Australian Government
Bureau of Meteorology

Tropical Cyclone Linda

11–15 March 2018

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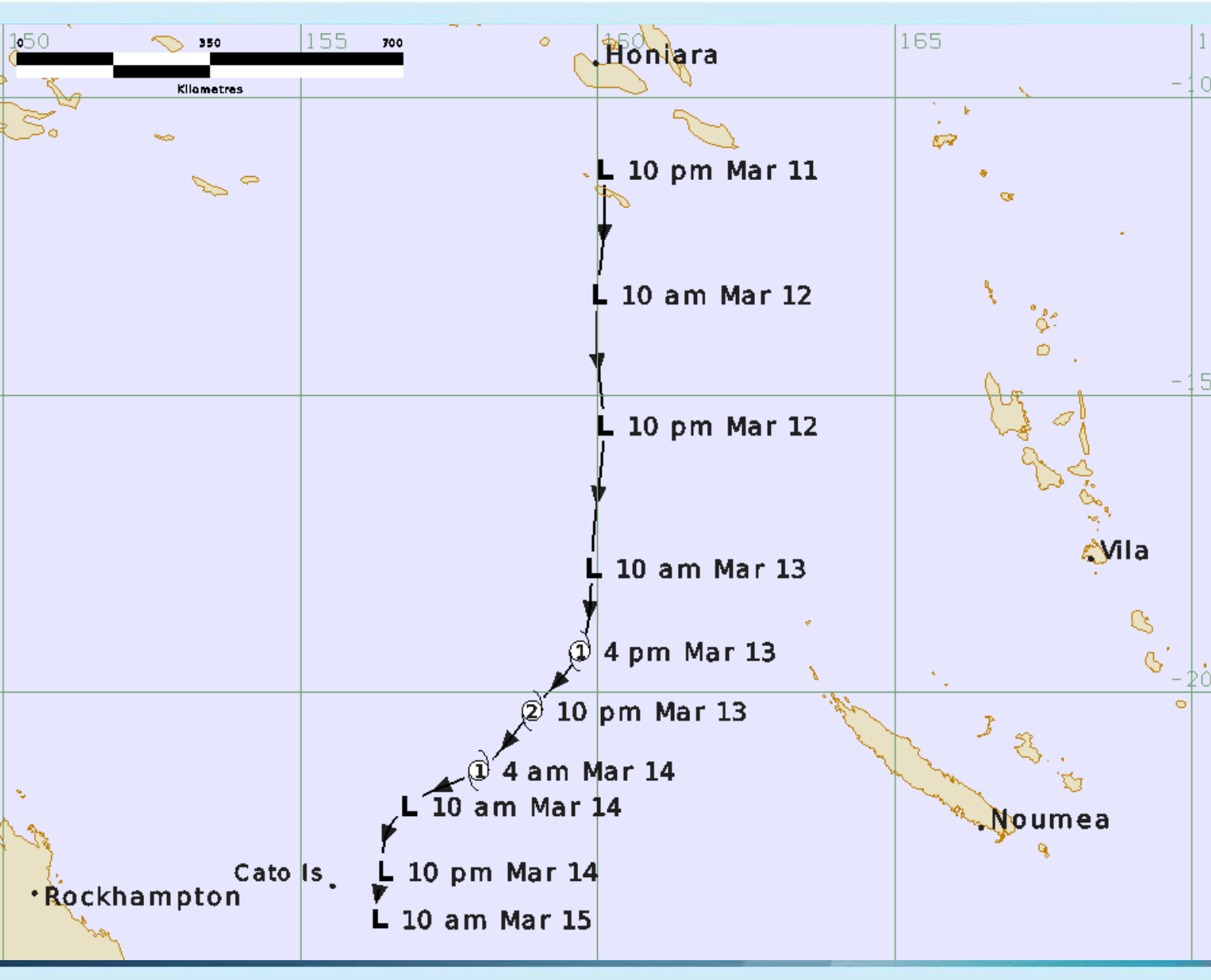

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1. Summary

Tropical Cyclone Linda formed offshore in the Coral Sea in March 2018 and reached category 2 intensity as it tracked to the west of New Caledonia (see Figure 1). Linda caused dangerous surf conditions about the southeast Queensland coast with maximum wave heights of 8 metres recorded off the Sunshine Coast and beach scarping of around a metre on the Gold Coast.

