Australian Government
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2020/21 Tropical Cyclone preseason update

- Useful websites
- Satellite: NRL changes; microwave and scatterometry
- NWP upgrades
- Online training resources microwave and scatterometry

Joe Courtney, Bureau of Meteorology

joe.courtney@bom.gov.au

9 December 2020

VLAB: http://www.virtuallab.bom.gov.au/

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Websites: CIMSS
http://tropic.ssec.wisc.edu/

AMV winds + diagnostics

Future: Hi-res AMVs

Mimic-TPW

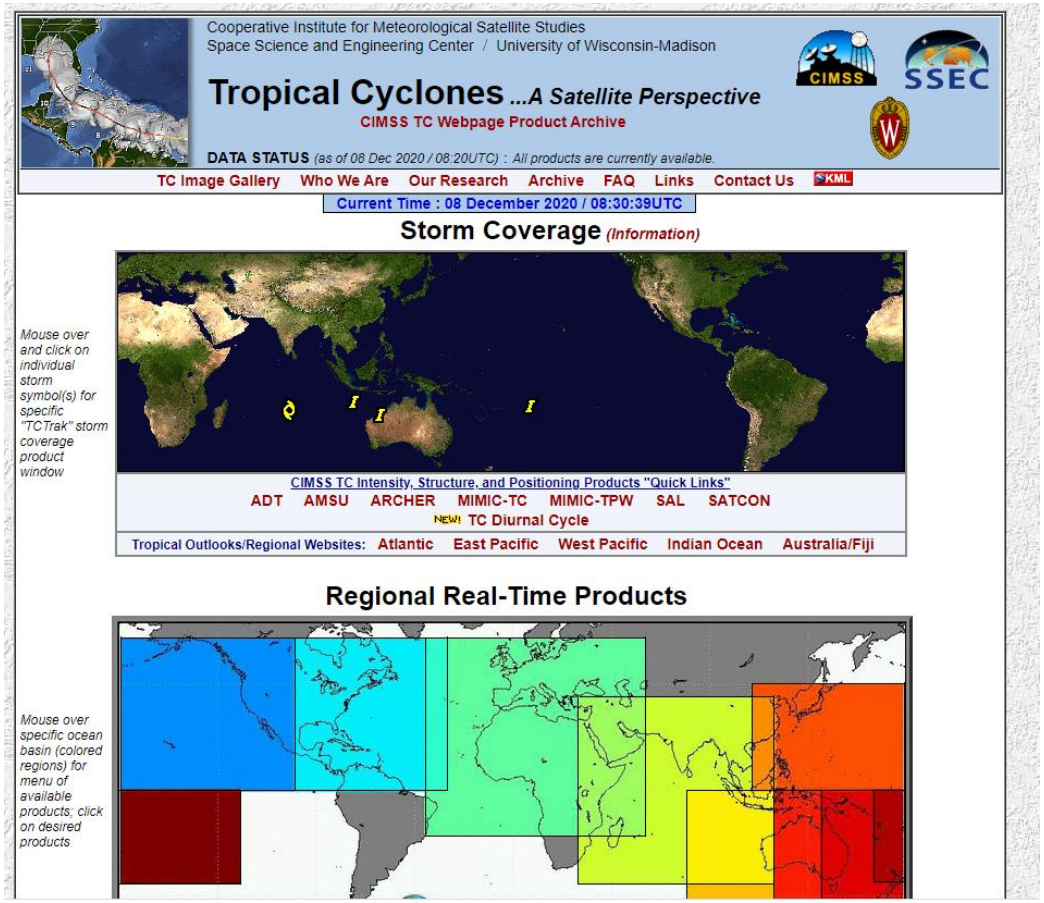
ADT V9.0 (NESDIS V8.2)

Future: AI version!

SATCON

ARCHER and M-PERC

NEW: diurnal cycle



Poll: Do you use this a. all the time; b. sometimes c. not so often

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Websites: CIRA

https://rammb-data.cira.colostate.edu/tc_realtime/index.asp

Lots: Imagery esp WV; model data products; multi-platform wind analyses

NOAA Satellites and Information
National Environmental Satellite, Data, and Information Service

Cooperative Research Program (CoRP) | Center for Satellite Applications and Research (STAR)

SH022021 - Tropical Cyclone (<64 kt) BONGOYO

- Current Active Cyclones
- Archive
  - 2021 Season
  - 2020 Season
  - 2019 Season
  - 2018 Season
  - 2017 Season
  - 2016 Season
  - 2015 Season
  - 2014 Season
  - 2013 Season
  - 2012 Season
  - 2011 Season
  - 2010 Season
  - 2009 Season
  - 2008 Season
  - 2007 Season
  - 2006 Season
- Additional Information
- Additional Links

View model data products for this storm.

View wind speed probabilities products for this storm

Forecast Track

Time of Latest Forecast: 2020-12-08 06:00

Forecast Hour	Latitude	Longitude	Intensity
0	-16.8	78.1	55
12	-18.4	76.9	55
24	-19.5	76.2	50
36	-19.9	75.4	45
48	-20.1	74.1	40
72	-20.1	69.9	35
96	-19.9	64.8	35
120	-19.7	58.6	35

Forecast Track Archive

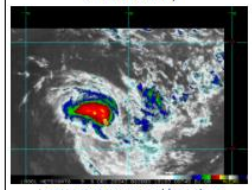
About Forecast Track

Track History

Synoptic Time	Latitude	Longitude	Intensity
2020-12-08 06:00	-16.8	78.1	55
2020-12-08 00:00	-15.8	79.3	55
2020-12-07 18:00	-15.5	80.0	45
2020-12-07 12:00	-15.0	80.9	40
2020-12-07 06:00	-14.6	81.9	35

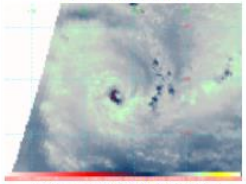
About Track History

Enhanced Infrared (IR) Imagery (4 km Mercator)



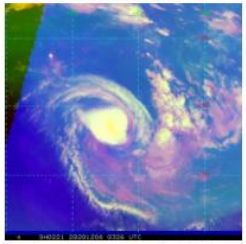
Loop | Latest Image | Archive | About
Time of Latest Image: 2020-12-08 08:30

AMSU Microwave 89 GHz Imagery (4 km Mercator)



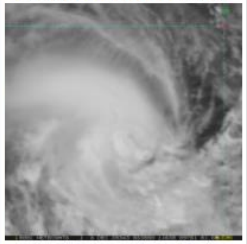
Loop | Latest Image | Archive | About
Time of Latest Image: 2020-12-08 03:26

IR/WV/Microwave RGB (IR [R], WV [G], MI89 [B])



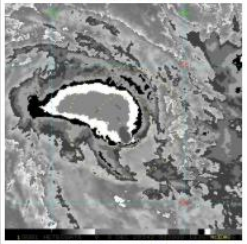
Loop | Latest Image | Archive | About
Time of Latest Image: 2020-12-08 03:26

Storm Relative 1 km Geostationary Visible Imagery



Loop | Latest Image | Archive | About
Time of Latest Image: 2020-12-08 08:30

2 km Storm Relative IR Imagery with BD Enhancement Curve



Loop | Latest Image | Archive | About
Time of Latest Image: 2020-12-08 08:30

Enhanced Infrared (IR) Imagery (1 km Mercator, MODIS/AVHRR)
No Data Available

Day/Night Visible Imagery VIIRS
No Data Available

Day/Night DNB Imagery VIIRS
No Data Available

Enhanced Infrared (IR) VIIRS
No Data Available

Visible Imagery (1 km Mercator, MODIS/AVHRR)
No Data Available

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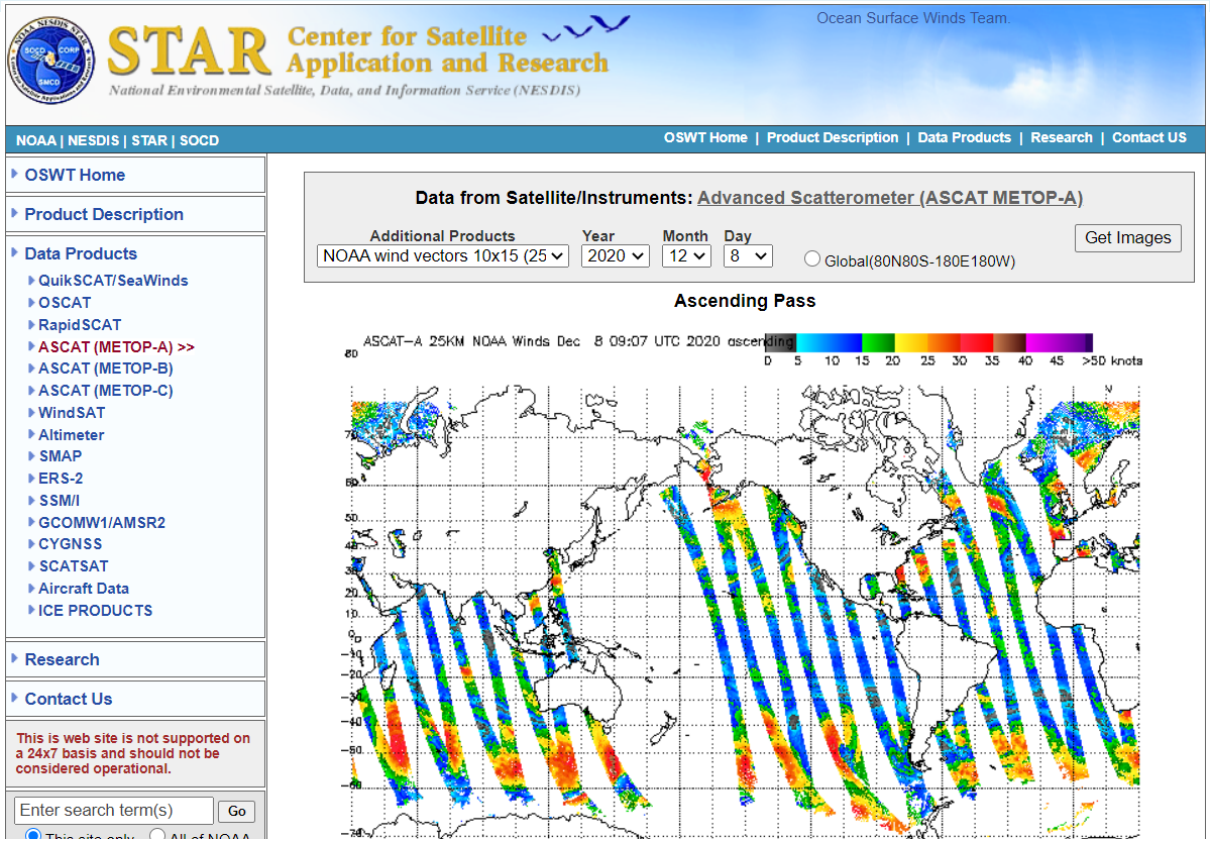
Websites: NOAA/NESDIS scat

