This paper presents a study into the variability of the moist margin, a boundary in the tropics where total column water vapour (TCWV) falls below 48 kg m^{-2} (though 45 kg m^{-2} is used in this study). Within this region, there is frequent rainfall. This work builds on recent studies to relate synoptic-scale variations in the moist margin to modes of tropical rainfall variability.

The study utilises an object-based approach, whereby overlaps between different 'weather' objects, such as convectively coupled tropical waves (CCTWs) and wet perturbations of the moist margin, are examined.

In general, the study provides interesting insights into the relationship between different tropical modes and the variation in the moist margin. The following general comments outline ways the manuscript could be improved: the methodology could be explained further, the study could be better motivated in the introduction, and a more expanded discussion of the role of CCTWs in modulating the moist margin could be provided. The manuscript is recommended for publication after the following major and minor comments are addressed.

Major Comments

1. Introduction Expansion

The introduction is a bit short. It could be expanded to include the following: (a) An explanation of why an object-based approach was used (e.g., whether this methodology has been used in previous studies) and the advantages of using Eulerian and Lagrangian approaches. (b) A discussion of how different modes of tropical variability might influence the moist margin. For instance, it is mentioned in the discussion that potential vorticity (PV) anomalies may be a response to changes in the tropical margin. As tropical heating anomalies influence the extratropics, providing this background earlier would enhance the context.

2. Clarification and Explanation in Figure 1

a. A significant amount of information is provided in the caption of Figure 1. Key details, such as the definition of the moist margin and the association of wet perturbations with weather objects, should be incorporated into the main text.
b. The section could benefit from a clearer explanation of what is depicted in Figure 1, such as explicitly stating how the MJO active object overlaps with the wet perturbation object and similar interactions for other objects.

c. Figure 1: The caption states, "The background moist margin, defined as the 90-day running mean of 45 kg m^{-2}, is in black," whereas the main text mentions, "Wet perturbations are areas where the daily TCWV is above and where the background TCWV is below 45 kg m^{-2}." This appears contradictory. Clarify whether there is a distinction between the background moist margin and the background state, and define these terms in the text.

3. Role of CCTWs in Wet Perturbations

The discussion does not adequately explain why CCTWs only slightly modulate wet perturbations despite their significance in tropical rainfall variability. One possible explanation is that CCTWs have their highest amplitudes within the moist margin (e.g., see Figure 5 of Kiladis et al., 2009). Kelvin waves, in particular, have their greatest amplitude confined close to the equator, well within the moist margin. Thus, it is plausible that CCTWs primarily contribute to internal variability within the moist margin.

4. Interactions of Multiple Weather Objects

The manuscript does not address cases where more than one weather object contributes to a wet perturbation. For example, Kelvin waves and ER waves are often embedded in active MJO events, forming part of a larger weather event. Are such events double-counted in Figure 6 (panels c and d)? A figure similar to Figure 4 could be included to show events where MJO + Kelvin waves, MJO + ER waves, ER + Kelvin waves, and MJO + ER + Kelvin waves are associated with a wet perturbation. It could be valuable to test the hypothesis that simultaneous modes result in a greater effect on wet perturbations.

5. Indirect Influence of CCTWs on the Moist Margin

As noted in Comment 3, CCTWs are potentially more important for the internal variability of TCWV within the moist margin. However, since they are responsible for high-amplitude rainfall in the tropics, they may release significant latent heat that causes upper-level divergence. This divergence could interact with the subtropical jet, producing PV anomalies. Hence the influence of CCTWs could be indirect. Investigating this could be a point of future work.

Minor Comments

1. Introduction

   a. Line 15: Consider rephrasing to "Observations reveal that the tropical atmosphere is largely characterised by..."
2. **Section 2.2.2: Convectively Coupled Tropical Waves**
   a. Line 67: Clarify what is meant by the "20-degree latitude band." Does this refer to all latitudes within 20°S-20°N? If so, why does the Kelvin wave contour extend beyond 20°N?
3. **Section 2.3**
   a. Line 107: The URL is not enclosed in brackets.
4. **Section 3.1: Results**
   a. Clarify whether the objects in Figure 2 are only those overlapping with wet perturbations or all identified objects. If the latter, how does this change when considering only objects overlapping with wet perturbations?
5. **Section 3.2**
   a. Figure 3: Define "proportion." Is it the ratio of objects during wet perturbations? Note in the caption that proportions add to a value greater than one, possibly due to multiple objects contributing to a wet perturbation (related to Major Comment 4).
   b. Figure 4: The caption mentions numbers in brackets, but these are absent from the panels.
6. **Section 3.3**
   a. Figure 6: The caption needs clarity. Could the authors explain how the composites are "relative" to the centre of mass and what "by their associated weather objects" means? Also, clarify "pseudo-latitude" and its necessity. Perhaps replace it with "poleward" for better comprehension. Additionally, explain why negative pseudo-latitude is used and what "pseudo-longitude" means in the caption.
   b. Line 216: The text states, "There exists a wave-like pattern that propagates equatorward towards the east." As this is a spatial composite, propagation cannot be inferred. Perhaps rephrase to indicate the pattern slants eastward.
7. **Section 4.1**
   a. Line 290: "A wet perturbation event is said to be associated with a weather object if the conditions in the previous section are satisfied at any point..." Restate these conditions for clarity.