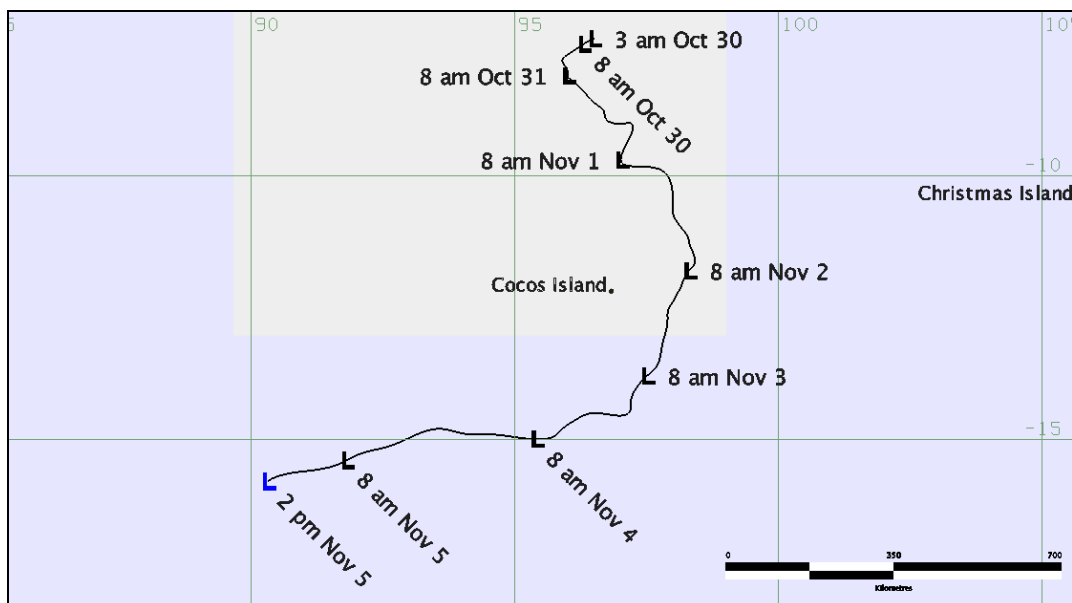
**A. Summary**

A tropical low pressure system (01U) formed to the south of Sumatra on 28 October and moved initially west. By 30 October a low pressure system had formed which began to move south. The low was named *TC Anggrek* by the Jakarta Tropical Cyclone Warning Centre (TCWC) and warnings were continued by the Perth TCWC once the system had moved into the Perth Area of Responsibility (AOR). The cyclone moved to the east of the Cocos Islands before turning west and dissipating over the Indian Ocean.

Post analysis of tropical low 01U (*Anggrek*) downgraded the system to below cyclone strength as it is likely that gales only occurred in one quadrant throughout its lifecycle.

Tropical low (01U) passed to the east and then to the south of the Cocos Islands with the closest approach being about 130 kilometres (km) to the east-southeast of the islands late 2 November. Moderate rainfall occurred over the Cocos Islands during the passage of 01U with the maximum 24 hour rainfall being 56 mm on 1 November. No damage was reported.

Figure 1: Best track of AU1011\_01U (times given in AWST - UTC+8h).



## **B. Meteorological Description**

### *Intensity analysis*

An active phase of the Madden-Julian Oscillation (MJO), which passed across the eastern Indian Ocean in mid October, left an area of enhanced convection in its wake. This combined with an equatorial Rossby wave to aid in the development of a low pressure system to the southwest of Sumatra.

The developing low had a maximum 10 minute mean wind speed of 35 knots at 00 Coordinated Universal Time (UTC) 31 October (8 am AWST, UTC+8h). Dvorak analysis, using a sheared pattern, gave a Data T-Number (DT) of 3.0 which equated to a maximum wind of 35 knots (1 kn= 1.852 kilometres per hour). Other objective and subjective intensity estimates (refer Figure. 2.) indicated the system had a maximum wind speed of between 30 and 40 kn. The 0223 UTC (2:23 am AWST) 31 October Advanced Scatterometer (ASCAT) pass (refer Figure. 3) showed a maximum wind of 30 kn, however this pass only covered the eastern half of the system. The western quadrants, where the deep convection was located, would likely have had the strongest winds. However, this pass indicates that gales did not wrap more than half way around the circulation centre and hence the system did not meet the definition of a tropical cyclone at this time.