https://manati.star.nesdis.noaa.gov/

ASCAT A, B, C
SCATSAT (OSCAT)
SMAP
Storm page



Poll: Do you use this a. all the time; b. sometimes c. not so often

Scatterometry: SAR (synthetic aperture radar) Now operationally available

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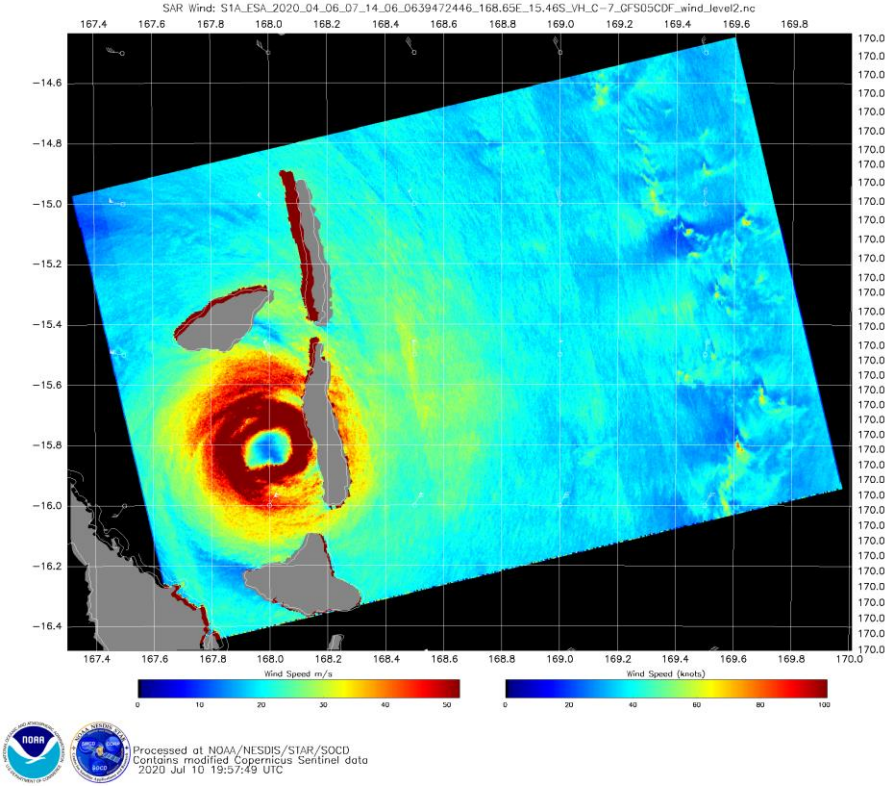
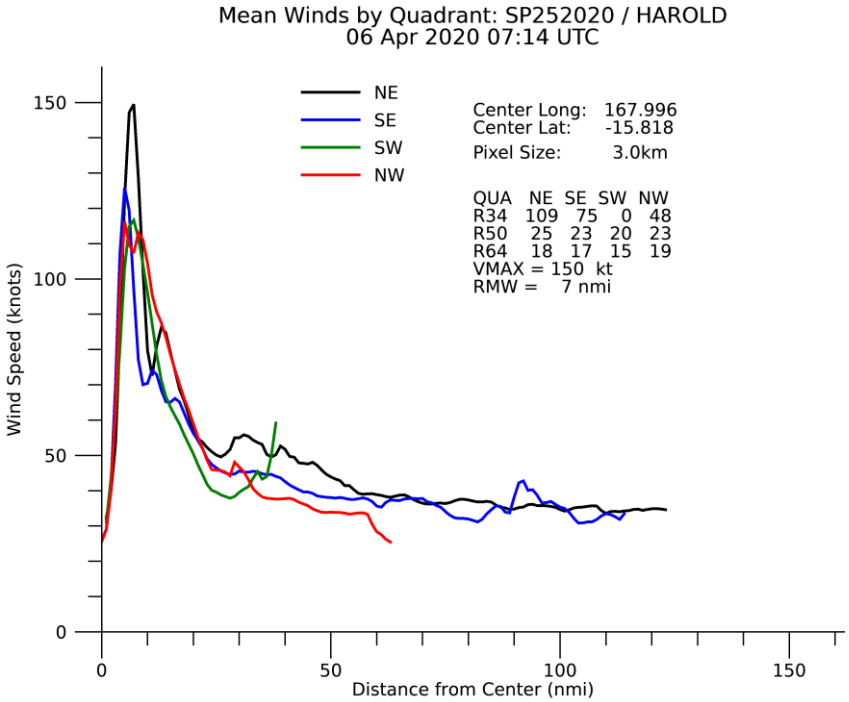
https://www.star.nesdis.noaa.gov/socd/mecb/sar/AKDEMO_products/APL_winds/tropical/index.html

Hi res: 3km but narrow 400km swathe – infrequently available; on Sentinel-1 A&B (EU) and RadarSat (Canada)





Refer to training module:
https://learn.bom.gov.au/mod/book/view.php?id=16297&chapterid=6339

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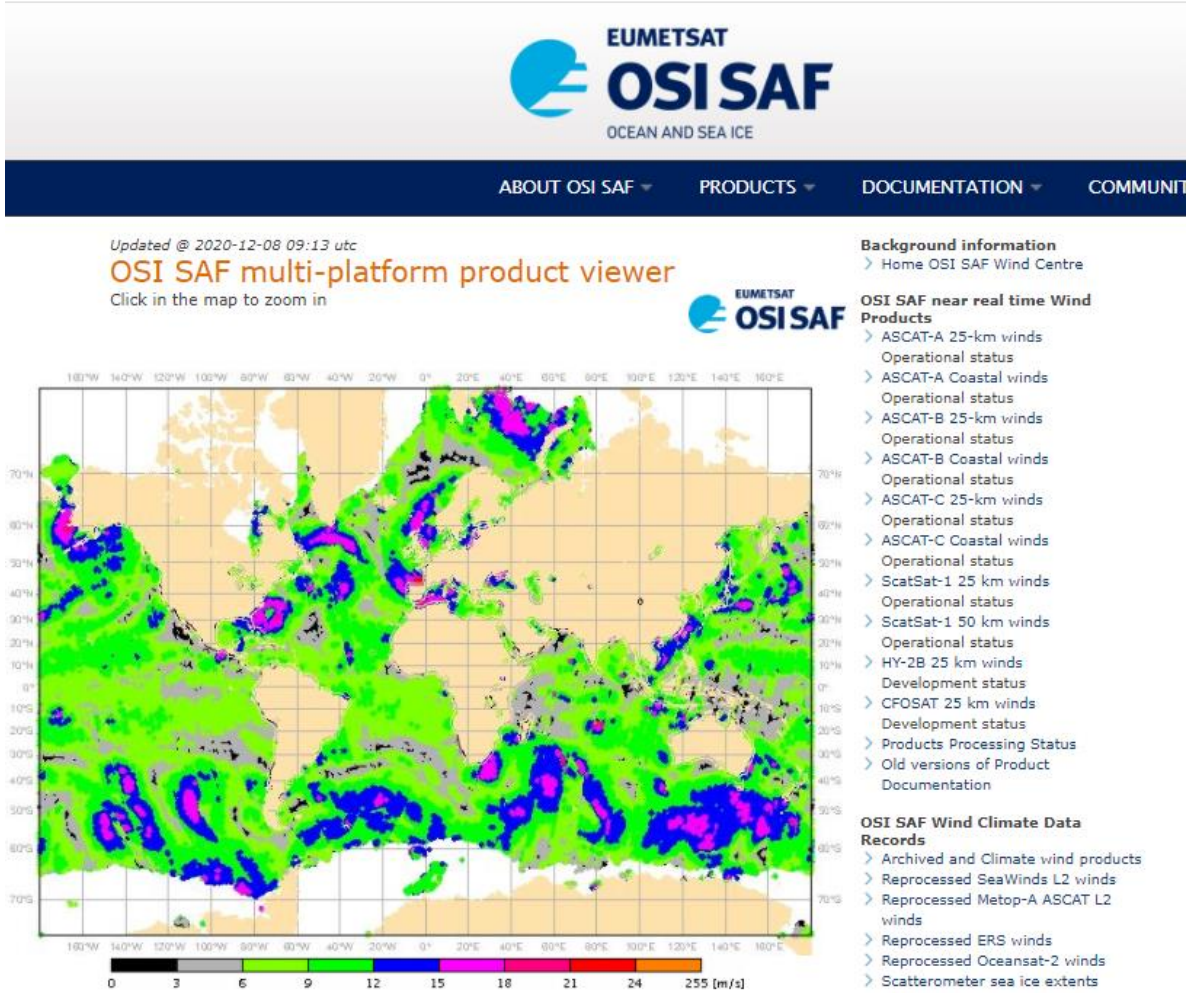
Websites: KNMI scat

