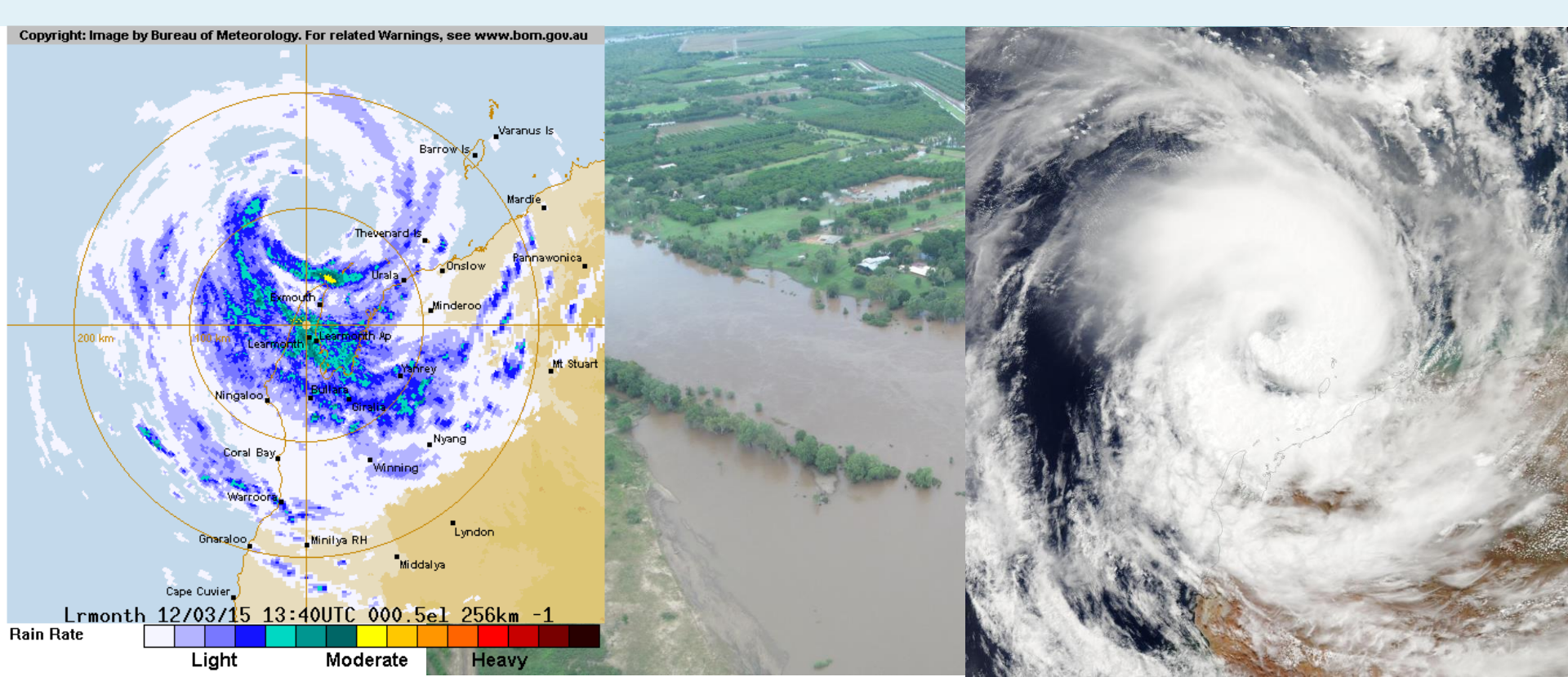




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Tropical Cyclone and Flood Pre-Season Presentation 2015/2016

Grahame Reader and Bradley Santos





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Outline

- Review of the 2014/15 season
- 2015/16 Seasonal Outlook
- New Bureau Products/Services
- Tropical Cyclone *Quang* Case Study
- Questions and Discussion



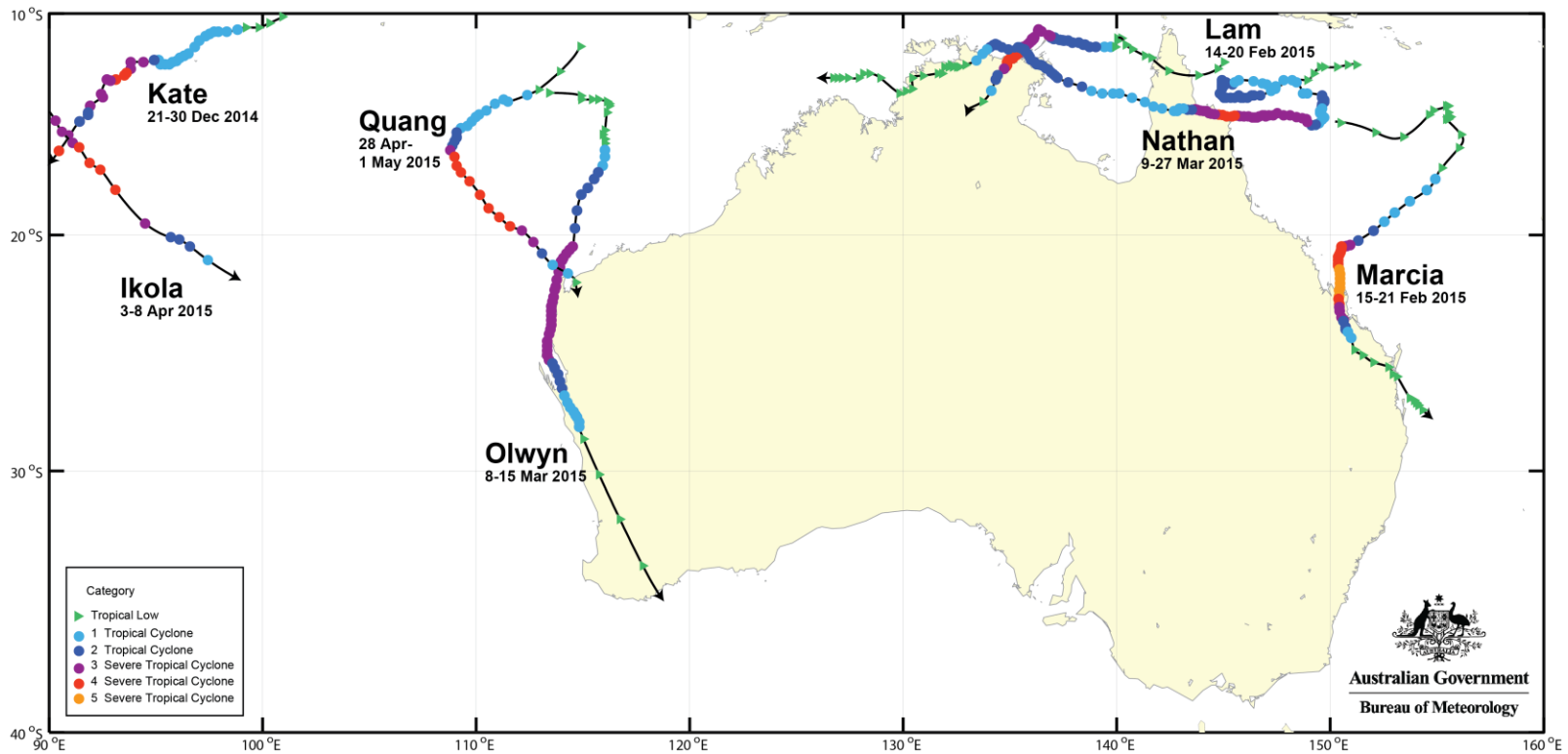
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Review of the 2014/15 season

Summary of the Tropical Cyclone Outlook for Western Australia:

- A 38% chance of an above average number (62% chance of a below average number) of tropical cyclones in waters off the northwest coast (average number is five).
- Likelihood of around two coastal impacts.
- Significant risk of at least one severe tropical cyclone coastal impact during the season.



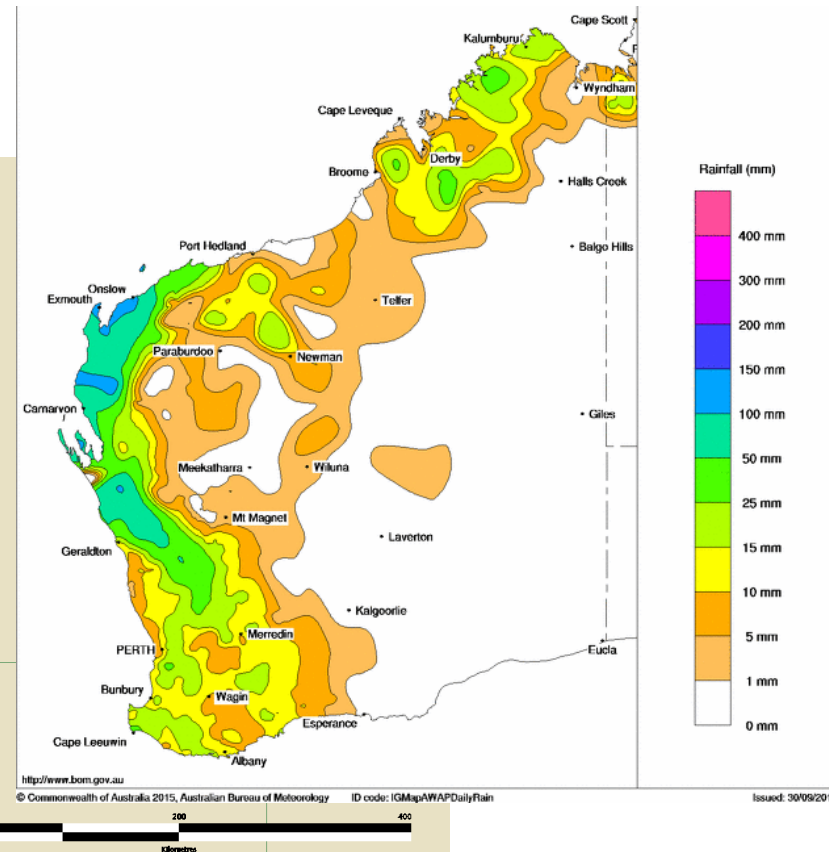
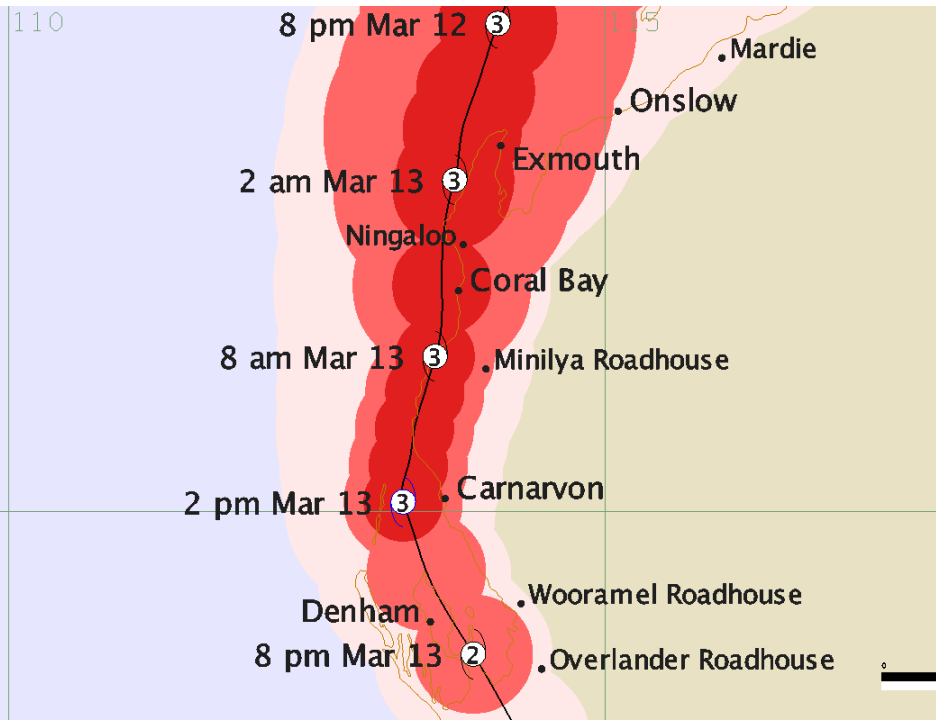


Severe Tropical Cyclone Olwyn

It is important to remember that a tropical cyclone is not a point and that the associated hazards can extend well away from the cyclone centre.

