Australian VLab Centre of Excellence Regional Focus Group meeting

30 March 2021

Weather and Forecast Discussion with a focus on the recent heavy rainfall event over eastern Australia, March 2021

Bodo Zeschke Australian VLab Centre of Excellence Point of Contact

…some slides not shown…

The heavy rainfall event over eastern and northern Australia

- 2020–21 La Niña is nearing its end.
- However, a number of indicators remain at La Nina levels.
- Warmer SST off Australia.
- **Wetter than average month for northern and eastern parts of Australia.**

OLR anomalies – 7 days to 15th Mar 2021

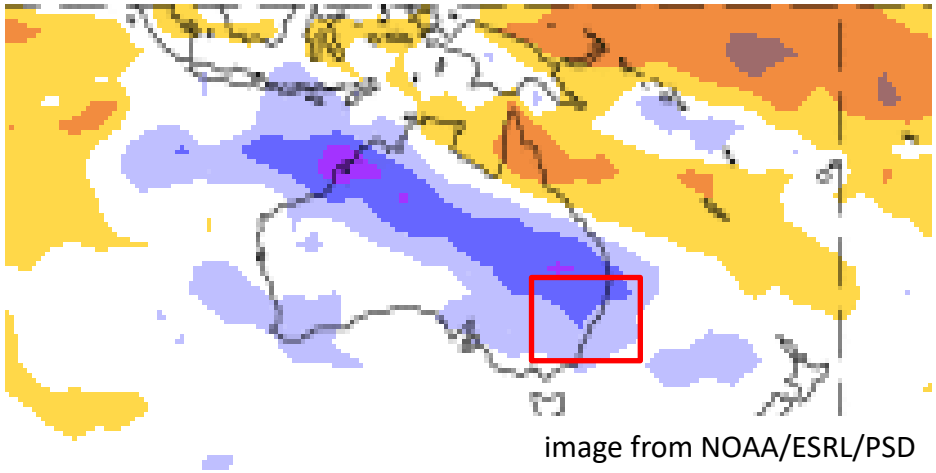
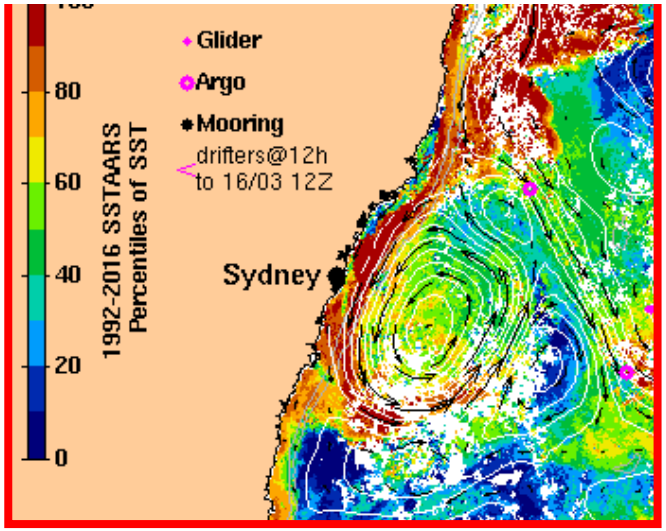
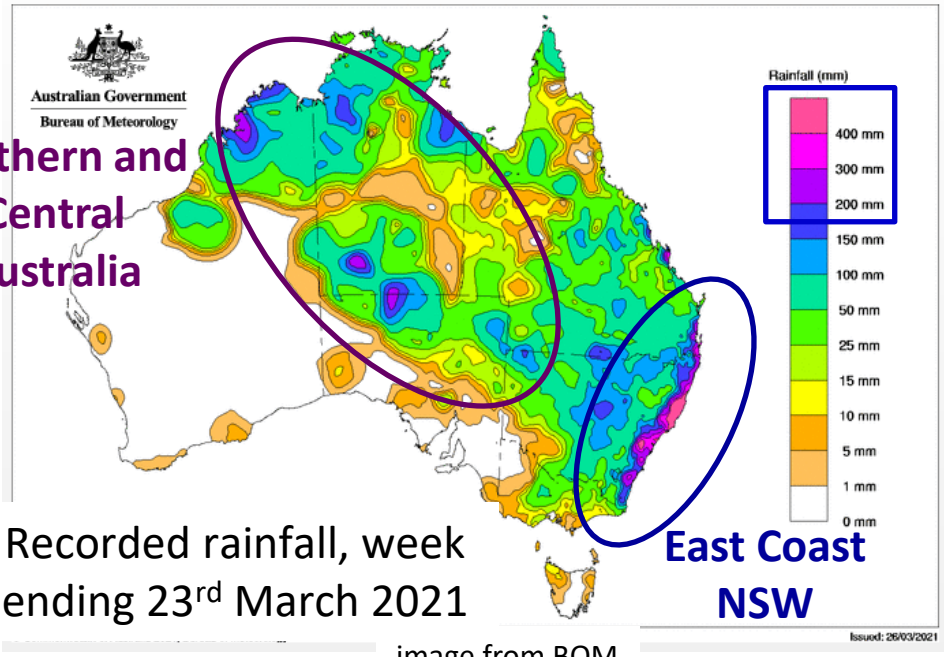


image from NOAA/ESRL/PSD

Sea surface temperature percentile anomalies 15th March 2021



images from http://oceancurrent.imos.org.au/product.php

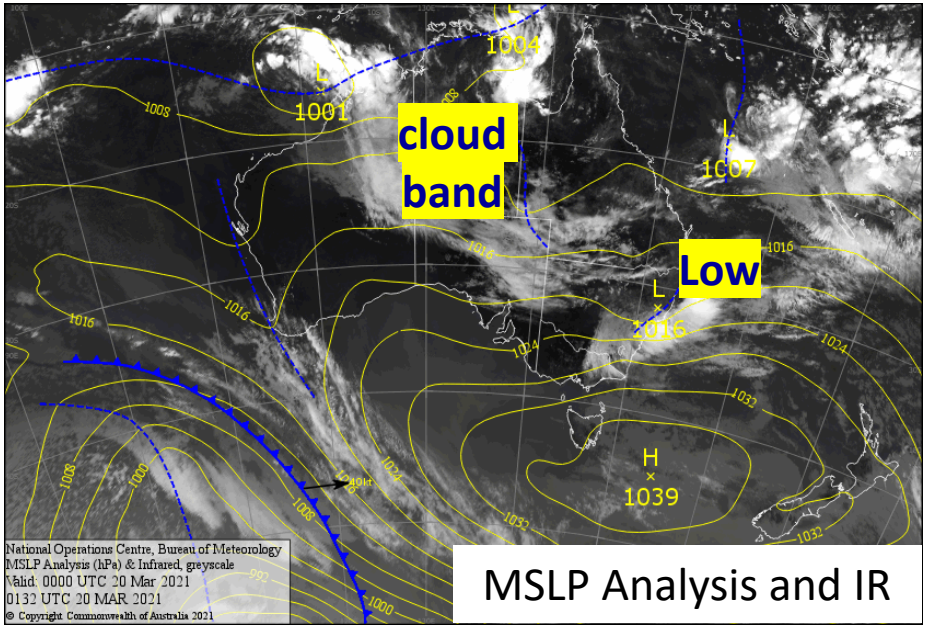


Recorded rainfall, week ending 23rd March 2021

image from BOM

…some slides not shown…

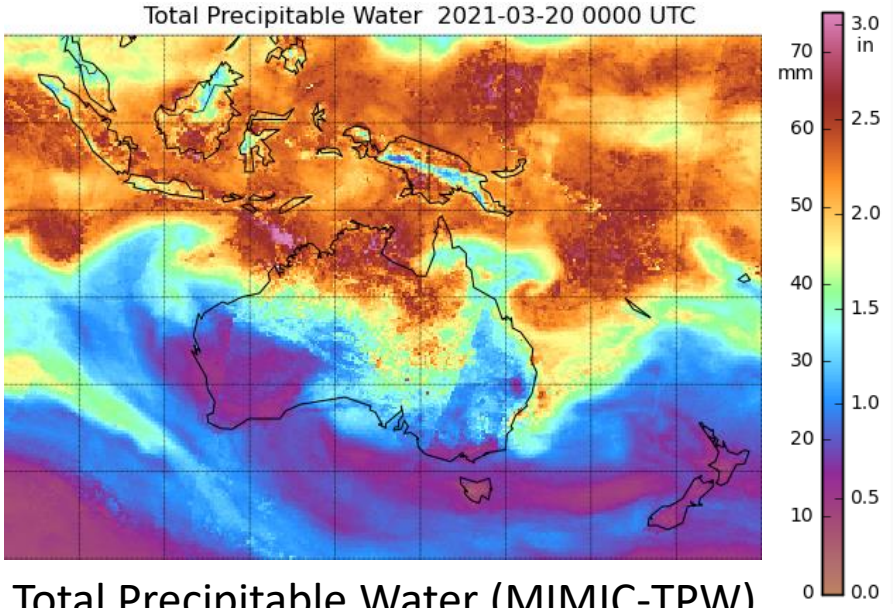
Situation at 00UTC 20th March



MSLP Analysis and IR

image courtesy BOM

image courtesy SSEC University of Wisconsin Madison



Total Precipitable Water (MIMIC-TPW) and Anomalies (NOAA OSPO)

Mid-upper level CDW and WV Band 8

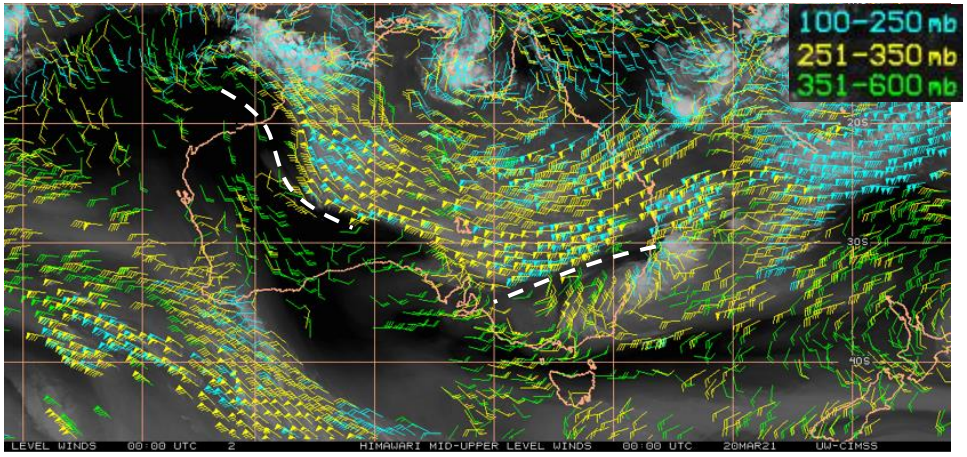
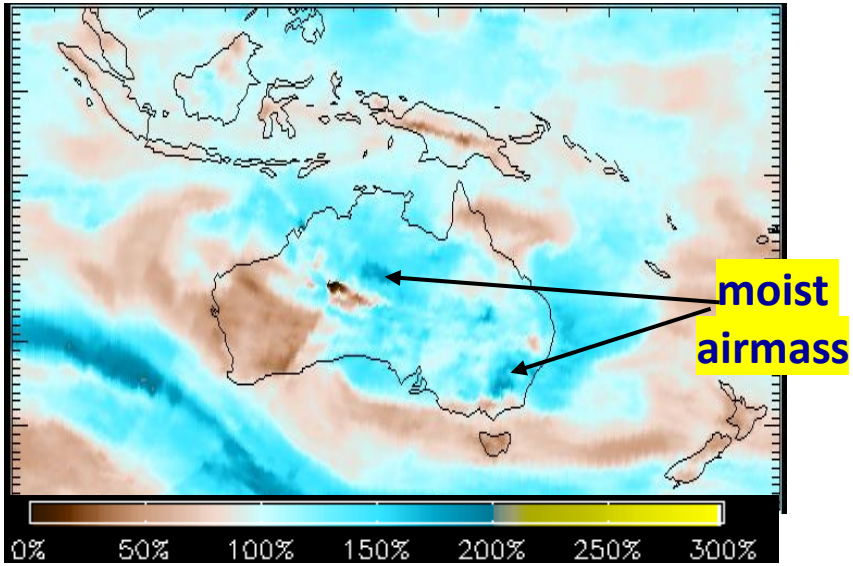


image courtesy CIMSS/SSEC University of Wisconsin Madison



images courtesy NOAA OSPO

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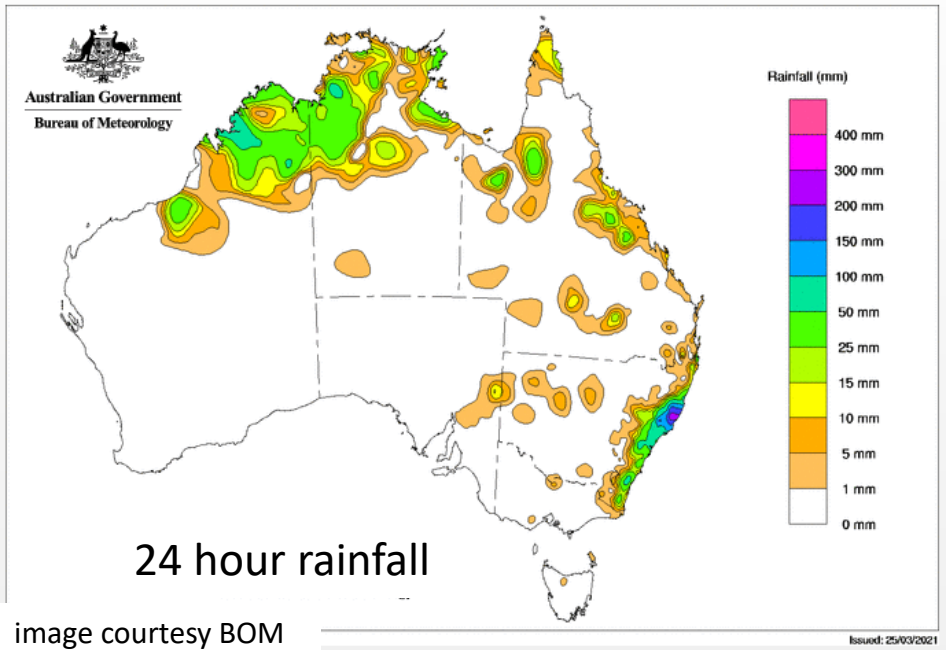
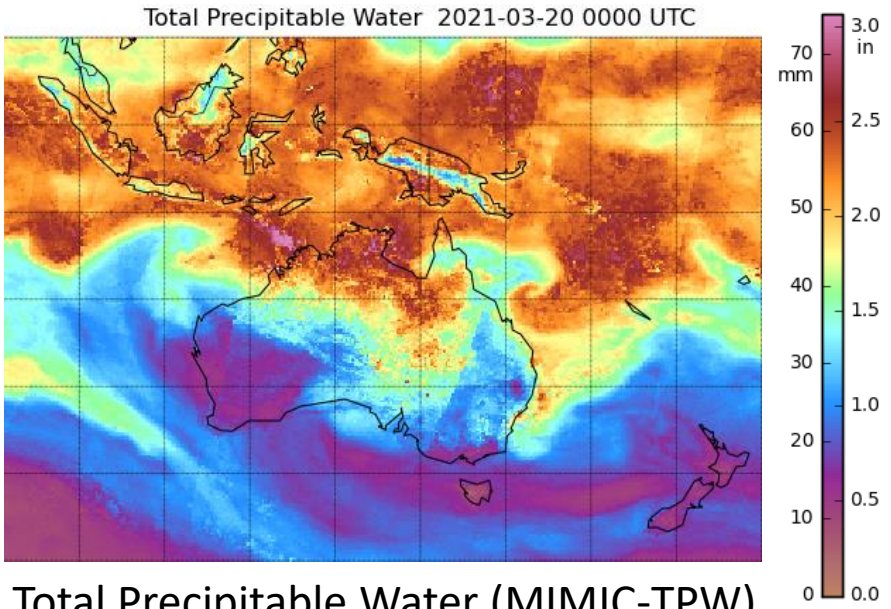


24 hour rainfall

image courtesy BOM

image courtesy SSEC University of Wisconsin Madison



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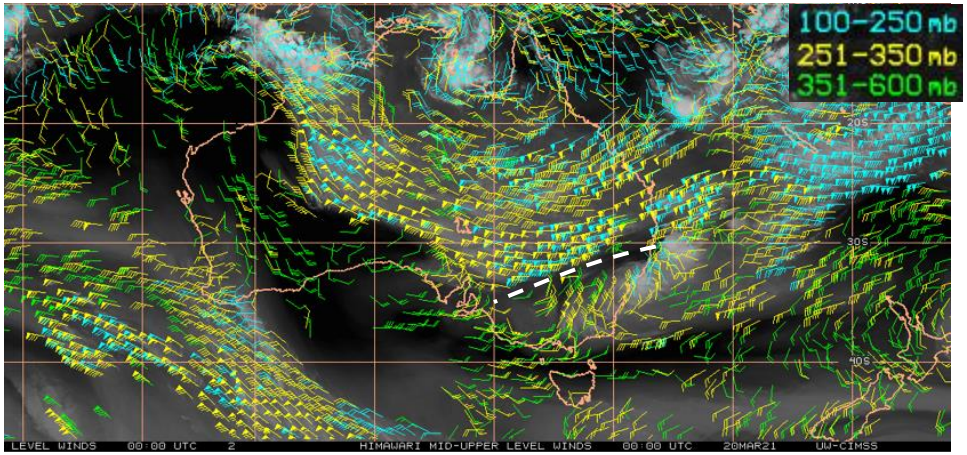
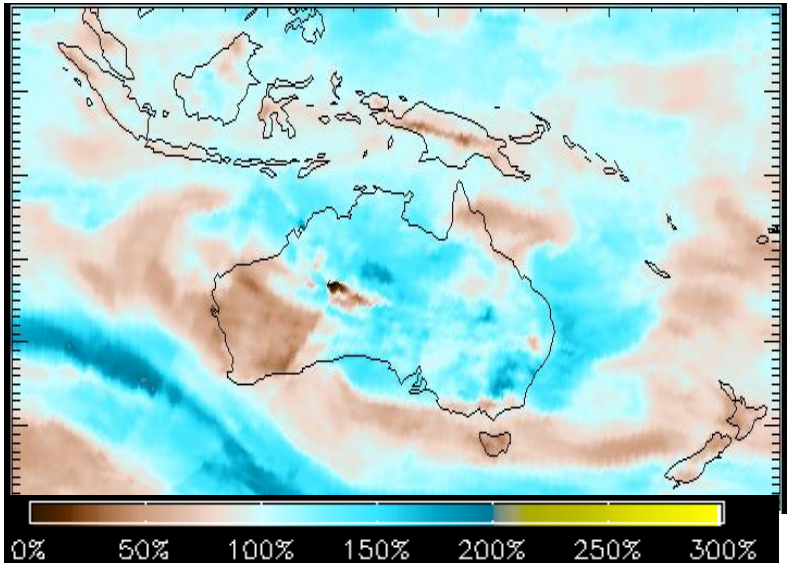
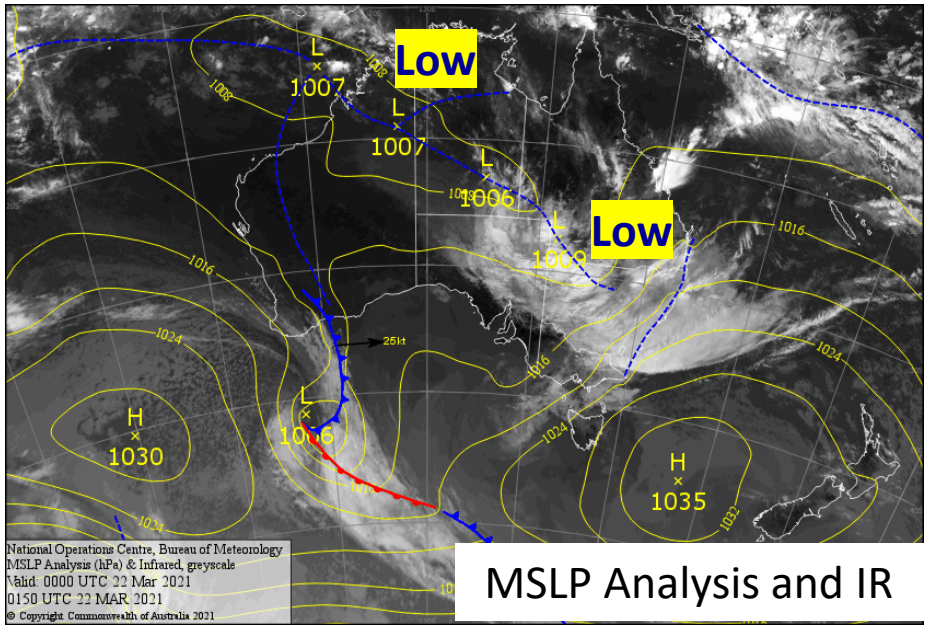