http://projects.knmi.nl/scatterometer/tile_prod/tile_app.cgi

Multiproduct viewer ASCAT A, B, C and SCATSAT



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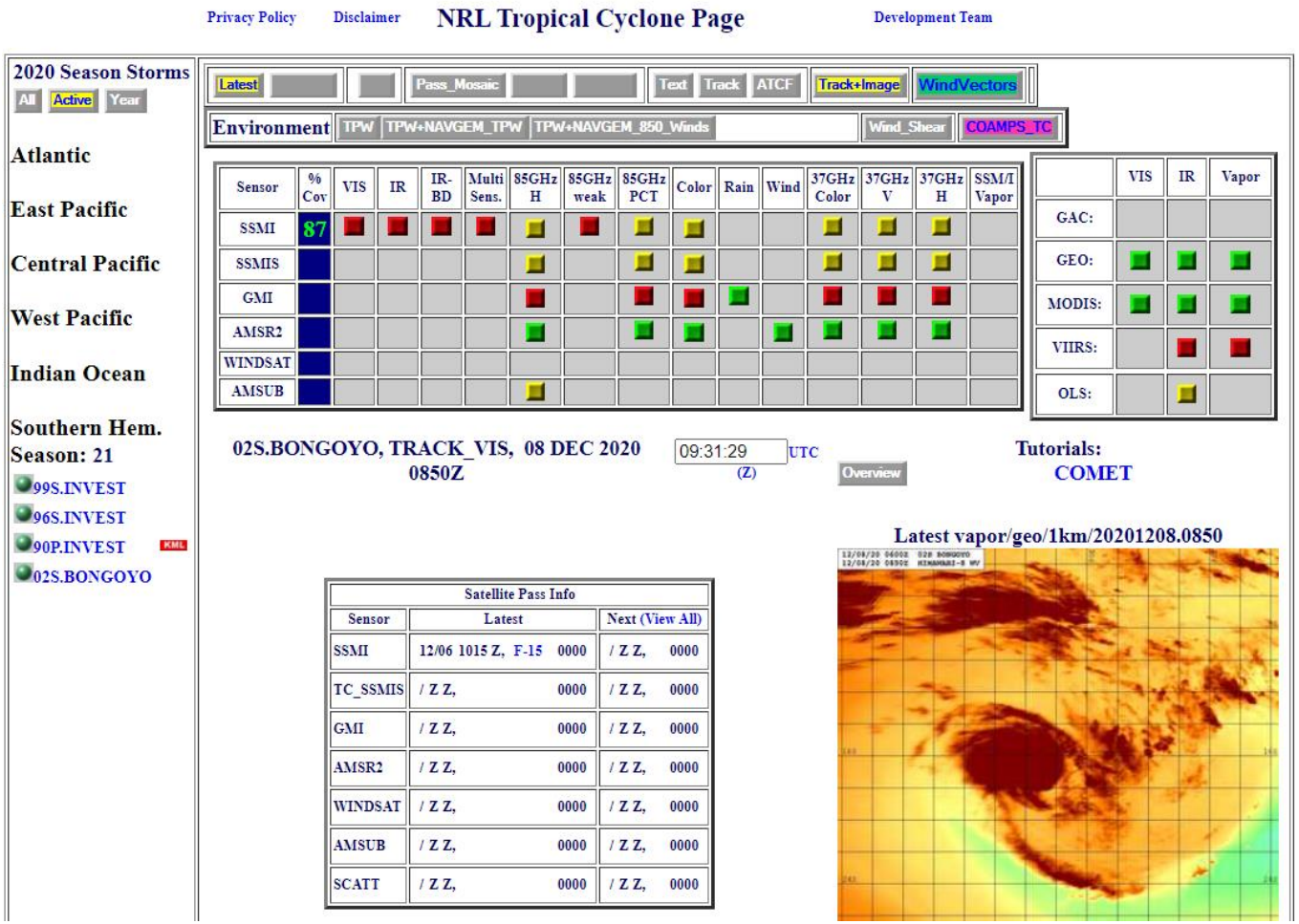
NRL: microwave

https://www.nrlmry.navy.mil/tc_pages/tc_home.html

Poll: Do you use microwave imagery for TCs
a. all the time; b. sometimes c. not at all



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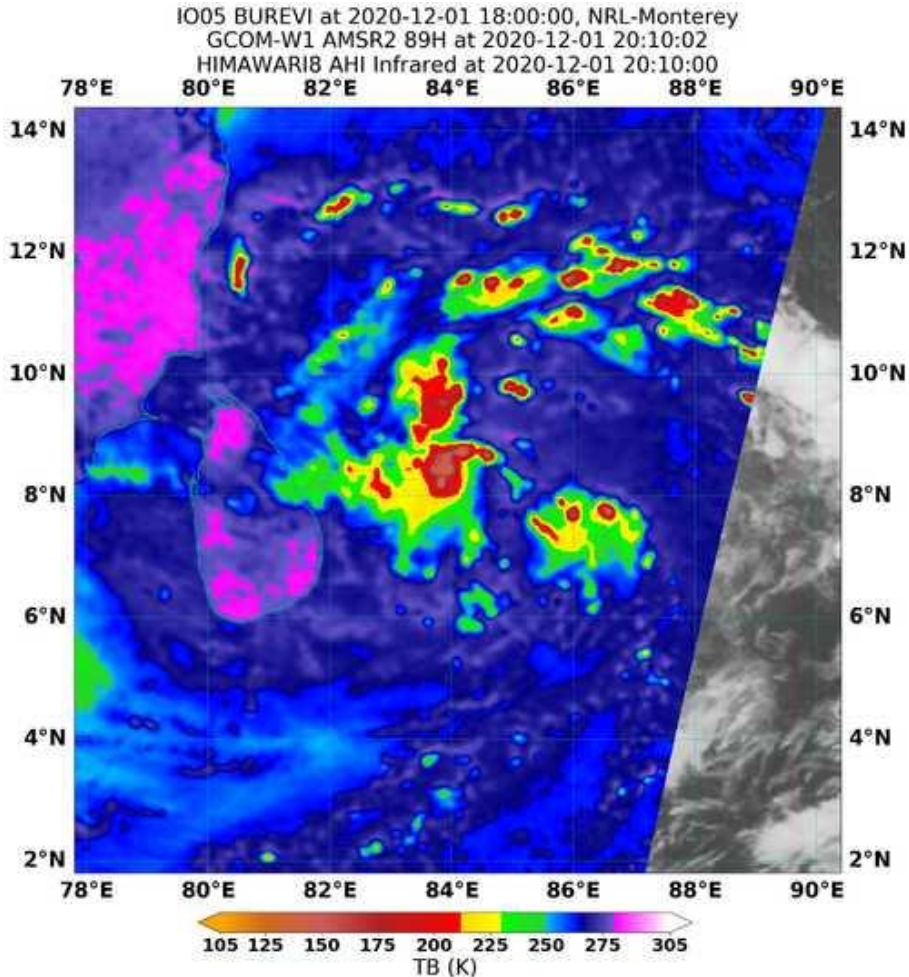
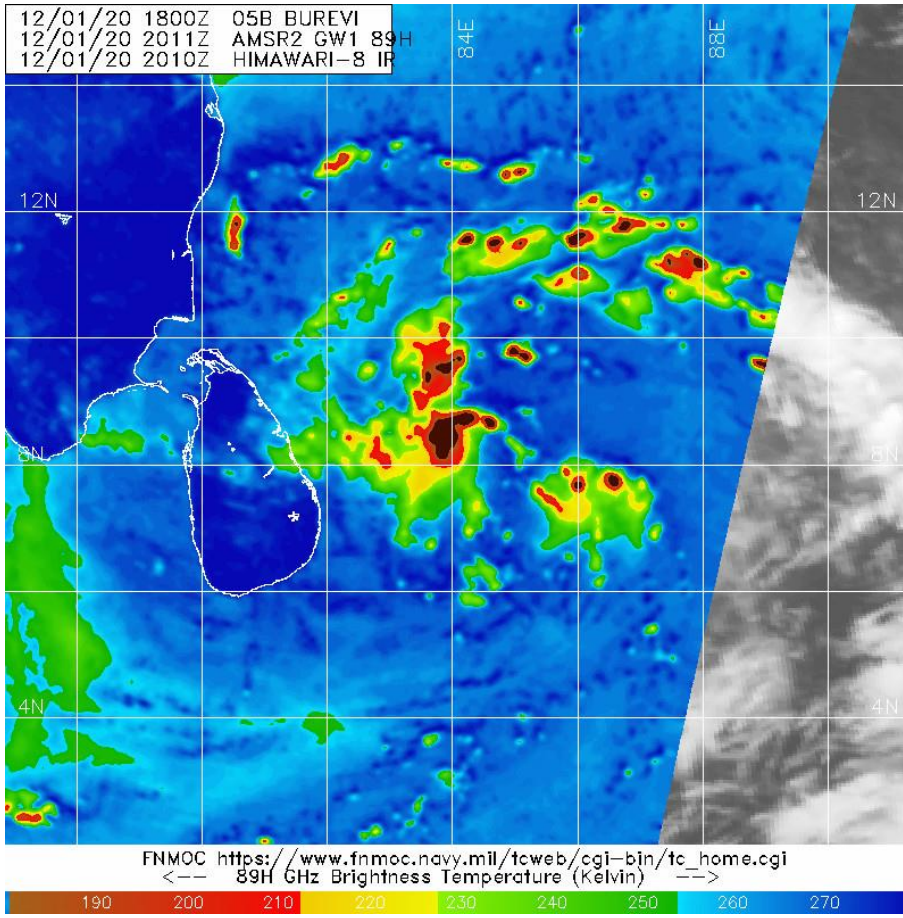
NRL: microwave changes