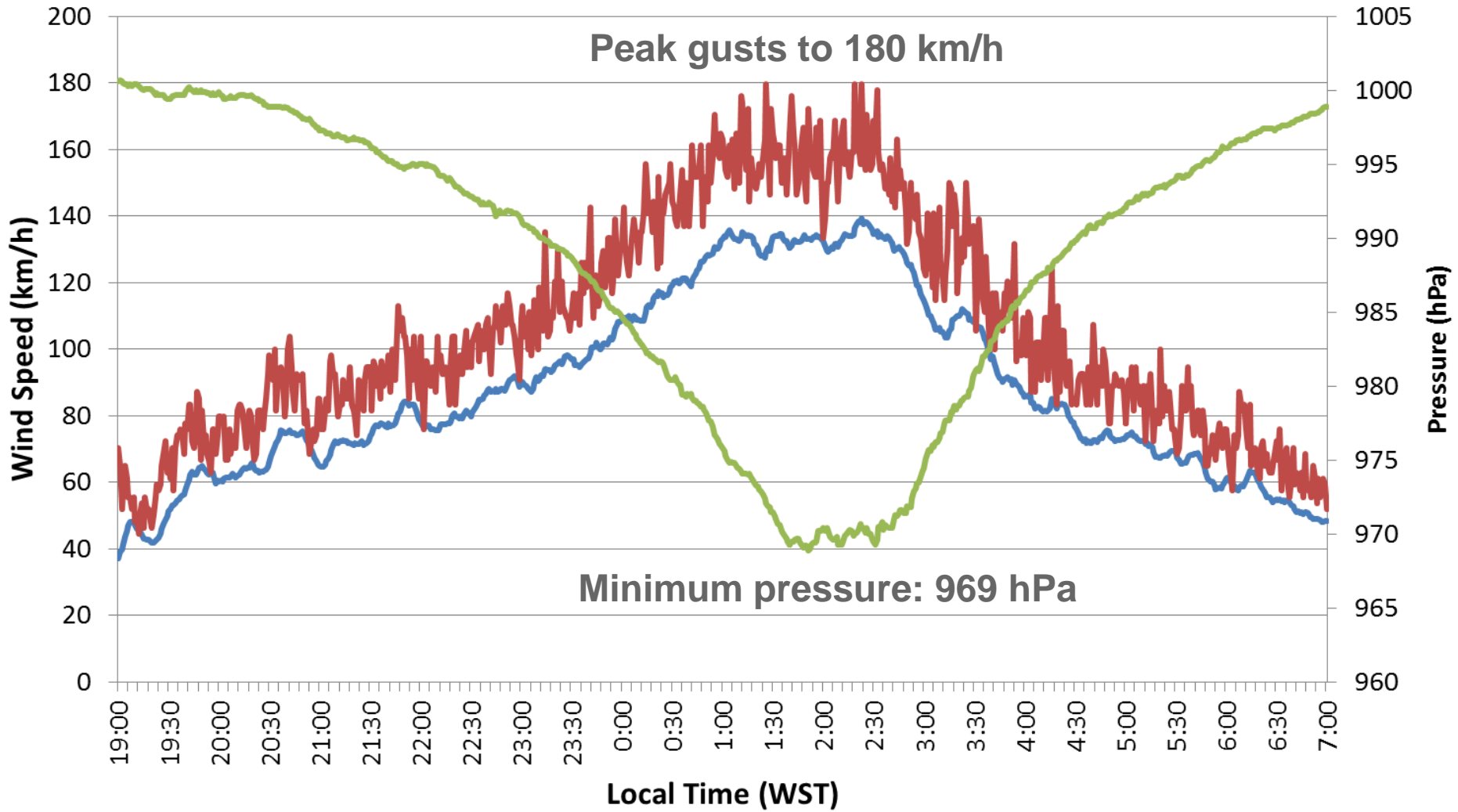
- Red** - hurricane force / very destructive winds.
- Light red** - storm force / destructive winds.
- Pink** - gale force / damaging winds.

Rainfall Total 11-15 March 2015



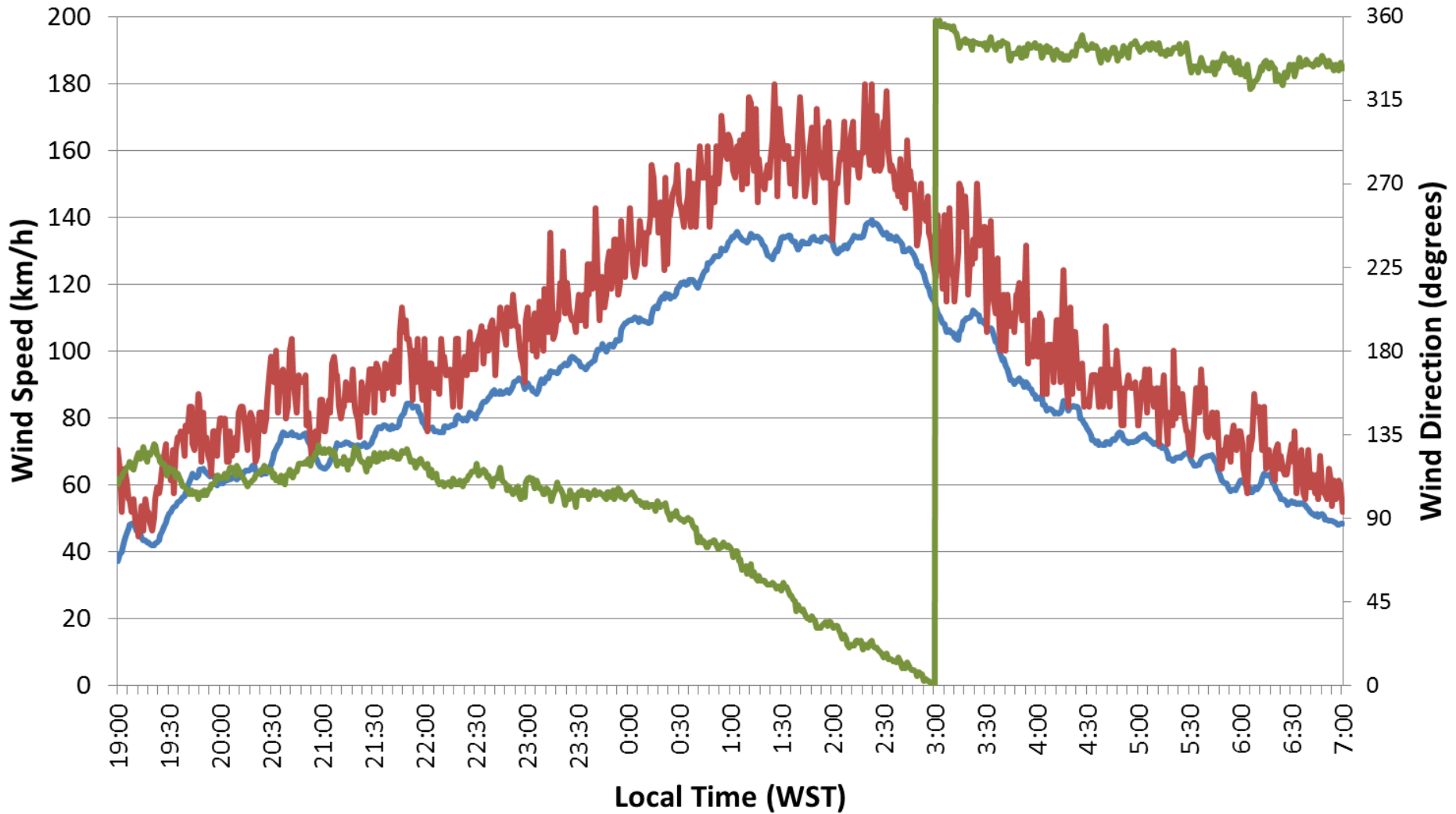
Weather Observations from Learmonth Airport 12-13 March 2015

— Wind Speed (km/h) — Wind Gust (km/h) — Pressure (hPa)



Weather Observations from Learmonth Airport 12-13 March 2015

— Wind Speed (km/h) — Wind Gust (km/h) — Wind Direction (degrees)





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2015/16 WA Tropical Cyclone Seasonal Outlook

- **Irrespective of the outlook, communities need to be prepared from the start and throughout the TC season.**
- An 85% chance of a below average number (15% chance of an above average number) of tropical cyclones in waters off the northwest coast (average number is five).
- First cyclone near the coast likely to be later than usual, probably in early to mid-January. (In most years the first cyclone is seen near the coast late December to early January.)
- Regardless of the season (neutral, La Nina, El Nino), the chance of a coastal impact remains the same.



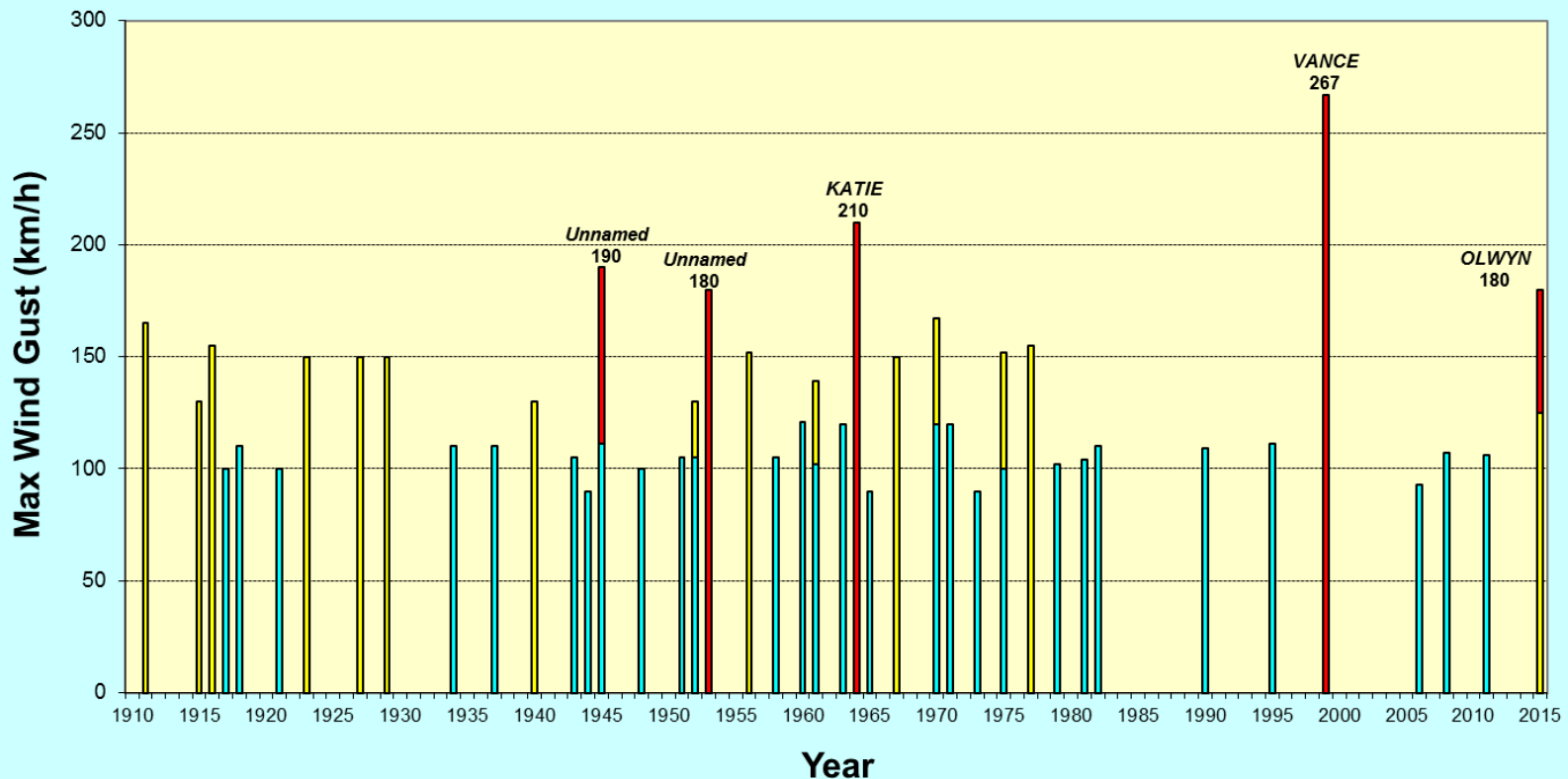
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Tropical Cyclone Climatology



