

What Controls Tropical Cyclogenesis: Moisture or Moist Static Stability?

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Thermodynamic Indices

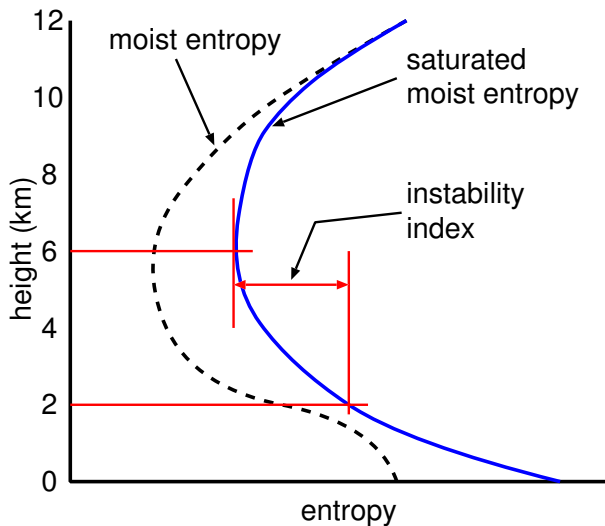
Saturation fraction (column relative humidity):

$$S = \frac{\textit{precipitable water}}{\textit{saturated precipitable water}}$$

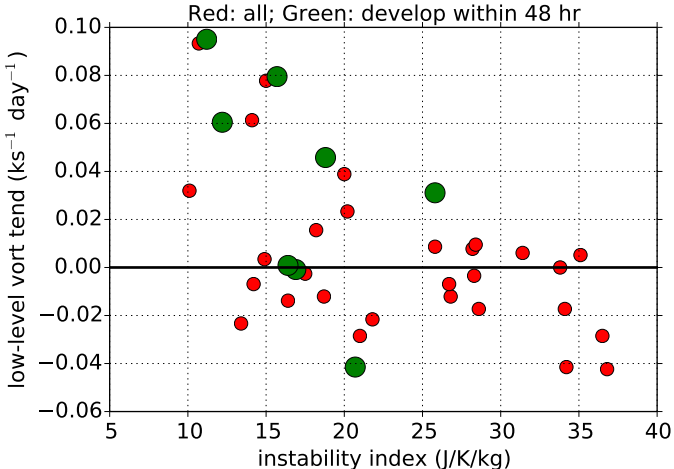
Instability index (s^* is saturated moist entropy):

$$\Delta s^* = s_{1-3km}^* - s_{5-7km}^*$$

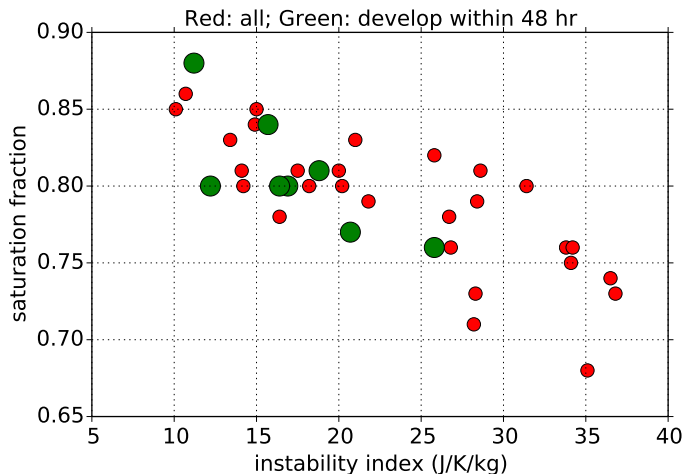
Instability Index



Instability Index and Low-Level Spinup



Saturation Fraction and Instability Index



A Question of Causality

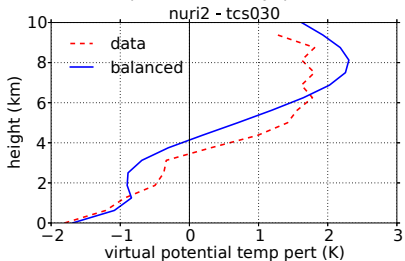
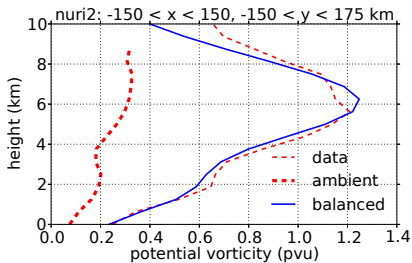
Stability \implies Moisture