New



Previously



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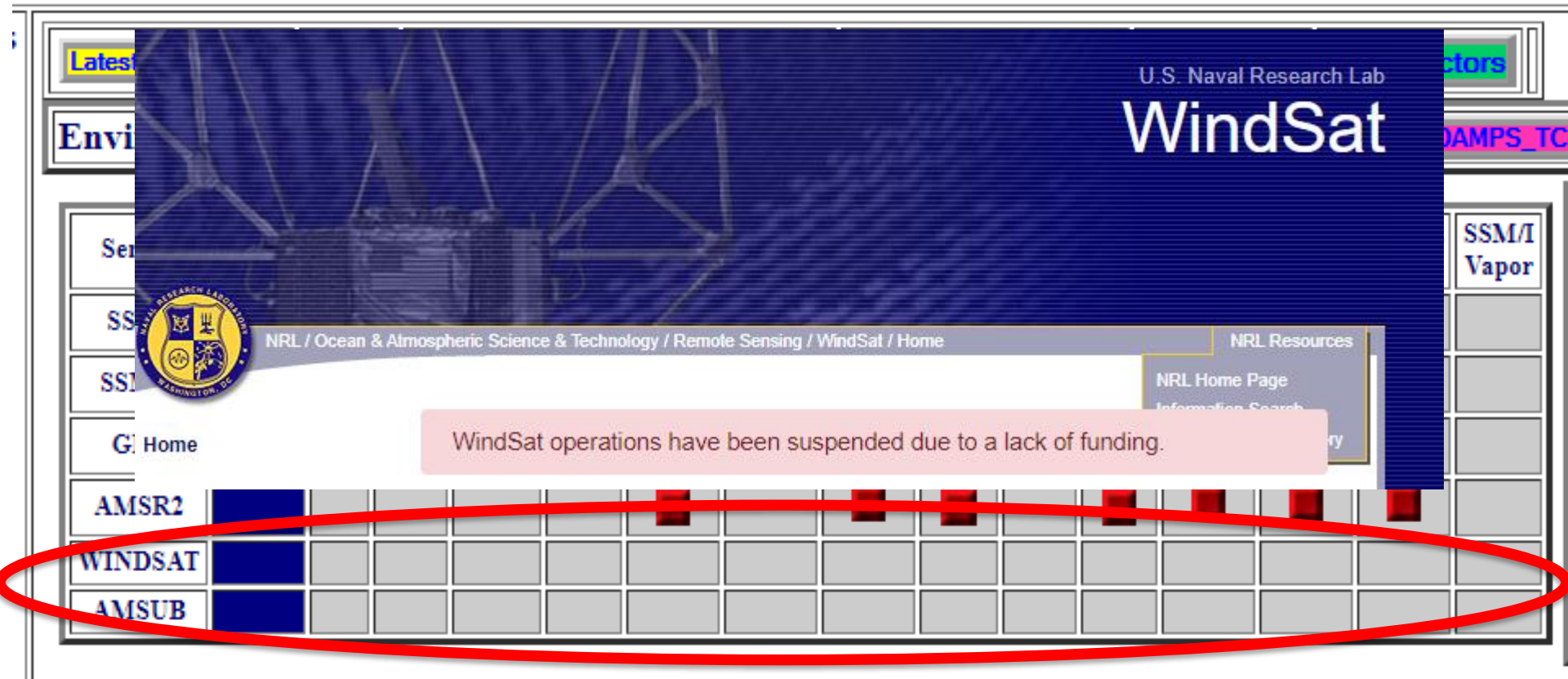
NRL: no more windsat or AMSU imagery

- Windsat was the highest resolution at 37 GHz



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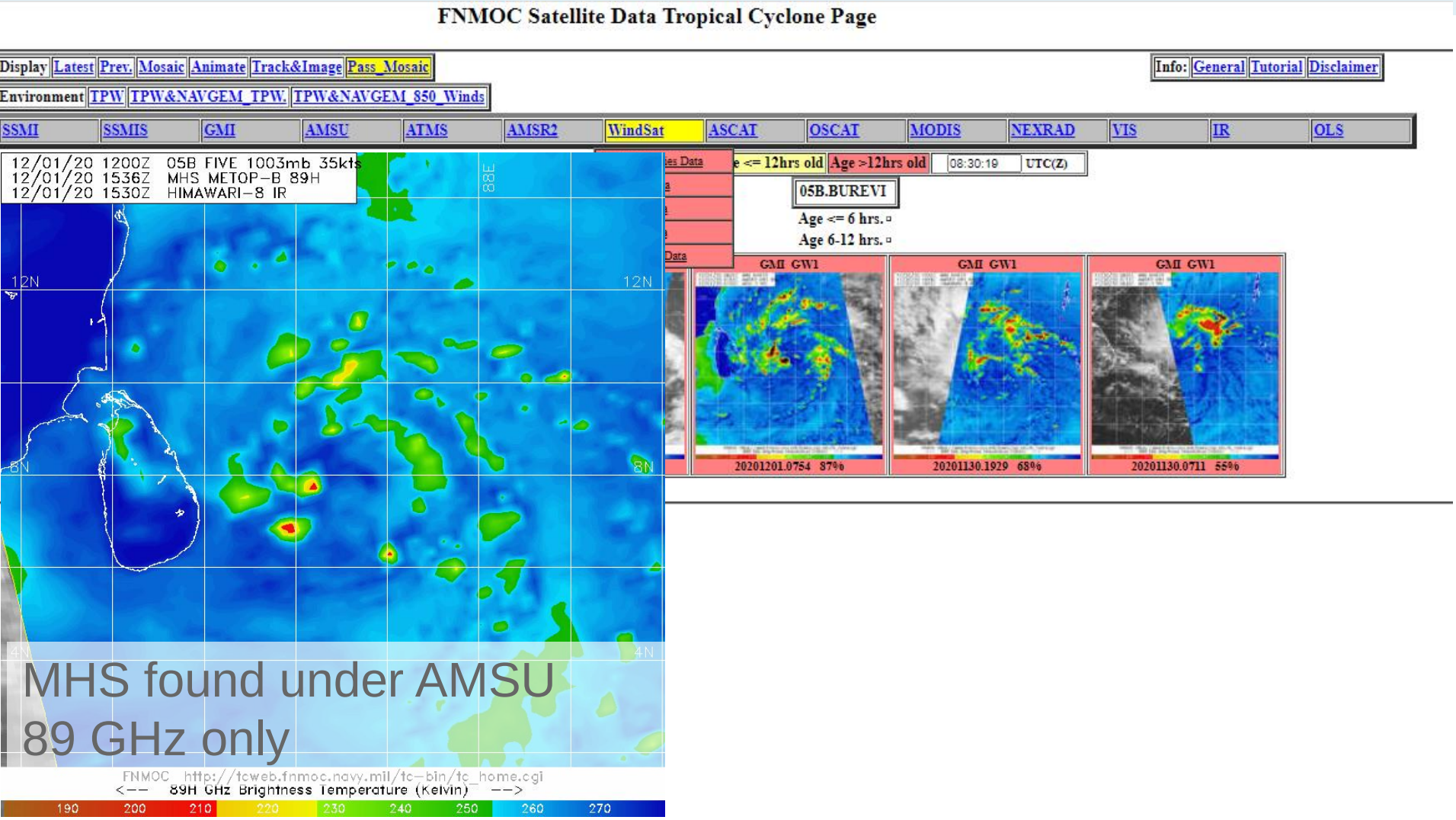
FNMOC page for MHS (89GHz) and ATMS

https://www.fnmoc.navy.mil/tcweb/cgi-bin/tc_home.cgi



MHS found under AMSU
89 GHz only

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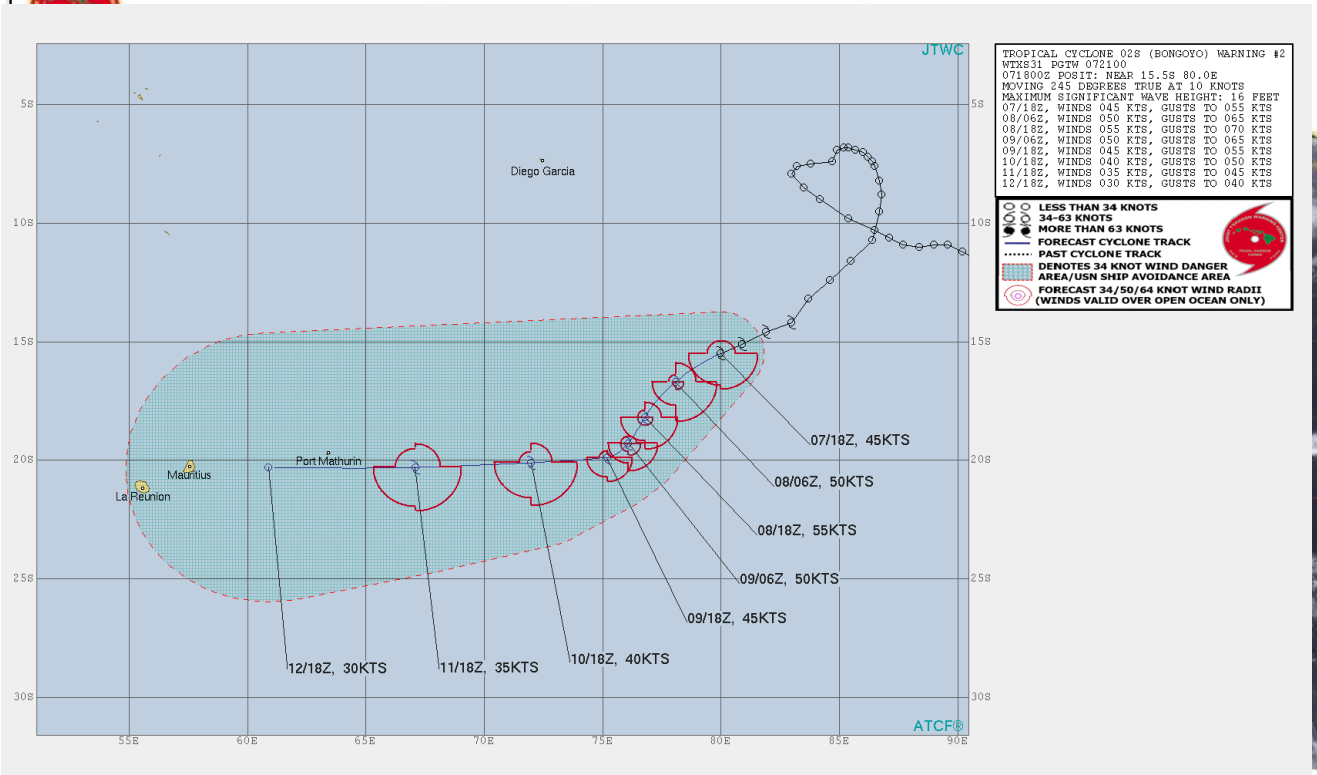
Websites: JTWC