image courtesy CIMSS/SSEC University of Wisconsin Madison



images courtesy NOAA OSPO

Situation at 00UTC 22nd March



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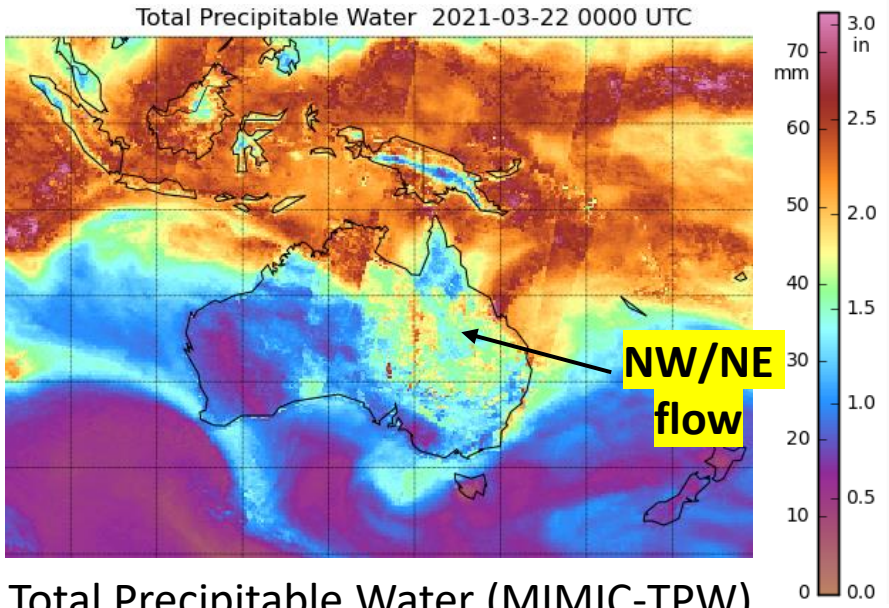

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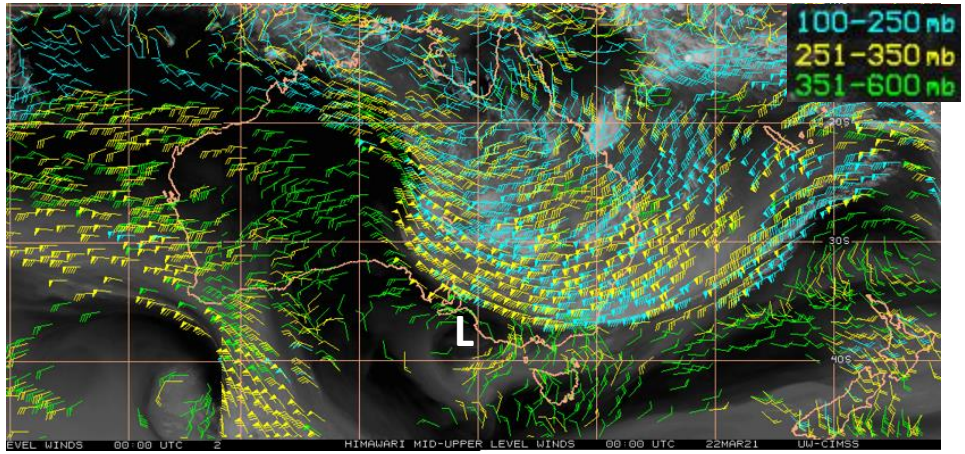
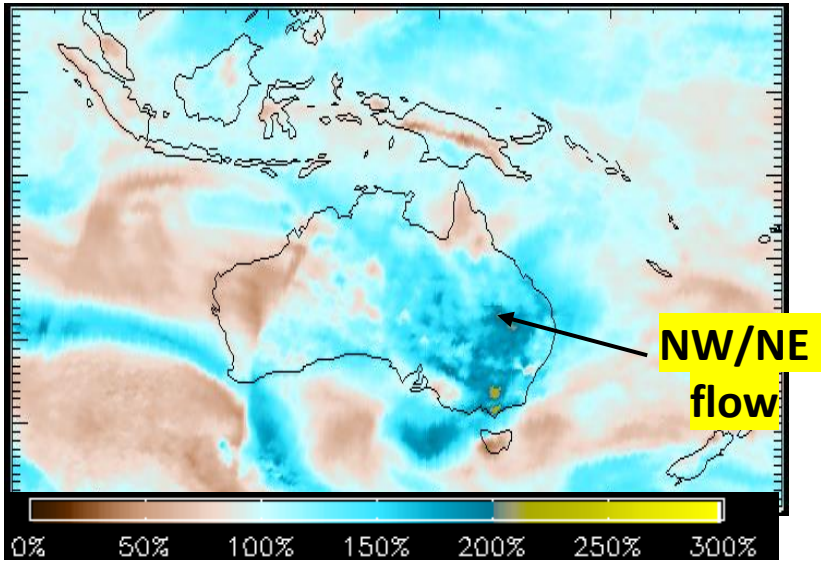


image courtesy CIMSS/SSEC University of Wisconsin Madison



images courtesy NOAA OSPO

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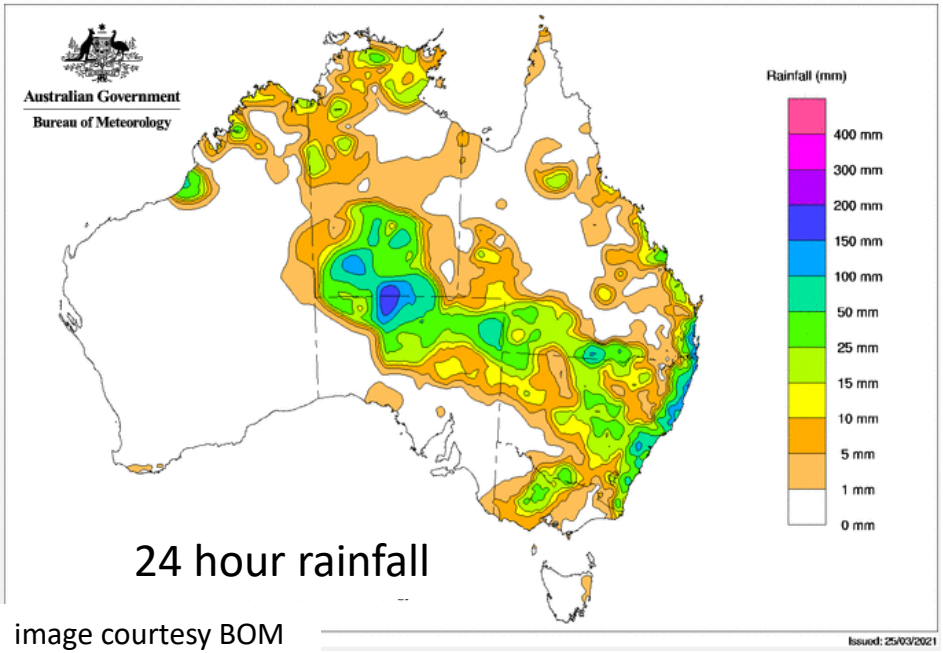

24 hour rainfall

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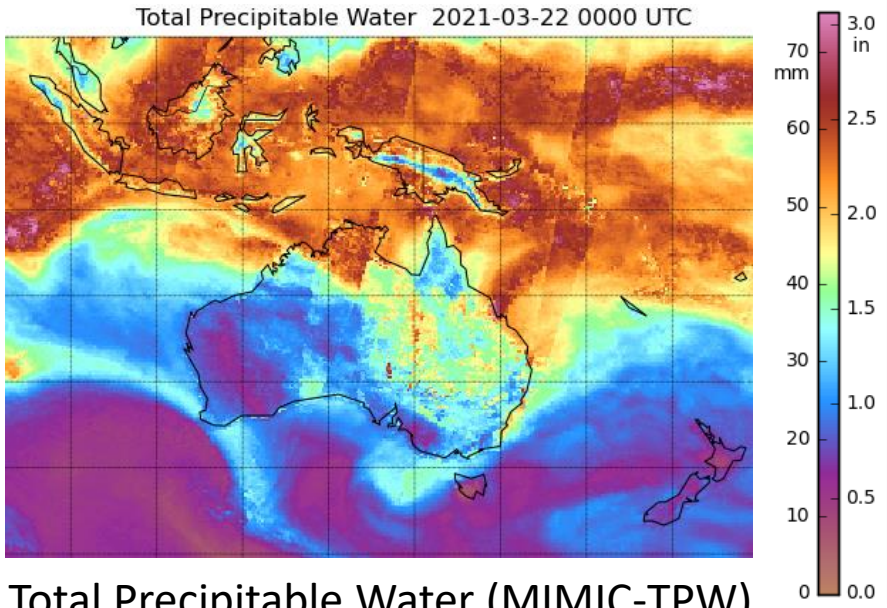

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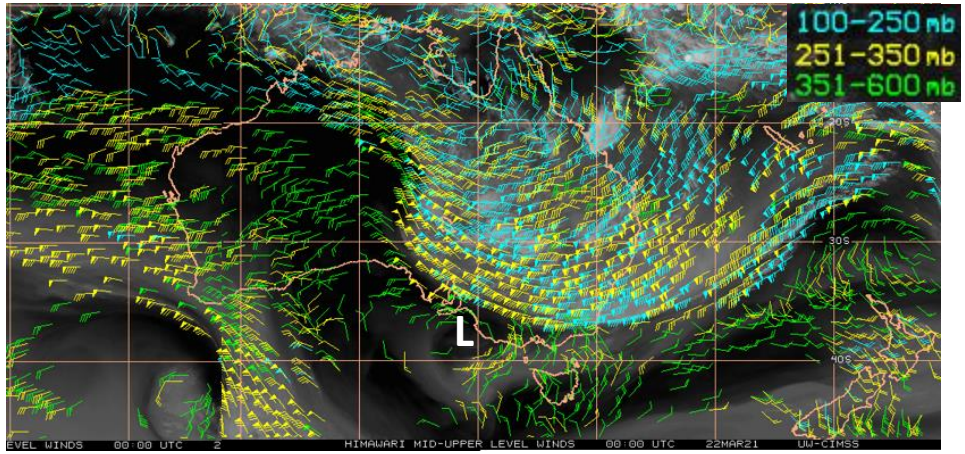

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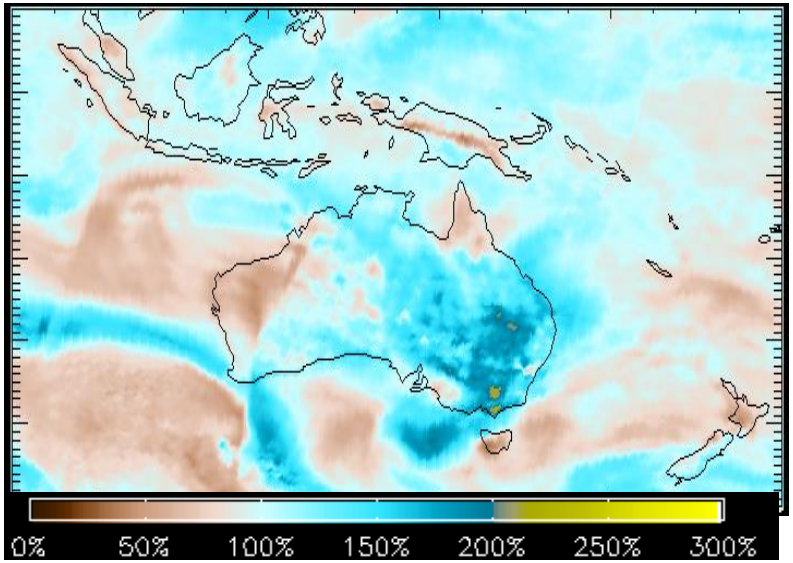
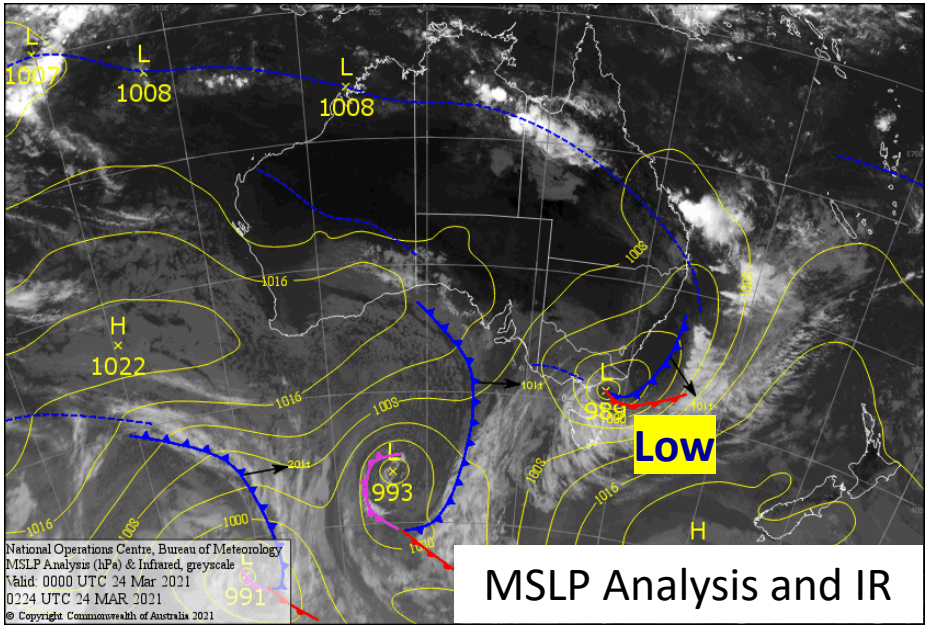


images courtesy NOAA OSPO

Situation at 00UTC 24th March



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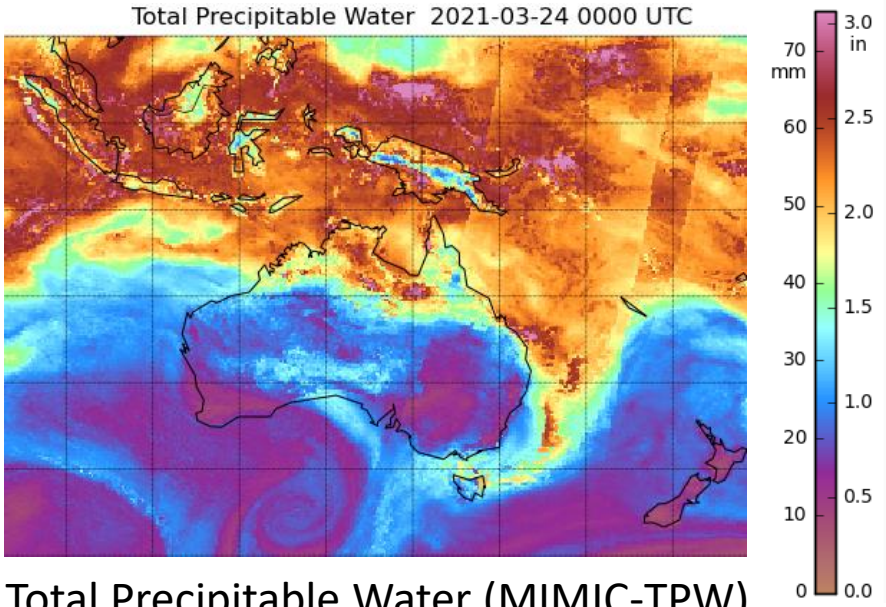