During 31 October Advanced Dvorak Technique (ADT) and Cooperative Institute for Meteorological Satellite Studies (CIMMS) Advanced Microwave Sounding Unit (AMSU) estimates continued to rise and gave values of around 45 kn (10-minute mean) wind speeds. Subjective Dvorak intensity estimates based on a shear pattern continued to give DT of 3.0. The 1458 UTC (10:58 pm AWST) 31 October ASCAT pass (refer Fig. 4) captured the western quadrants, however the edge of the swathe was approximately 2 degrees from the centre of the system. The pass showed 30 kn wind speeds associated with convection in the western quadrants. It is likely that there were slightly stronger winds closer to the centre but similar to earlier passes there were no gales present in the eastern quadrants where there was no convection.

The corresponding microwave pass at 1905 UTC 31 October (3.05 am AWST 1 November) showed a reasonable low level circulation with some curved banding in the deep convection in the southwest quadrants (refer Fig. 5). At 1200 UTC (8 pm AWST) 1 November ADT, CIMMS AMSU and Cooperative Institute for Research in the Atmosphere (CIRA) AMSU intensity estimates had continued to climb and gave peak intensity estimates of 52 kn, 42 kn and 45 kn respectively. Subjective Dvorak gave a DT of 3.5, based on a shear pattern, with a maximum wind of 50 kn. The 1436 UTC (10.36 pm AWST) 1 November ASCAT pass (refer Figure.6) went directly over 01U and showed a maximum wind speed of 40 kn southwest of the centre. Due to this information the peak intensity was analysed at 40 kn at this time. However this ASCAT pass also indicates that gales were still not wrapped greater than half way around the system centre.

Subsequent microwave imagery showed that convection began to decrease and 01U became less organised. By 00 UTC (8am AWST) 2 November subjective Dvorak DT analyses had decreased to 3.0 and a partial ASCAT pass showed a maximum wind of 30 kn. The 1534 UTC (11:34 pm AWST) 3 November ASCAT pass (refer Figure.

7) showed 30 kn winds to the south of the system, under the little remaining convection. The system drifted west until it dissipated on 6 November.

From 00 UTC 2 November ADT intensity estimates increased and reached a peak of about 65 kn. This was significantly higher than any other intensity estimate for 01U. Examination of the hourly estimates suggests that the method was not taking into account the sheared nature of the system and that it was erroneously locating the centre close to the deep convection.

### *Motion*

Initially 01U was steered south and then south-southeast ahead of a mid-level trough to the west of the system. On 2 November when the system was located to the east of the Cocos Islands the system began to move south southwest as the trough moved to the east of 01U. During 3 November a ridge formed to the southeast of the system and 01U began to move to the west. It continued this motion until it dissipated.

### *Structure*

01U was affected by wind shear throughout its entire lifecycle. CIMMS analyses showed 20 to 30 kn of east northeast shear from 31 October to 1 November and imagery showed convection predominantly in the southwest quadrant. On 2 November wind shear dropped to below 20 kn and became more northerly with convection located to the south of the system centre.

The wind shear played a significant role in inhibiting the development of 01U to reach tropical cyclone strength. Satellite imagery showed convection persisted in the southwest quadrant. The partial ASCAT passes at 0233 UTC (02:23 am AWST) (refer Figure. 2) and 1458 UTC (10:58 pm AWST) (refer Figure. 4) 31 October showed Gales were not wrapping more than half way around the system centre hence it was not a cyclone. An excellent pass at 1438 UTC (10:38 pm AWST) 1 November showed, despite other intensity estimates indicating that 01U had intensified, the maximum wind of 40 kn was only in one quadrant and that the system had not met the definition of a cyclone. Subsequent partial passes indicated that at no time did gales wrap more than half way around the centre and it is likely that gales only existed predominantly only in the southwest quadrant.