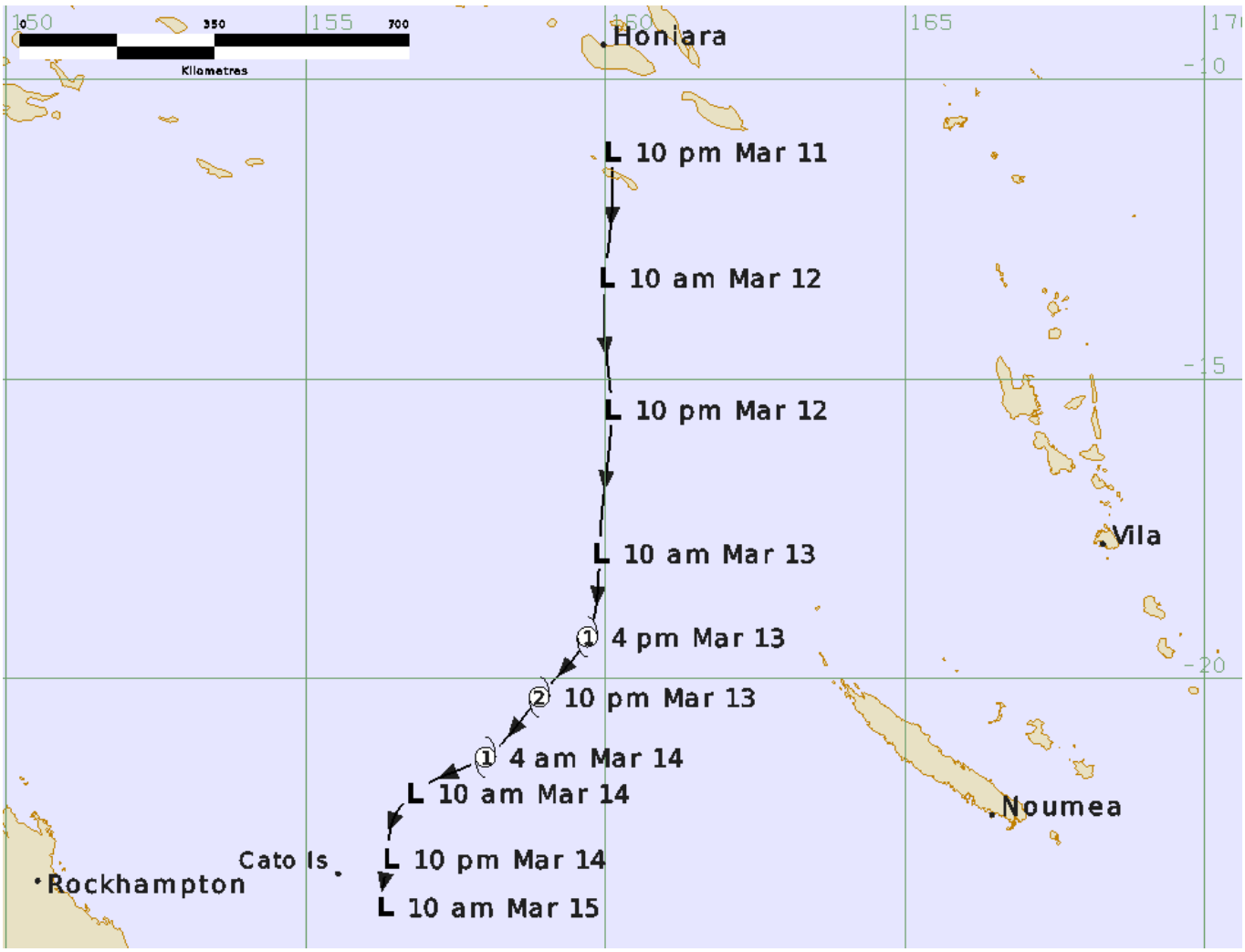
The tropical low that became Linda was first identified and tracked near the Solomon Islands on 11 March before it tracked southwards into the Coral Sea. The system gradually developed over the next couple of days before it took advantage of a window of opportunity to intensify into a tropical cyclone on 13 March. Linda managed to briefly reach category 2 intensity before it began to weaken and was subsequently downgraded to a tropical low on 14 March.

TABLE 1. Best track summary for Tropical Cyclone Linda.

Refer to the Australian Tropical Cyclone database for complete listing of parameters. Note: AEST is UTC +10 hours. *Not at tropical cyclone intensity 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
2018	3	11	1200	11.2	160.1	60	20	45	1001	0/0/0/0	0/0/0/0	-
2018	3	11	1800	12.3	160.1	60	25	45	1002	0/0/0/0	0/0/0/0	-
2018	3	12	0000	13.3	160.0	60	25	45	1000	0/0/0/0	0/0/0/0	-
2018	3	12	0600	14.4	160.0	60	25	45	999	0/0/0/0	0/0/0/0	-
2018	3	12	1200	15.5	160.1	45	25	45	998	0/0/0/0	0/0/0/0	-
2018	3	12	1800	16.7	160.0	60	35*	50	995	0/80/0/0	0/0/0/0	-
2018	3	13	0000	17.9	159.9	45	35*	50	999	0/80/0/0	0/0/0/0	-
2018	3	13	0600	19.3	159.7	30	45	65	990	30/90/110/30	0/0/0/0	25
2018	3	13	1200	20.3	158.9	30	50	70	988	30/90/130/40	0/0/50/0	25
2018	3	13	1800	21.3	158.0	20	45*	65	987	0/90/130/0	0/0/0/0	25
2018	3	14	0000	21.9	156.8	10	45*	65	990	0/0/130/0	0/0/0/0	-
2018	3	14	0600	22.6	156.4	10	40*	55	988	0/0/120/0	0/0/0/0	-
2018	3	14	1200	23.0	156.4	30	40*	55	991	0/0/110/0	0/0/0/0	-
2018	3	14	1800	23.4	156.3	30	35*	50	995	0/0/100/0	0/0/0/0	-
2018	3	15	0000	23.8	156.3	10	25	45	1001	0/0/0/0	0/0/0/0	-