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Tropical Cyclones at Northwest Cape 1910 - 2015



Note: Category relates to the impact at the town not to the intensity of the cyclone.
Wind instrumentation and official sites have changed over the years.
The accuracy of wind gust values early in the record are usually less reliable than those in more recent times.

■ Category 1 ■ Category 2 ■ Category 3,4,5

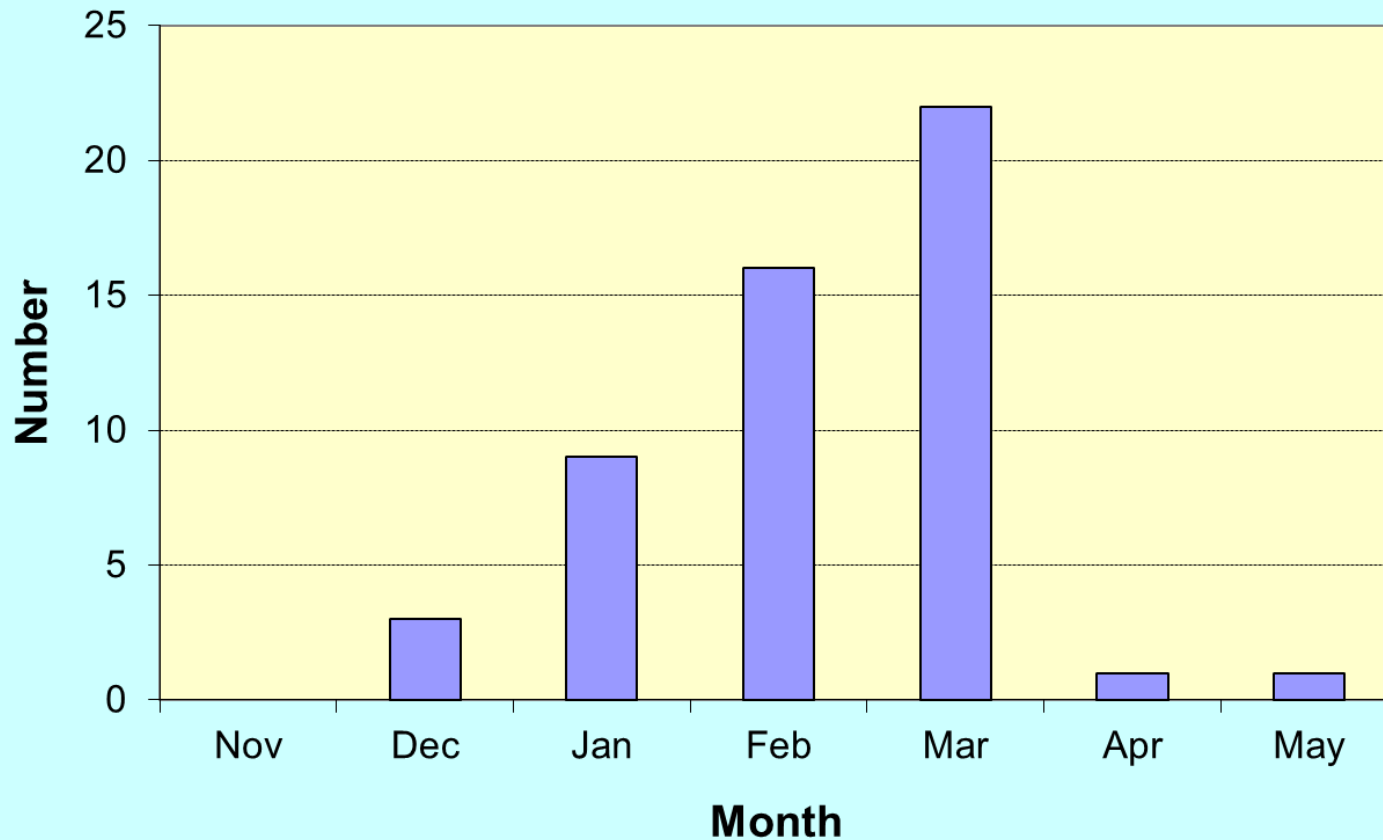


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Tropical Cyclone Climatology

Monthly tropical cyclone frequency at Exmouth
1910 - 2015





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Tropical cyclones at Exmouth/Learmonth/NW Cape area (1910 - 2015)

- Cyclone season mid-December to April, most common in February and March
- 51 cyclone impacts
- A cyclone impact every 2 years or so
- A severe cyclone impact every 21 years or so
- Severe cyclones: 1945, 1953, *Katie* (1964), *Vance* (1999), *Olwyn* (2015)



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(New) Bureau of Meteorology Products/Services

- **New Satellite – Himawari 8**
- **5 day Forecast Track Map on MetEye**
- **Social Media – Twitter, YouTube**
- **Mobile Web Page**
- **MetEye**

Himawari-8 satellite Facts and figures

LAUNCHED FROM THE
TANEGASHIMA
SPACE CENTRE, JAPAN


LOCATED AT LONGITUDE 140.8°E
35 800 km
ABOVE THE EQUATOR

1ST GEOSTATIONARY
WEATHER SATELLITE
TO TAKE **TRUE COLOUR**
PICTURES




50 TIMES MORE DATA

HIMAWARI-8 PROVIDES

 **SCANS OF OUR SIDE OF THE EARTH EVERY TEN MINUTES**

 **NEAR REAL-TIME DELIVERY OF DATA TO FORECASTERS**

 **DATA TO FEED INTO NUMERICAL WEATHER PREDICTION MODELS ON OUR SUPERCOMPUTER**

SATELLITE COMPARISON

OLD MTSAT-2 **VS** NEW HIMAWARI-8

OLD MTSAT-2	RESOLUTION	NEW HIMAWARI-8
1-4 km		0.5-2 km
0.3 GB	DATA PER SCAN	2.3 GB
1	SCANS PER HOUR	6
5	IMAGE TYPES RECORDED	16

Benefits to Australia

IMPROVING THE BUREAU'S ABILITY TO DETECT AND MONITOR:



CENTRES OF TROPICAL CYCLONES OVER THE OCEAN



THUNDERSTORMS AS THEY DEVELOP



VOLCANIC ASH, FIRE AND SMOKE



FOG AND LOW CLOUD

 JOIN THE CONVERSATION
#BOMsat

 SEE IT FOR YOURSELF
www.bom.gov.au/satellite

WITH THANKS TO THE JAPAN METEOROLOGICAL AGENCY



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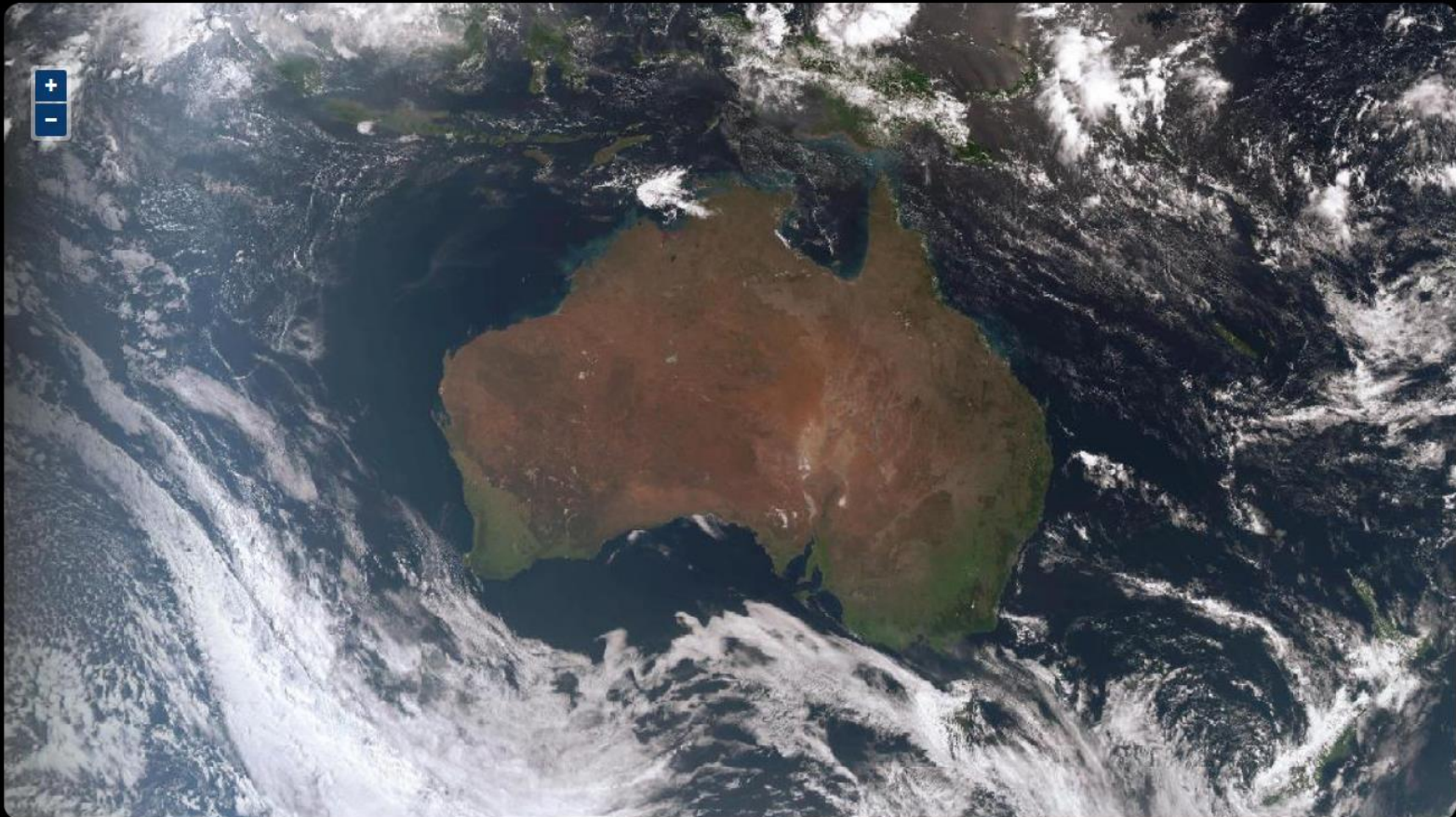
New Satellite Viewer