## **C. Impact**

01U caused no damage to the Cocos Islands as it moved past on 1 and 2 November.

## **D. Observations**

The Cocos Islands recorded 56mm of rainfall on 1 November.

## **E. Forecast Performance**

The first public Advice was issued for the Cocos Islands at 9 am AWST 30 October while 01U was still in Indonesia's area of responsibility. Advices continued until 11 pm AWST 2 November when 01U was located southeast of the Islands and moving away.

Table 1. Best track summary for AU1011\_01U.

Refer to the Australian Tropical Cyclone database for complete listing of parameters.

Year	Month	Day	Hour (UTC)	Position Latitude S	Position Longitude E	Position Accuracy nm	Max wind 10min knots	Max gust knots	Central Pressure hPa	Rad. of Gales # nm	Rad. of storm force winds	Radius Max. Wind ^ (RMW)
2010	10	30	00	7.5	96.3	10	25	45	1002			
2010	10	30	06	7.8	96.0	10	30	45	1002			
2010	10	30	12	7.8	95.9	20	30	45	1002			
2010	10	30	18	8.0	96.0	15	30	45	1002			
2010	10	31	00	8.1	96.0	15	35	50	1000	80*		45
2010	10	31	06	8.5	96.4	20	35	50	998	80*		45
2010	10	31	12	8.8	96.7	20	35	50	998	80*		45
2010	10	31	18	9.0	97.1	20	35	50	998	80*		45
2010	11	1	00	9.7	97.5	30	35	50	998	80*		45
2010	11	1	06	10.4	98.0	30	35	50	998	80*		45
2010	11	1	12	11.2	98.3	30	40	55	996	80*		45
2010	11	1	18	11.5	98.4	30	40	55	995	80*		45
2010	11	2	00	11.8	98.3	30	35	50	997	80*		60
2010	11	2	06	12.2	98.1	30	35	50	998	80*		60
2010	11	2	12	12.6	98.0	20	35	50	998	80*		60
2010	11	2	18	13.2	97.8	25	35	50	998	80*		60
2010	11	3	00	13.8	97.5	25	35	50	998	80*		70
2010	11	3	06	14.3	97.2	15	30	45	1001			
2010	11	3	12	14.5	96.5	15	30	45	1001			
2010	11	3	18	14.8	95.9	15	30	45	1001			
2010	11	4	00	15.0	95.4	15	30	45	1003			
2010	11	4	06	14.9	94.4	10	30	45	1003			
2010	11	4	12	14.8	93.6	15	30	45	1003			
2010	11	4	18	15.1	92.7	20	30	45	1003			
2010	11	5	00	15.4	91.8	20	30	45	1003			
2010	11	5	06	15.8	90.3	10	25	45	1007			