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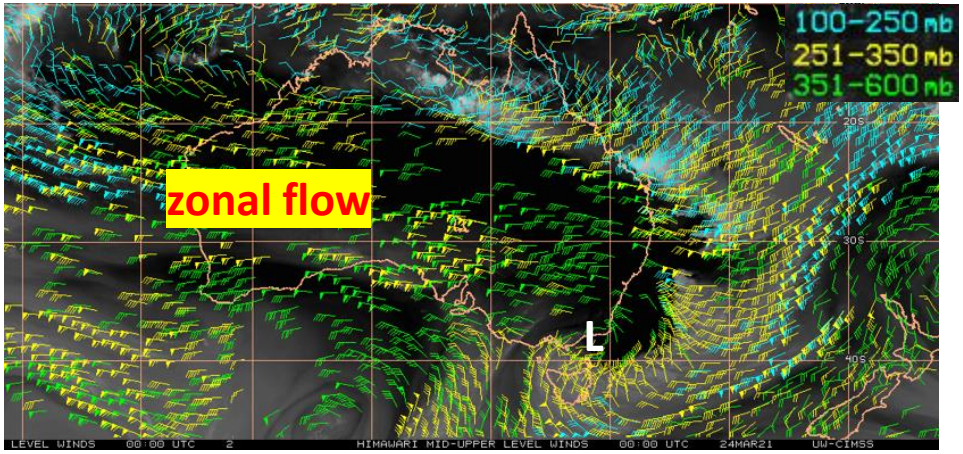
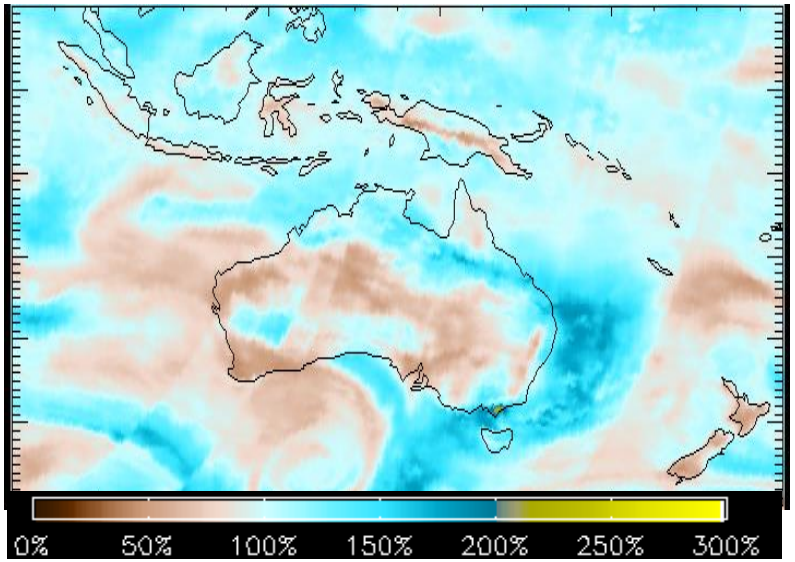


image courtesy CIMSS/SSEC University of Wisconsin Madison



images courtesy NOAA OSPO

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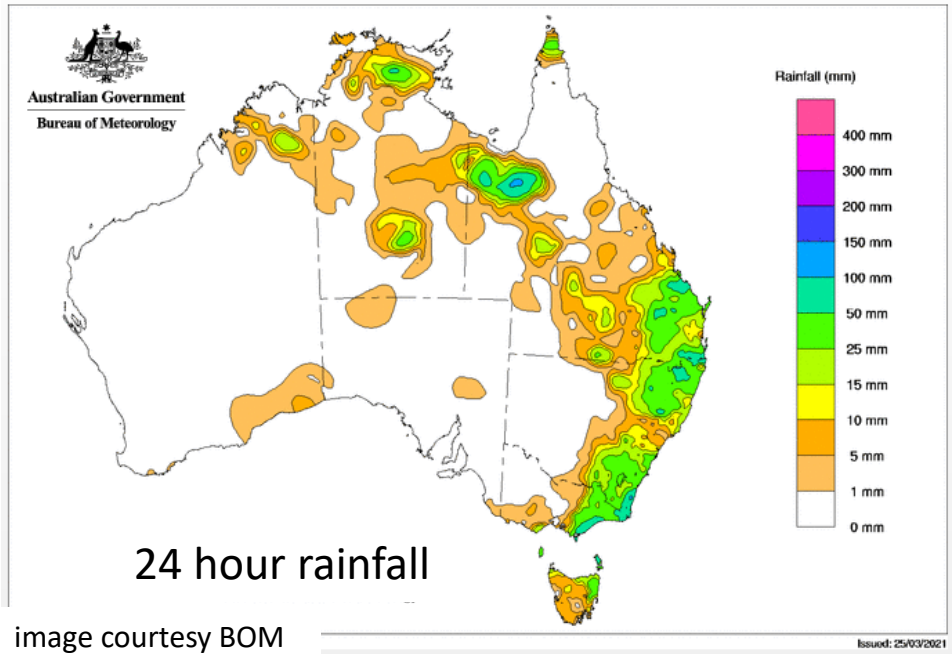

24 hour rainfall

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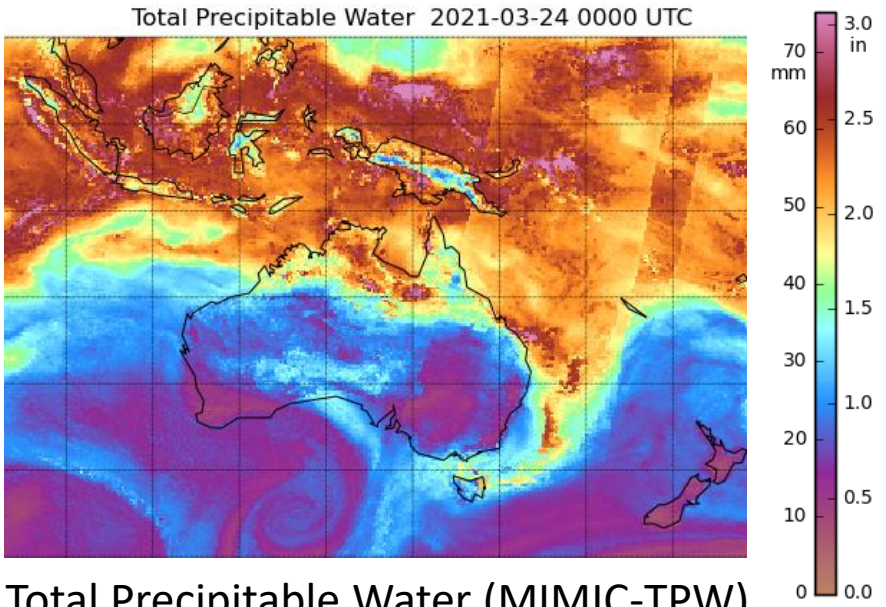

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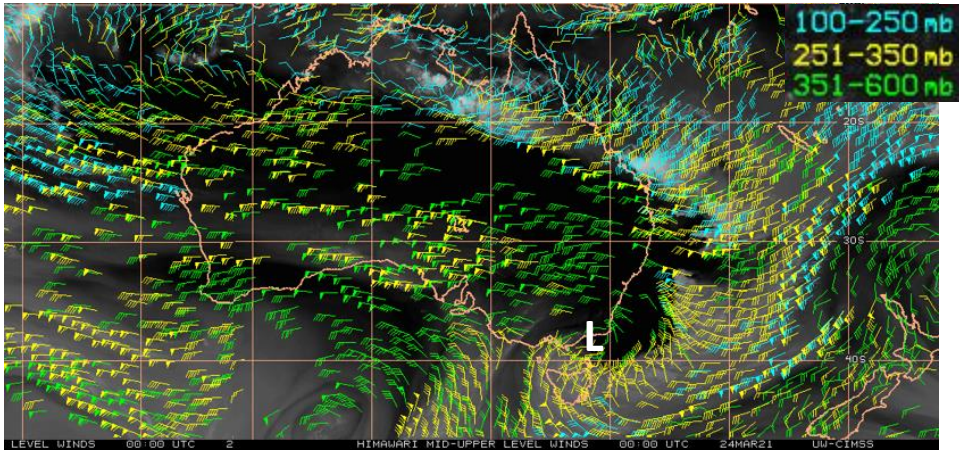

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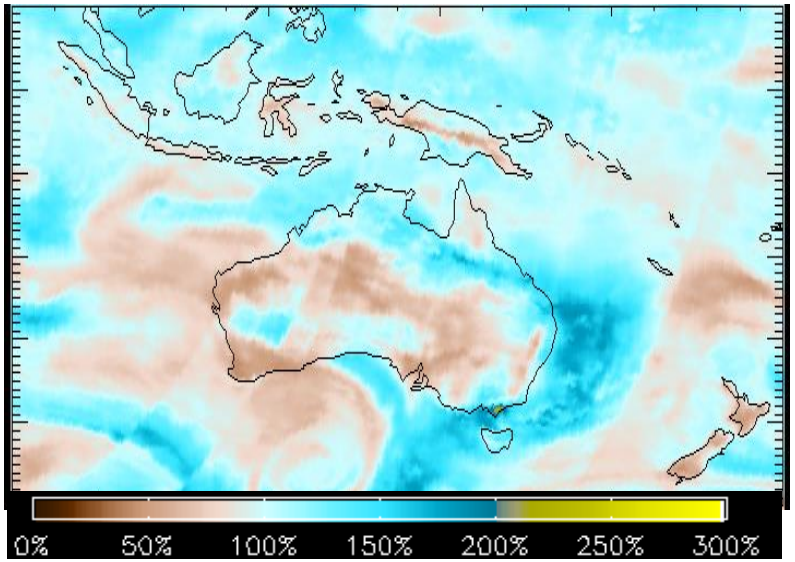
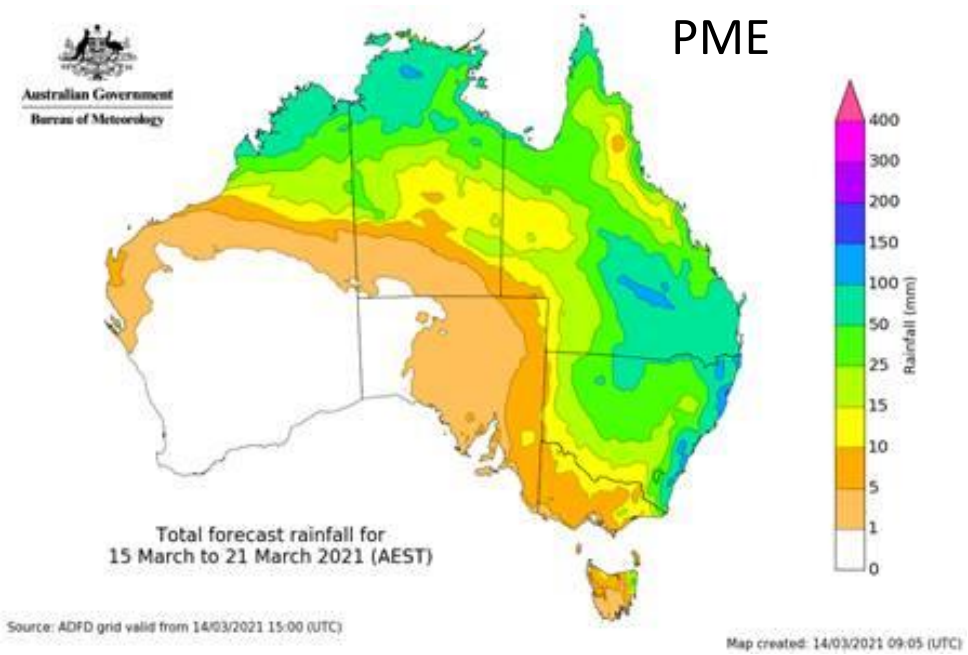


images courtesy NOAA OSPO

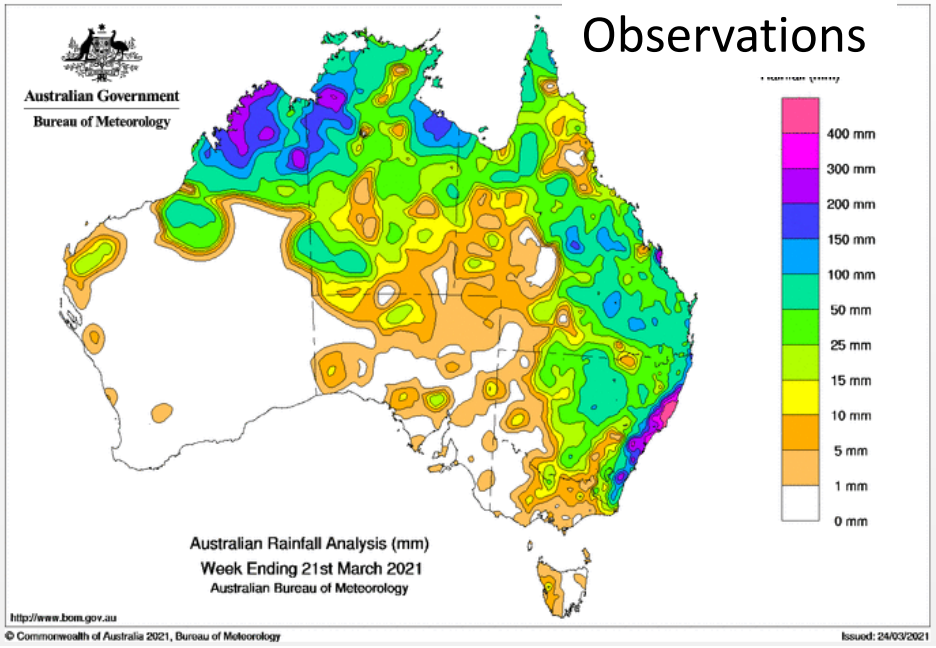
Poor Man's Ensemble forecast vs Observed rainfall.

15-21st March 2021. Australia

PME



Observations



These maps display automated forecasts from computer models. Please note they may be different to the Bureau's official forecasts which consider other sources of information and are fine-tuned by meteorologists.

NWP models do not perform so well:

- Rainfall involving a tropical airmass
- NWP resolution issues.
- Queensland forecasters use as guide 2-3 times rainfall predicted by NWP model

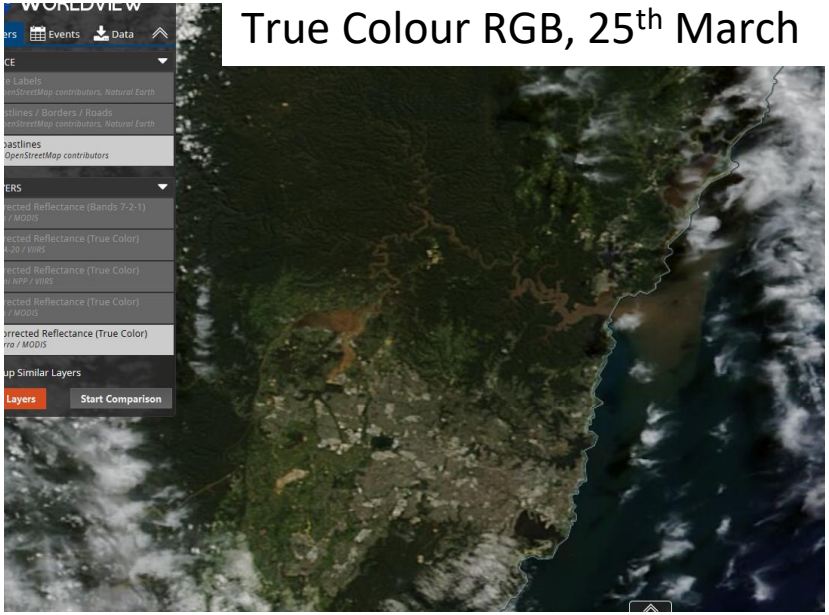
images courtesy BOM

…some slides not shown…

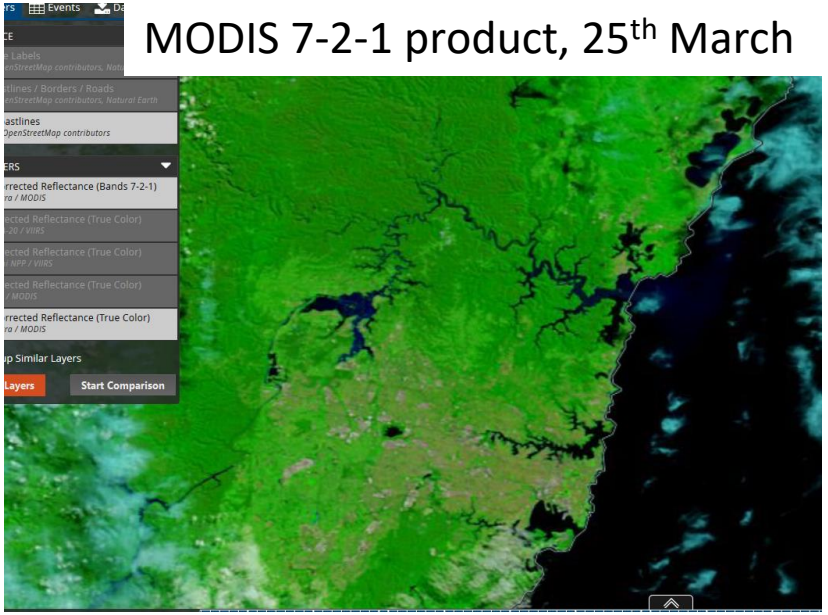
images courtesy NASA Worldview https://worldview.earthdata.nasa.gov

Flooding in the Sydney area comparison

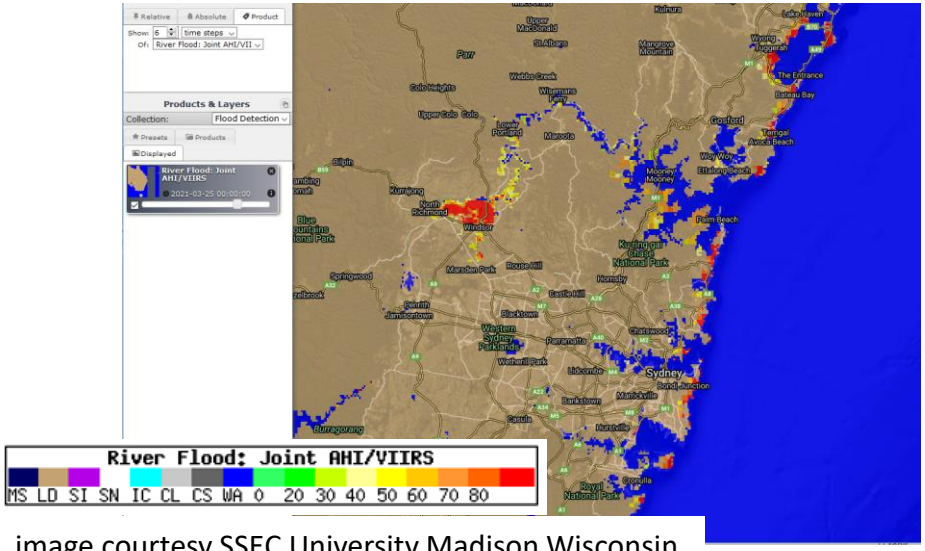
True Colour RGB, 25th March



MODIS 7-2-1 product, 25th March



River Flood. Joint AHI/VIIRS, 25th March



MODIS 7-2-1 product, 9th March

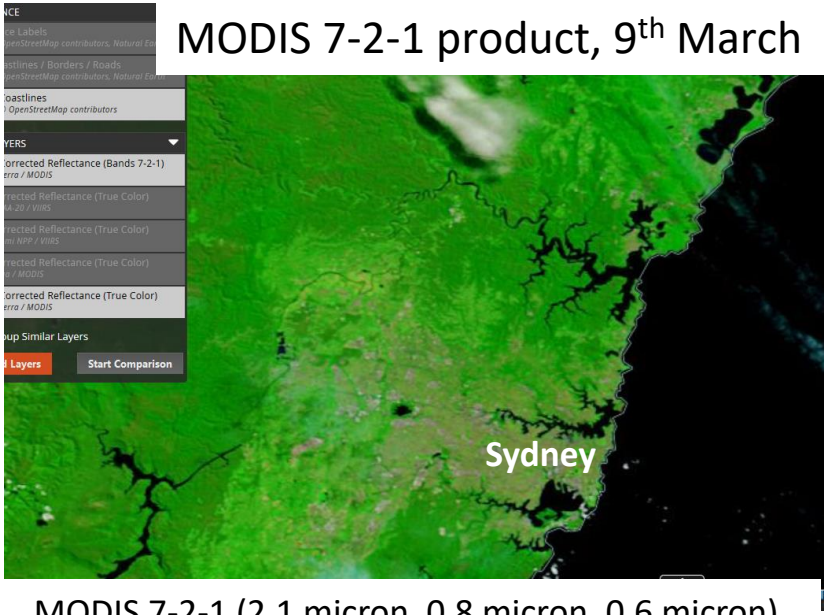


image courtesy SSEC University Madison Wisconsin

MODIS 7-2-1 (2.1 micron, 0.8 micron, 0.6 micron)