<http://satview.bom.gov.au/>



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Day + Night



Layers +

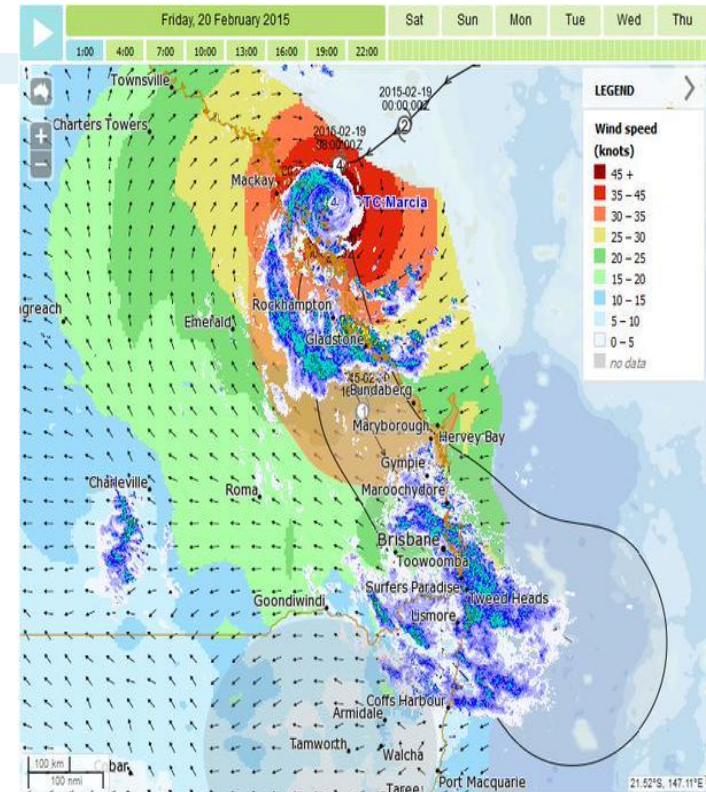
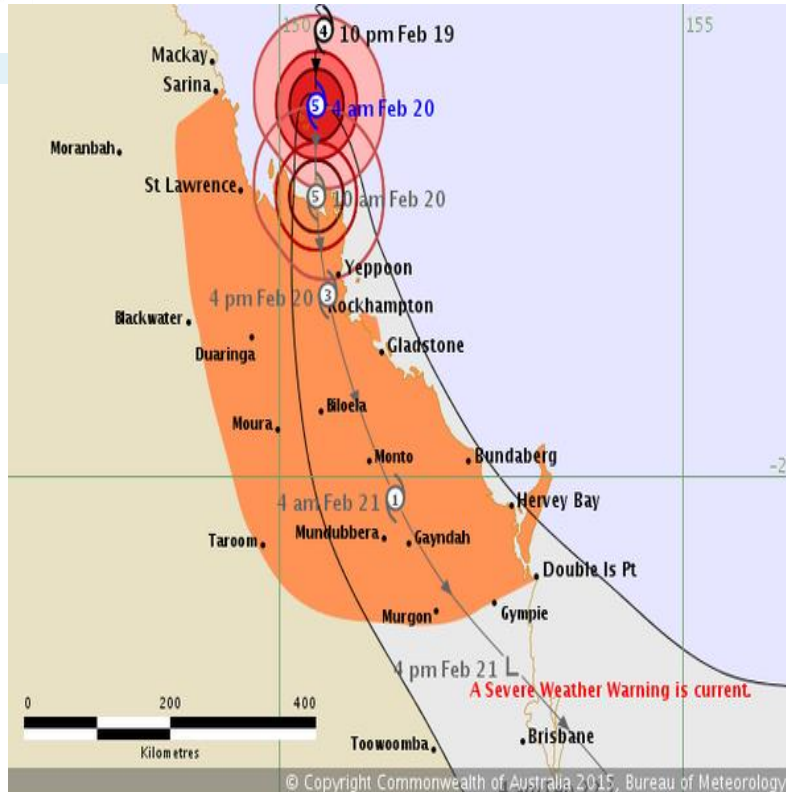
Thursday, 1 October 2015 08:30 am AVIST

Slower — ⏪ ⏩ + Faster





Extension of the Forecast Track beyond 72 hours in MetEye



- The full Tropical Cyclone Track and the uncertainty zone to 72 hours can be viewed in MetEye via the zoom out feature.
- From 2015-16 season, the official Tropical Cyclone Threat map won't change but users would be able to view the track and the uncertainty zone to 120 hours by click of a button in MetEye.



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Bureau of Meteorology YouTube Channel

<https://www.youtube.com/user/BureauOfMeteorology/videos>



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Himawari-8



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by Bureau of Meteorology
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Himawari-8: The weather comes alive
by Bureau of Meteorology
1,318 views · 1 day ago
CC



Himawari-8: Facts and figures
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Climate and Water Outlook

The monthly Climate and Water Outlook videos covers rainfall, streamflow and temperature for the next three months.



Climate and Water Outlook, September–November 2015



Climate and Water Outlook, August–October 2015



Climate and Water Outlook, July–September 2015



Climate and Water Outlook, June–August 2015



Climate and Water Outlook, May–July 2015



Climate and Water Outlook, April–June 2015



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Bureau of Meteorology YouTube Channel





Website

1,463

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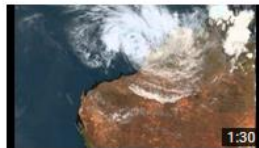
Tropical cyclone forecast track maps – Stay informed to stay safe

by Bureau of Meteorology
11 months ago • 4,981 views
Find out more about the Bureau of Meteorology's Tropical Cyclone Forecast Track Map. This graphical product provides information about the movement and intensity of a tropical ...



Severe Tropical Cyclone Ita 5-13 April 2014

by Bureau of Meteorology
1 year ago • 5,543 views
This satellite loop from the Japanese MTSAT satellite orbiting approximately 35 000 km above the Earth's surface, captures the formation and movement of severe tropical cyclone ...



Tropical Cyclone Christine 25-31 December 2013

by Bureau of Meteorology
1 year ago • 7,928 views
This special satellite loop, with images at 10 minute intervals from the Japanese MTSAT satellite orbiting approximately 35 000 km above the Earth's surface, dramatically captures ...



Bureau of Meteorology Social Media: Twitter



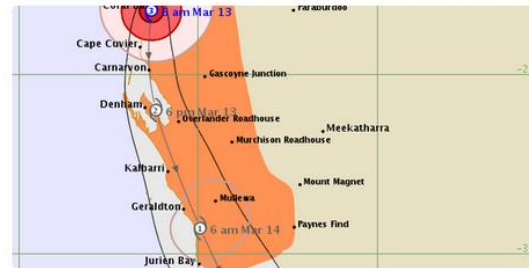
BOM WA
@BOM_WA

TWEETS 836 FOLLOWING 52 FOLLOWERS 14K



BOM WA @BOM_WA · Mar 12

Track map for Severe Tropical
#CycloneOlwyn. bom.gov.au/products/IDW60... 9km SW of Coral Bay and still a Cat 3.



9



BOM WA @BOM_WA · Mar 12

Severe Tropical Cyclone Olwyn near Coral Bay. Very destructive winds being experienced. bom.gov.au/cyclone

7



BOM WA @BOM_WA · Mar 12

Severe Tropical Cyclone Olwyn moving towards Coral Bay. Very destructive winds being experienced. bom.gov.au/cyclone

3



BOM WA @BOM_WA · Mar 12

Severe Tropical Cyclone Olwyn just southwest of Exmouth. Very destructive winds being experienced. bom.gov.au/cyclone