or

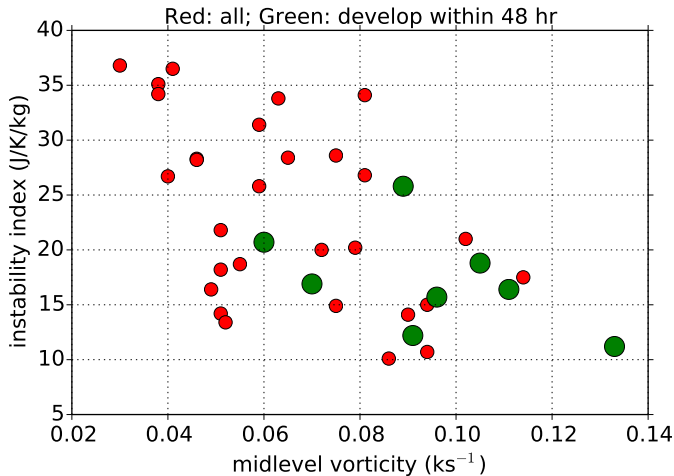
Moisture \implies Stability

???

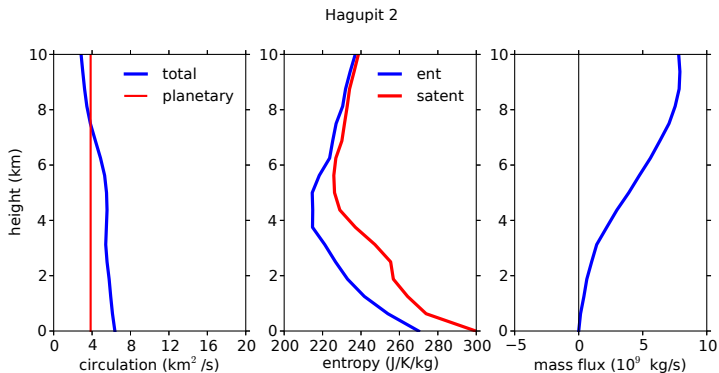
Nonlinear Balance Inversion (Raymond, 2012)



Midlevel Vorticity and Instability Index

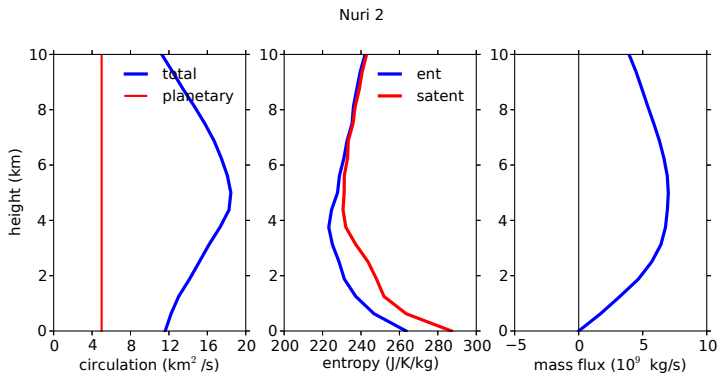


Hagupit2 profiles



Saturation fraction = 0.82; Instability index = $27 \text{ J K}^{-1} \text{ kg}^{-1}$

Nuri2 profiles



Saturation fraction = 0.88; Instability index = $11 \text{ J K}^{-1} \text{ kg}^{-1}$

Spinup Sequence