Figure 1. Best track of Tropical Cyclone Linda 11-15 March 2018 (times in AEST, UTC +10 hours)



2. Meteorological Description

2.1 Intensity analysis

The tropical low that became Linda was first identified and tracked near the Solomon Islands on 11 March. An initial Dvorak T-no. of 1.0 was assigned at 1200 UTC 11 March following evidence of convective cloud persisting around a centre that was identified on an Advanced Scatterometer ASCAT-B pass at 1032 UTC 11 March 2018 (see Figure 2).

The system gradually developed from this point as it tracked southwards into the Coral Sea and microwave imagery indicated that convection was starting to wrap tightly near the centre during 12 March. Gale force winds became evident on scatterometer output early on 13 March and later that day it was deemed that the system had formed into a tropical cyclone at 0600 UTC 13 March. The Dvorak estimate at the time of naming was based on a curved band pattern with a 0.6-0.7 degree wrap, which yielded a DT of 3.0 (see Figure 3).

A SMAP radiometer pass at 0723 UTC 13 March (Figure 4) and an Advanced Scatterometer ASCAT-B pass at 1128 UTC 13 March (Figure 5) indicated that Linda reached category 2 intensity for a brief period on this day. Observations from these sensors led to an increase in the category of the system in post-event analysis.

Vertical wind shear increased across Linda by 14 March and most of the deep convection became well removed from the low-level centre by 0000 UTC. As a result, Linda was downgraded to a tropical low at this time though the intensity of the system was held at 40-45 knots until 1200 UTC, primarily based on wind observations from the Automatic Weather Station at Cato Island (see Figure 7).

2.2 Structure

Gale force winds associated with Linda were primarily within approximately 90-130 nm (167-241 km) in the southern semicircle and 30-40 nm (56-74 km) in the northern semicircle. An area of storm force winds developed in the southwest quadrant within 50 nm (93 km) of the centre.

After Linda was downgraded to a tropical low an area of gale force winds persisted within approximately 130nm in the southwest quadrant until around 1800 UTC 14 March.

2.3 Motion

The motion of Linda was largely influenced by a combination of a mid-level ridge to the east of the system and mid-level trough to the west.

Figure 2. Advanced Scatterometer ASCAT-B pass at 1032 UTC 11 March 2018.

