Dvorak Visual (VIS) Analysis Diagram

1. **START** Locate cloud system center. → Locate the Cloud System Centre ("CSC") at the focal point of all the curved cloud lines or bands. For initial development (T1), see Step 1a

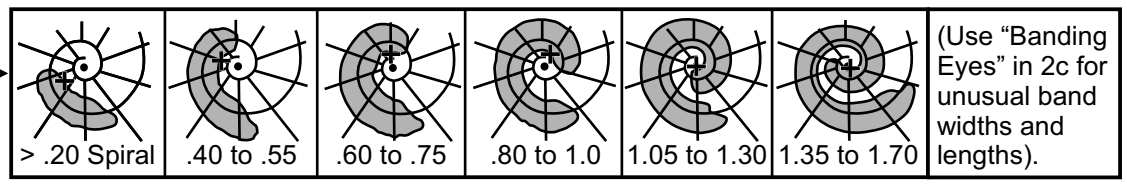
2. Analyze using pattern below when possible; then go to Step 3 → When your storm pattern does not fit the description of any of Steps 2a thru d, do Steps 3, 4, 5, and 6; then return to Step 2 if indicated.

Eye Adjustment Rules:

1. Poorly defined or ragged eyes:
   - Subtract 0.5 for E-no. ⩽ 4.5
     Or 1.0 for E-no. ⩾ 5.0
2. Large eye:
   - Limit T-no. to T6 for round, well-defined eyes, and to T5.0 for large ragged eyes and eye diameter ⩾ 45nm.
3. For MET ⩾ 6:
   - 0.5 to 1.0 may be added to DT for well-defined eye in smooth CDO when DT < MET

2a. **"Curved Band" Pattern** Use spiral arc distance along 10° long spiral.

Scale of DT's



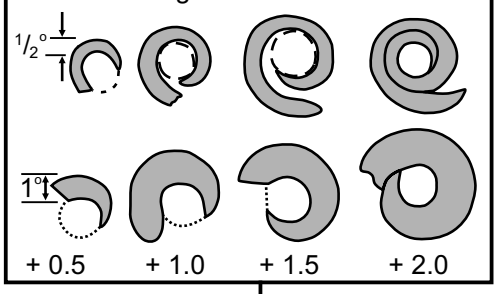
(Use "Banding Eyes" in 2c for unusual band widths and lengths).

2b. **"Shear" Pattern** Use center definition and center's distance to dense overcast.

DT 1.5 ± 0.5 | DT 2.5 | DT 3.0 | DT 3.5 | DT 4 | DT 4.5

Dvorak 1995 allows discretion in assigning DT in the range 2.5 to 3.5

Banding Feature Additions



2c. **"Eye" Pattern** Always use EIR for eye pattern when possible → Was 24-hr T-no ⩾ T2.0? YES

Nautical Miles	60	60	45	30	15	75	45	15
Embedded Distance	> 1°	= 1°	= ¾°	= ½°	= ¼°	Banding Eyes		
Average band width (degrees)						1¼°	¾°	¼°
	E7	E6	E5	E4	E3	E5	E4	E3

NO → Step 2a or 4

2d. **"CDO" Pattern** (Center indicated under ⊕) → Is "CDO" ⩾ ¾° in diameter? YES

Edge	Well-Defined				Irregular	
Diameter Size	> 2¼°	1¾°	1¼°	¾°	1½°	¼°
degrees						
Nautical Miles	135	105	75	45	90	15
	CF5	CF4	CF3	CF2	CF3	CF2