6



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BOM Mobile Website



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m.bom.gov.au

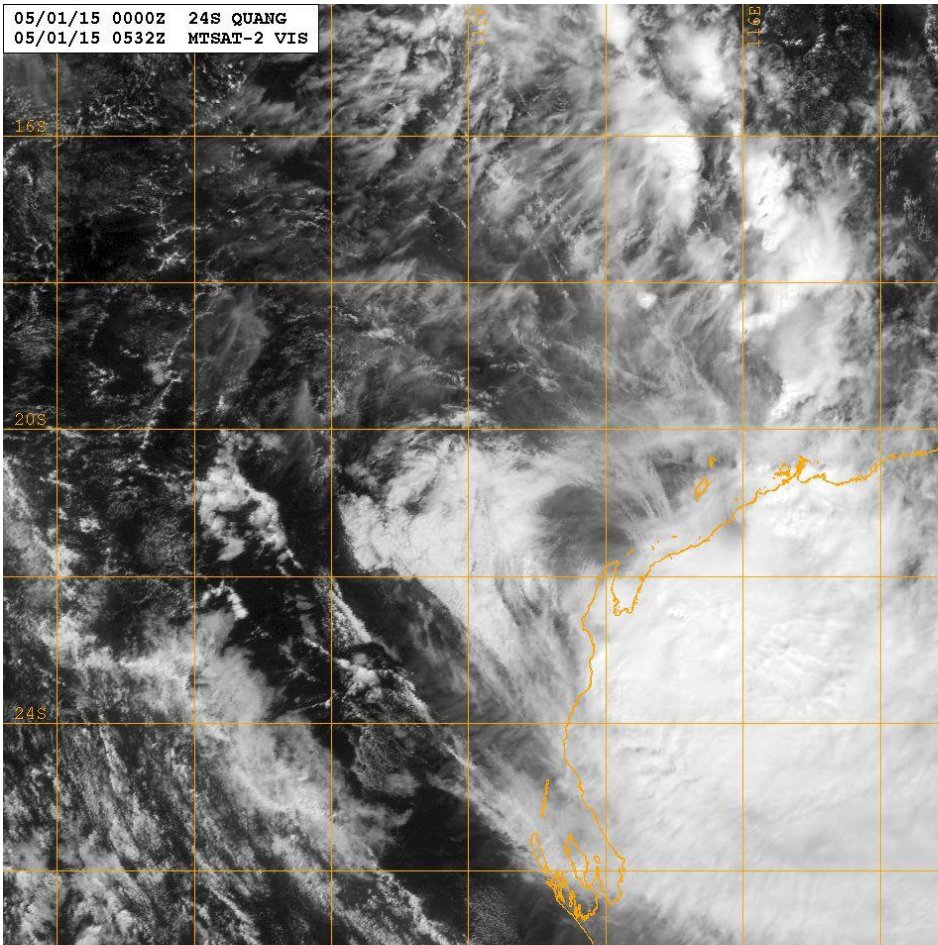




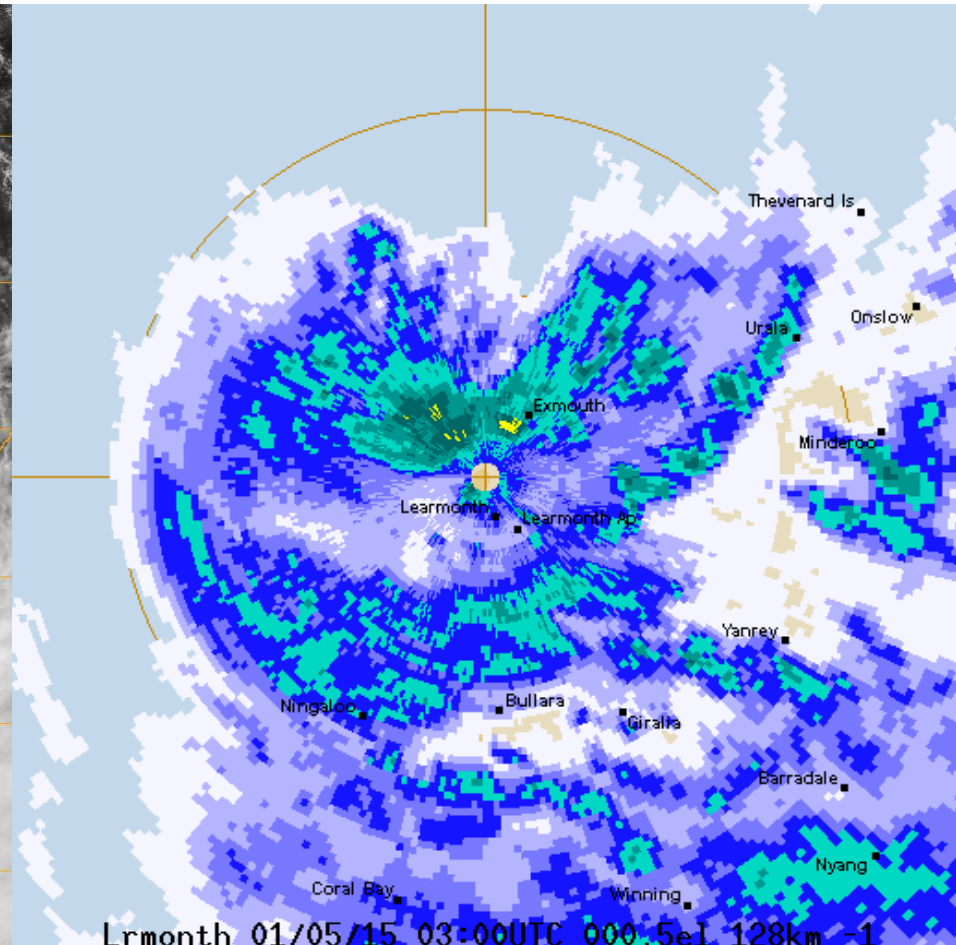
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Severe Tropical Cyclone Quang

Grahame Reader, Manager Weather Services



Naval Research Lab http://www.nrlmry.navy.mil/sat_products.html
<-- Visible (Sun elevation at center is 50 degrees) -->



Rain Rate





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Severe Tropical Cyclone *Quang*

Why are we here?

- 2014/15 –a tough Tropical Cyclone (TC) Season for Exmouth residents!
 - Prior to TC Olwyn, the last significant impact was Severe TC Vance in 1999.
- To hear and understand first hand the impacts on the ground and acknowledge community concerns regarding TC Quang.
- Address confusion around the TC position and the associated impact.
- Explain what occurred
- Answer questions and receive feedback.

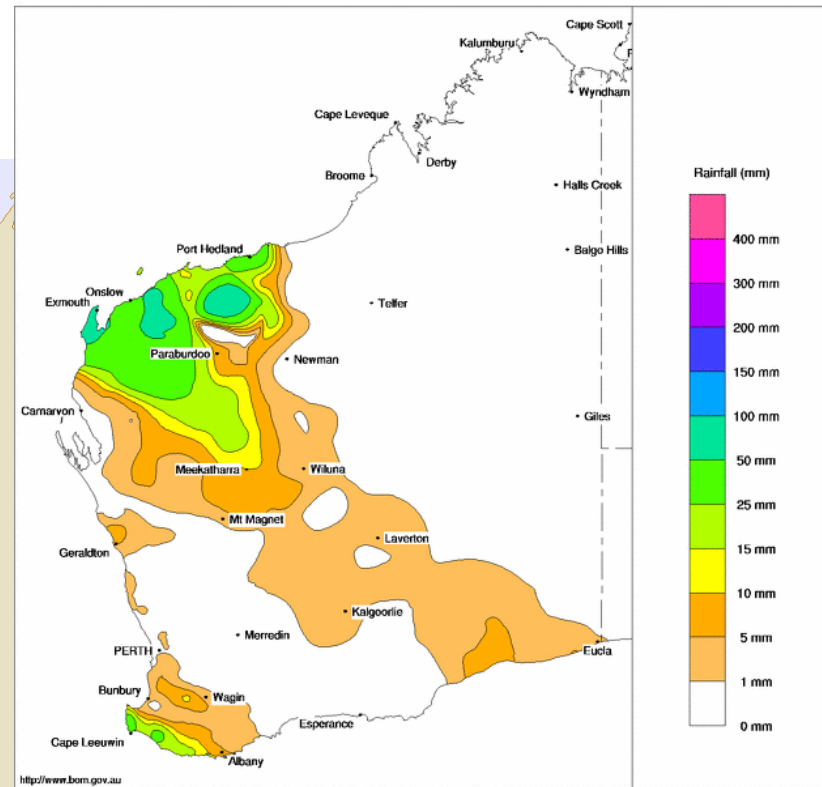
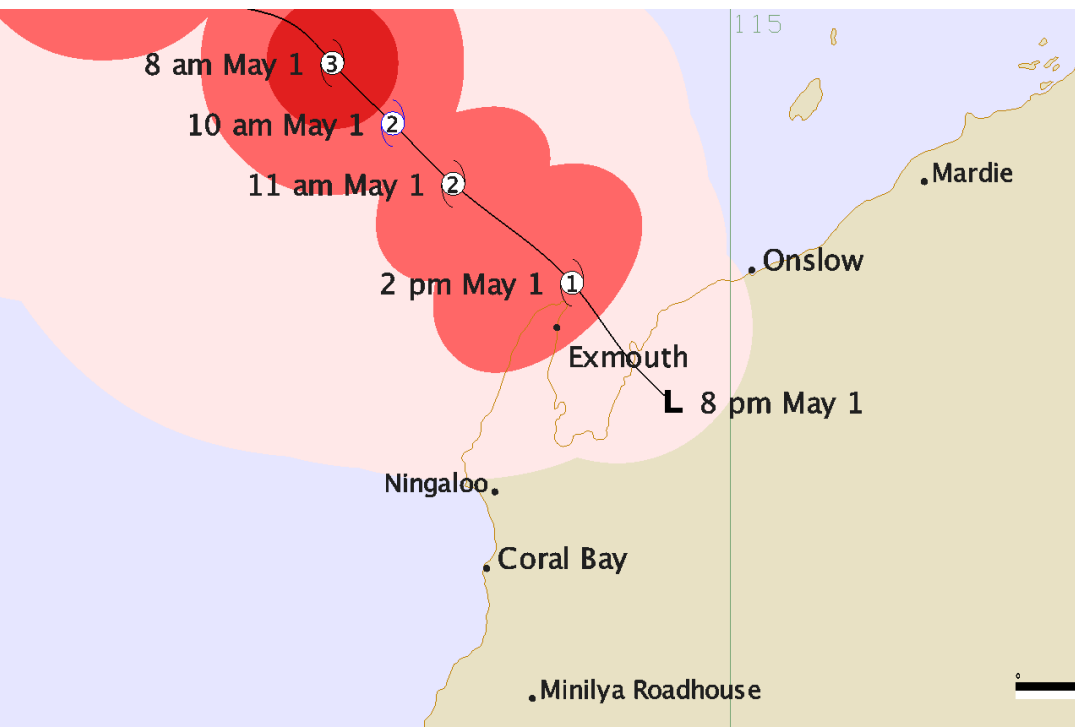


Severe Tropical Cyclone Quang

A significant impact on the Exmouth community,

Rainfall Total 29 April – 2 May 2015

- Red - hurricane force / very destructive winds.
- Light red - storm force / destructive winds.
- Pink - gale force / damaging winds.





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Unusual TC?

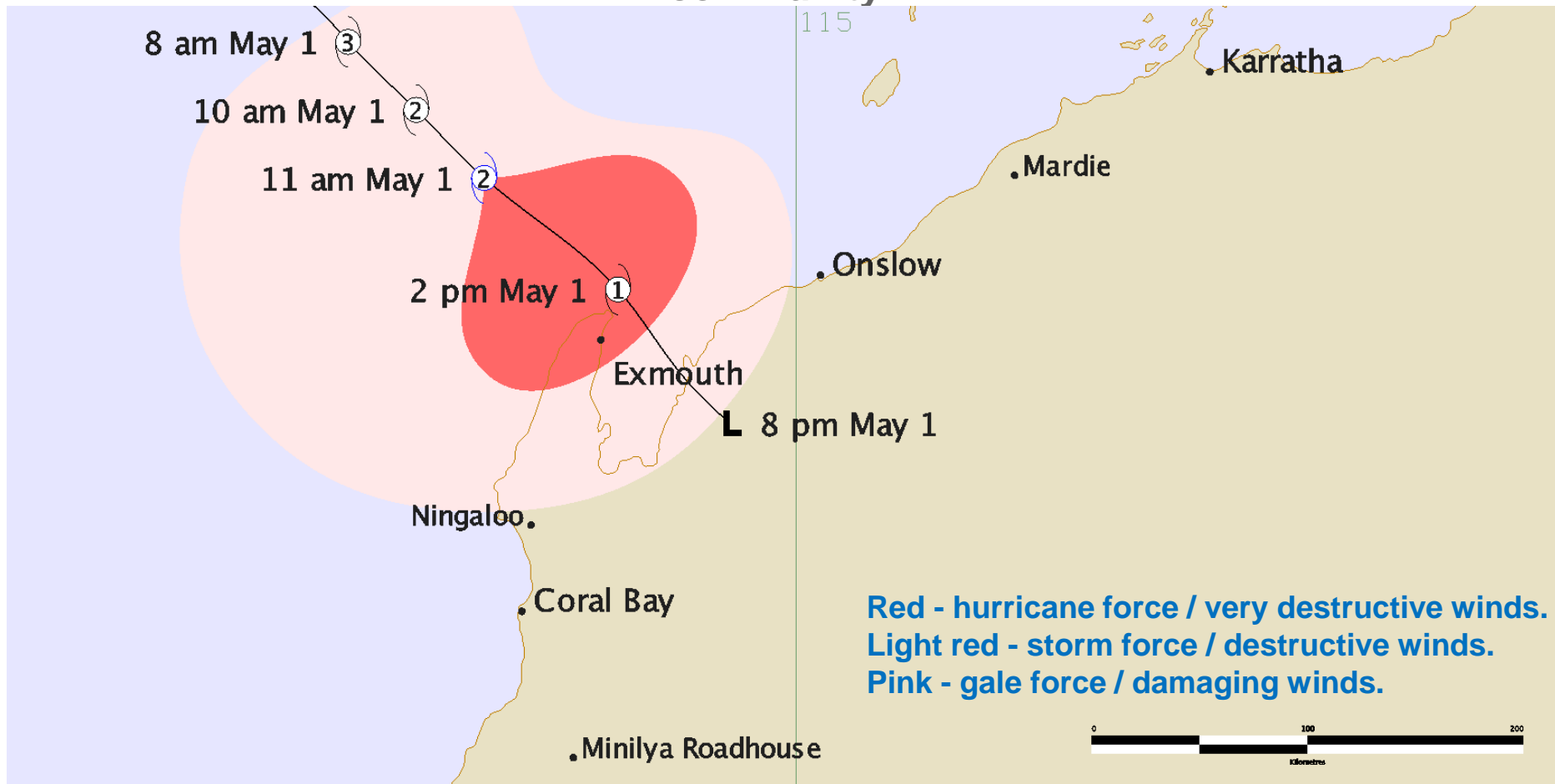
Quang was both unusual and difficult to forecast.