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

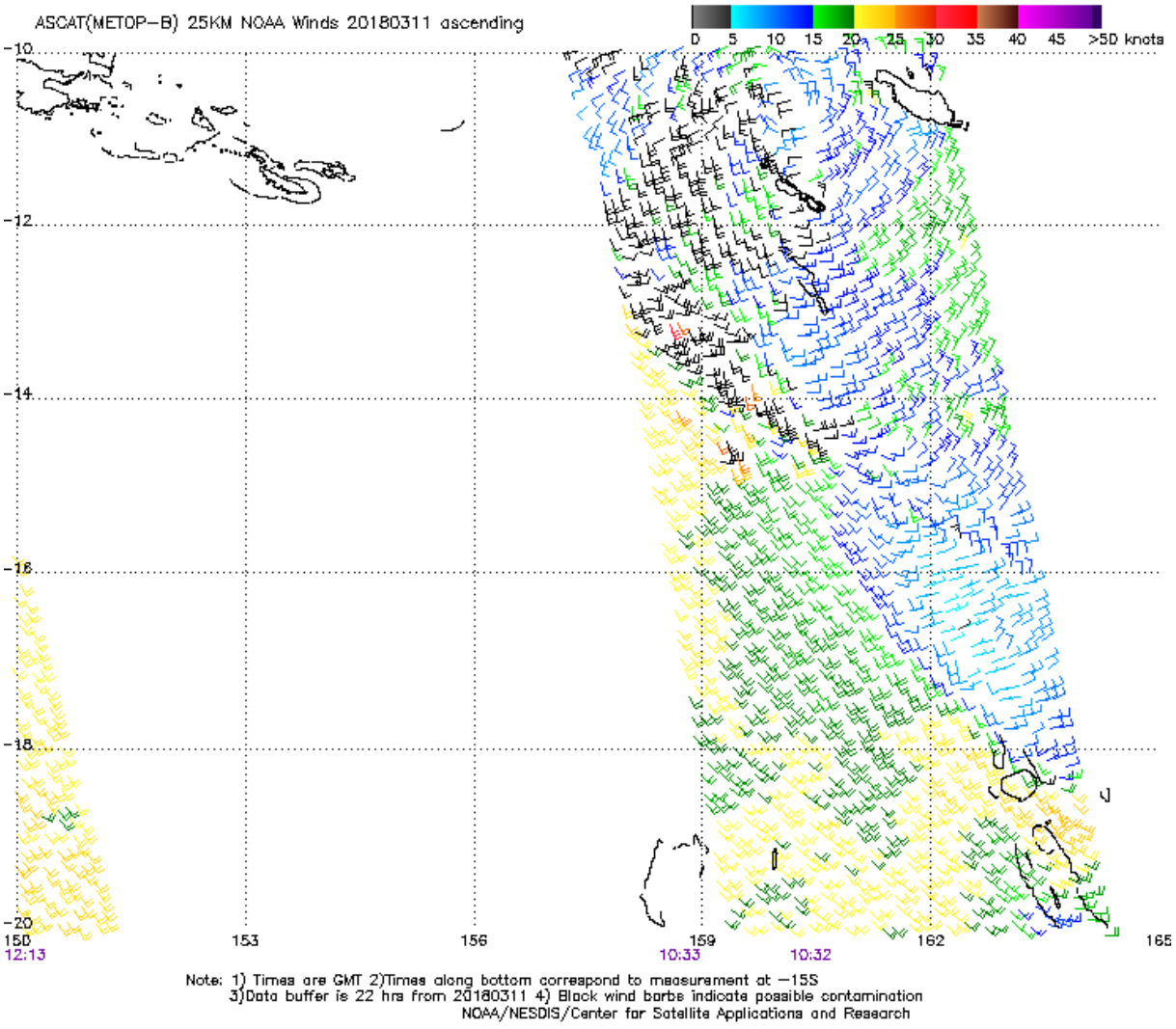


Figure 3. Himawari-8 visible satellite image at 0530 UTC 13 March 2018 when Linda first at tropical cyclone intensity.

Image courtesy of CIRA: https://rammb-data.cira.colostate.edu/tc_realtime/index.asp

