Necessary and Sufficient Conditions for Tropical Cyclogenesis: Evidence from Recent Field Programs

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1. Introduction
This study seeks to advance our understanding of the necessary and sufficient conditions for tropical cyclogenesis, specifically those environmental, convective and thermodynamic properties that may determine the fate of disturbances with apparent cyclogenesis potential.

The following questions are addressed through synthesizing data from multiple aircraft and satellite platforms for 12 developing and 4 non-developing disturbances:

- What is the thermodynamic evolution of the developing inner core?
- What properties of wave organization are important for genesis? Does a mid-level circulation in a near-saturated environment precede genesis?
- Which of the following convective properties are most important for genesis?
  - Fractional coverage / proximity of rainfall around the center
  - Convective Intensity
  - Timing of intense convective bursts
  - Duration

2. Data and Methodology

3. Results: Thermodynamic

4. Results: Environment

5. Results: Convection

6. Conclusions

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The most favorable convective burst (in terms of area, proximity to center, and intensity) does not necessarily occur within a day of formation; some are observed as many as 3-4 days in advance.

Given the variability in convective properties, within the context of the wave organization, there are likely multiple pathways to formation.