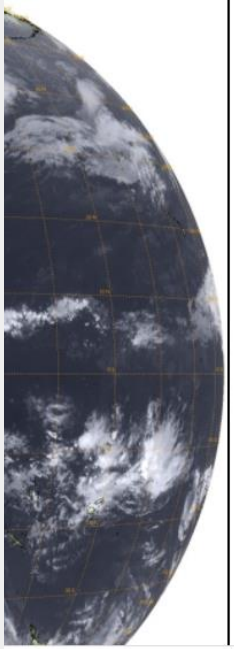
https://www.metoc.navy.mil/jtwc/jtwc.html

Naval Oceanography Portal

Tropical Cyclone Support Tsunami Support

Tropical Cyclone Development Potential





JTWC Tropical Warnings

Current Northwest Pacific/North Indian Ocean* Tropical Systems

- No Current Tropical Cyclone Warnings.

** Includes Bay of Bengal and Arabian Sea*

Current Central/Eastern Pacific Tropical Systems

- No Current Tropical Cyclone Warnings.

Current Southern Hemisphere Tropical Systems

Tropical Cyclone Formation Alert WTXS22 Issued at 08/0530Z

- TCFA Text
- TCFA Graphic
- JMV 3.0 Data
- Google Earth Overlay KML
- IR Satellite Imagery
- Satellite Fix Bulletin

Tropical Cyclone 02S (Bongoyo) Warning #02 Issued at 07/2100Z

- TC Warning Text
- TC Warning Graphic
- JMV 3.0 Data
- Google Earth Overlay KML
- IR Satellite Imagery
- Satellite Fix Bulletin

Current Significant Tropical Weather Advisories

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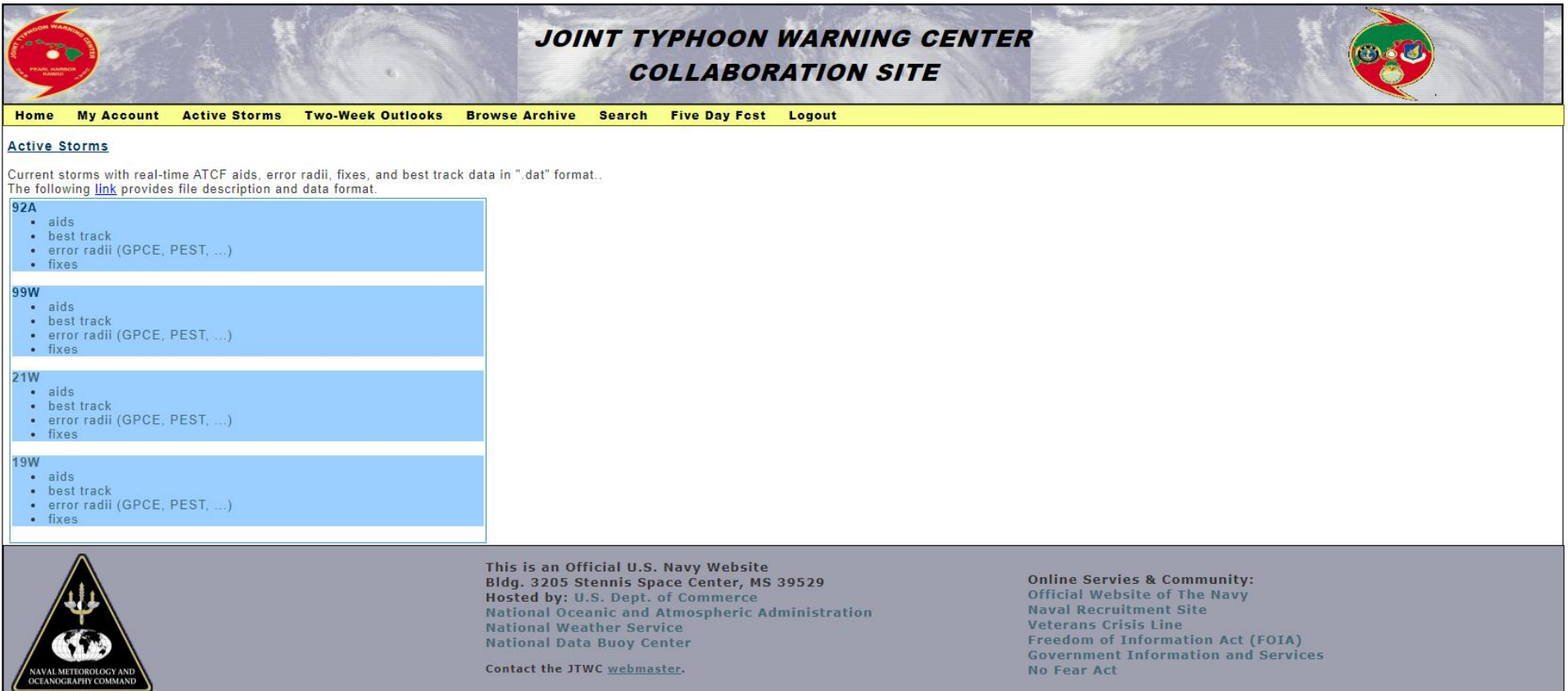
For RSMC/TCWCs only JTWC collab. page

- Have you tested downloading from JTWC website?
- ACCESS-G called 'AGDM'; ACCESS-TC (for intensity) called 'ACES'



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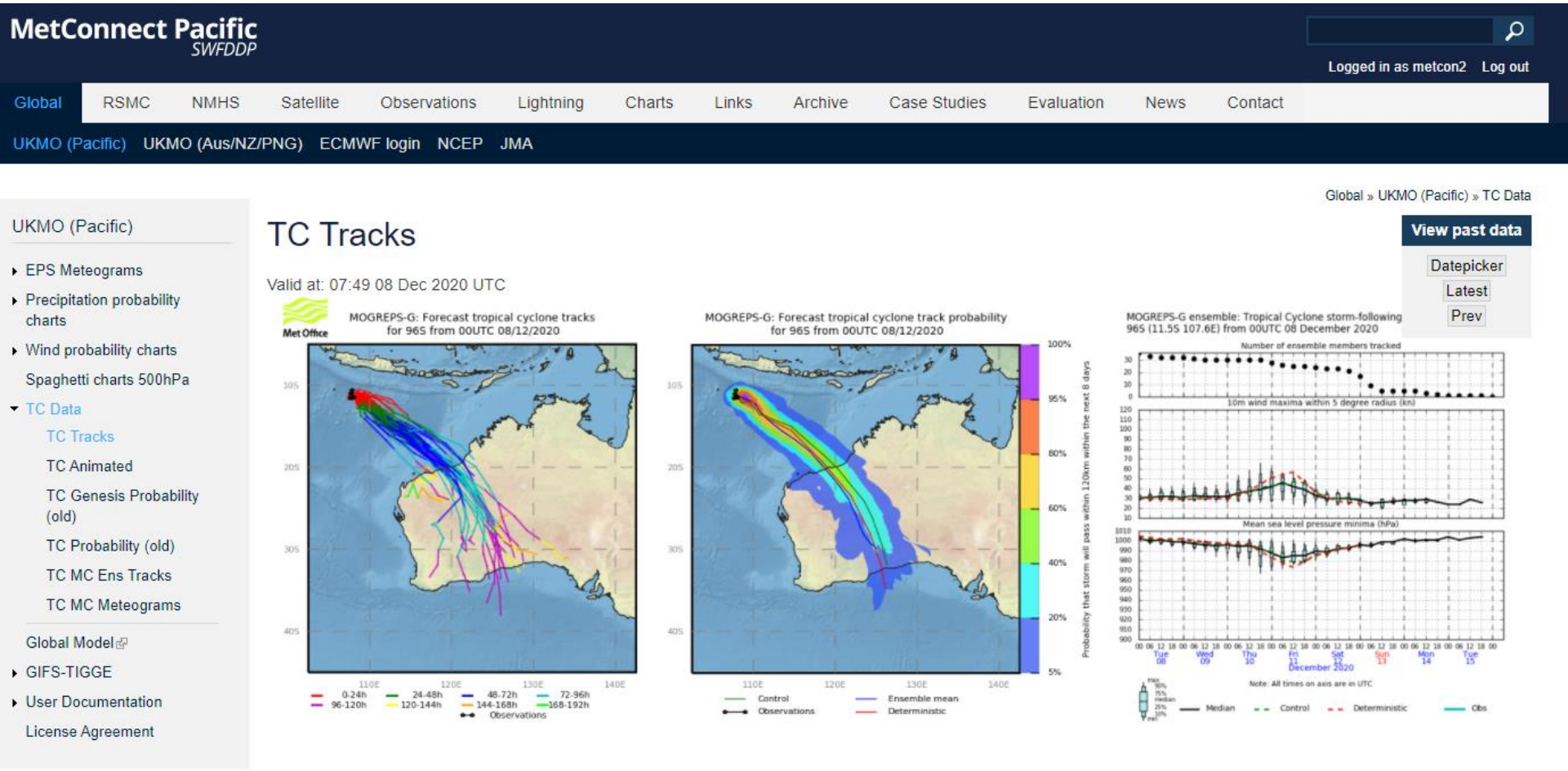
MetConnect Pacific: SWFDP
http://swfddp.metservice.com/