…some slides not shown…

Flooding details – Orara River, Northern NSW

image courtesy Google

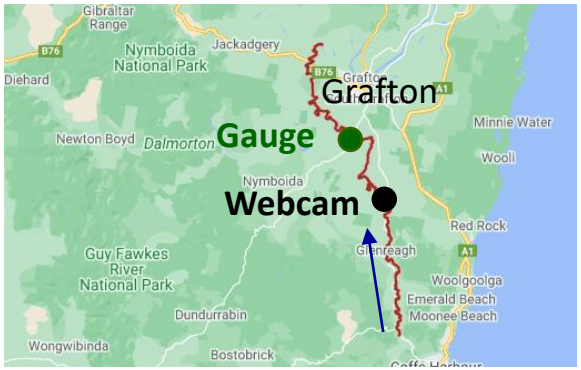
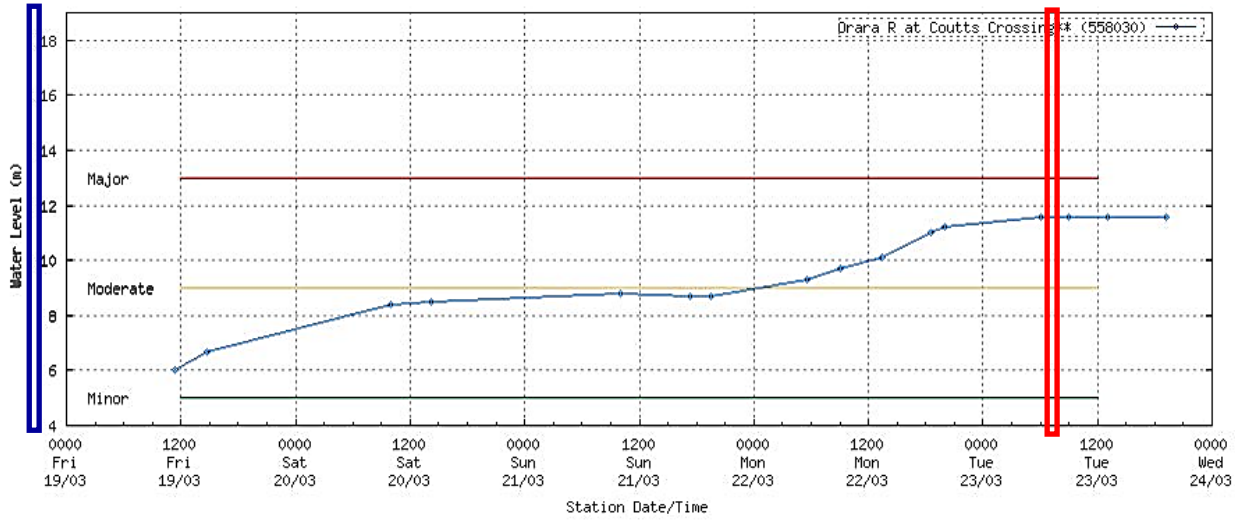
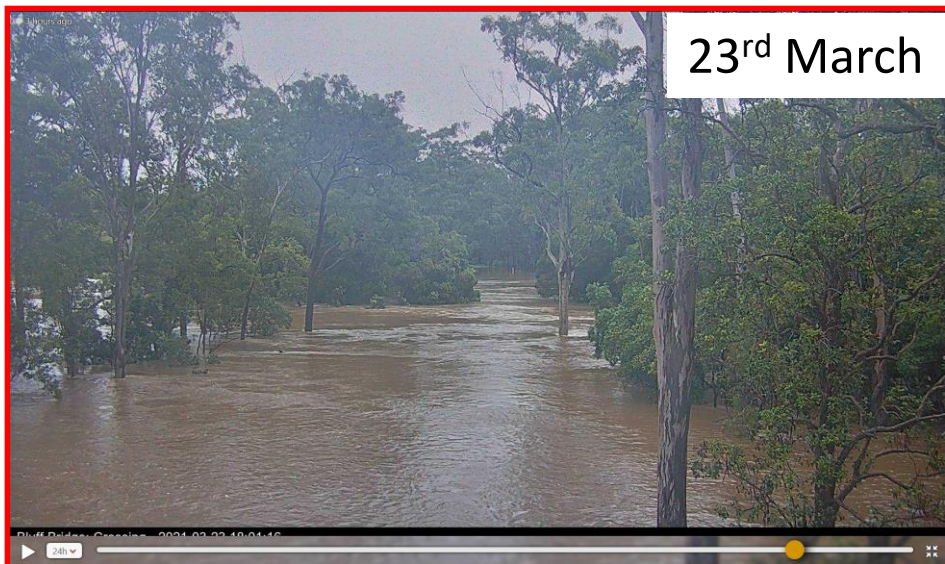


Image courtesy BOM



Data as Table | Previous Station | Next Station | Back to Bulletin

images courtesy Windy.com



Australian VLab Centre of Excellence Regional Focus Group meeting
10 July 2018

Utilising microwave data from polar orbiting satellites and Himawari-8 data for forecasting and nowcasting of heavy rainfall events, including a case study from North Queensland

Bodo Zeschke Australian VLab Centre of Excellence Point of Contact

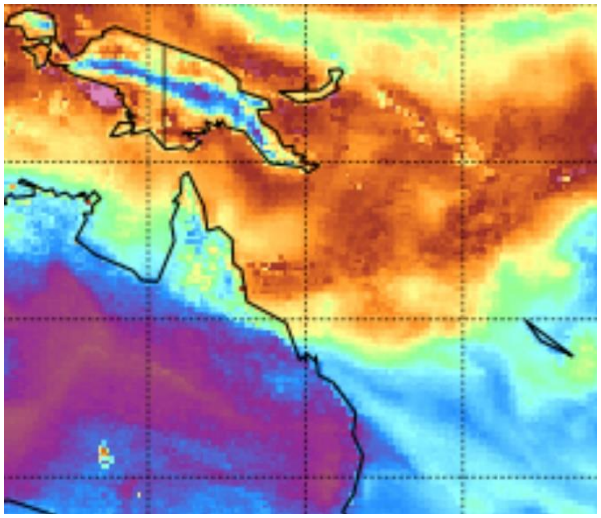
…some slides not shown…

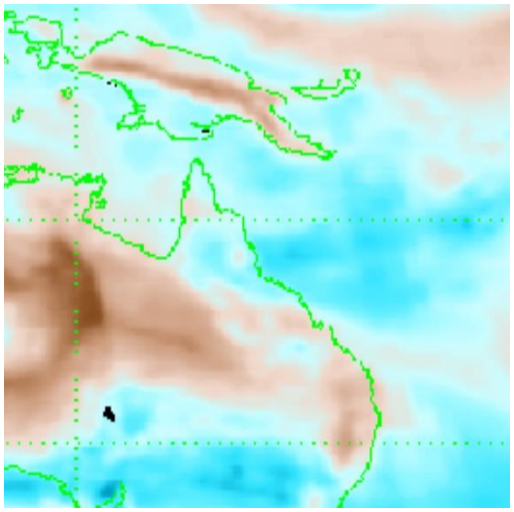
image courtesy Space Science and Engineering Center University of Wisconsin Madison

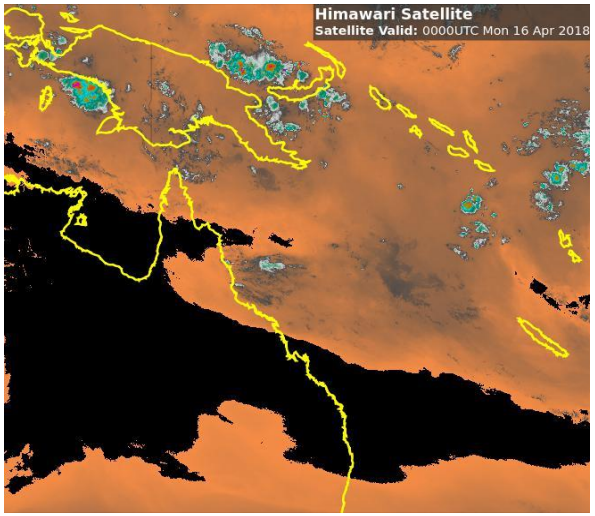
North Queensland case study of the 16th April 2018

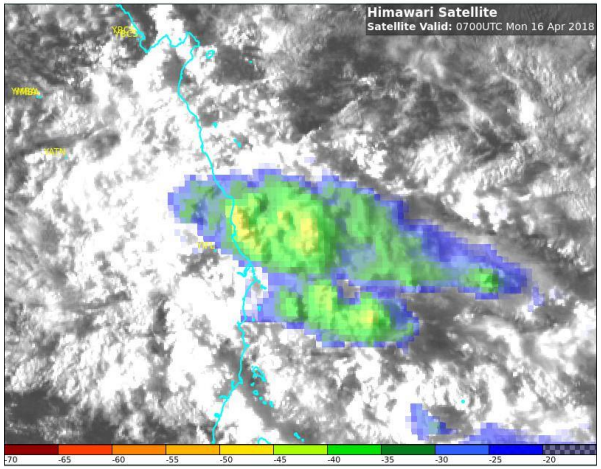
image courtesy NOAA/NESDIS

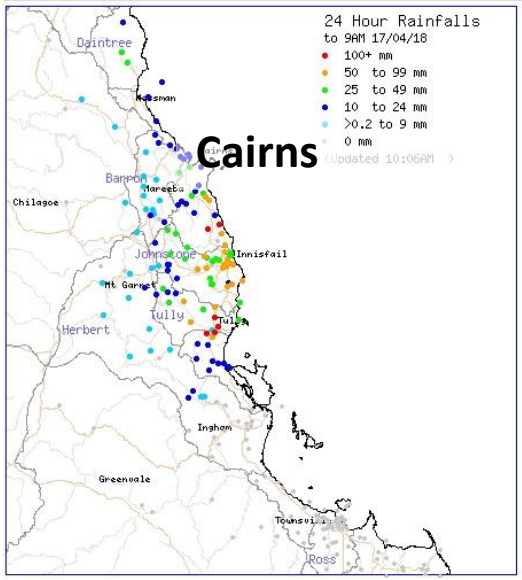
image courtesy JMA / BOM











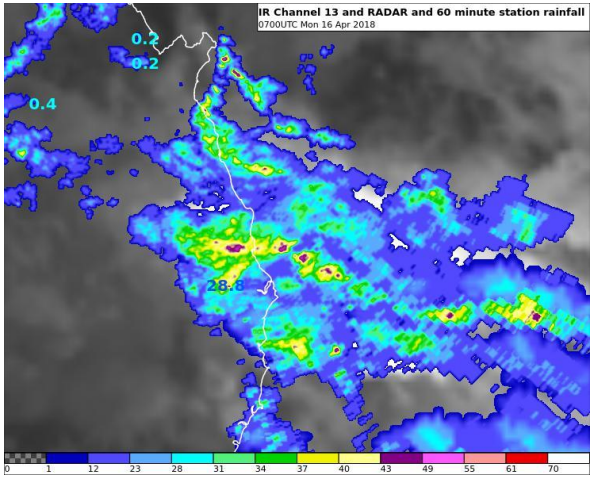


image courtesy JMA / BOM

image courtesy BOM

image courtesy JMA / BOM

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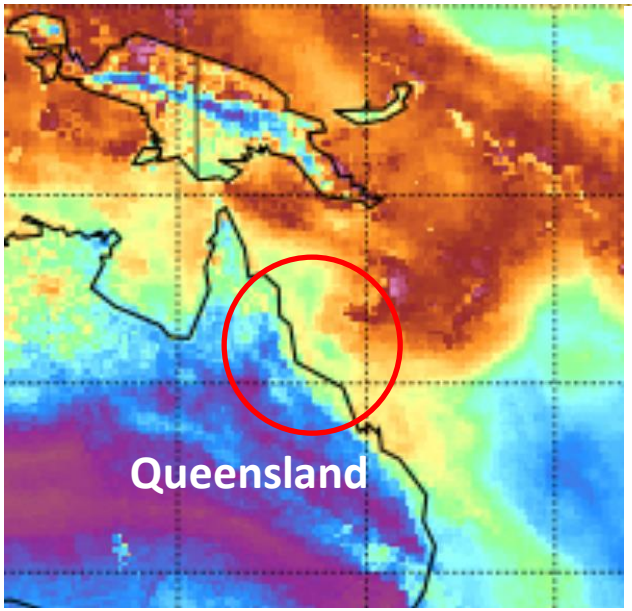
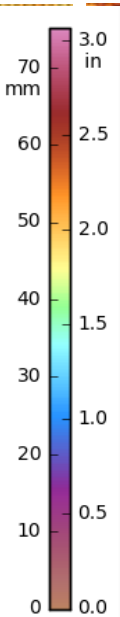
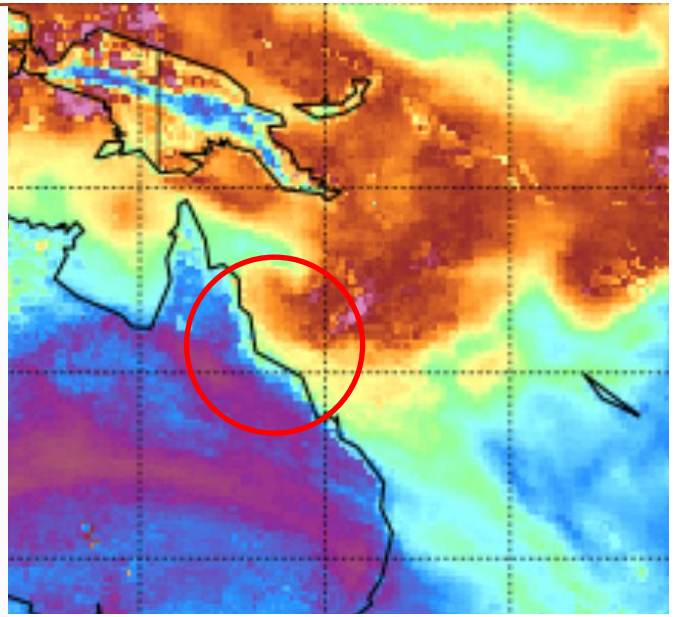
Examination of Precipitable Water using satellite microwave imagery

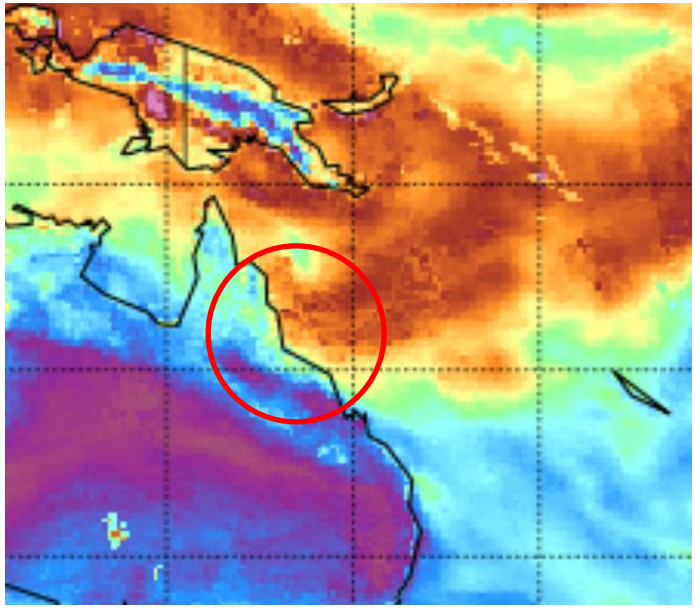


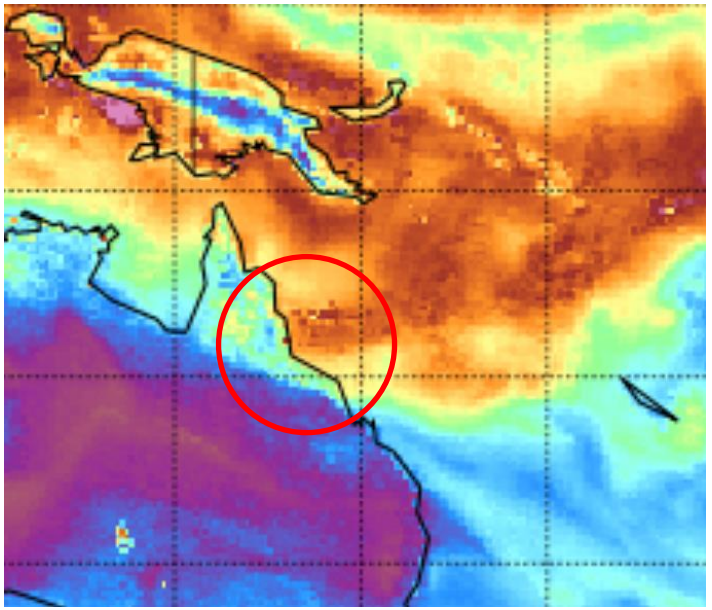




14th April 12UTC

15th April 00UTC





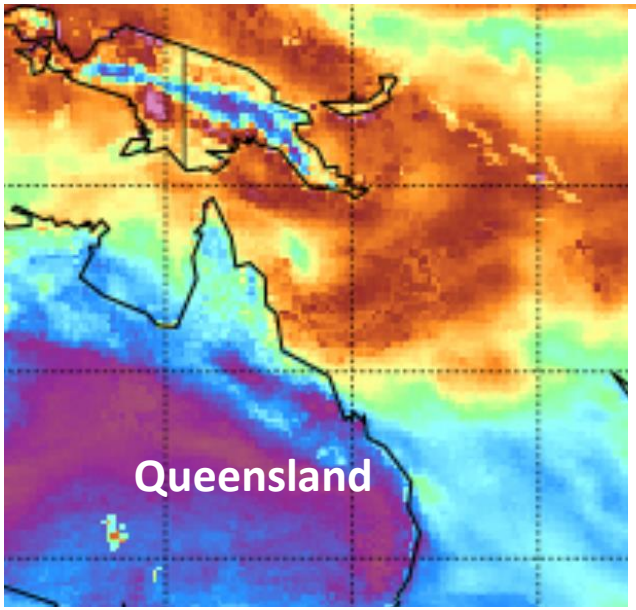
15th April 12UTC

16th April 00UTC

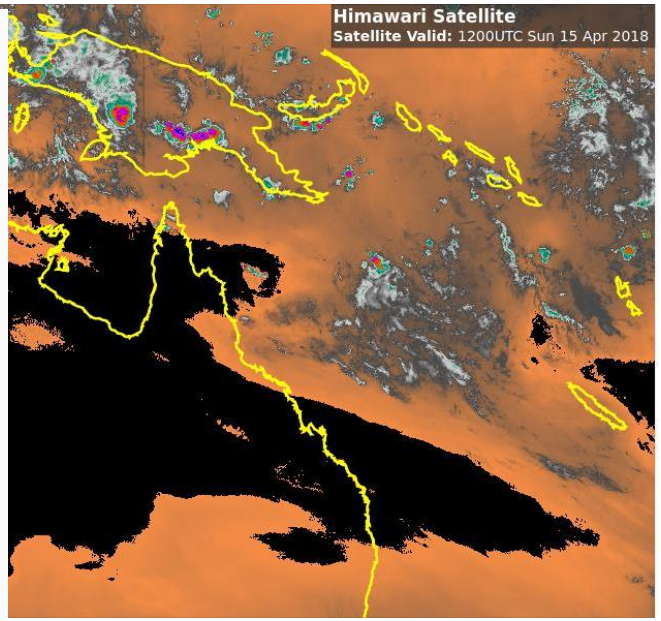
images courtesy Space Science and Engineering Center University of Wisconsin Madison

image courtesy Space Science and Engineering Center University of Wisconsin Madison