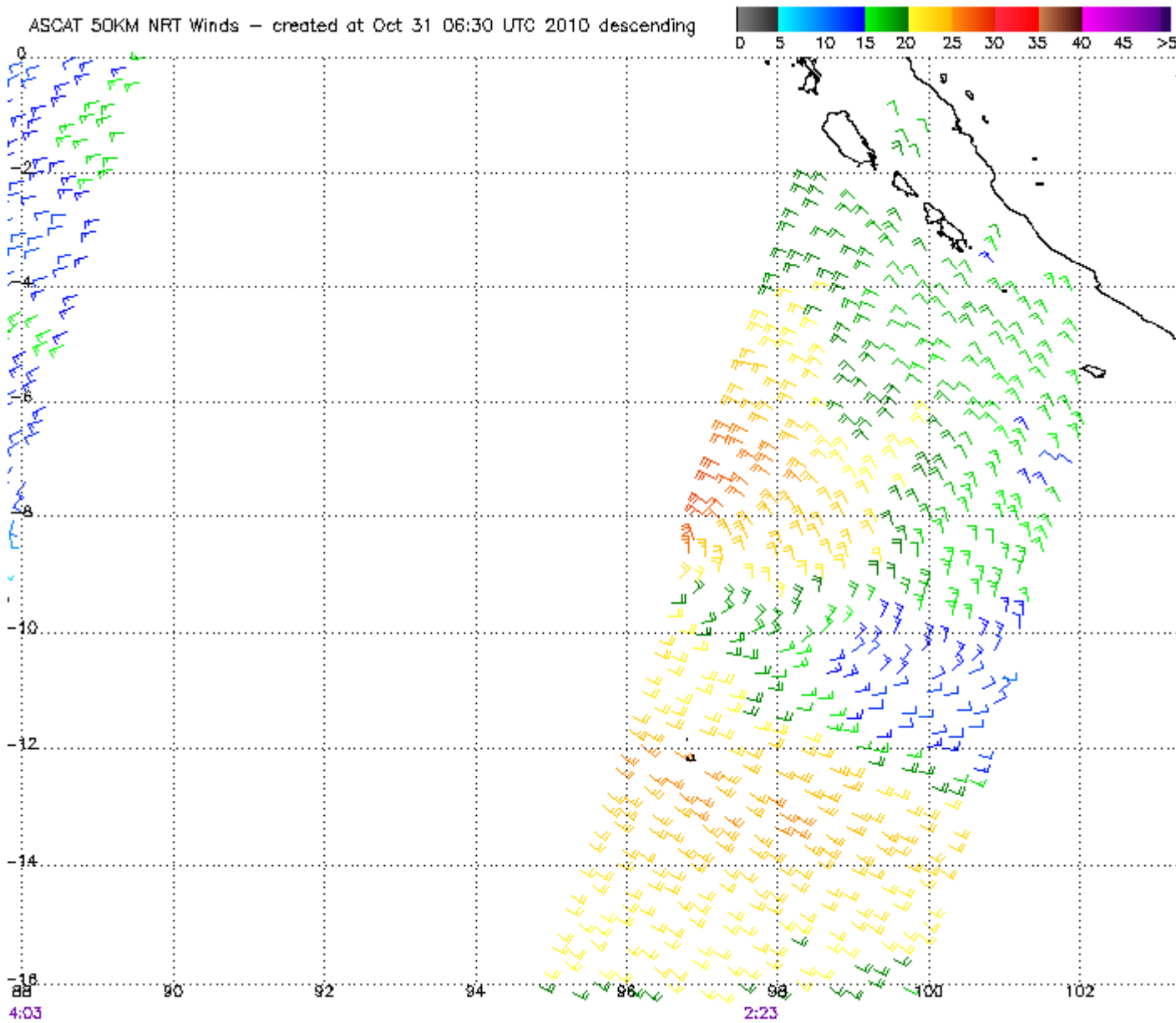
#Average of non-zero quadrants.

^Minimum distance to maximum mean wind in any quadrant.

\*Gales do not extend more than half way around the system and hence it is not a tropical cyclone.



Figure 3. ASCAT image at 0223 UTC 31 October (10:23 am AWST 31 October).  
(image courtesy of US NOAA <http://manati.orbit.nesdis.noaa.gov/datasets/ASCATData.php>)

