

Australian Cyclogenesis Analysis

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Routine Cyclogenesis Analysis

1. Longer term assessment

1.1 Intraseasonal information

The following are useful for assessing the likelihood of TC formation beyond the next three days. Of course skill decreases with time and the longer term predictability varies with the behaviour of the MJO in particular.

- [Weekly Tropical Climate Note](#) (issued every Tuesday)
- [Intraseasonal prediction \(MeteoFrance\)](#) This is also useful for looking at the departures from climatology.
- [Intraseasonal prediction \(Paul Roundy\)](#)

1.2 MJO or other tropical wave

- Is the MJO or another tropical wave active in the area or has one recently left the area (if one has just left the area may still be more active than expected) or is likely to affect the area in the next 84h?
- [Tropical Wave animation](#) (-20 to +10 days) requires login
- [MJO BoM](#) | [MJO RMM forecast](#) | [Tigge](#) | [GFS \(CPC\)](#)

1.3 EC ensembles

- What probabilities for a depression/TC are being suggested?
- [EC weekly cyclogenesis guidance \(ECMWF website\)](#)(login required) | [Weekly Strikes \(ECMWF web\)](#)

<http://wa-cws-op.bom.gov.au/web/tcETracks/plot.php>

2. Identify location of existing or potential Tropical Cyclones

1. Is there an existing defined (>10/15kt) low/mid-level circulation in or near the area?
 - Exclude heat lows and smaller mesoscale features - assess those lows that exist in depth and have significant rainfall/moisture associated with them. Use Ascat (note Windsat only on NOAA site), OScat, low level wind flow - lastly use model streamlines and vorticity.
 - [Scatterometer winds](#)(NOAA website) | Gradient winds: | MSLP anal | [CIMSS Low Level Vorticity](#)
2. Is there a currently a persistent area of deep convection which has been active for at least 6-12 hrs? Refer WV/IR/Vis/TPW [CIMSS TPW](#)
3. Have JTWC talking about a tropical disturbance in the region? [JTWC bulletin](#)
4. Does NWP indicate the development of any persistent low/mid level circulation during the next week, particularly the next 84h? Refer VW

If answers to these questions were all NO, issue outlook with Very Low likelihood of TC forming. Otherwise proceed with process.

3. Broadscale Analysis

3.1 Synoptic systems

Identify synoptic scale systems that may affect cyclogenesis (STR, MT, upper troughs, cross equatorial interactions etc)

- WV loop

3.2 SST/OHC

- [TC Heat Potential NOAA](#) | [RSS SST and anomaly](#) | [BoM Bluelink](#)

3.3 Low level winds

Are there any strong (>20kts) low-level monsoon/trade flows or surges in the proximity of the suspect area?

- [Scatterometer winds](#) | [Scatterometer winds](#)(NOAA website) | [CIMSS low level winds](#) | Gradient winds:

3.4 Upper level winds

Is there strong upper divergence over the suspect area? (use satellite imagery to look for divergence, and CIMSS winds) [CIMSS Sat winds](#) | [CIMSS upper divergence](#) |

3.5 Wind shear

What is the shear environment? (eg:15/20kt NE, decreasing over the last 24hs; Low(favourable) <10kn, Mod(neutral) 11-20kn, Strong(unfavourable) >20kn) [CIMSS deep wind shear](#) | [CIMSS Shear Tendency](#)

3.6 Deep moist air

Is the suspect area being fed by deep moist air in all sectors? (use TPW and WV)

- TPW 4 day: [Aust](#) , [IO](#)

4. Circulation Analysis

4.1 Development of Deep Convection

- Has convection persisted for at least 12h (Dvk T1 criterion)? Has convection persisted through the diurnal minimum?
- Has a cloud system centre defined within an area having a diameter of $2\frac{1}{2}^{\circ}$ latitude or less persisted for 6 hours? (Dvk T1 criterion)
- It has an area of dense, cold (DG or colder) overcast* of $>1\frac{1}{2}^{\circ}$ in extent that appears less than 2° from the centre (Dvk T1 criterion)
- Has organisation of convection improved? Curvature, extent, cloud top cooling, focussed on and closer to centre.
- Any development of low level cloud lines.

- What is the 24h trend?

Initial classification of T1 and T1.5 doc

4.2 Outflow channels

- Is there evidence on satellite imagery or upper streamline charts of at least one outflow channel?
- Is there evidence of two outflow channels or fanning of cirrus (equatorward and eastward of CDO)? If so consider rapid development potential.