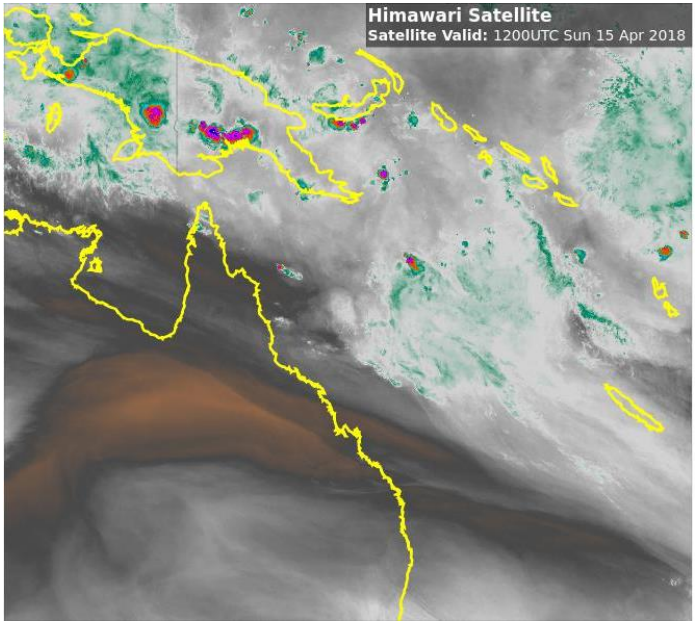
Microwave imagery and Himawari-8 water vapour channels 15th April 12UTC



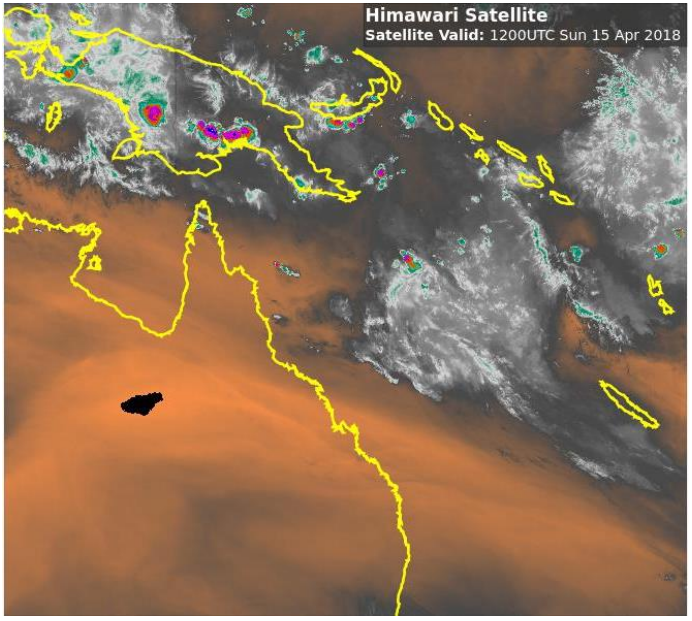
Microwave



Band 10 (7.3 micron)



Band 8 (6.2 micron)



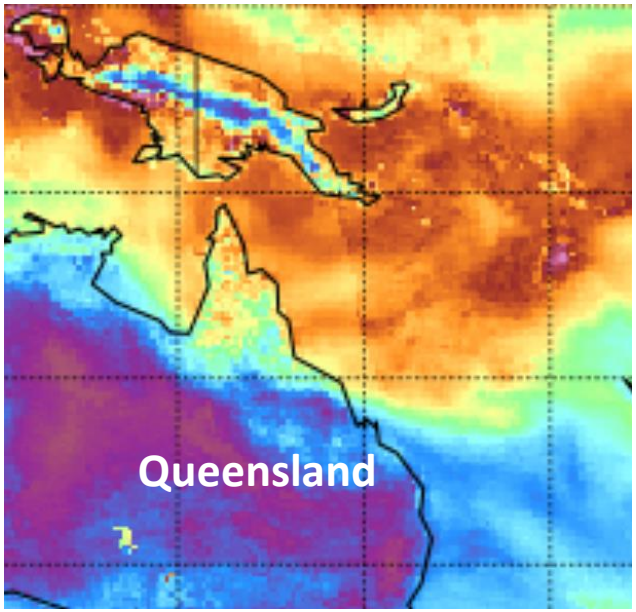
Band 9 (6.9 micron)

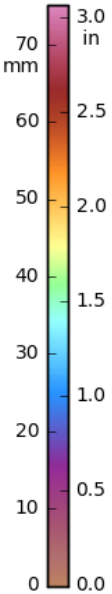
images courtesy JMA / BOM

…some slides not shown…

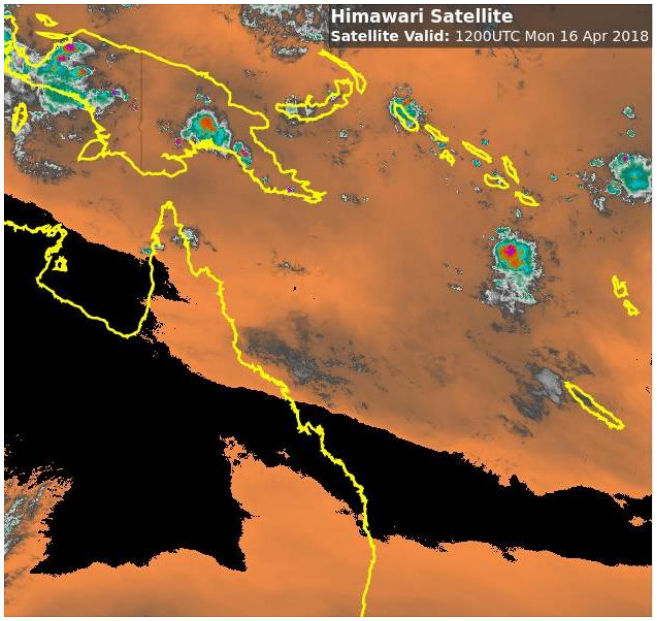
image courtesy Space Science and Engineering Center University of Wisconsin Madison

Microwave imagery and Himawari-8 water vapour channels 16th April 12UTC

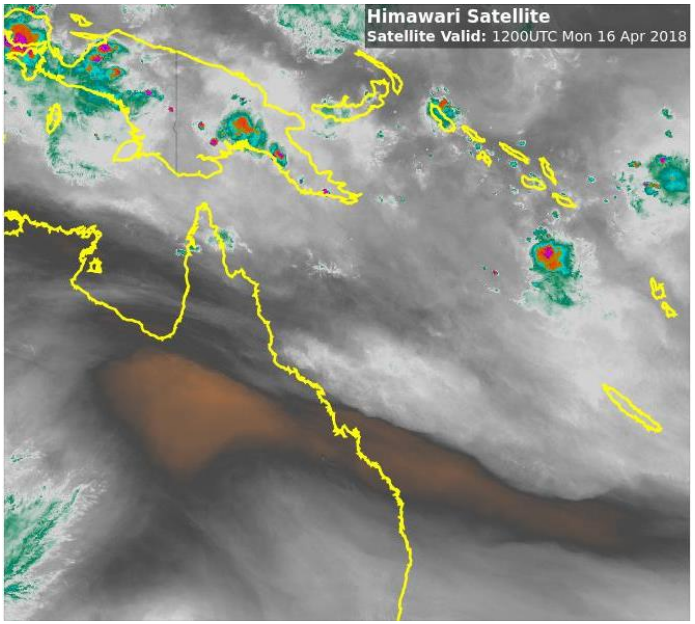




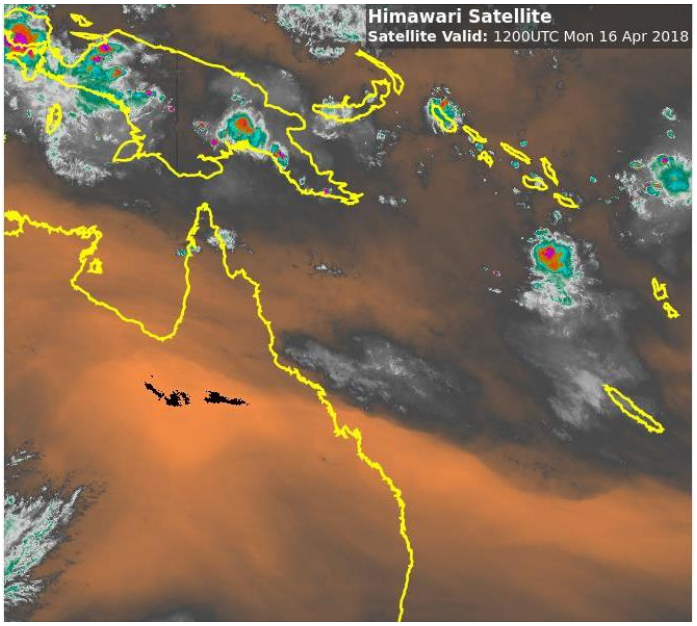
Microwave



Band 10 (7.3 micron)



Band 8 (6.2 micron)

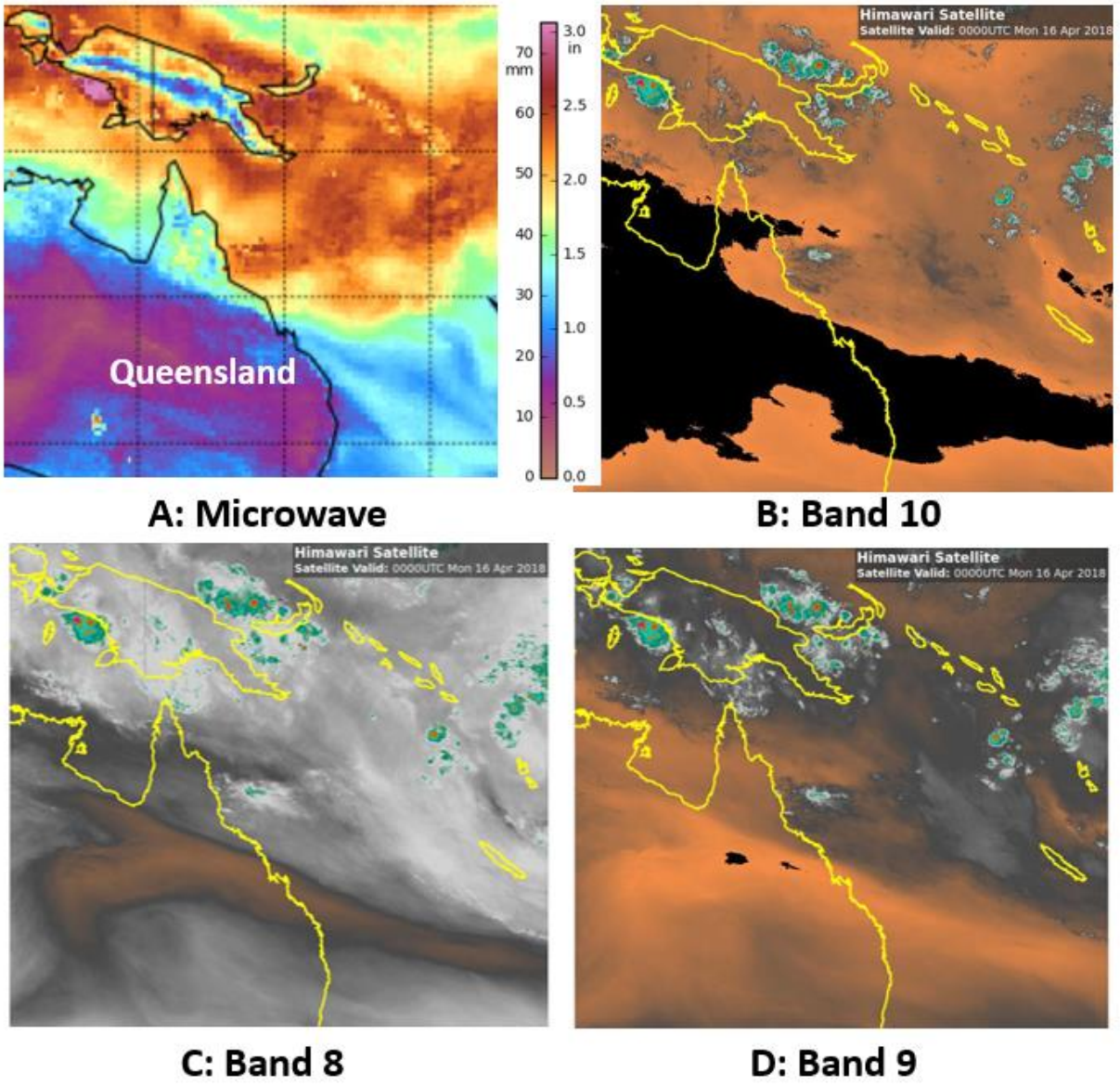


Band 9 (6.9 micron)

images courtesy JMA / BOM

Question: In which imagery can you see the evolution of the moisture into the region of interest the best?

A. Microwave image
B. Band 10
C. Band 8
D. Band 9

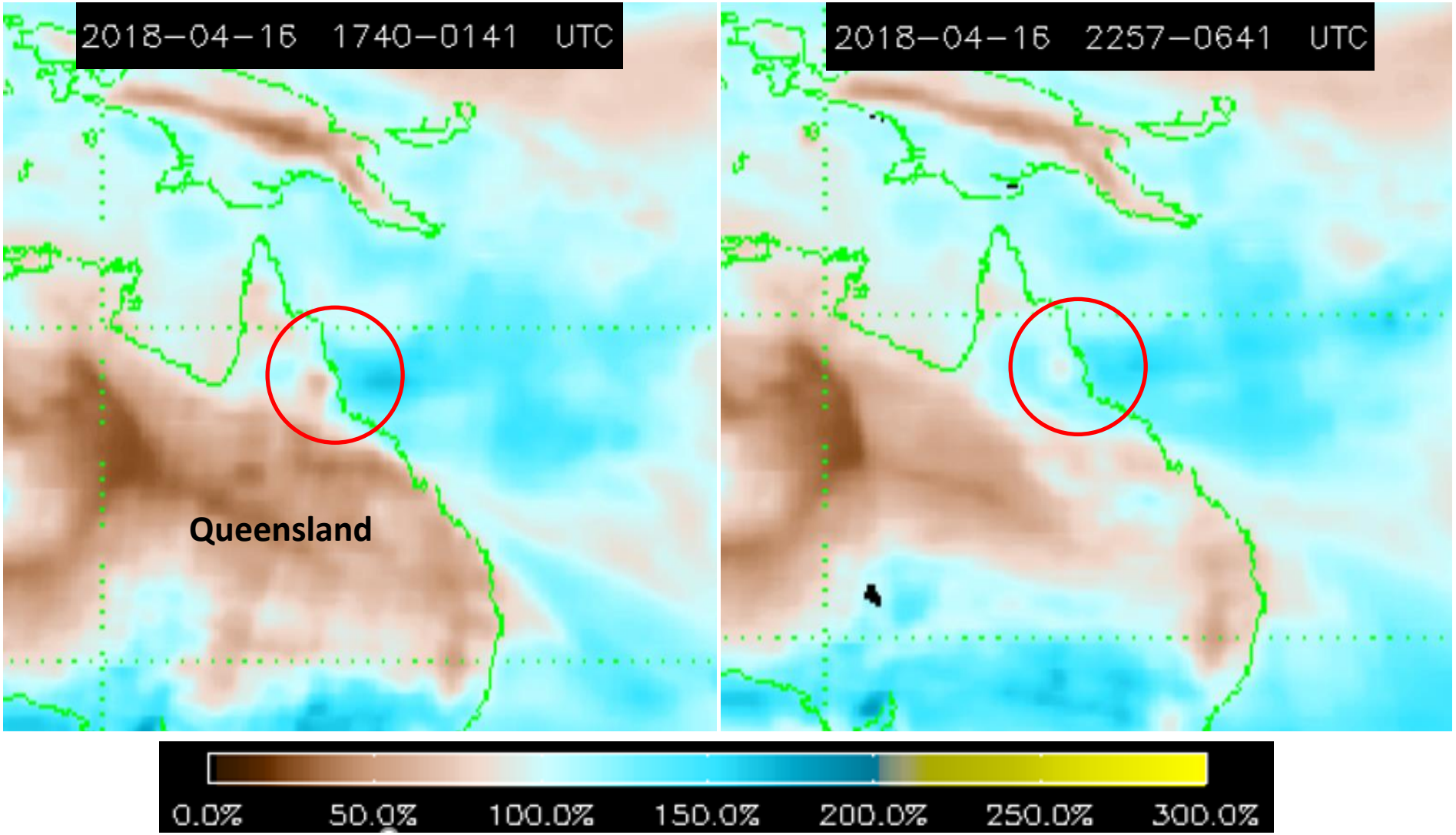


…some slides not shown…

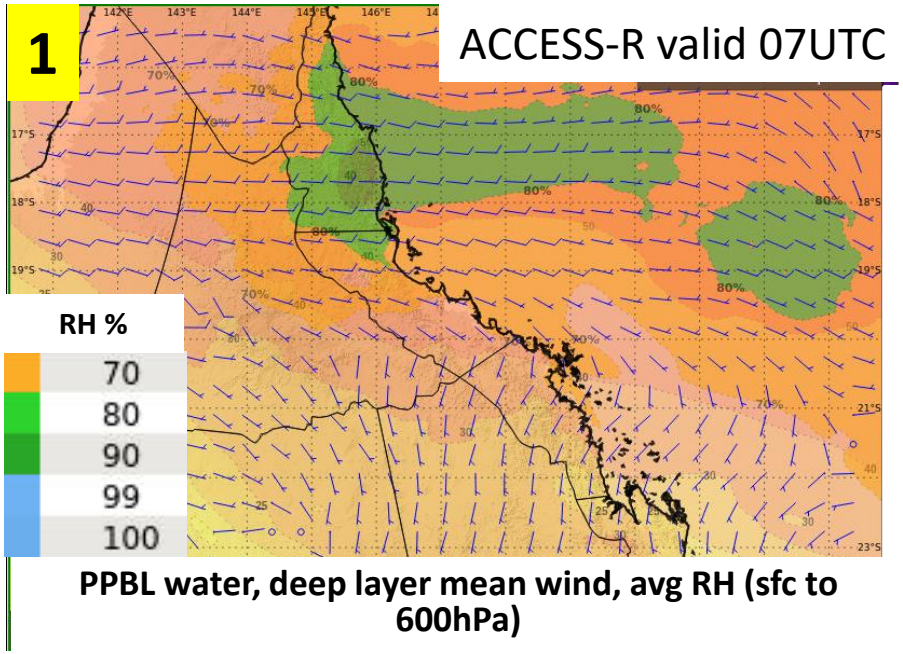
from NOAA / NESDIS / OSPO

Total Precipitable Water Anomaly

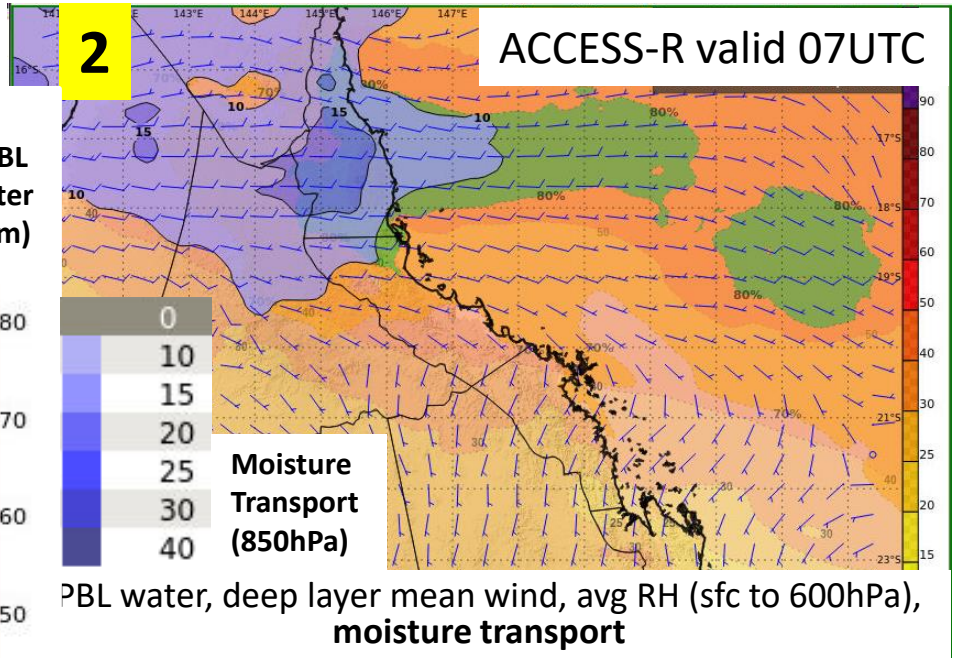
(NESDIS Operational)