- Late season tropical cyclone 27 April – 1 May.
- Rapidly changing system: Cat 1 to Cat 4 in 36 hours.
Cat 4 to tropical low in 30 hours.
- Rapid weakening due to increasing 'wind shear'
- Causing the system to change structure.
- Destructive winds and heavy rain detached from the centre and affected Exmouth and surrounds well ahead of the centre passing by
- Highlighting that significant winds don't have to be near the cyclone centre.



Impact

Category 2 cyclone impact, with destructive winds, significant effect on community



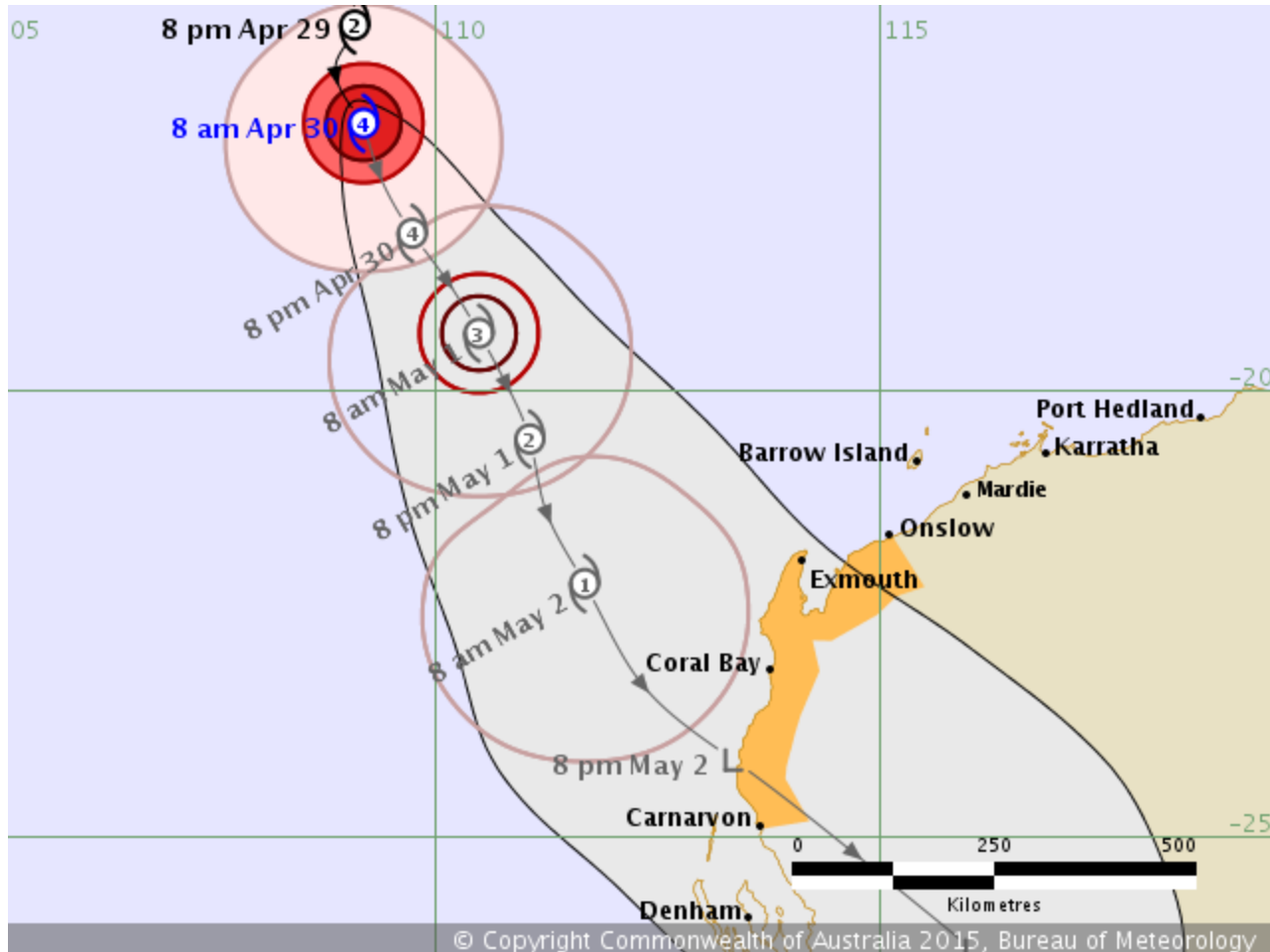


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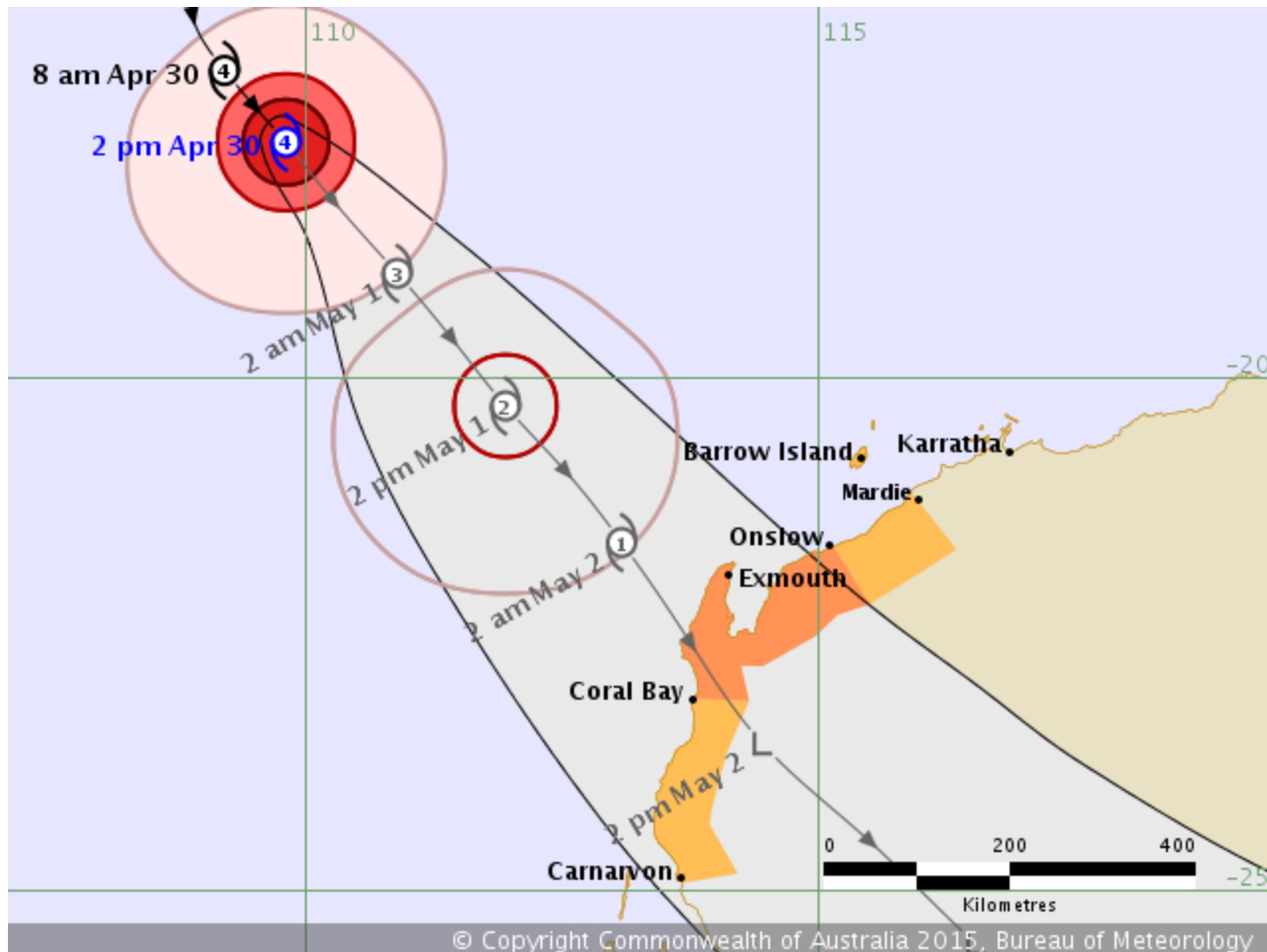
Advanced Notice

First Forecast Track Map issued 9:15am Thursday 30 April



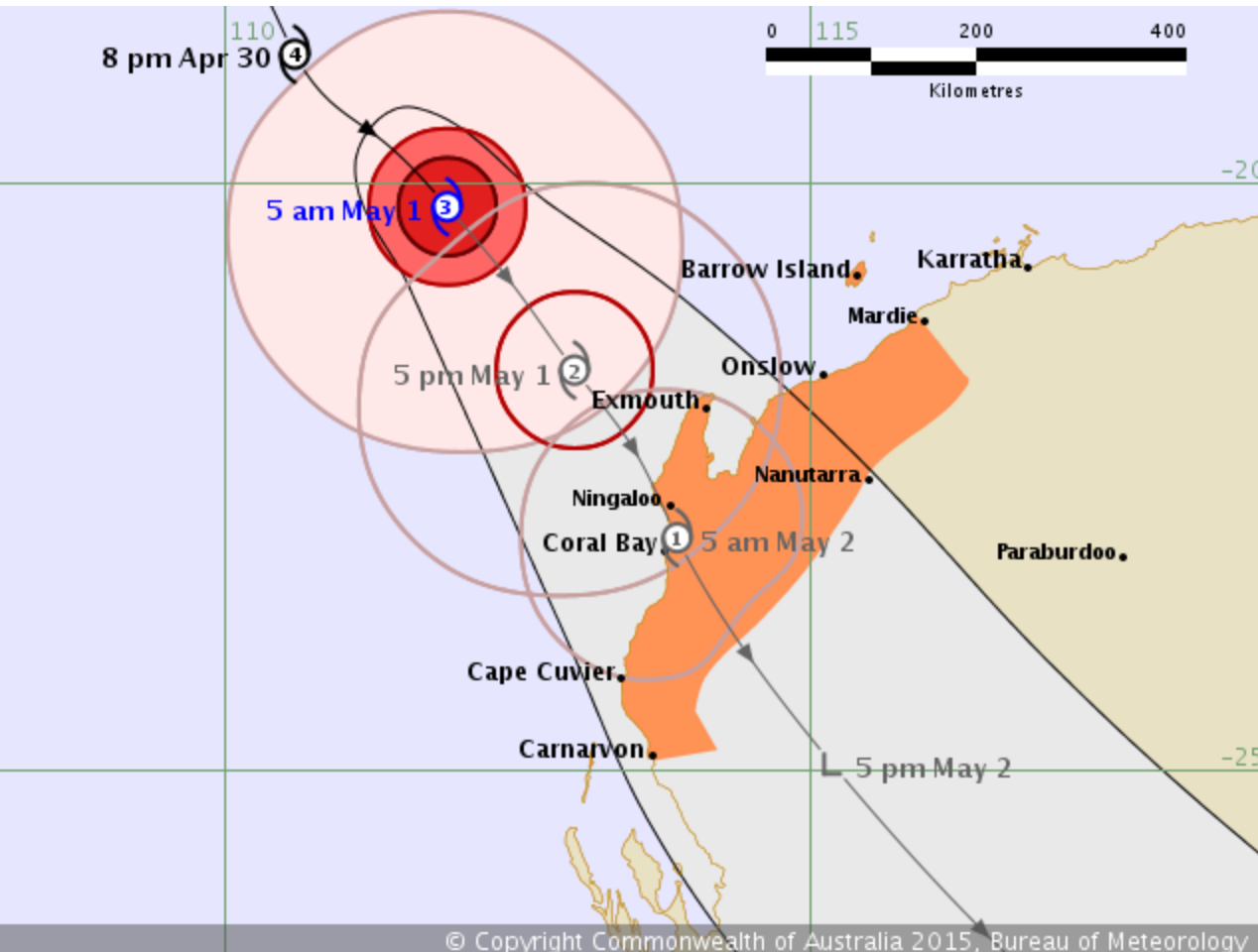


Watch upgraded to Warning at 3:00pm Thursday 30 April





TC Forecast Track Map issued at 6:00am Friday 1 May



DAMAGING WINDS are expected near North West Cape later Friday morning or early on Friday afternoon.