NO → Step 2a or 4

Eye Adjustment? E-No. + Eye Adj. = CF

Banding Feature (BF)? CF + BF = DT

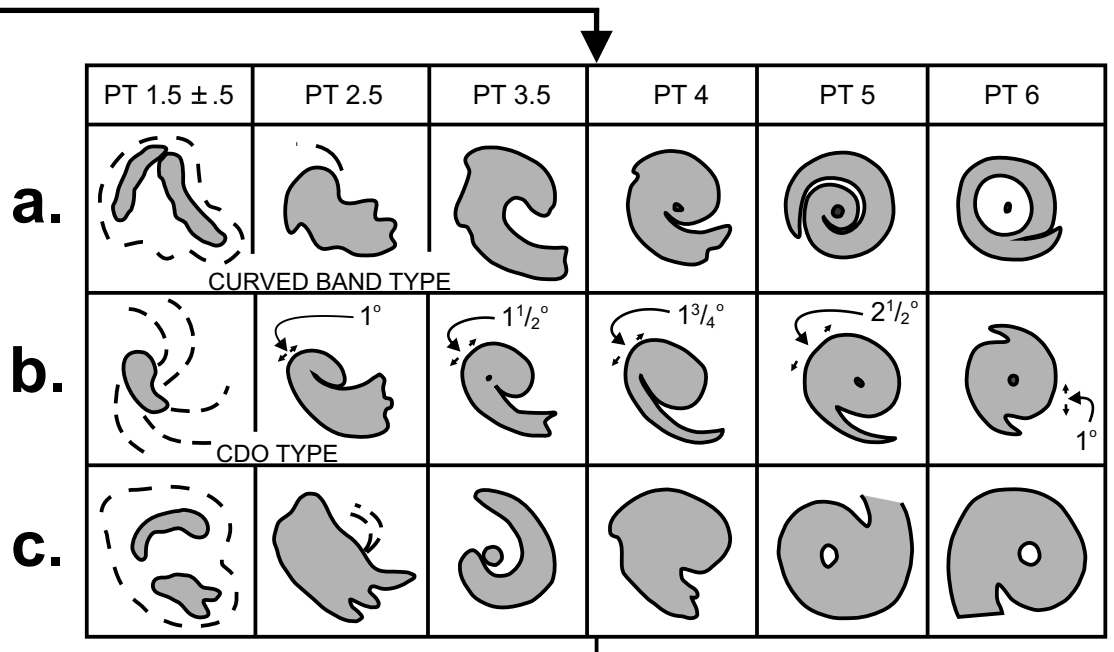
Always considered for VIS imagery.

3. **"Central Cold Cover" Pattern** Concept applies primarily to IR. In VIS CDO or curved band usually visible beneath cirrus → Rules: When past T-no. ⩽ T3, maintain model trend for 12 hours; then hold same. When past T-no. ⩾ T3.5 hold T-no. same. Use as final T-no.; then go to Step 9.

4. Determine past 24 hour trend. Is Development, Weakening, or Same; indicated in a change of:
(a) centre or eye characteristics
or
(b) centre's involvement with dense overcast

5. Determine Model Expected T-no. (MET). 0.5, 1.0, 1.5 (as determined by step 4) to 24 hr old FT

6. Determine pattern T-no. Select pattern in diagram that best matches your storm picture within one column of the MET. Adjust MET .5 when indicated.



When cloud comma is extremely small (< 2 ½ ° lat), subtract 1 from pattern number.

7. **T-no Determination:**

1. Use data T-no. from Step 2 when cloud features are clear-cut.
2. Use Pattern T-no. when DT is not clear and adjustment to MET is made.
3. For all other cases, use the MET.

8. **Final T-no Constraints:**

1. Initial classification must be T1.0 or T1.5.
2. During the first 48 hours of development, T-no. cannot be lowered at night.
3. 24 hrs after initial T1.0, storm's T-no, must be ⩽ T2.5
4. Final T-no. limits:
   - <T4.0: change of 0.5 over 6 hrs,
   - >T4.0: - change of 1.0 over 6 hrs
     - change of 1.5 over 12 hrs
     - change of 2.5* over 18 hrs
     - change of 3.0* over 24 hrs.
5. Final T-no. must = MET ±1

* Ref: Sangster&Landsea, 2020

9. **Current Intensity (CI) Number Rules:**

1. Use CI = Final T-no.(FT) except when Final T-no. shows change to weakening trend, or when redevelopment is indicated.
2. For initial weakening, hold CI same for 6* hours, then hold CI 0.5 or 1.0 higher than Final T-no, as storm weakens until the FT has plateaued for >6h.

* ref Brown and Franklin (2004) paper

10. **24 Hr Forecast**

Extrapolate past trend unless one of the five rules in the instructions applies

Source: *Dvorak, V.F. 1995 Tropical clouds and cloud systems observed in satellite imagery: Tropical cyclones. Workbook Vol. 2. Modified by Tropical Cyclone Warning Centre, Bureau of Meteorology, tcwc@bom.gov.au. Date: 10 July 2020.*