NWP Heavy Rainfall diagnostics using ACCESS-R (set up by D. Sgarbossa)

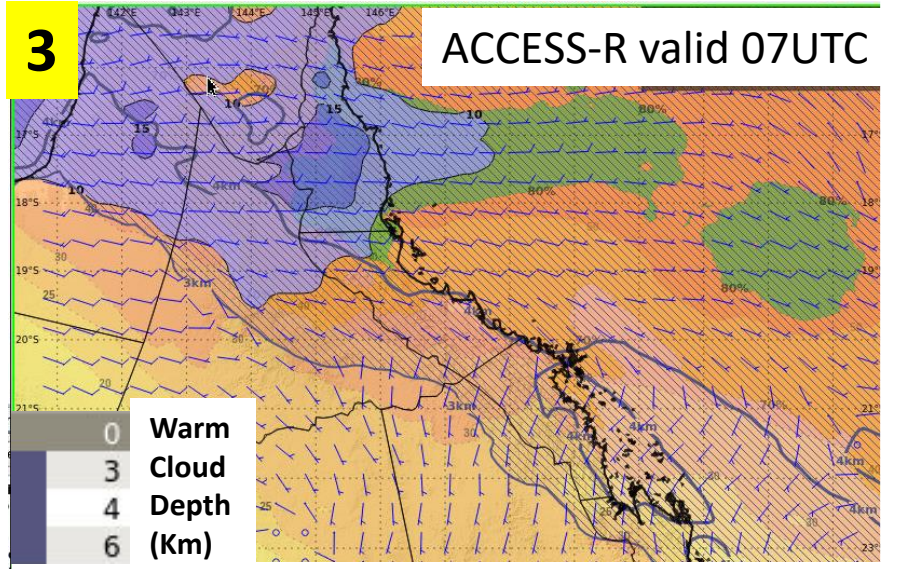


PPBL water, deep layer mean wind, avg RH (sfc to 600hPa)

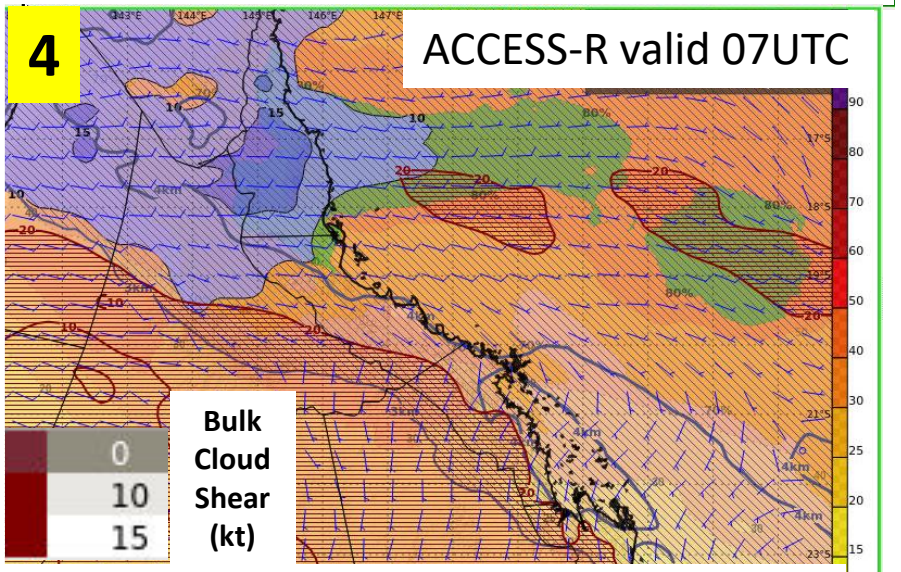


PBL water, deep layer mean wind, avg RH (sfc to 600hPa), **moisture transport**

PPBL water (mm)



PPBL water, deep layer mean wind, avg RH (sfc to 600hPa), moisture transport, **warm cloud depth**



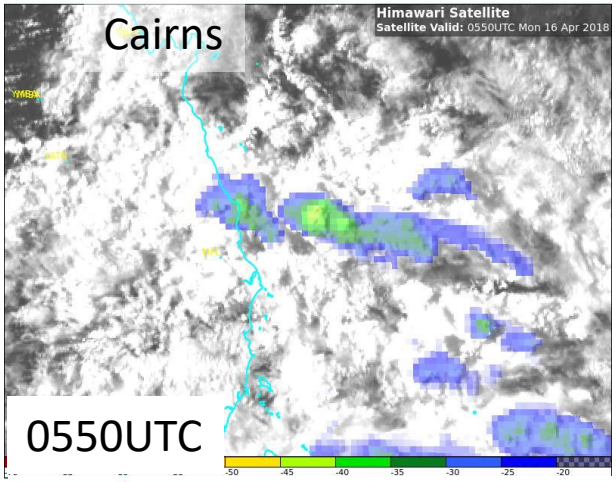
PPBL water, deep layer mean wind, avg RH (sfc to 600hPa), moisture transport, warm cloud depth, **bulk cloud shear**

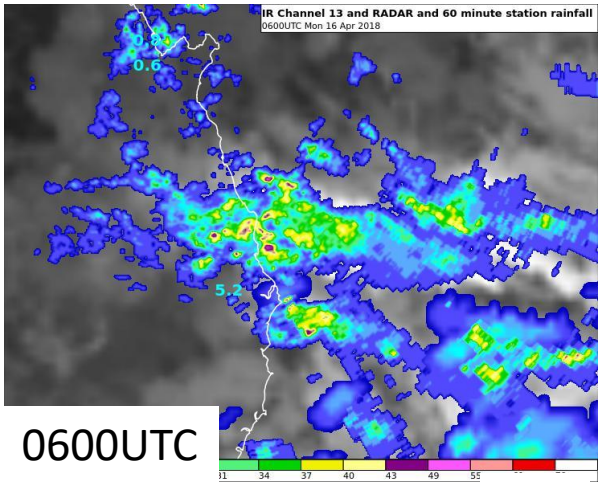
…some slides not shown…

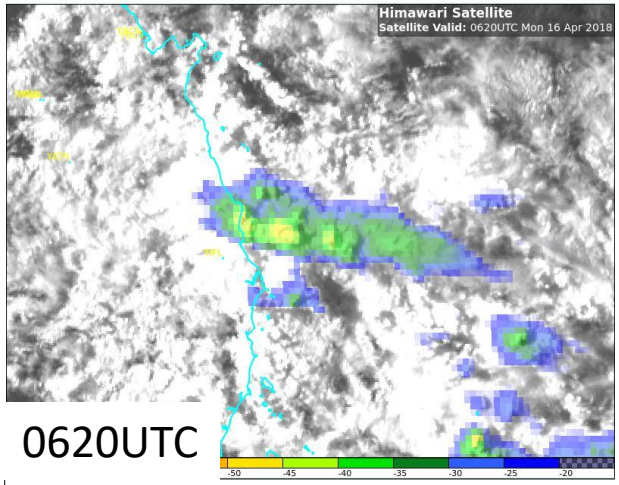
Sandwich product and cloud top cooling 16th April 06 to 07UTC

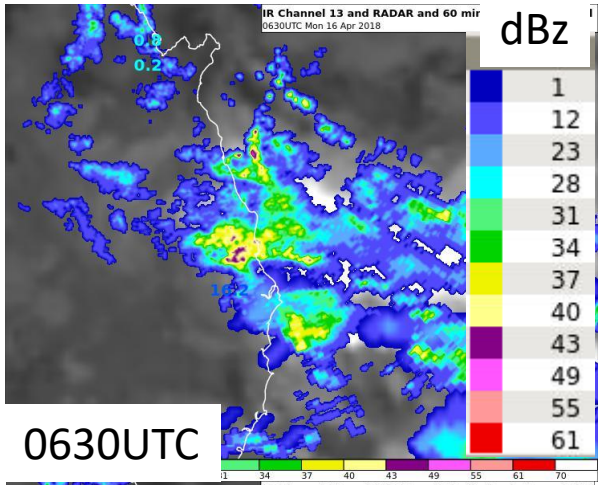
Date stamps on imagery corresponds to delays in receipt of satellite and RADAR data

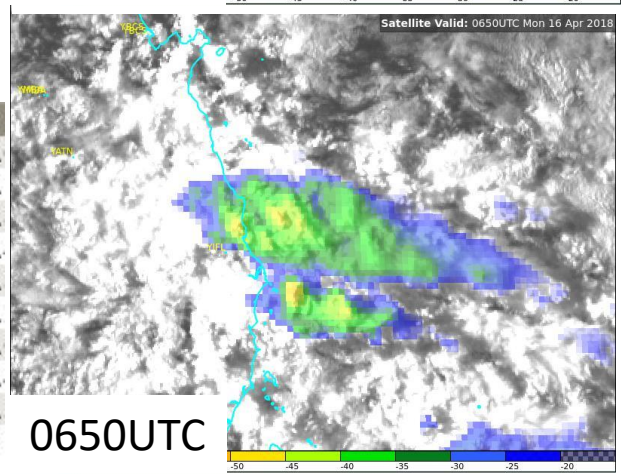
Some correspondence between cloud top cooling and maximum precipitation

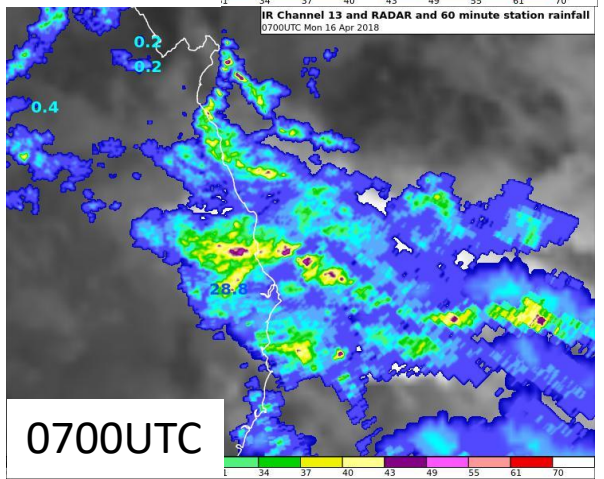


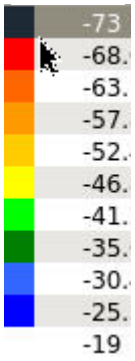












images courtesy JMA / BOM

Verification: Models compared to actual precipitation

Question: which model has performed the best?

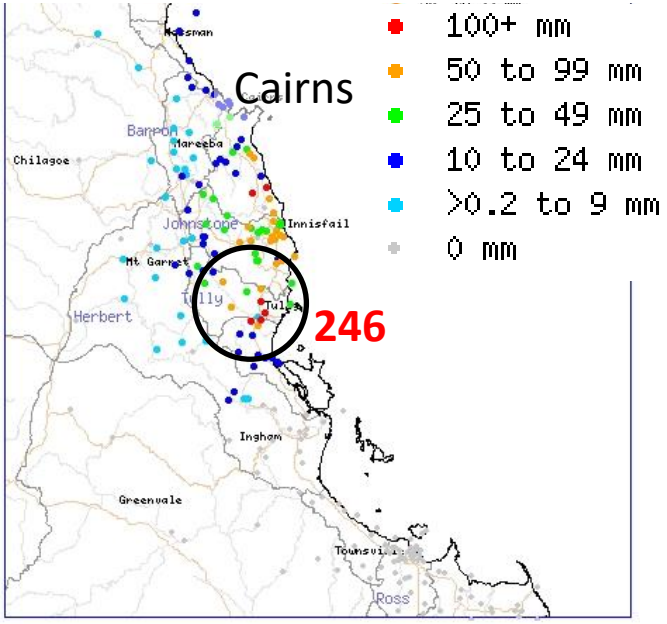
For the amount of precipitation?

For the location of precipitation?

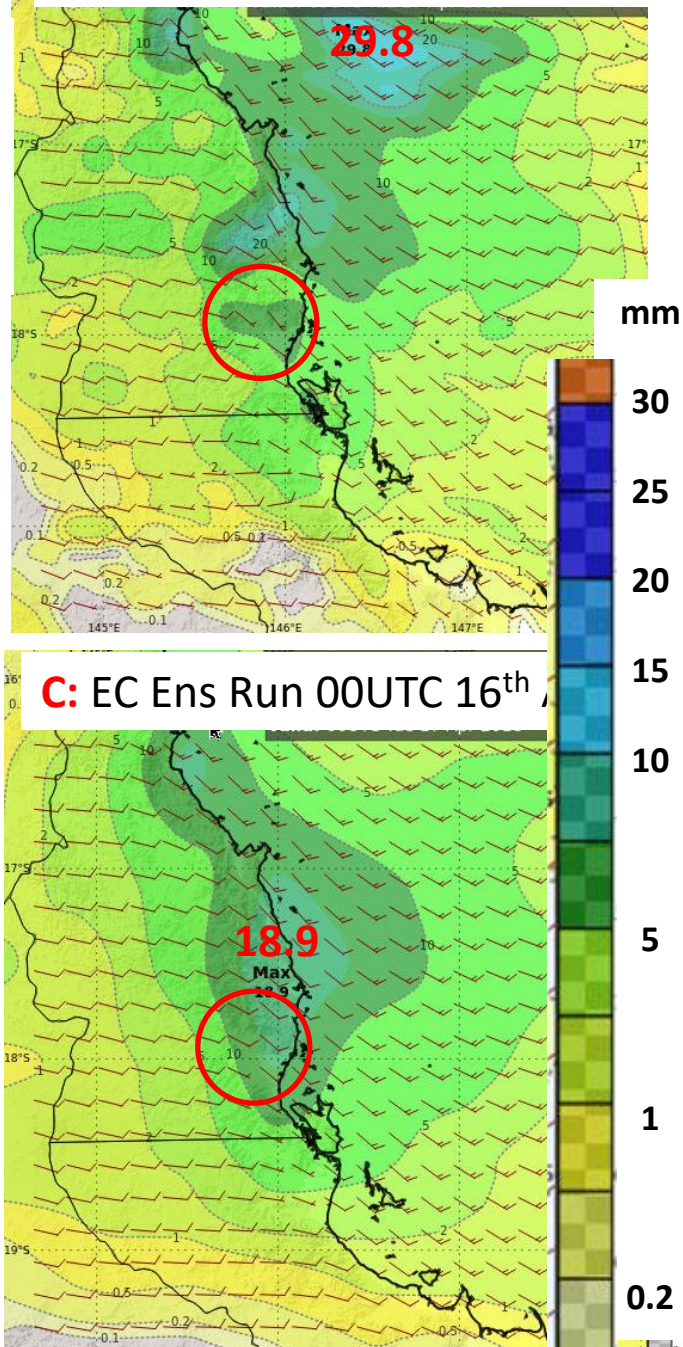
None of the models have performed well

images courtesy BOM

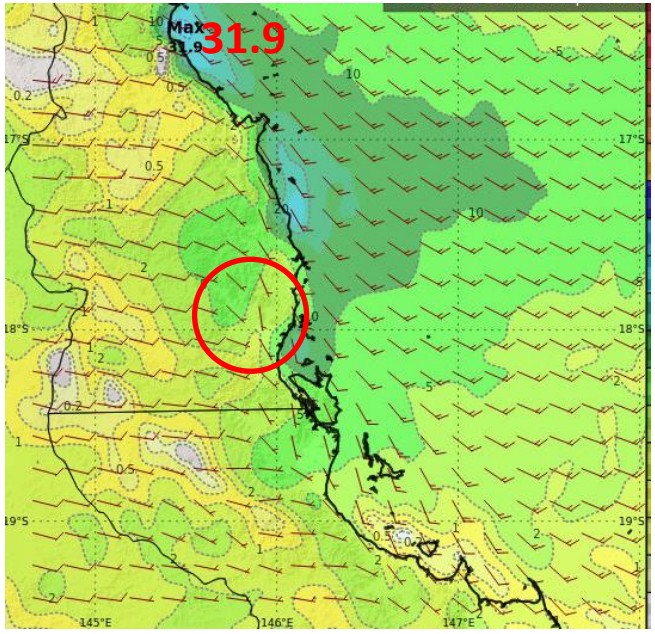
24 hr Rainfall to 9am 17 April



A: EC Det Run 00UTC 16th April



B: ACCESS-R Run 00UTC 16th April



C: EC Ens Run 00UTC 16th A

…some slides not shown…

Regional Focus Group Weather and Forecasting Discussion 11 October 2016

Tropical Case Study: West Java Flooding Event, 20-21st September 2016

Bodo Zeschke Australian VLab Centre of Excellence Point of Contact

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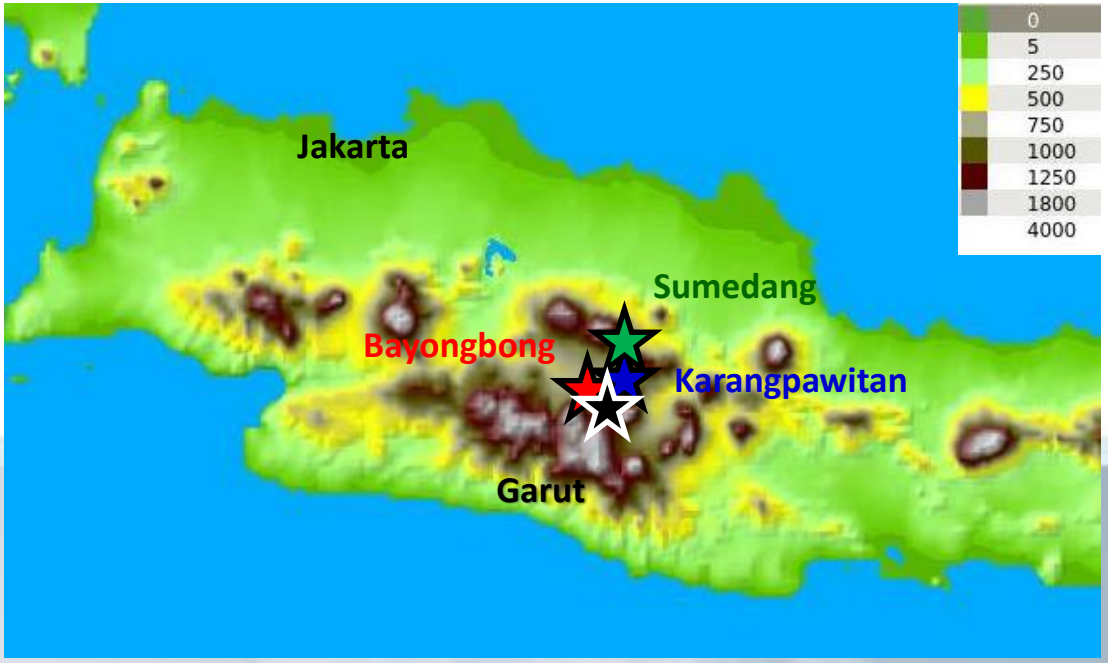
Java Flooding case study of the 20/21st September 2016



- Flash floods in Garut (Bayongbong, Karangpawitan), West Java in the early morning of the 21 September caused 33 deaths, with 20 people still missing and over 6,000 people temporarily displaced. There were also landslides in some of these locations.
- The flash flooding was caused by heavy rainfall which covered the area from Tuesday evening.