Lots: SPac guidance; MOGREPS, charts, satellite



Model upgrades : ECMWF

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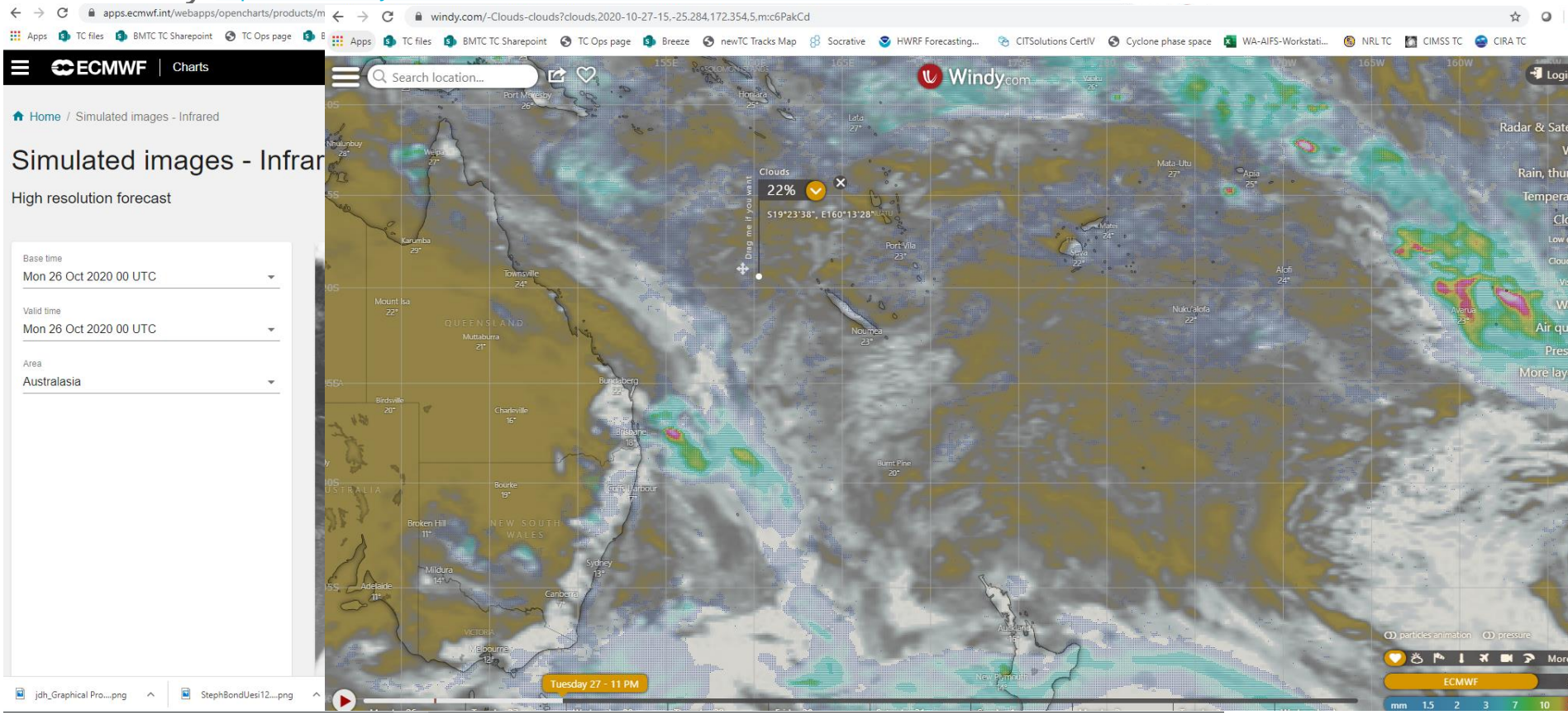
Four* runs per day coming! Deterministic: 9km res, 137 levels 10 days

Ensemble: 51 members **18 km;** 91 levels to 15 days ahead

Free access to EC web page: https://www.ecmwf.int/en/forecasts/charts

Synthetic cloud cover: https://apps.ecmwf.int/webapps/opencharts/products/medium-simulated-ir?base_time=202010260000&projection=opencharts_australasia&valid_time=202010260000

Or Windy https://www.windy.com/-Clouds-clouds?clouds,2020-10-27-15,-25.284,172.354,5,m:c6PakCd



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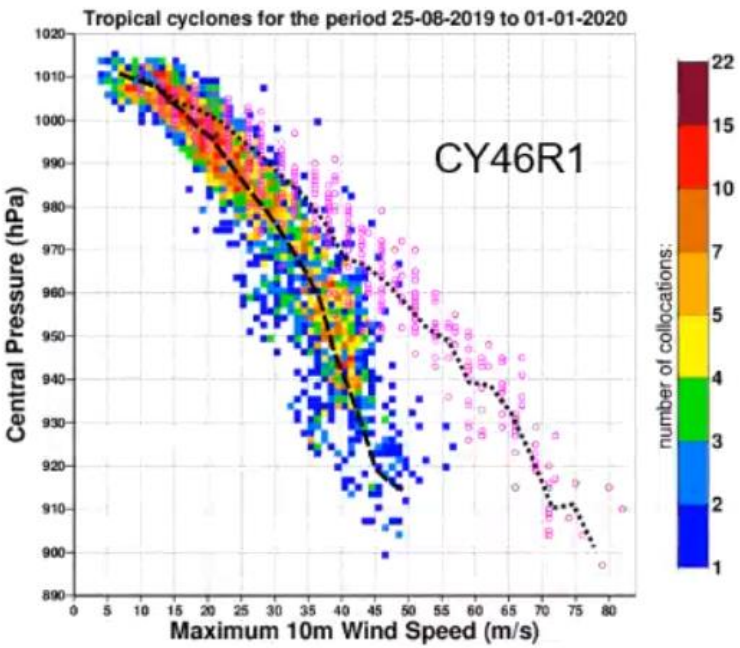
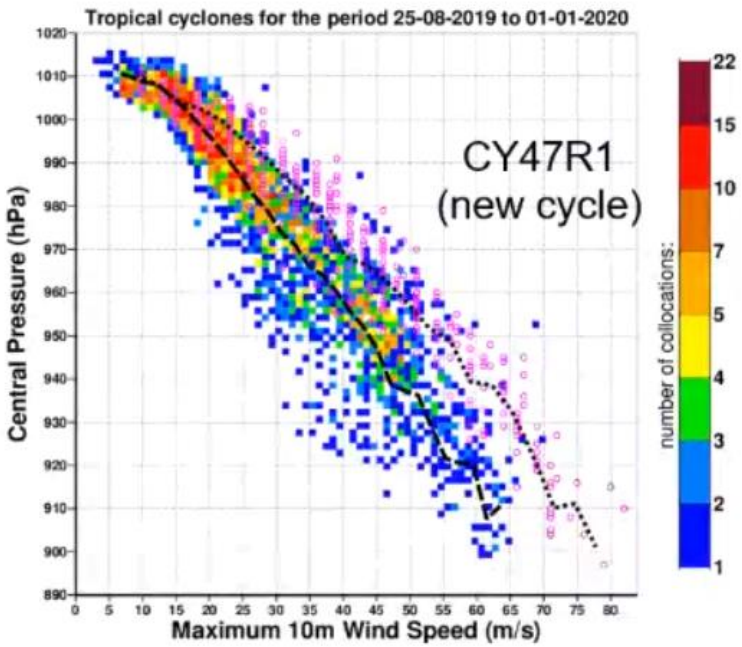
Model upgrades : ECMWF

2020 upgrade 47r1: https://confluence.ecmwf.int/display/FCST/Implementation+of+IFS+Cycle+47r1
now has wind radii (34, 50, 64kn) in track file; underestimating size cf BT
Vm Vs Pc: Tuning drag coefficient to increase winds for CP
EC upgrade: Includes webinars (TC discusion 15-19min of 2nd webinar);

Tropical cyclone max wind - min pressure relationship



Colour shading and dashed line: TCo1279 forecasts (h9s0), all forecasts intialised from 0 UTC.
Pink symbols and dotted line: Best Track data.



Colour shading and dashed line: TCo1279 forecasts (h9s3), all forecasts intialised from 0 UTC.
Pink symbols and dotted line: Best Track data.