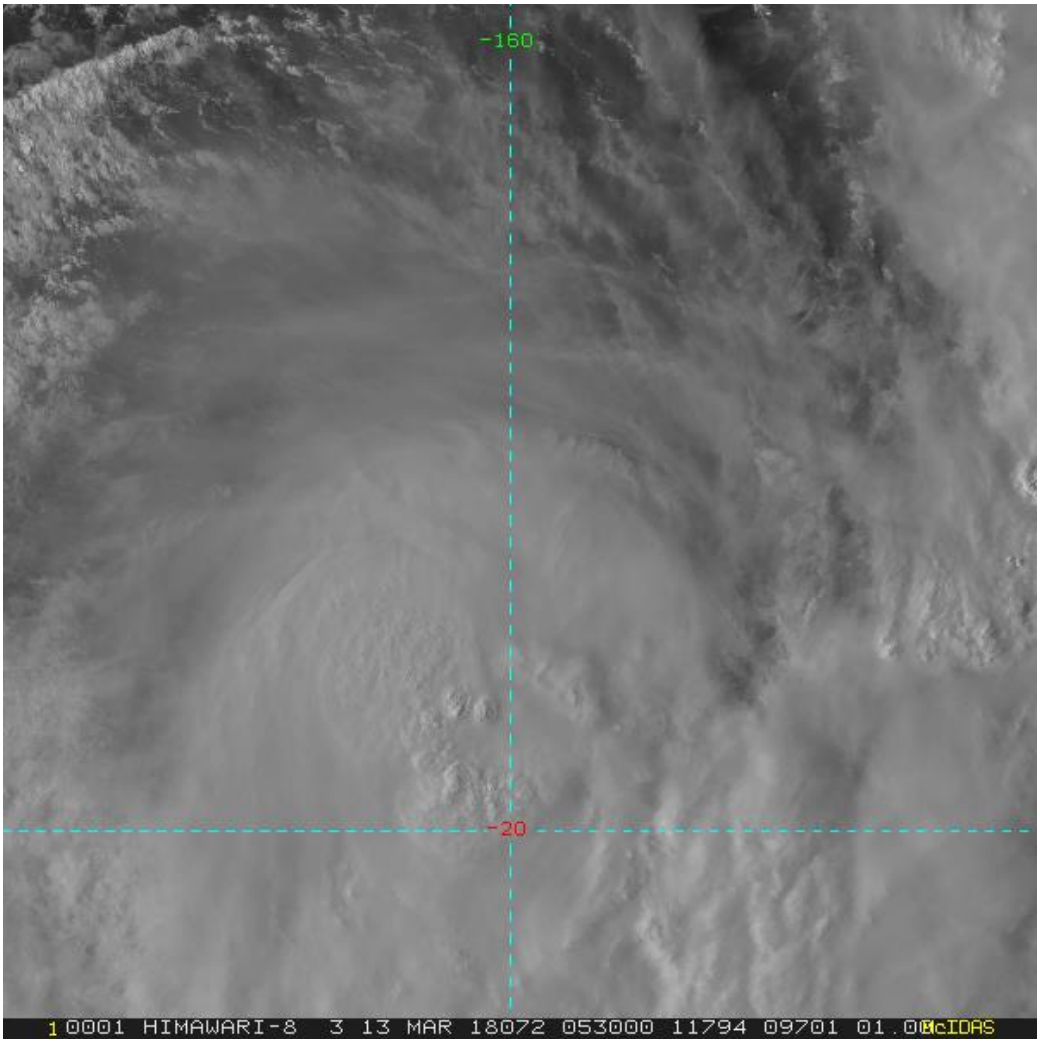


Figure 4. SMAP radiometer pass at 0723 UTC 13 March 2018.

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

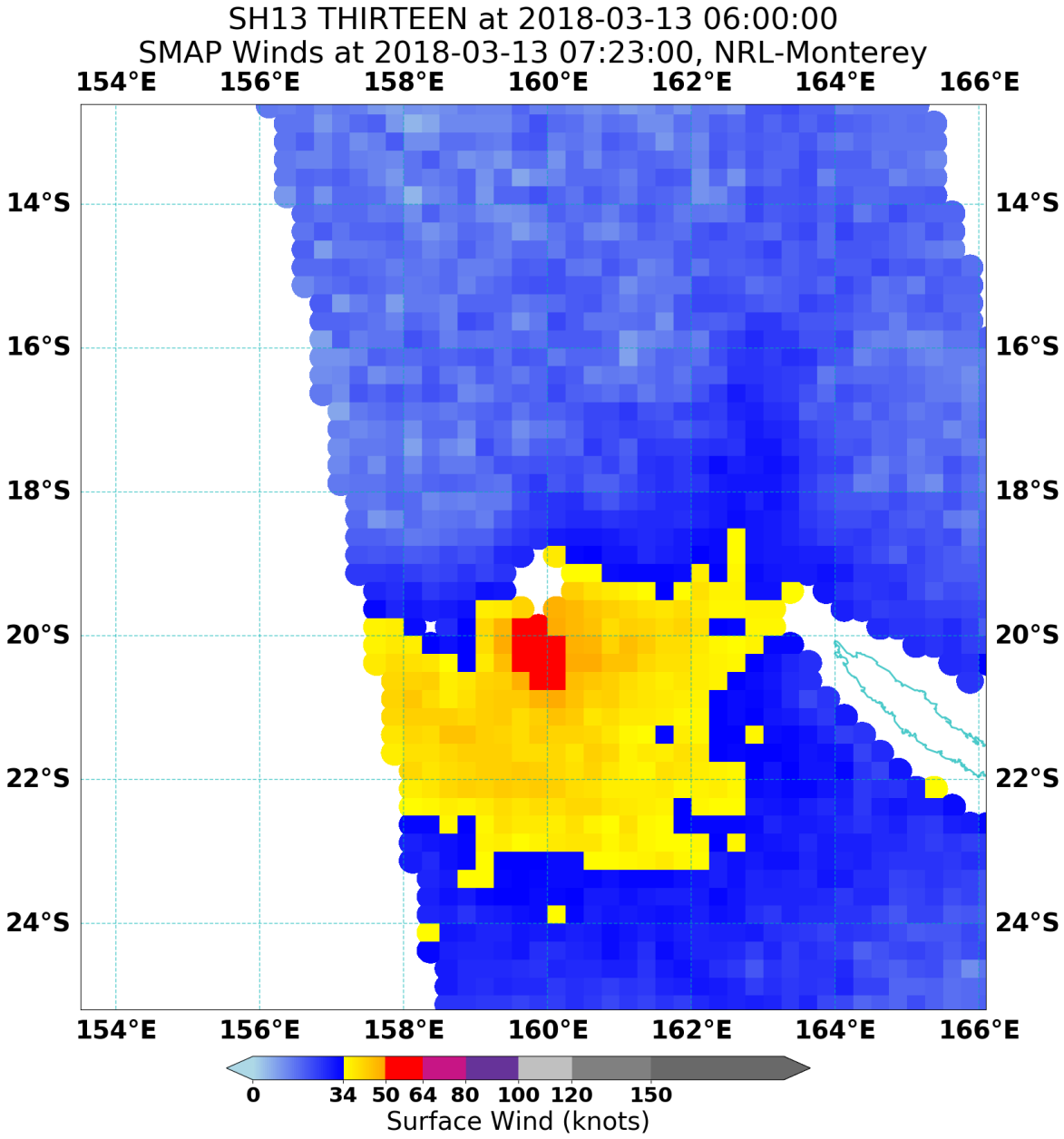


Figure 5. Advanced Scatterometer ASCAT-B pass at 1128 UTC 13 March 2018.