From "reliefweb" Asia and the Pacific: Weekly Regional Humanitarian Snapshot (20 - 26 September 2016)
Also The Jakarta Post September 21 2016 http://www.thejakartapost.com/news/2016/09/21/10-dead-after-flash-flood-and-landslides-hit-in-w-java.html

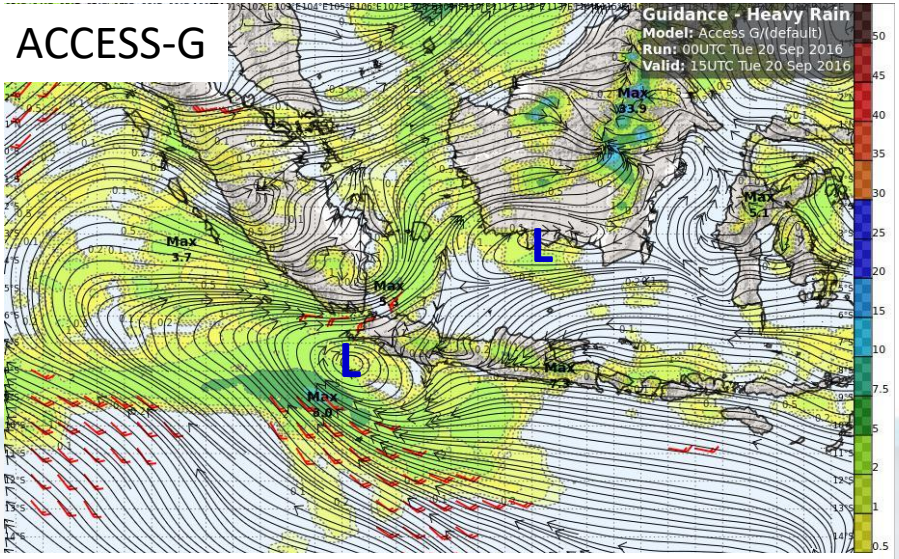
…some slides not shown…

Closer examination of the precipitation forecasts for Java

images courtesy BOM

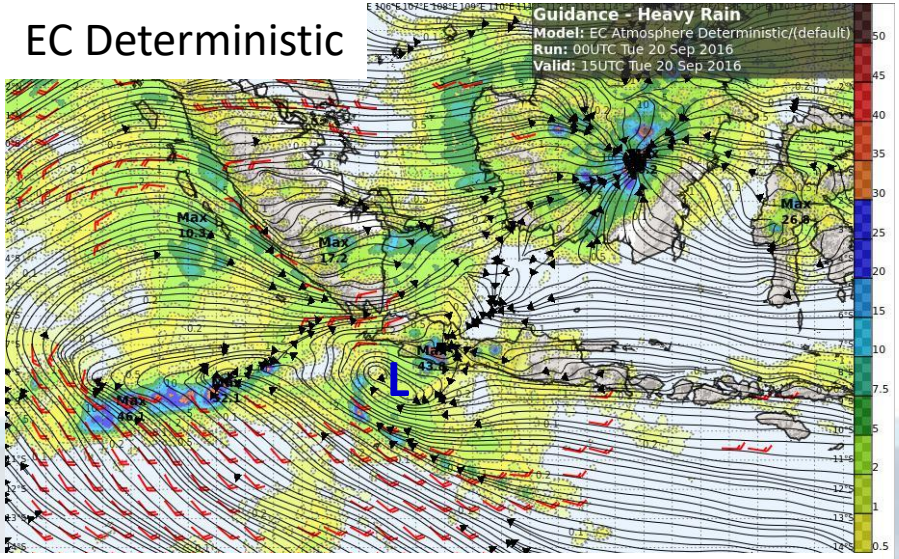
15UTC 20th September 2016

ACCESS-G



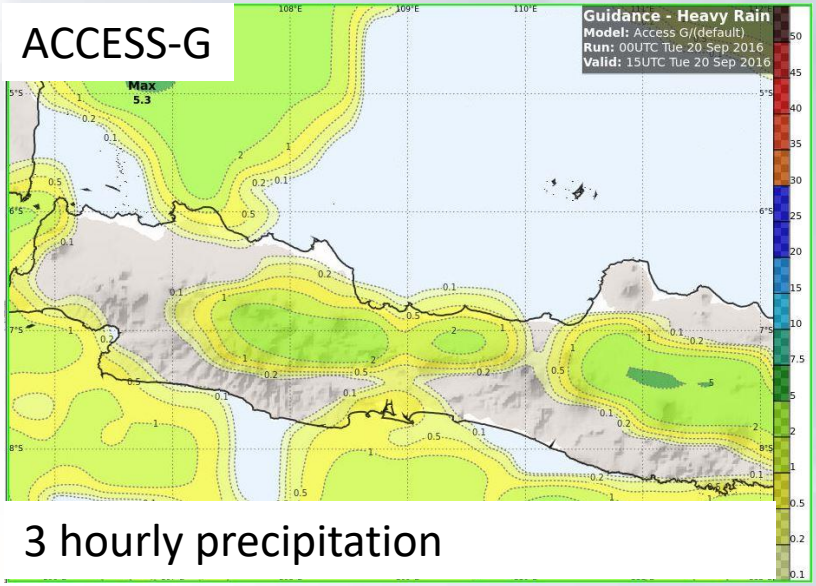
Streamlines, winds >15kt and 3 hourly pptn

EC Deterministic



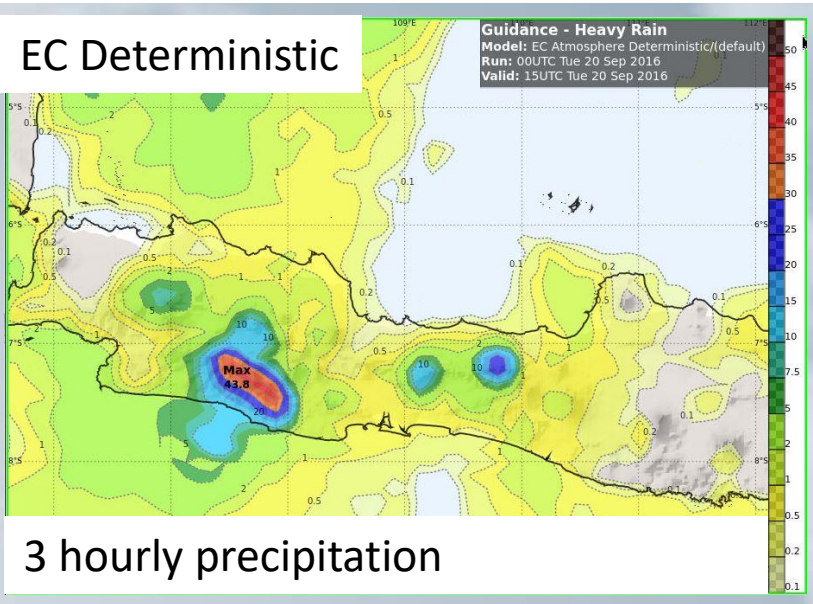
Streamlines, winds >15kt and 3 hourly pptn

ACCESS-G



3 hourly precipitation

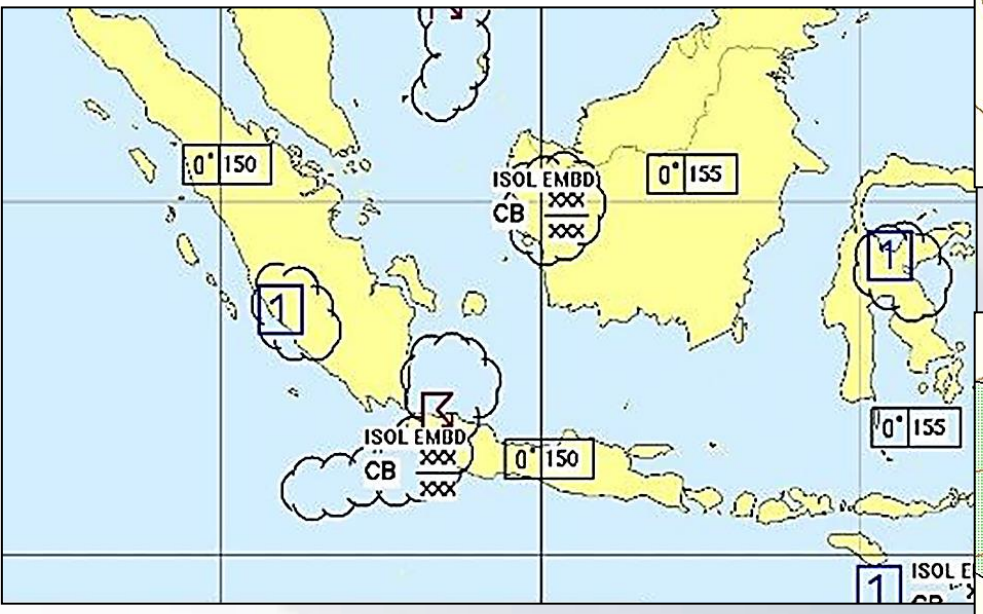
EC Deterministic



3 hourly precipitation

BMKG Indonesian Significant Weather Conditions

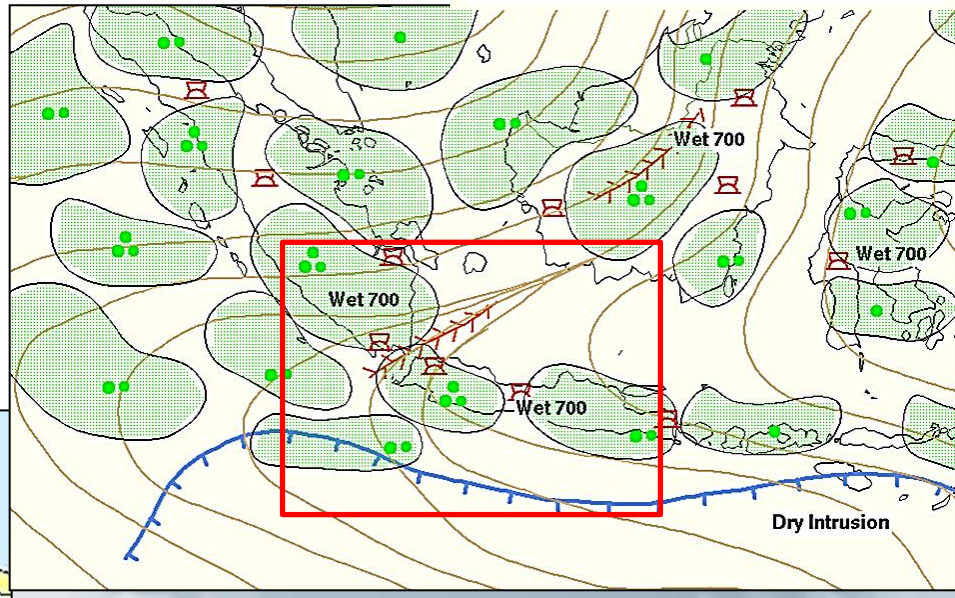
Note the line of convergence near and over western Java, and the heavy rainfall from Cb

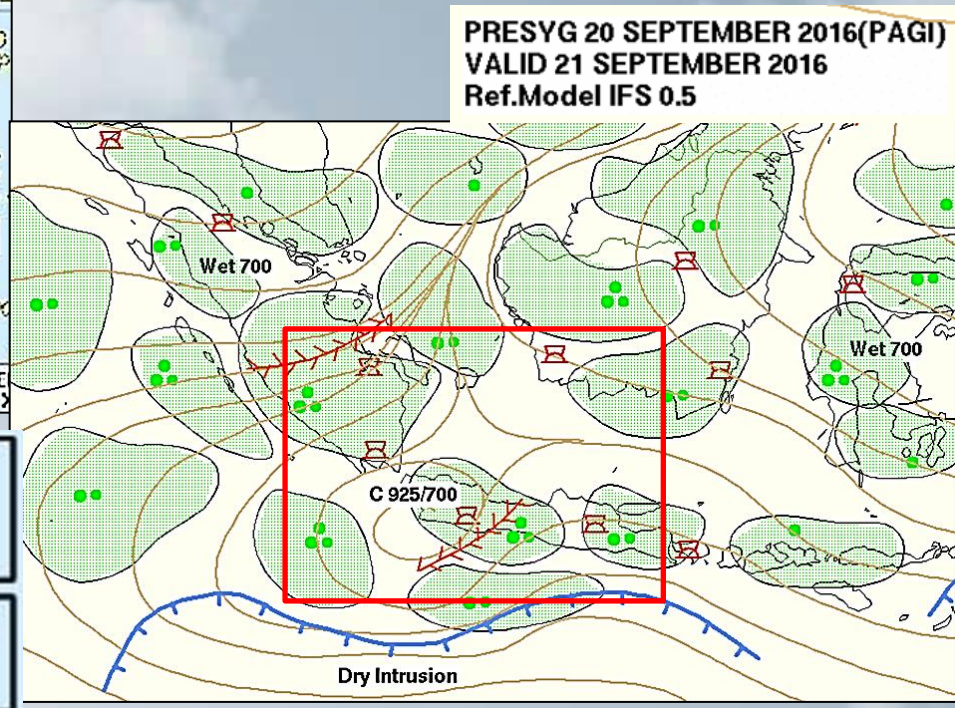


BMKG

BADAN METEOROLOGI KLIMATOLOGI DAN GEOFISIKA
FIXED TIME PROGNOSTIC CHART
FL 100 – FL 250
VALID 06 UTC 20 SEPTEMBER 2016

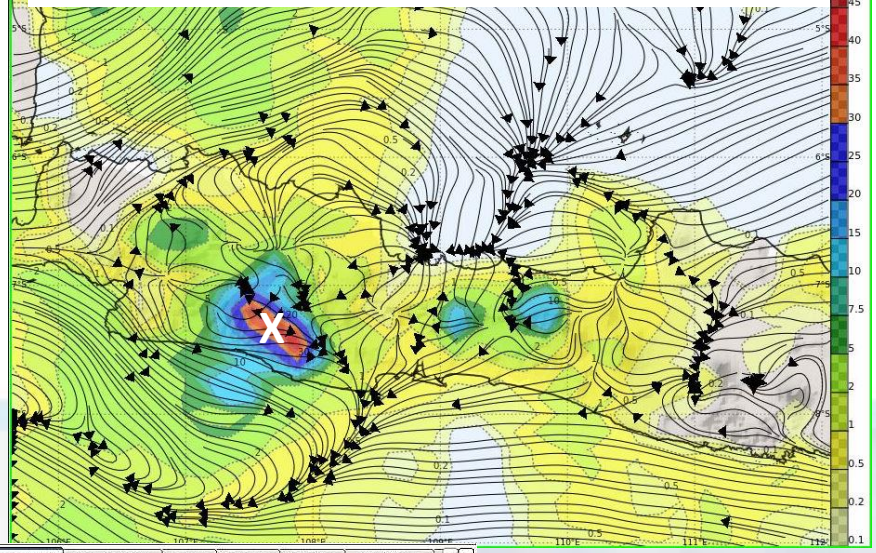
ALL HEIGHT INDICATION IN FLIGHT LEVELS
SYMBOL OR CB IMPLY MOD OR SEVERE TURBULENCE AND ICING
CHECK SIGMET, ADVISORIES, ASHTAM AND NOTAM
FOR VOLCANIC ASH



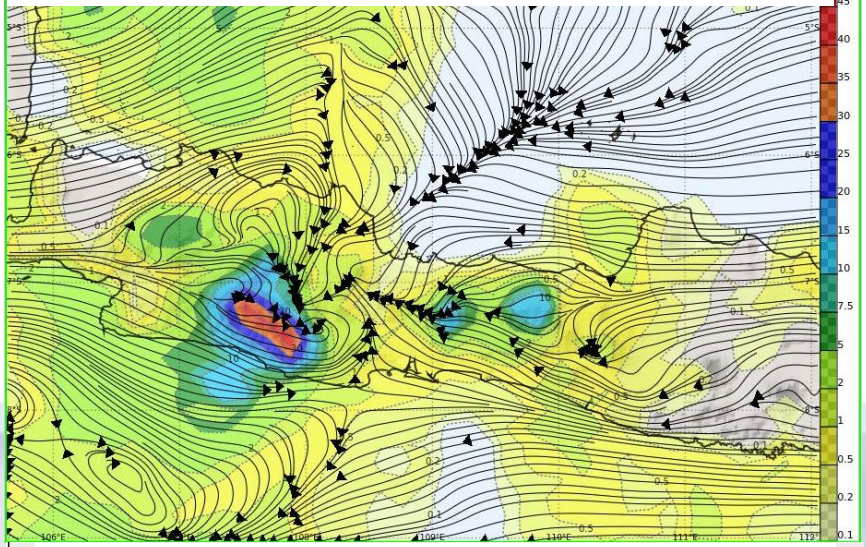


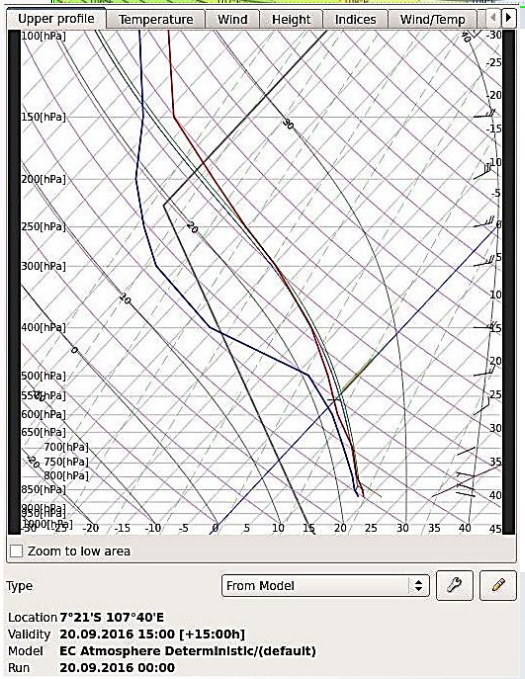
Closer examination of the EC Deterministic forecast for Java