There is a slight risk of DESTRUCTIVE WINDS near North West Cape this evening if Quang maintains intensity for longer than forecast.

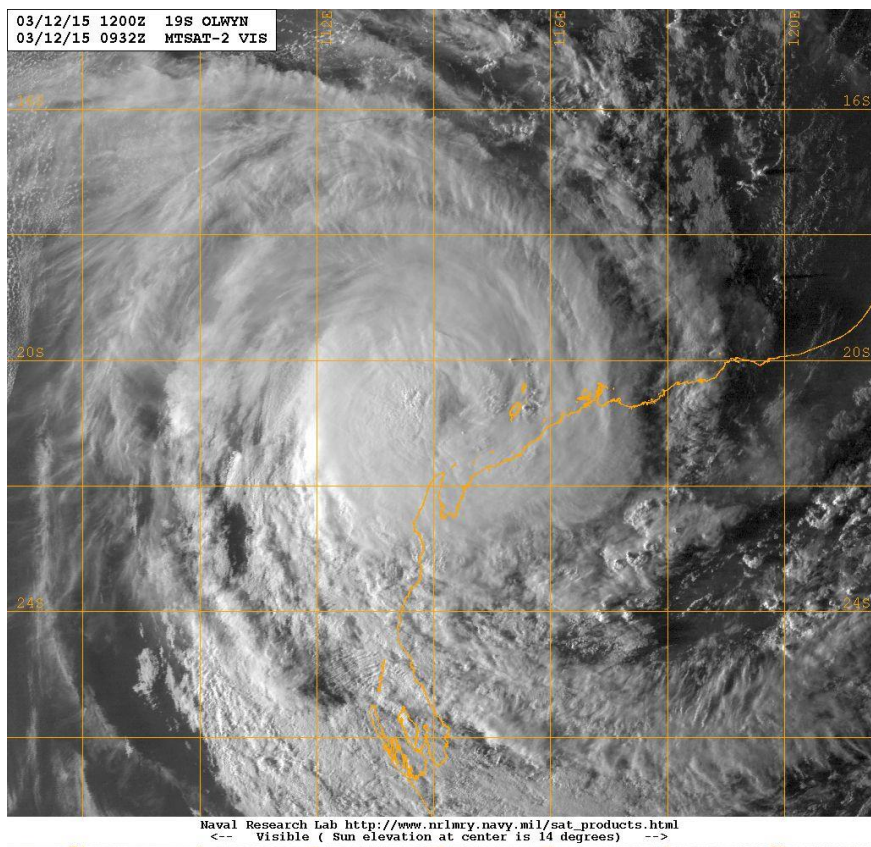


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What actually happened Olwyn versus Quang Satellite Images

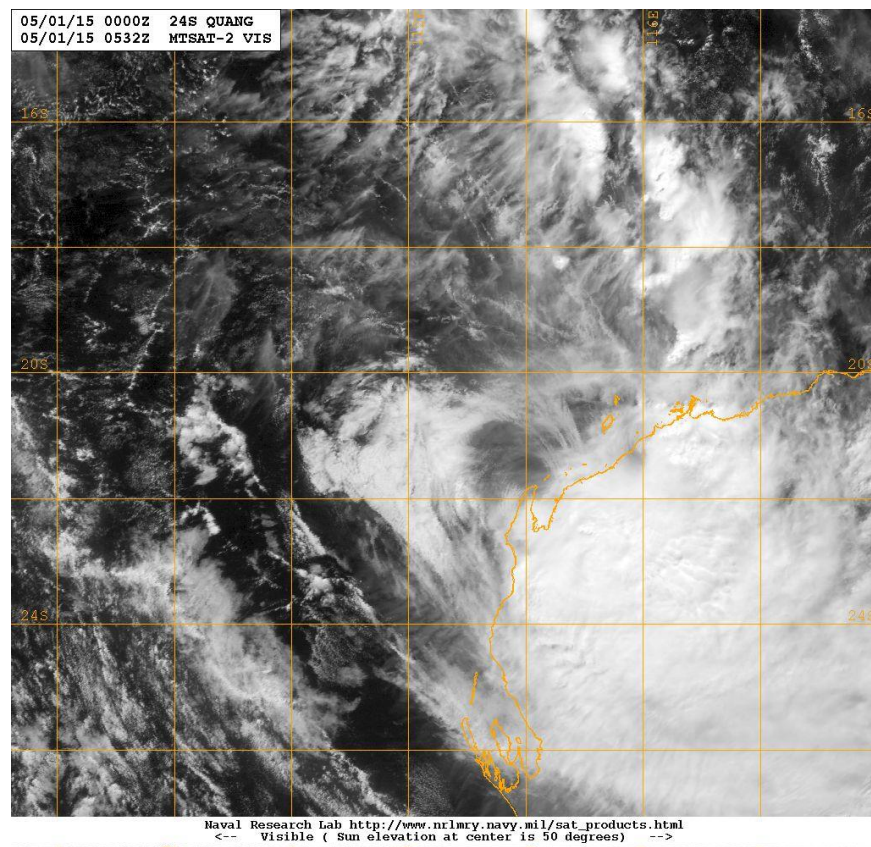
Images courtesy of the Japan Meteorological Agency and the Naval Research Laboratory

Olwyn



5:30pm WST 12 March 2015

Quang



1:30pm WST 1 May 2015

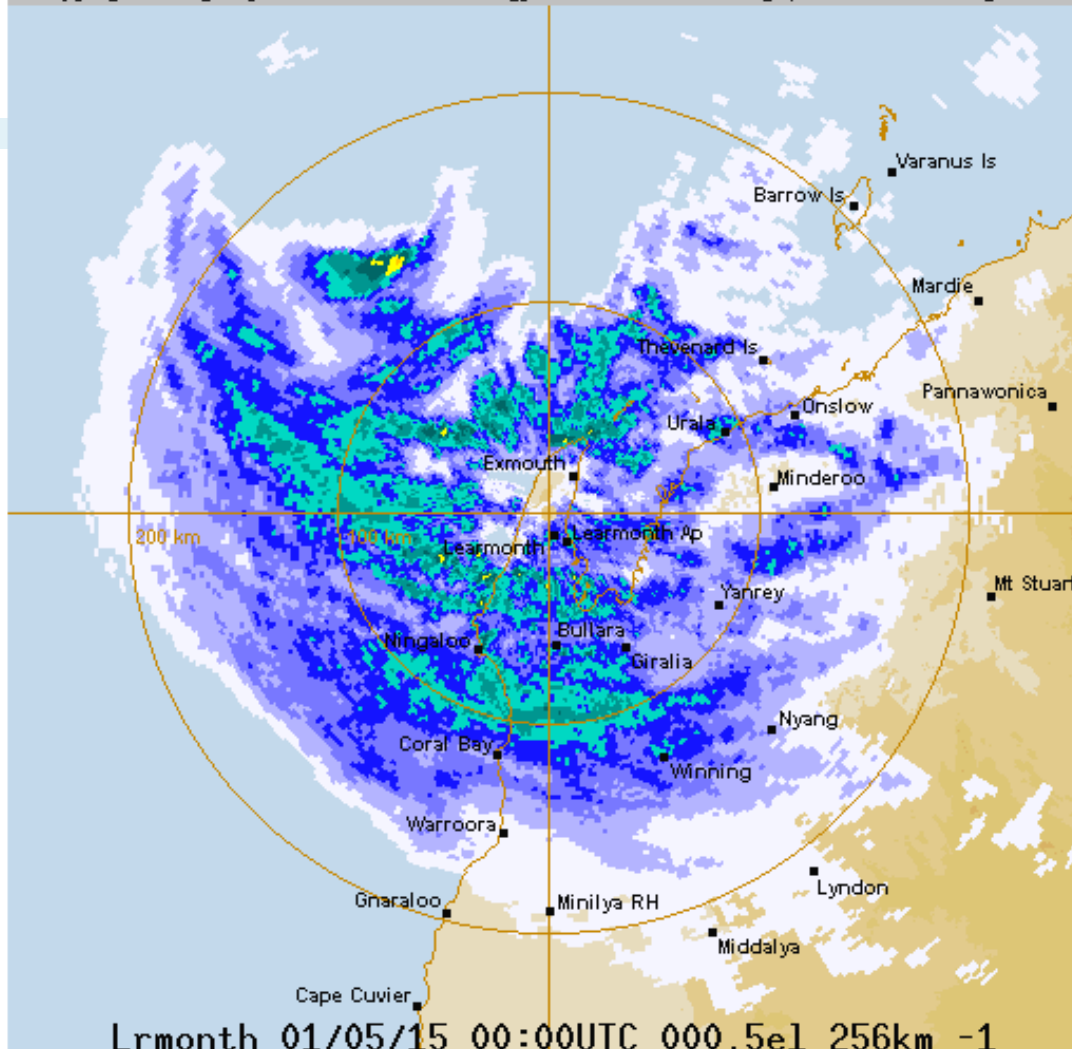


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Radar Loop

Copyright: Image by Bureau of Meteorology. For related Warnings, see www.bom.gov.au