Model upgrades : UK

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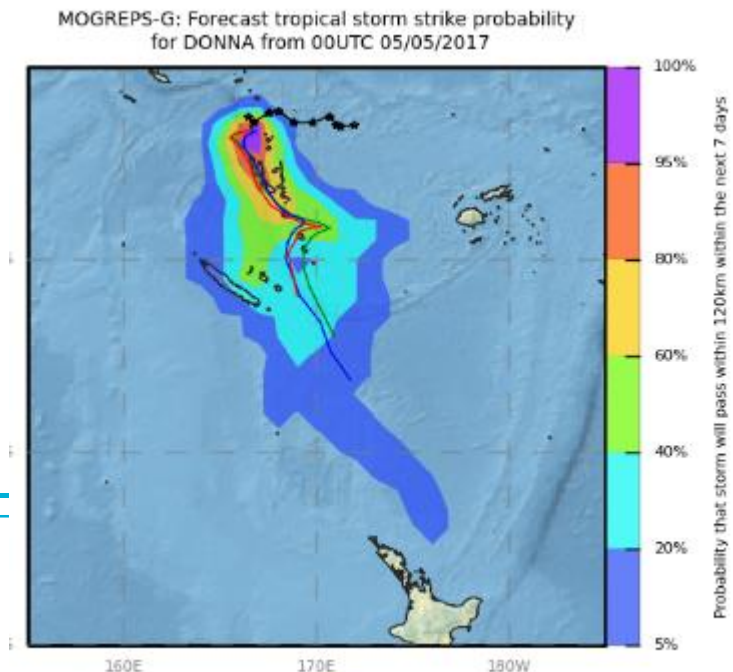
Met Office

Deterministic: 4 per day at 10km to 6 days for 00/12 runs
Ensemble: 4/day 18 members x 2 lagged ~20 km

Not aware of any significant changes
Skill near to EC and GFS since major 2014 upgrade
2018 upgrade: Deterministic 10km
Ensembles (MOGREPS): 2 x 18 members at 20km resolution
Control + 17 perturbed members, combined with previous cycle to get 36 total

MOGREPS

http://www.metoffice.gov.uk/research/modelling-systems/unified-model/weather-forecasting



Model upgrades : GFS

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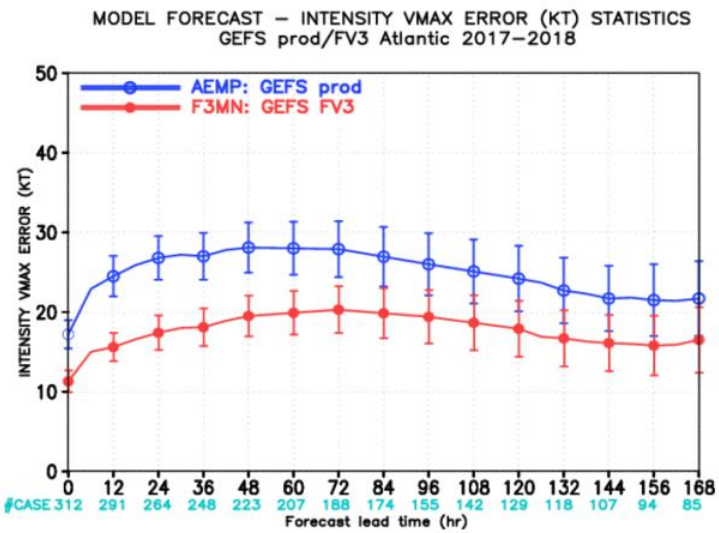
Deterministic: four per day at 13km to 10 days

Ensemble: four per day 31 members ~25 km

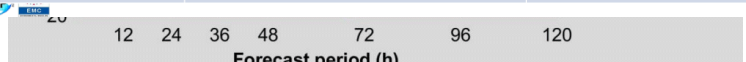
GEFS: now 31 members (was 21) and 25km resolution (was 34km)
Improved intensity/track skill; Greater/more realistic spread;
https://ral.ucar.edu/sites/default/files/public/events/2019/8th-ncep-ensemble-user-workshop/docs/01.4-zhou-xiaqiong-the-ncep-global-ensemble-forceast-system.pdf
GFS no sig change following major 2019 upgrade (using FV3)
FV3GFS decreases the tendency to over develop TCs at 4+ days.
GFS preformation tracks available to 5 days in track viewer ('USG')

Atlantic



PROD-GEFS (v11) .vs. FV3-GEFS (v12)

	PROD-GEFS	FV3-GEFS
Model	GSM (hydro)	FV3 (non-hydro)
Micro-phy	ZHAO-CARR MP	GFDL MP
IC uncertainty	EnKF TC perturbed after relocation	EnKF No relocation
Model uncertainty	STTP	Stochastic physics (SPPT + SKEB)
Resolution	TL574L64 (~33km), 0-8 days TL382L64 (~50km), 8-16 days	C384L64 (~25km)
Forecast days	16 days	16 days (06Z, 12Z and 18Z) 35 days (00Z)
Ensemble size	21 members	31 members
Ocean forcing	Persistent + relaxation SST	NSST and 2-tiered SST



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Model upgrades: ACCESS-G3

Deterministic: four per day 12km resolution, 06/18 runs to +84h

Ensemble: four per day 18 members at 25 km

ACCESS-G resolution 12 km significant improvement from G2

- track now contains R34, R48, R64 quadrant info.
- 06 and 18UTC runs to +84h optional consensus member depending on length concerns and differences from previous run;
- GE ensembles – 18 members (25 km resolution) internal BoM currently

ACCESS-TC variable domain at 4km resolution (was 12km) when a TC is declared but will run only twice per day; using only for intensity and structure.

http://www.bom.gov.au/australia/charts/viewer/

Ops bulletin 122

Model upgrades : HWRF
Still best intensity model (with COAMPS)

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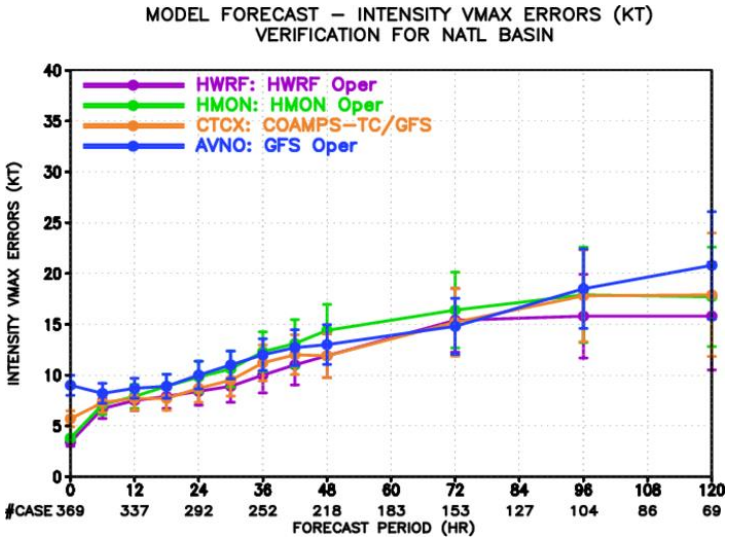
Intensity good except when

1. it intensifies and globals don't in early stages;
2. nearby TC interaction;
3. bad track

- Resolution: 13.5/4.5/1.5 km
- Air-Sea-Wave coupled system
  - Two-way Ocean (MPIPOM or HYCOM)
  - One-way waves (WW3)



2020 upgrade: improved track/intensity skill
https://www.weather.gov/media/notification/pdf2/scn20-54hwrf_v13aaa.pdf

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Websites: NWP sites

a. Windy.com (EC&GFS – EC 06 and 18UTC by subscription)
b. ECMWF https://www.ecmwf.int/en/forecasts/charts
now free access inc. synthetic cloud
c. Tropicaltidbits.com has lots includes storm specific info
d. SWFDP http://swfddp.metservice.com/
HWRF : http://www.emc.ncep.noaa.gov/gc_wmb/vxt/HWRF/index.php
COAMPS: http://www.nrlmry.navy.mil/coamps-web/web/tc
ACCESS (BoM) http://www.bom.gov.au/australia/charts/viewer/index.shtml

Poll question: which is your most used NWP site? a. b. c. d. e. other
If 'other' which one? Put in chat

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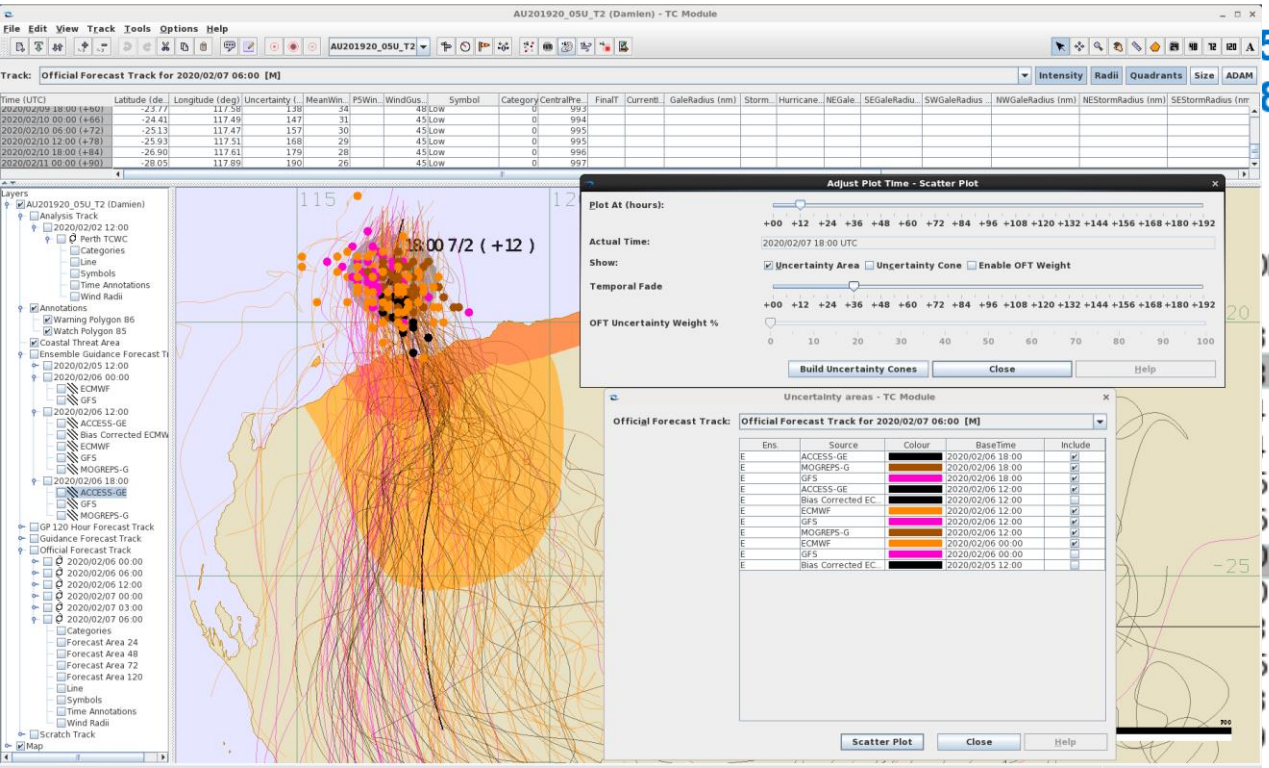
Forecast track – Consensus update