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

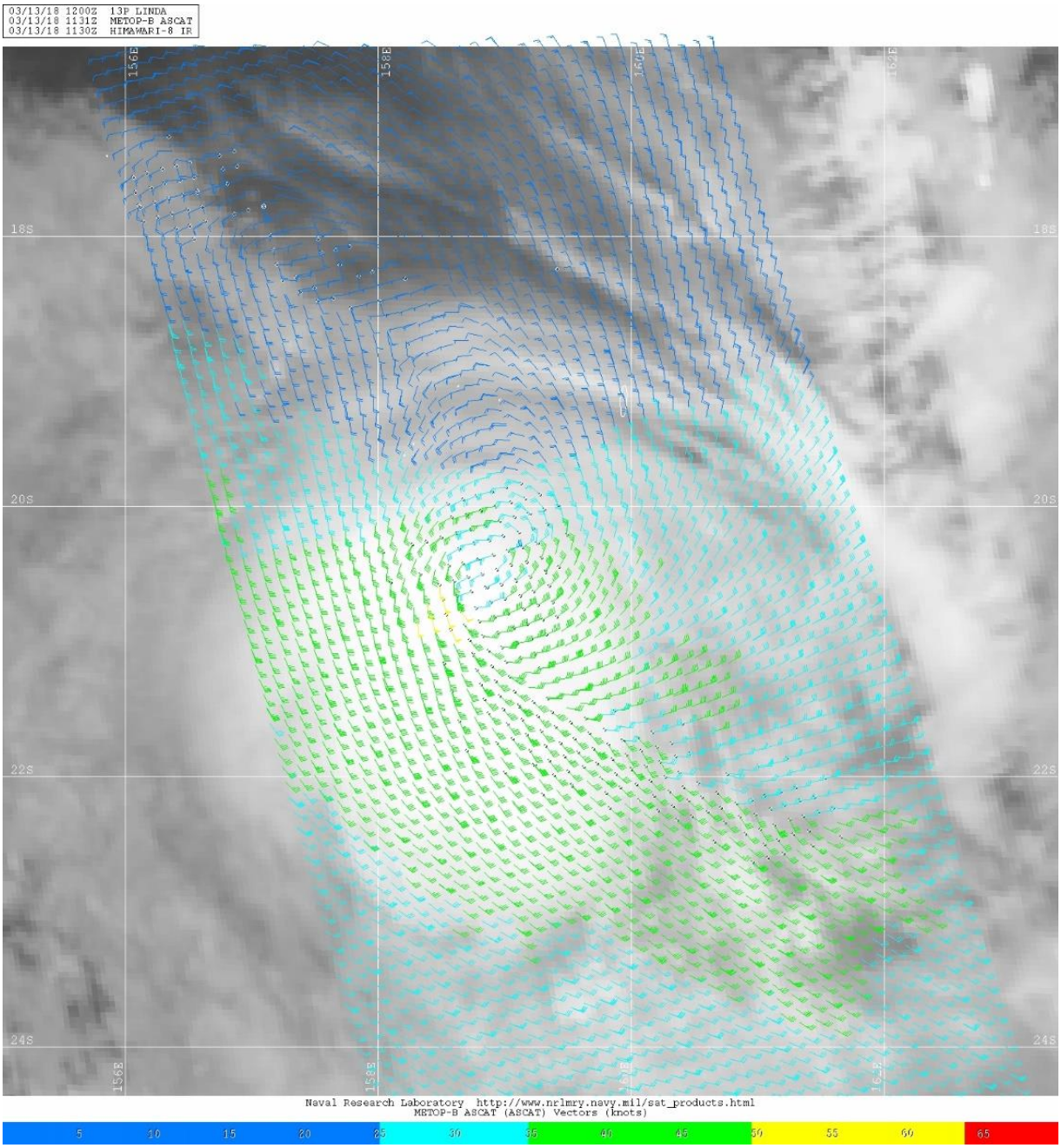
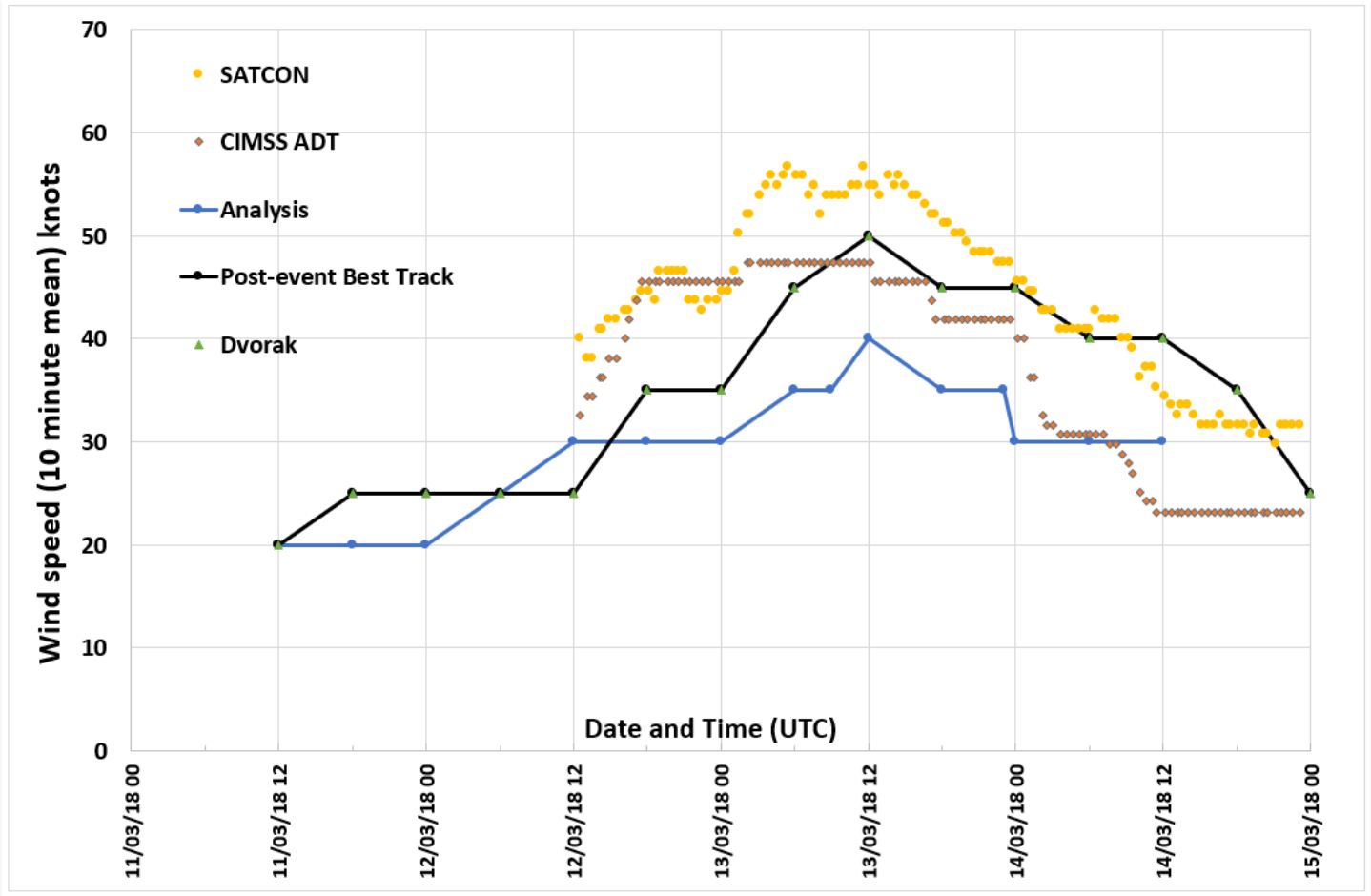