Surface Wind and precipitation, 15UTC



Gradient Wind and precipitation, 15UTC





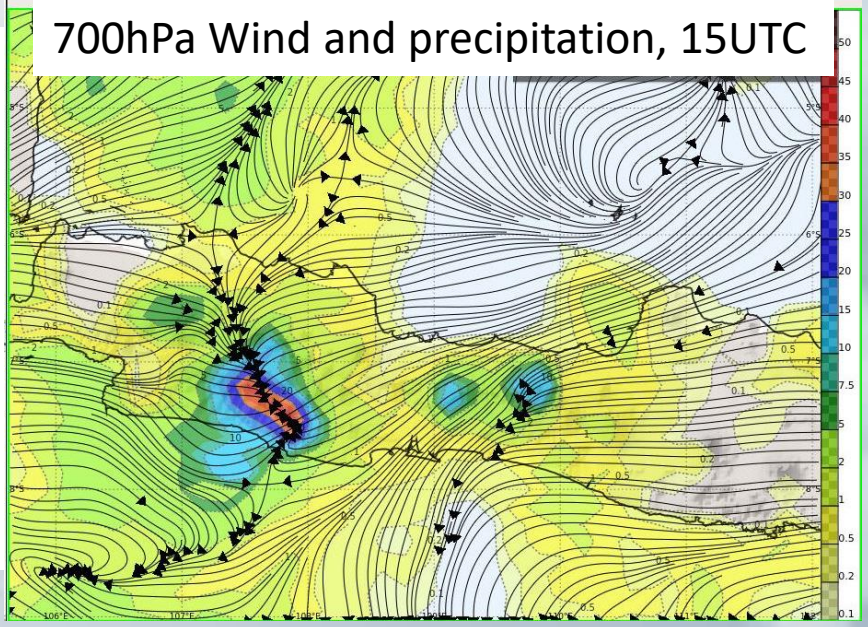
Model sounding at "X"

PW amount = 41.1 kg/m3

K-Index = 37.7

850-600hPa DLM wind = VRB05

700hPa Wind and precipitation, 15UTC



images courtesy BOM

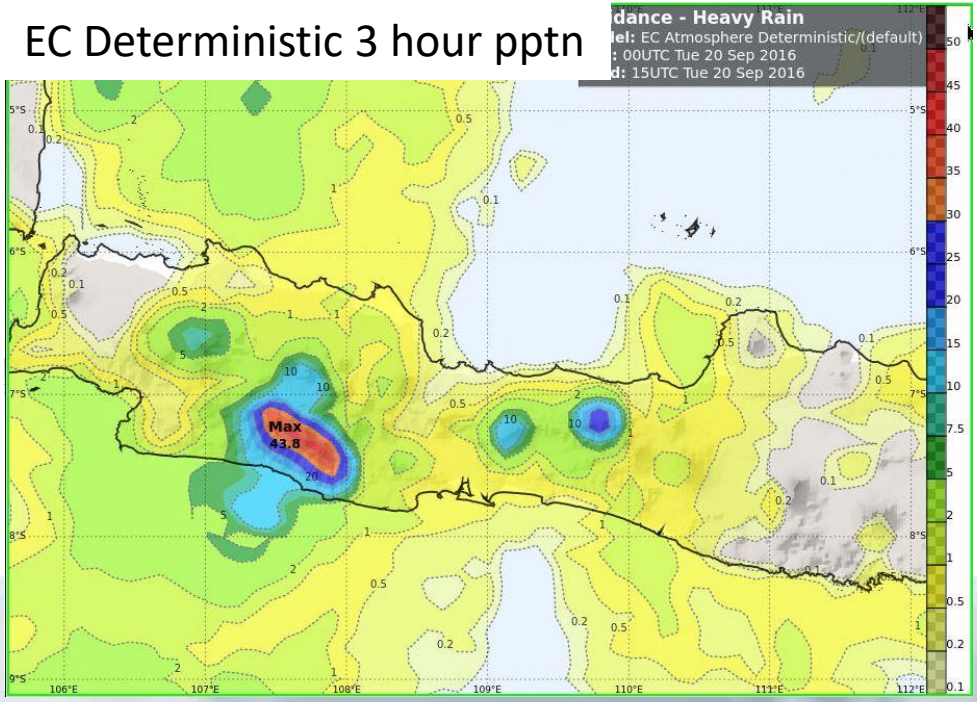
…some slides not shown…

Please start the PowerPoint Slide Show to activate the animation

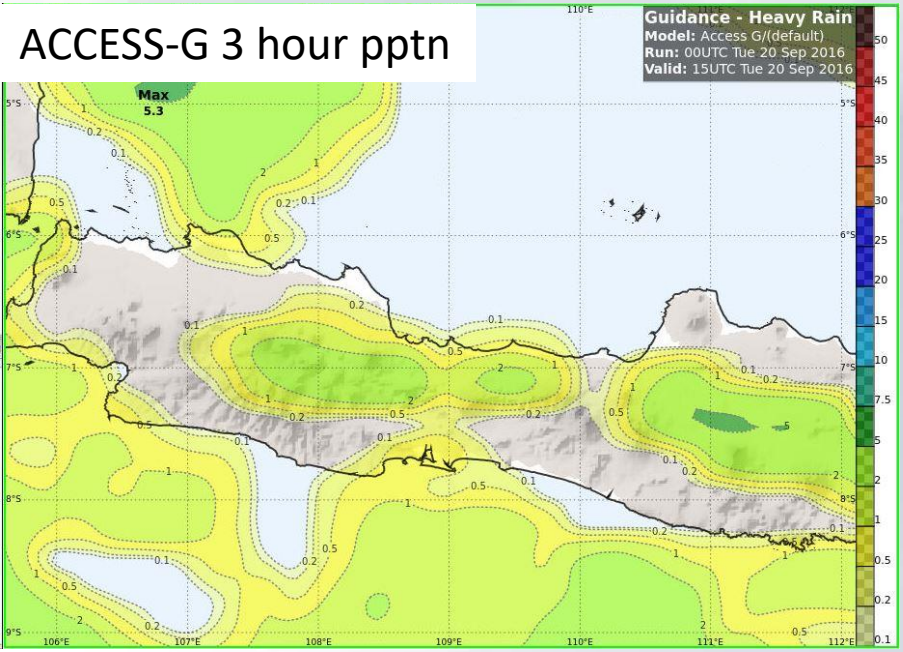
Animation 2: Model precipitation forecasts compared to satellite data at 15UTC

(00UTC model runs)

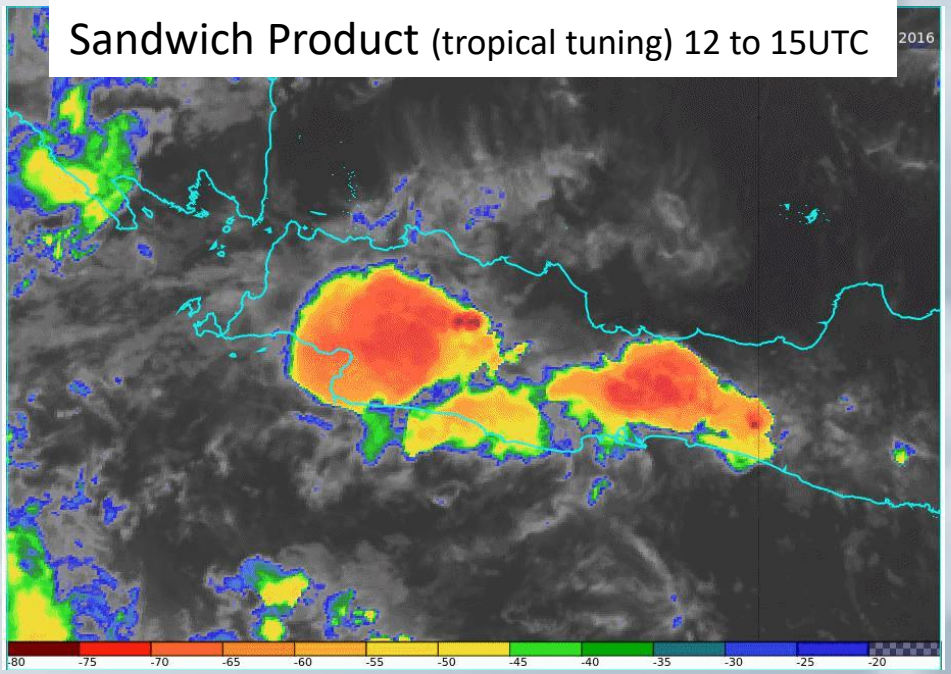
EC Deterministic 3 hour pptn



ACCESS-G 3 hour pptn



Sandwich Product (tropical tuning) 12 to 15UTC



Images courtesy BOM, satellite images courtesy JMA/BOM

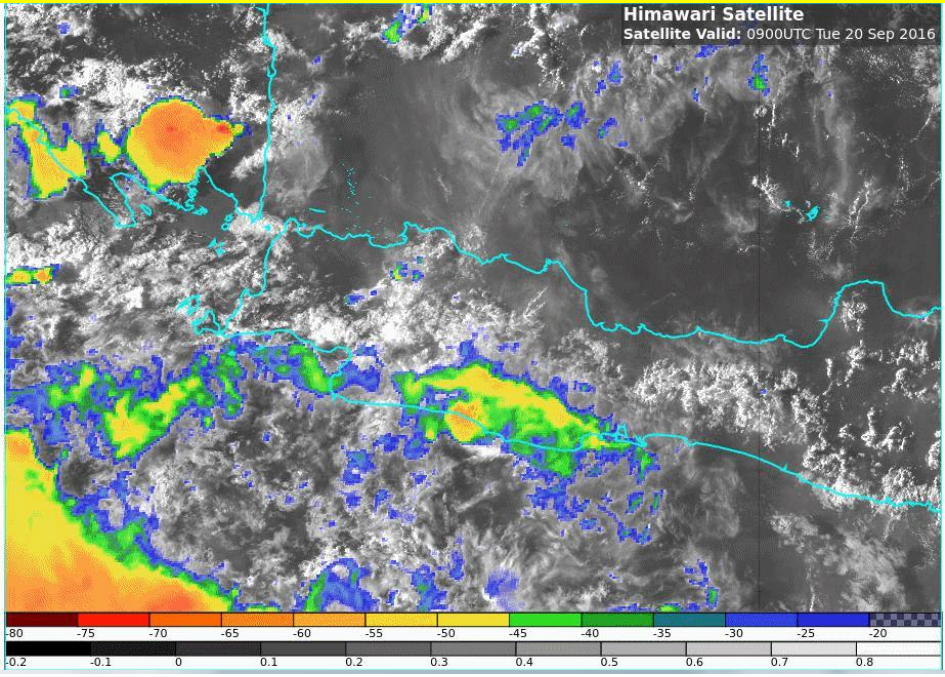
Please start the PowerPoint Slide Show to activate the animation

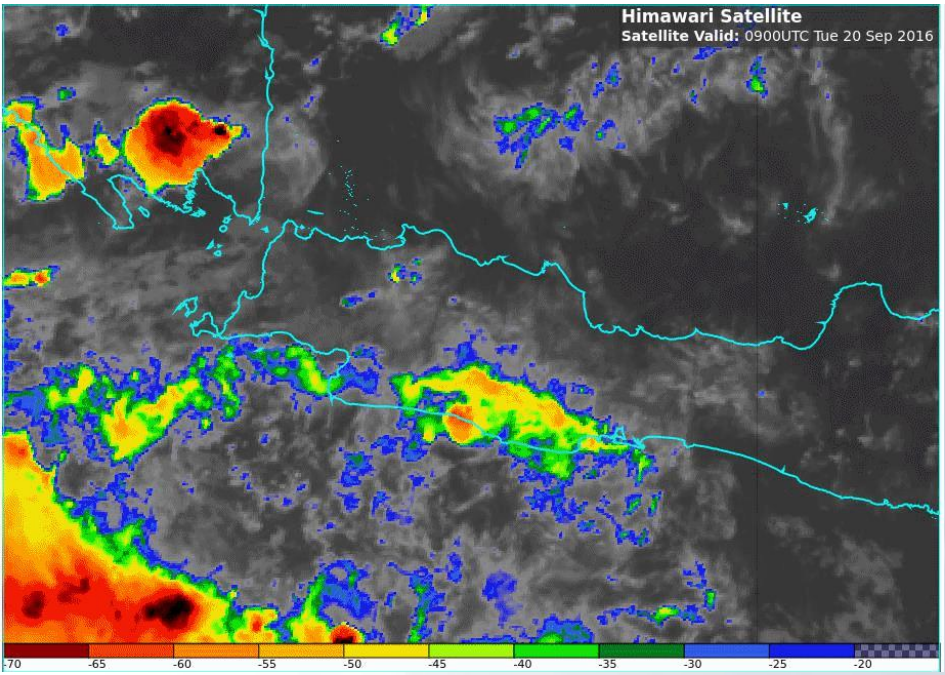
Animation 3: RADAR vs Sandwich Product

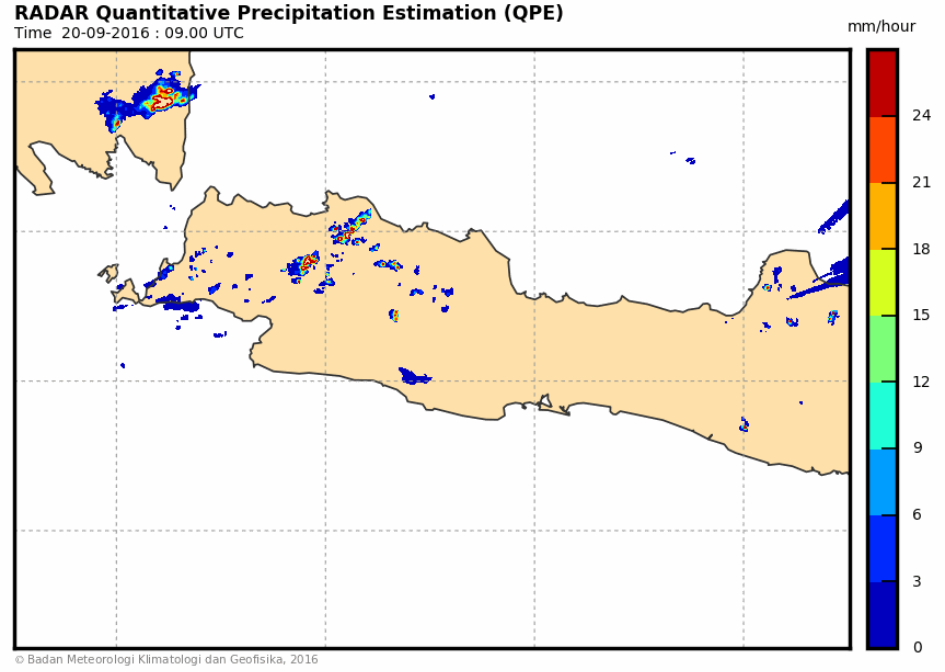
(09 to 16UTC, 20th September)

Question: Whilst watching this animation list one advantage and one disadvantage of the satellite and the RADAR data

satellite images courtesy JMA/BOM, RADAR data courtesy A.Panjaitan BMKG Indonesia





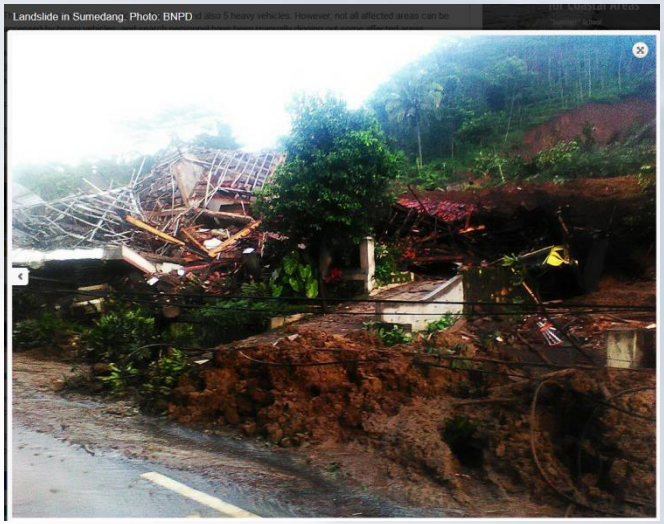


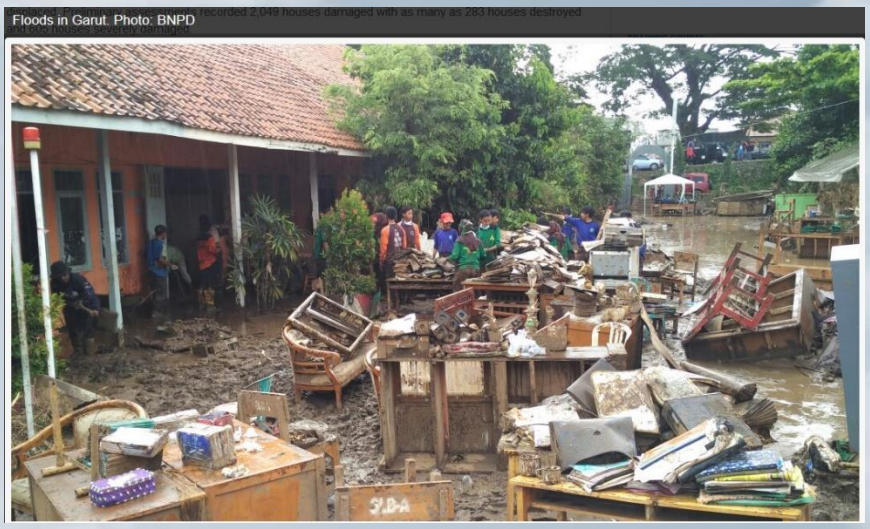
…some slides not shown…

Java Flooding case study – Impact of the Event

RAINFALL STATION	Sub-District	Rainfall (mm/day) 20 September 2016
Perkebunan Papandayan	Cikajang, Garut	255
Bayongbong	Bayongbong, Garut	140
Paseh	Paseh, Sumedang	127
Cisaruni	Cikajang, Garut	110
Rancakalong	Rancakalong, Sumedang	104
Conggeang	Conggeang, Sumedang	102

Stations with 24 hour precipitation > 100mm data courtesy BMKG Indonesia





Images courtesy Indonesian disaster management agency Badan Nasional Penanggulangan Bencana (BNPB), from web page at http://floodlist.com/asia/indonesia-garut-sumedang-west-java-floods-landslides