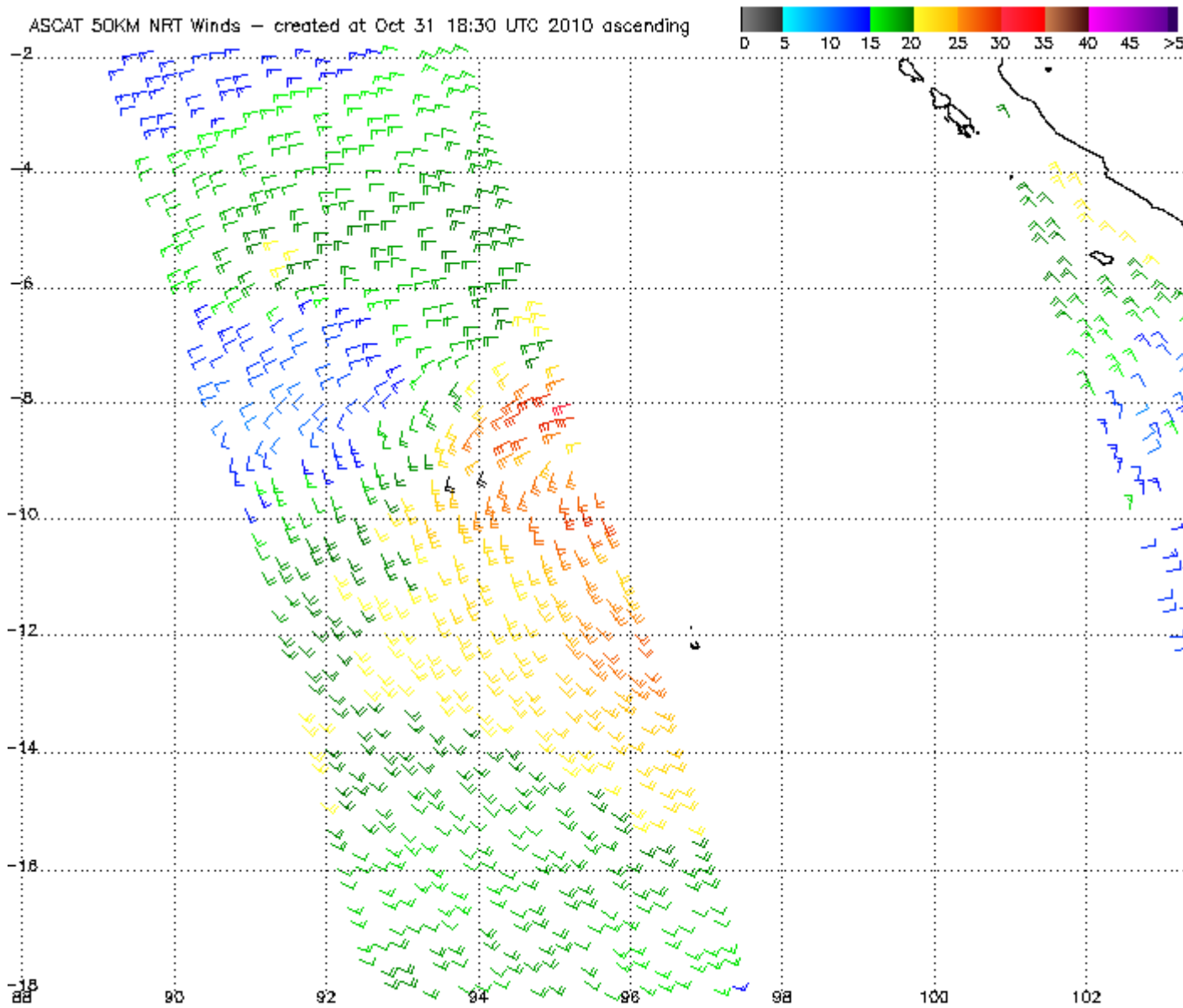


Storm number: 02 Storm name: ANGGREK

Note: 1) Times are GMT 2) Times along bottom correspond to measurement at -8S

3) Data buffer is 22 hrs from Oct 31 06:30 UTC 2010 4) Black Circles indicate possible contamination

Figure 4. ASCAT image at 1458 UTC 31 October (10:58 pm AWST 31 October).  
(image courtesy of US NOAA <http://manati.orbit.nesdis.noaa.gov/datasets/ASCATData.php>)



14:58  
Storm number: 02 Storm name: ANGGREK  
Note: 1) Times are GMT 2) Times along bottom correspond to measurement at -10S  
3) Data buffer is 22 hrs from Oct 31 18:30 UTC 2010 4) Black Circles indicate possible contamination

Figure 5. Microwave (AMSRE Composite) image at 1905 UTC 31 October (0305 AWST 1 November).