Australian TCWC Consensus

- EC+GFS+UK+A-G+JMA+ECEM+UKEM+HWRF+COAMPS



5-Day Aids and CONW
8, IO 2018, SH 2019)

Source: Buck Sampson, NRL

OR HOMOGENEOUS SAMPLE				
36	48	72	96	120
55.5	68.1	98.1	139.2	191.6
51.6	62.6	93.0	134.0	185.8
58.9	73.8	116.2	176.9	237.2
61.7	76.5	123.2	177.4	241.7
63.4	78.3	115.9	155.5	219.3
64.5	79.2	119.3	166.7	227.2
61.2	75.4	108.1	147.4	196.2
73.2	90.1	135.2	200.9	292.9
61.9	77.7	122.6	190.0	300.7
59.7	74.3	106.3	148.9	196.0
64.2	77.4	119.5	172.9	243.5
61.6	75.5	113.0	158.9	203.6
928	809	623	468	317

#CASES 1165 1089 994

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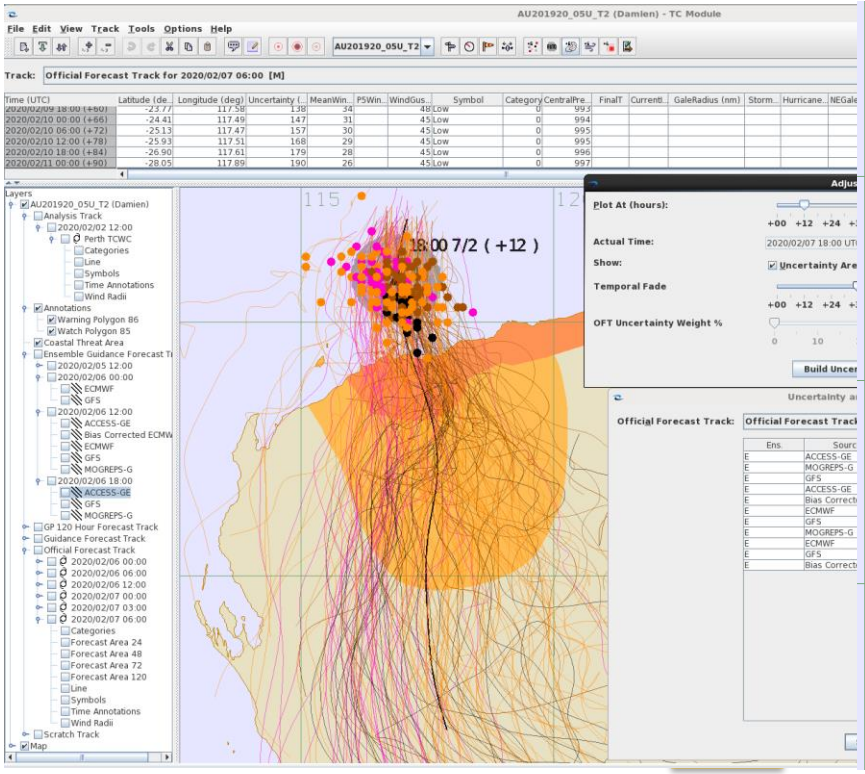
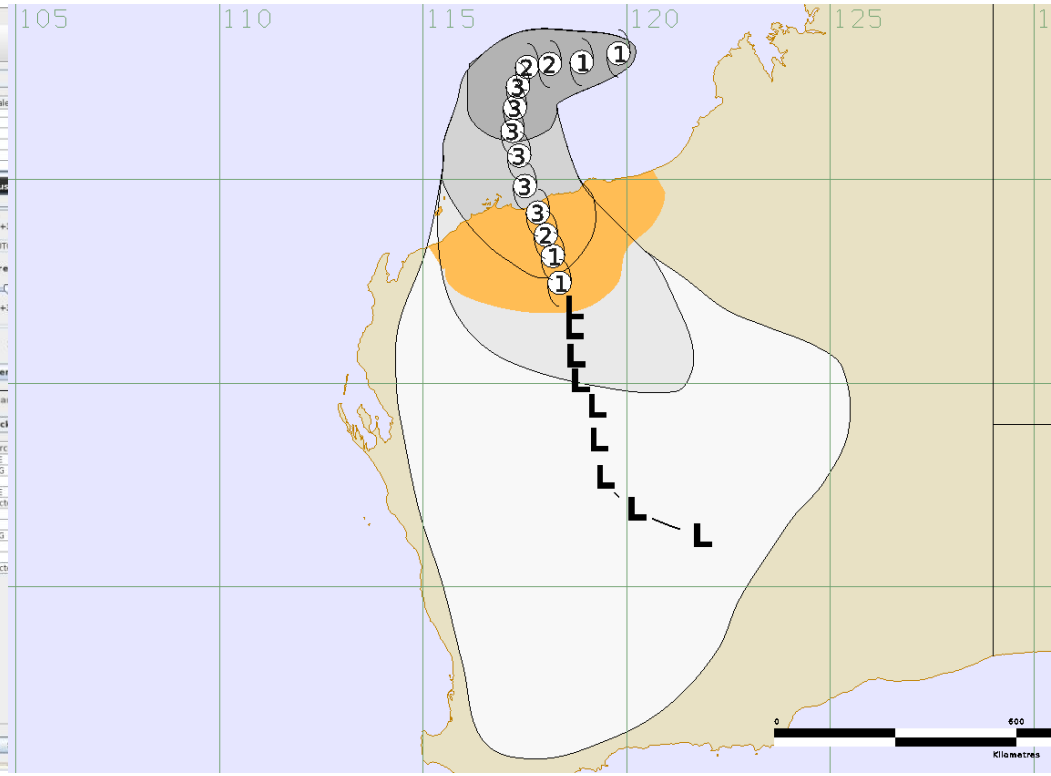
FYI: Australian track
Uncertainty area determined by ensembles

Australian TCWC Uncertainty area now determined by ensemble spread:

2 runs of EC, GFS, UK, ACCESS





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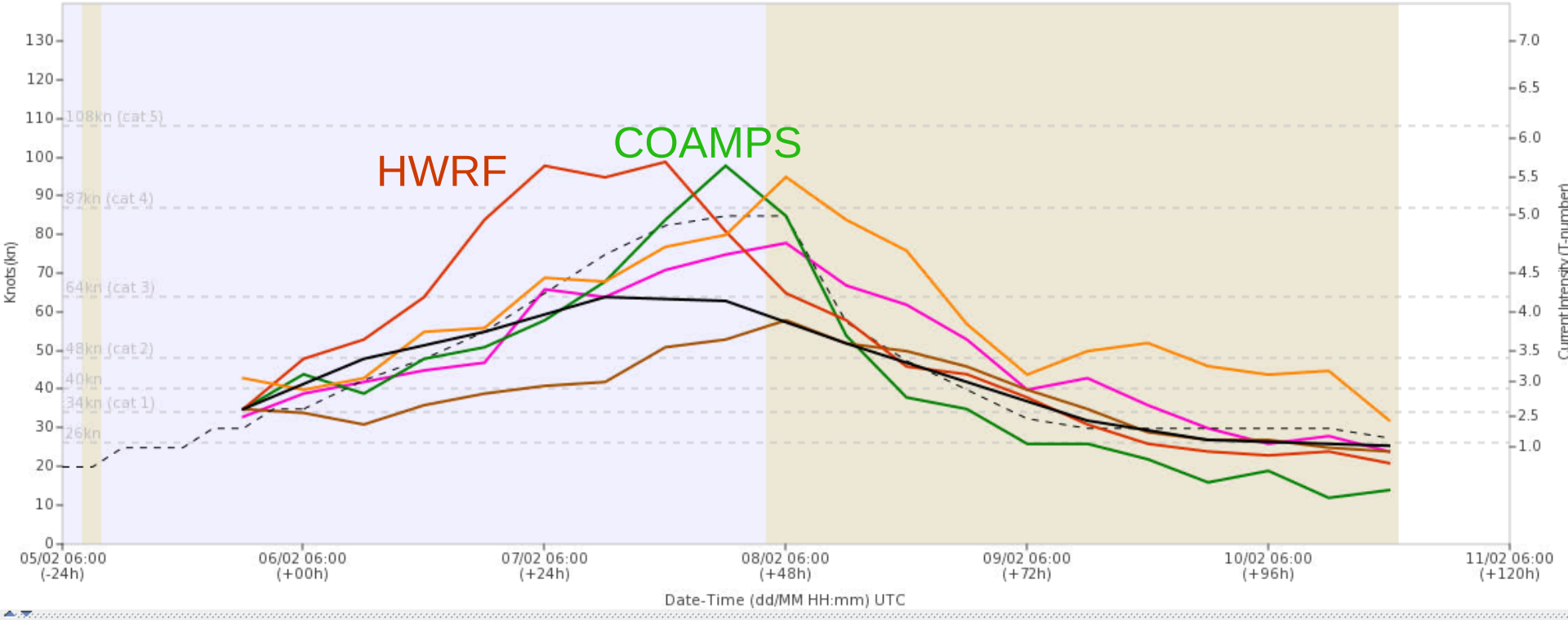
Intensity forecasting using NWP : HWRF, COAMPS, ACCESS-TC, EC, UK, GFS ICNW; RI guidance

HWRF, COAMPS usually highest



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Further learning resources from learn.bom.gov.au requires passkey

Microwave: https://learn.bom.gov.au/course/view.php?id=727

Scatterometry: https://learn.bom.gov.au/course/view.php?id=701

Introduction to TCs (Aust bias): https://learn.bom.gov.au/course/view.php?id=682

TCs outside the tropics: coming ~Feb 2021
Dvorak course: coming ~May 2021

Other questions?
joe.courtney@bom.gov.au