Figure 6. Plot of objective and subjective intensity estimates for Linda.



3. Impact

Linda caused dangerous surf conditions about the southeast Queensland coast with maximum wave heights of 8 metres recorded off the Sunshine Coast and beach scarping of around a metre on the Gold Coast.

Source: https://www.abc.net.au/news/2018-03-15/ex-cyclone-linda-to-cause-years-biggest-tides-big-waves-rolling-/9549068

4. Observations

4.1 Winds

Cato Island
Gales recorded between 0659 UTC 13 March and 1919 UTC 14 March.
Storm-force winds recorded between 0114 and 0323 UTC 14 March
Maximum 10-minute mean wind of 51 knots (94 km/h) at 0131 UTC 14 March.
Maximum 3-second wind gust of 60 knots (111 km/h) at 0130 and 1213 UTC 14 March.

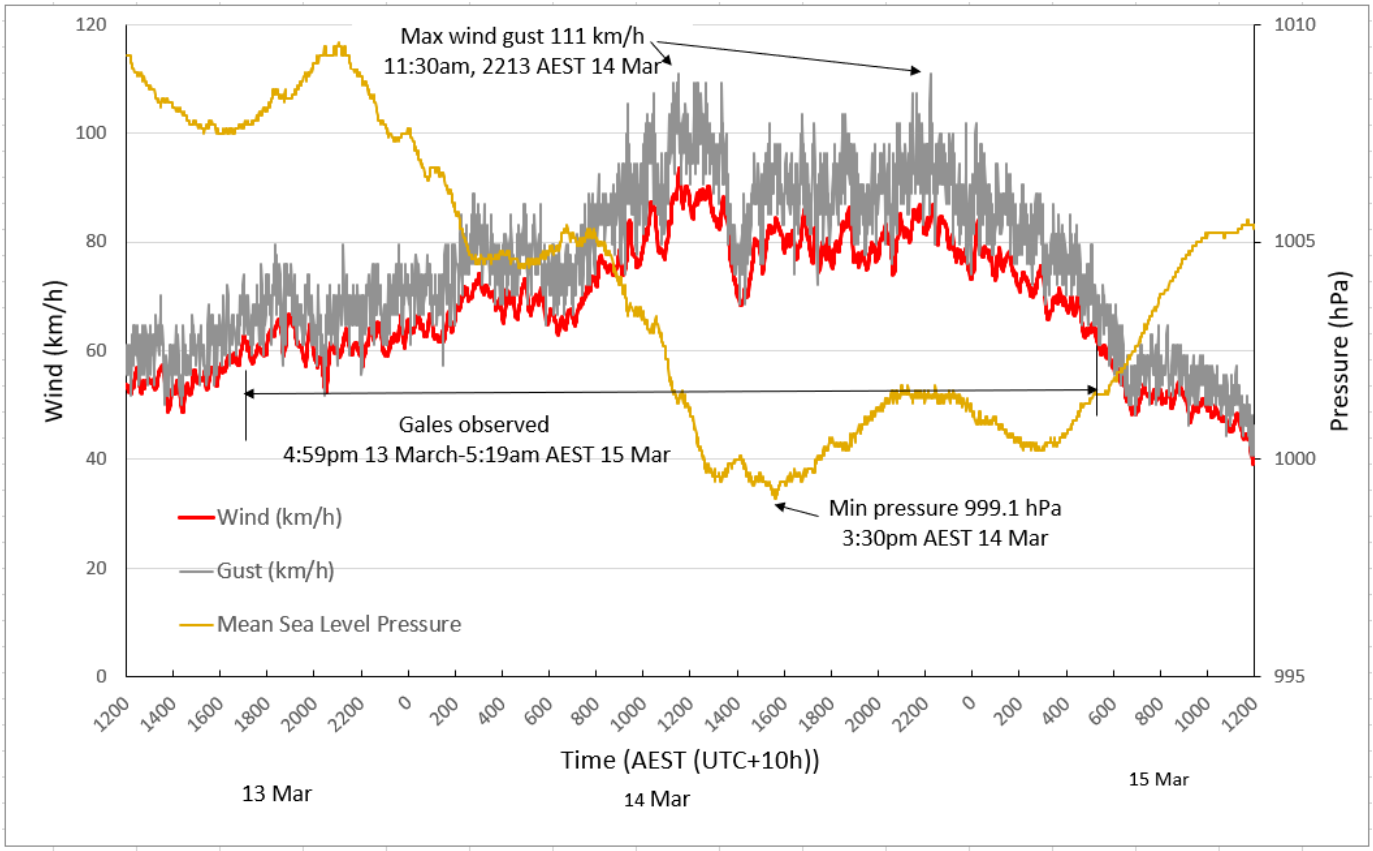
4.2 Pressure

Cato Island

Lowest mean-sea level pressure: 999.1 hPa at 0537 UTC 14 March.

Figure 7 shows a complete graph of wind and pressure observations at Cato Island during the event.

Figure 7. Wind and pressure observations at Cato Island, 13-15 March (times in AEST, UTC +10 hours).



5. Forecast Performance

Official Tropical Cyclone Forecast Track Maps were issued between 13-14 March 2018. Ocean Wind Warnings for a tropical cyclone in the Coral Sea commenced at 0645 UTC 13 March and continued until 1829 UTC on the same day. Tropical Cyclone Information Bulletins commenced at 0616 UTC 13 March and continued until 2347 UTC on the same day.

The accuracy figures for Tropical Cyclone Linda can be seen in the table below. The sample size of just four is too small to draw meaningful conclusions.

The accuracy statistics obtained by comparing the forecast positions and the intensities against the best track for Linda are:

	0	6	12	18	24	36	48	72	96	120
Position Absolute error (km)	33	97	137	162	246	426	-	-	-	-
Intensity Absolute error (kn)	8.8	7.7	7.5	6.5	7.1	5.0	-	-	-	-
Sample Size	4	4	4	4	4	2	0	0	0	0

List of abbreviations

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