(image courtesy of US NRL: <http://www.nrlmry.navy.mil/>)

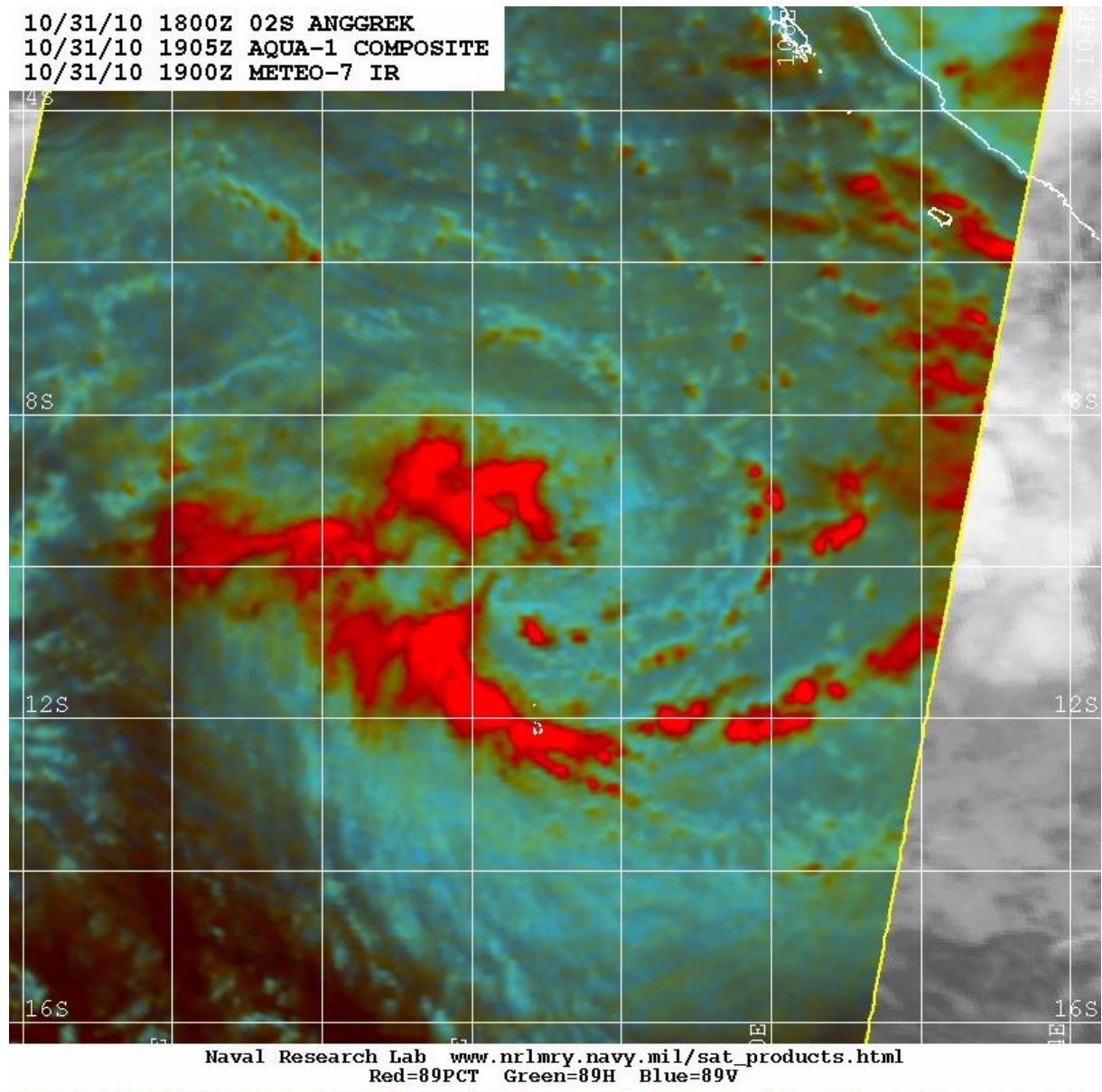
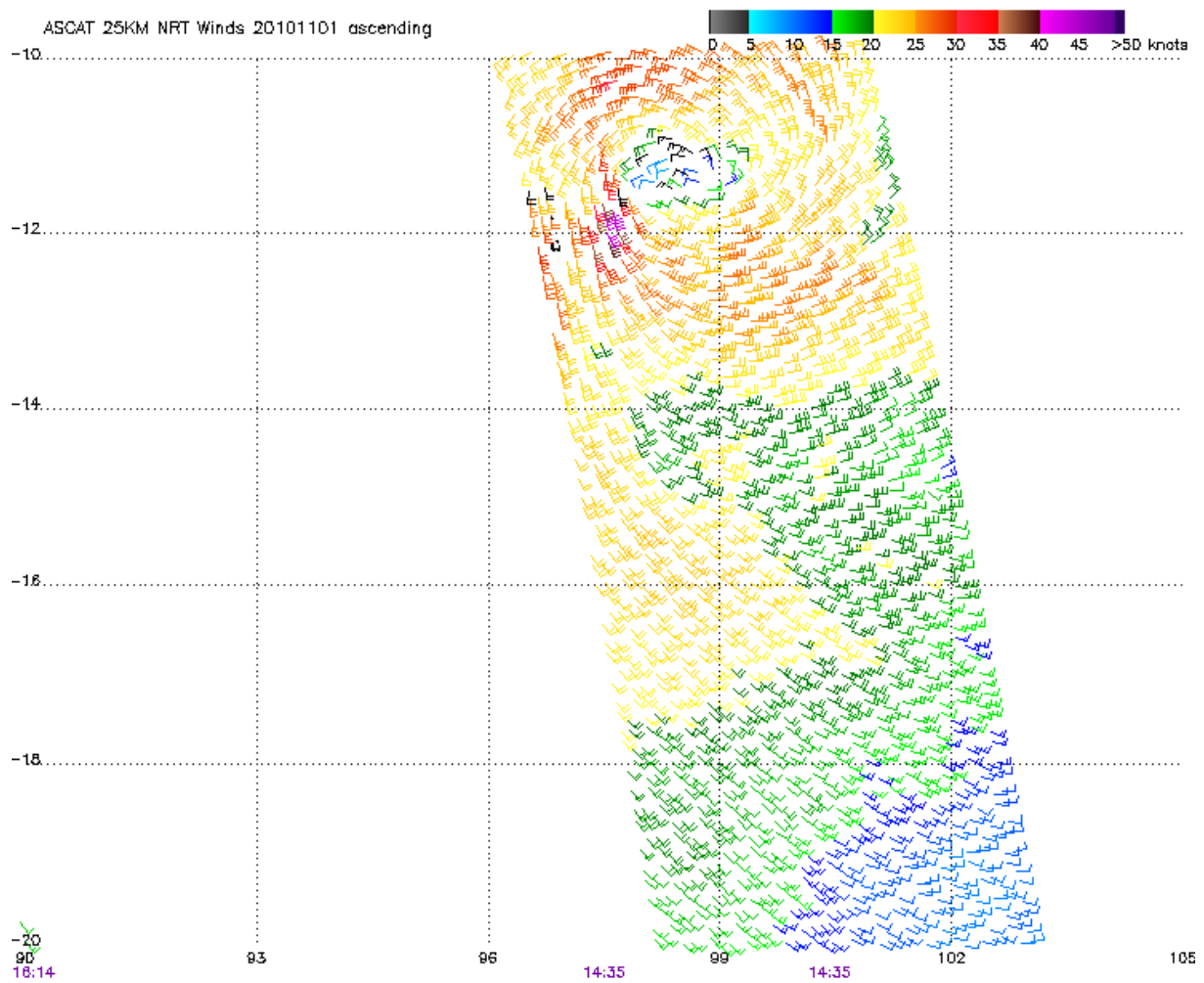