Lrmonth 01/05/15 00:00UTC 000.5e1 256km -1

Rain Rate



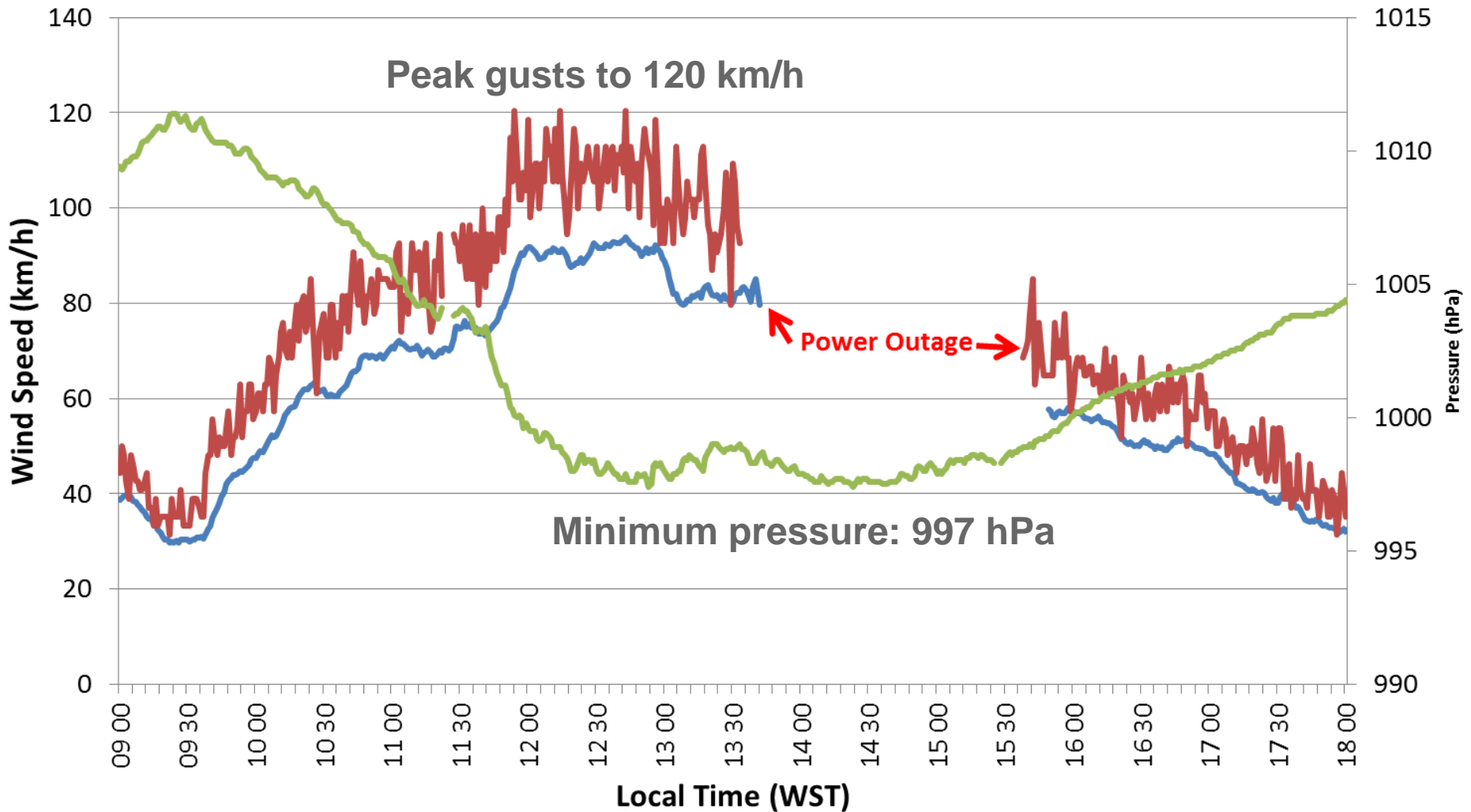
Light

Moderate

Heavy

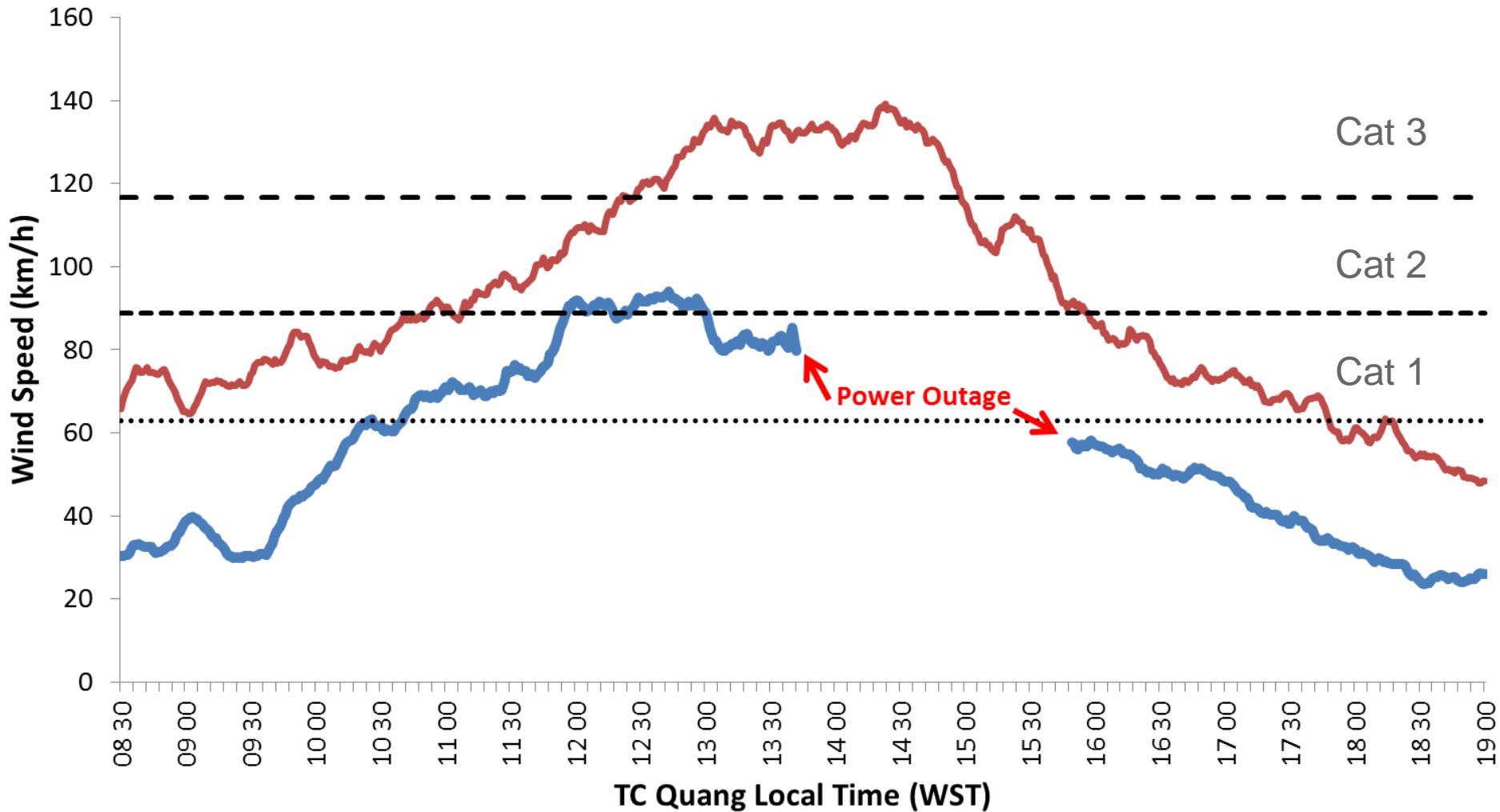
Weather Observations from Learmonth Airport 1 May 2015

— Wind Speed (km/h) — Wind Gust (km/h) — Pressure



Quang vs Olwyn: Wind Speed Comparison

TC QUANG TC Olwyn Category 1 Category 2 Category 3



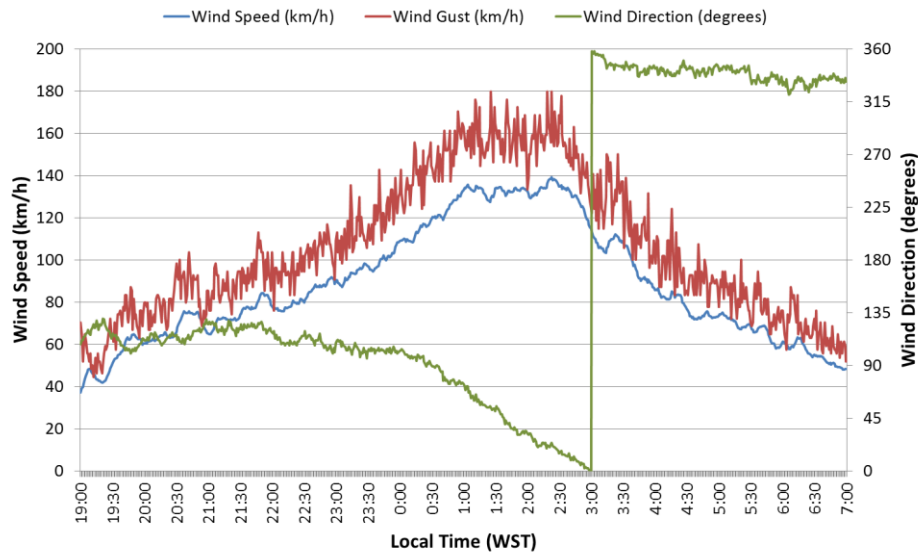


Olwyn versus Quang Wind Speed and Direction

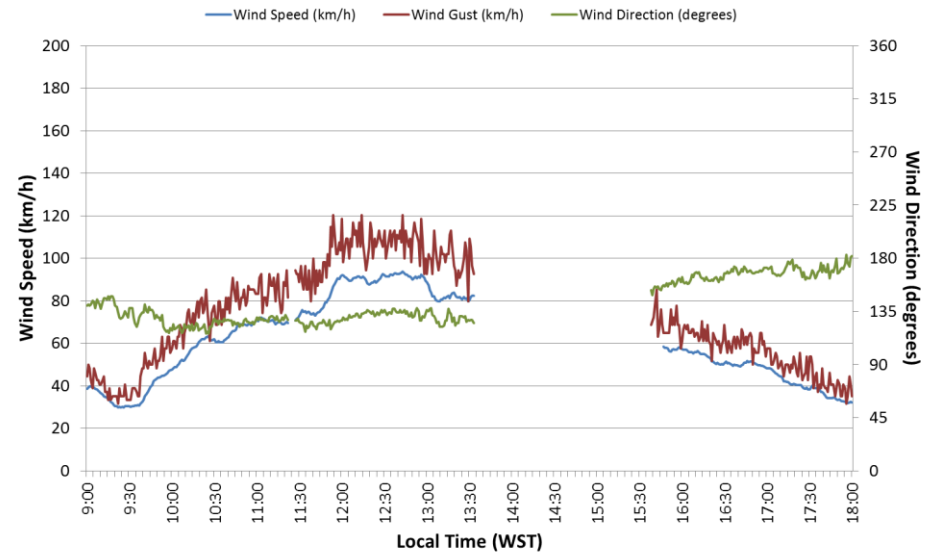
Olwyn

Quang

Weather Observations from Learmonth Airport 12-13 March 2015



Weather Observations from Learmonth Airport 1 May 2015





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Actions Taken

- Social Media and ABC Northwest Radio were actively monitored.
- Regular tweets were issued and regular ABC interviews conducted throughout.
- When the Bureau became aware of **residents' concerns**, a **live ABC interview focussed on Exmouth** was conducted and a **tweet was issued telling people that the worst was over**.



BOM WA ✓
@BOM_WA

Conditions at [#Exmouth](#) are now at their worst. Expecting an easing trend very soon. [#CycloneQuang](#)
bom.gov.au/products/IDW60...

1:25pm · 1 May 2015 · Radian6 -Social Media Management



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What have we learnt?

- TC Quang is being **intensively reviewed**.
- Ensuring that internal **training** includes a refresher on rapidly weakening cyclones.
- Need to **better communicate** the impacts associated with unusual and rapidly weakening cyclones.
- Social Media: Complements TC warnings and allows us to be **more responsive**.



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What we would like you to do

- Listen out for and read the latest TC advices and products from the Bureau.
- Be aware of the wealth of information on cyclones on the Bureau's web page – www.bom.gov.au/cyclone.
- Provide feedback, the Bureau does monitor social media.

Be assured that DFES and the Bureau are working closely together and are striving to improve the warning service.



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Department of Fire & Emergency Services





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Summary

Severe TC Quang

- Was an unusual cyclone
- Difficult to forecast, warnings were current
- but what we were expecting didn't fully eventuate
- We did respond quickly
- We've learned some lessons
- We work closely with DFES
- We're committed to improving the service to the community



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Thank you...

Any questions...

Additional information can be found on the Bureau's web pages:

- <http://www.bom.gov.au>
- <http://www.bom.gov.au/cyclone/>
- <http://www.bom.gov.au/wa/flood/>

Grahame Reader and Bradley Santos

g.reader@bom.gov.au, b.santos@bom.gov.au