4.3 Pressure falls (MSLP analyses)

- Have there been pressure falls of greater than 2hPa per day within 3° of the system centre?

4.4 Depth (Upper Wind analyses, NWP inc. OWZ)

- How deep does the circulation extend?
- Is it vertically stacked?

4.5 Wind strength (Ascat, MSLP analyses)

- How well defined is the surface circulation defined?
- What are the highest mean winds extending more than halfway around the centre?
- What are the maximum winds near the centre?

4.6 Current Intensity

- What is the Dvorak intensity and 24h trend? Complete spreadsheet if system at least T1.0.
- 0.0 - no circulation (equivalent to 'n' in model assessment);
- 0.5 – Yet to reach Dvorak initial classification. Closed isobar but weak surface winds around low of 15 knots or less;
- 1.0 or more – as per Dvorak classification;

Has the system reached initial classification yet? There are three criteria:

1. Convection has persisted for 12 hours or more
2. A cloud system centre defined within an area having a diameter of 2½° latitude or less has persisted for 6 hours
3. It has an area of dense, cold (DG or colder) overcast* of >1½° in extent that appears less than 2° from the centre. The overcast may also appear in cumulonimbus lines the curve around the centre.

5. NWP and Forecast and Outlook categories

5.1 NWP

Determine the NWP intensity for each of the next three days at 12UTC for the EC, ACCESS, GFS, UK (and JMA if relevant). Determine the 24h trend in the changes in Dvorak terms (i.e. D-). WA: consult the spreadsheet. Also consider OWZ parameter for the models.

5.2 Wind shear & Upper Divergence

Using the range of NWP guidance, what is the wind shear for each of the next three days at 12UTC?

Using the range of NWP guidance, consider changes in the upper level winds for each of the next three days at 12UTC?

5.4 Other

Consider the effects of landfall, dry air, SST on the system for each of the next three days at 12UTC.

For SST also consider the effects of slow motion (<5kn but also size and intensity dependent).

5.5 Dvorak forecast

From the above determine the overall intensity range estimate in Dvorak terms for each of the next three days at 12UTC.

D+=1.5, D=1.0, D-=0.5; S=0; W=-0.5, W=-1.0, W+=-1.5.

5.6 Model consistency

Check previous runs to look for trends and consistency between runs.

5.7 EC ensemble probabilities

What are the probabilities of a TC occurring from the EC ensembles?

6. Producing the Outlook

6.1 Outlook Policy

For each system consider the probabilities and therefore categories for each of the next three days:

Very Low <5%; Low 5-20%; Moderate 20-50%; High >50%

Compare the subjective approach and the model output to determine the 'Final' assessment.

1. Day +1: strongly bias the outlook upon the current assessment combined with an assessment of the environment.
2. Day +2: apply model development trend to current assessment.
3. Day +3: assessment should be based more on model assessment than the current assessment.
4. Days +4-7: There should be little reason to vary from the model assessment however there is licence to overwrite the model outcome to preserve consistency.
5. In general give a rating of Low if a defined tropical low exists. The exceptions are allocating Very Low for mainly Day+1 when the analysis does not suggest T1 has been attained, or if the environment is definitely unfavourable e.g. system is likely to be overland or if the shear is likely to be over 20kn throughout and if no model indicates development. Under these circumstances Very Low can be extended to D+2 and D+3 (with some degree of caution).
6. Consistency in output from issues one day to the next is strongly encouraged.

Border issues

If a circulation is near the border region then a further subjective assessment is required to determine the likelihood of the system being a tropical cyclone in the region. Additional text should be included in the outlook explaining this.

Liaison

6.2 Issuing the Outlook

6.3 Liaison and Action checklist

If relevant consult with Emergency Services, adjacent TCWC/RSMC such as Jakarta or [LaReunion](#).

Consult with Met Offices if relevant. Check and requirement for adaptive sondes.

If there is no invest area current for a disturbance and you wish to request one you may contact the JTWC TDO by emailing TDO.NMFC_JTCW@navy.mil (relevant phone numbers are located in the tropical cyclone directive).

- Consider talking points if required and discuss with MACR.
- Once issued, check Outlook is on the web, consider need for TC Advice or shipping warning, update TCModule and/or Dvorak worksheet, discuss need for TCWC activation and roster preparation with MWS.