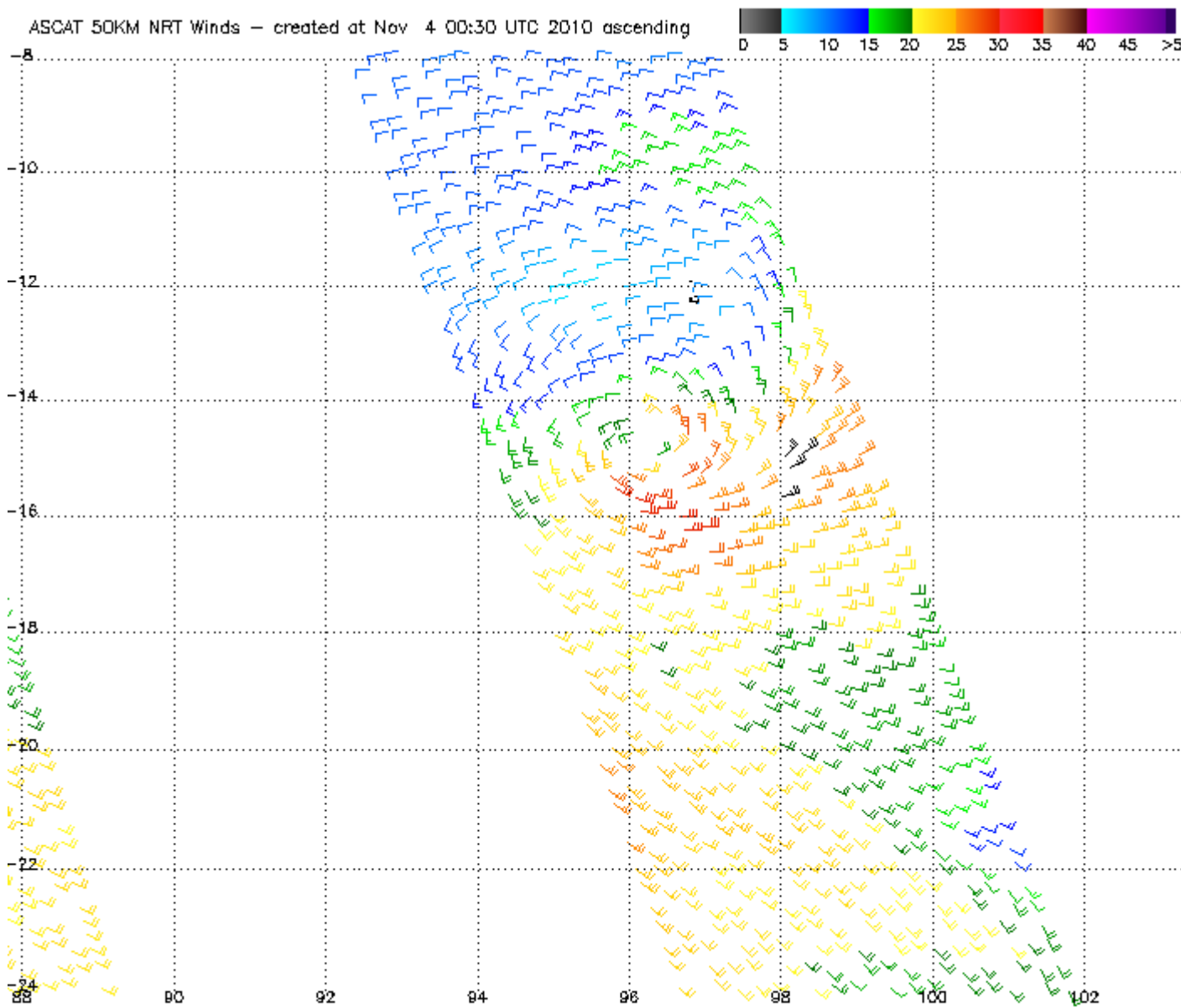


Figure 6. ASCAT image at 10:35 pm AWST 1 November (1435 UTC 1 November).  
 (image courtesy of US NOAA <http://manati.orbit.nesdis.noaa.gov/datasets/ASCATData.php>)



Note: 1) Times are GMT 2) Times along bottom correspond to measurement at -15S  
 3) Data buffer is 22 hrs from 20101101 4) Black circles indicate possible contamination  
 NOAA/NESDIS/Office of Research and Applications

Figure 7. ASCAT image at 1534 UTC 3 November (11:34 pm AWST 3 November).  
(image courtesy of US NOAA <http://manati.orbit.nesdis.noaa.gov/datasets/ASCATData.php/>)



Storm number: 02 Storm name: ANGGREK

Note: 1) Times are GMT 2) Times along bottom correspond to measurement at -16S

3) Data buffer is 22 hrs from Nov 4 00:30 UTC 2010 4) Black Circles indicate possible contamination