Reviewer #2

The manuscript introduces two novel datasets about deep convective systems over the intertropical belt: TOOCAN and CACATOES. The TOOCAN dataset contains the tracking of deep convective systems from 2012 to 2020, which is generated using a 3-D tracking algorithm and a homogenized geostationary infrared brightness temperature archive. The CACATOES dataset is derived from the TOOCAN dataset by projecting the morphological characteristics of each deep convective system onto 1-degree x 1-degree grids. Overall, the manuscript is written and organized well. The authors clearly describe the source datasets and explain how to generate the target datasets. Furthermore, the authors discuss the uncertainties of the datasets and briefly compare them with other existing datasets. I recommend the publication of the manuscript if the authors can correct minor language errors.

We would like to thank the reviewer for the positive comments, appreciations and encouragements. The reviewer #2 has made a number of comments that will benefit this manuscript. We have thoroughly revised our manuscript and addressed all the questions and concerns raised by the reviewer #1. Detailed responses to their comments are provided in the following. the original comments of the reviewers are in black and our responses in blue and italic.

We have also adjusted the manuscript accordingly to the journal standards:

- *The reference list has been compiled according to the journal standards.*
- *We have adjusted the color schemes in the figures 1 and 2 by using a Color Universal Design (CUD) palette, to ensure that colors are distinguishable by everyone, combined with some Different line styles and markers to enhance distinguishability. All the figures have been checked using the Coblis–Color Blindness Simulator to check for distinguishability. Figs. 1, 2, 7 have passed the test. More specifically, we have determined that Fig. 7 is sufficiently distinguishable for individuals with color blindness without any modifications.*
- *Finally, the color cells of the Tables have been removed to fit with the journal requirements.*

As supplement to the paper, a video (https://doi.org/10.5446/68200, Fiolleau 2024) has been added to the paper to illustrate at a 30-minute time frequency, showing the DCS identified by TOOCAN in October 2015 over the Western Pacific region.

Minor comments

1) Line 40: “the various the phases” to “the various phases”? “its evolution is” to “its evolution in”?

Thank you for your comment. We corrected accordingly.

Line 39: Despite a long research history (Houze, 2018), understanding the lifetime duration of tropical convective systems and the lengths of their various phases throughout their life cycles in the current climate, as well as their evolution in a warmer and moister world, remains challenging (Roca et al., 2020).

2) Line 47: Are all DCS events initiated from several individual deep convective cells? Why can't deep convection be initiated from a single deep convective cell?

Thank you for your comment.

You are right. deep convection be initiated from a single deep convective cell as well as several convective cells. We have corrected the sentence in the text:

Line 48: "DCS initiate and develop from one or more individual deep convective cells"

3) Line 53: "infirm"? Do you mean "weaken"?

We have replaced by "refined".

4) Line 90: "then" to "the"?

Done

5) Line 97: Correct the citation format of Endlich and Wolf 1981.

Done

6) Line 110: "multi-thresolding" to "multi-thresholding"?

Done

7) Lines 117-120: Please rewrite this sentence.

Thank you for your comment

We have corrected the sentence as follow:

Line 117: "These climatologies provided an initial perspective at tropical scale, revealing the ubiquity of mesoscale systems with various durations and spatial extents across a wide spectrum of large-scale environments. This insight has prompted numerous scientific investigations."

8) Line 182: "zenithal" to "zenith".

Done

9) Line 186: Delete "a"?

Done

10) Lines 223-224: Delete "making the processes easier"?

Done

11) Line 237: “the all” to ”all the”.

Done

12) Lines 281-282: Please rewrite the sentence.

Thank you for your remark:

We have reworded the sentence:

Line 285: “Thanks to its spatio-temporal region-growing technique, the TOOCAN algorithm can track DCS by suppressing split and merge artifacts throughout their life cycles, which are inherent to classic overlap-based tracking techniques.”

13) Line 344: Delete “a”

Done

14) Lines 362-365: If consecutive images are deleted during other hours, how about the results?

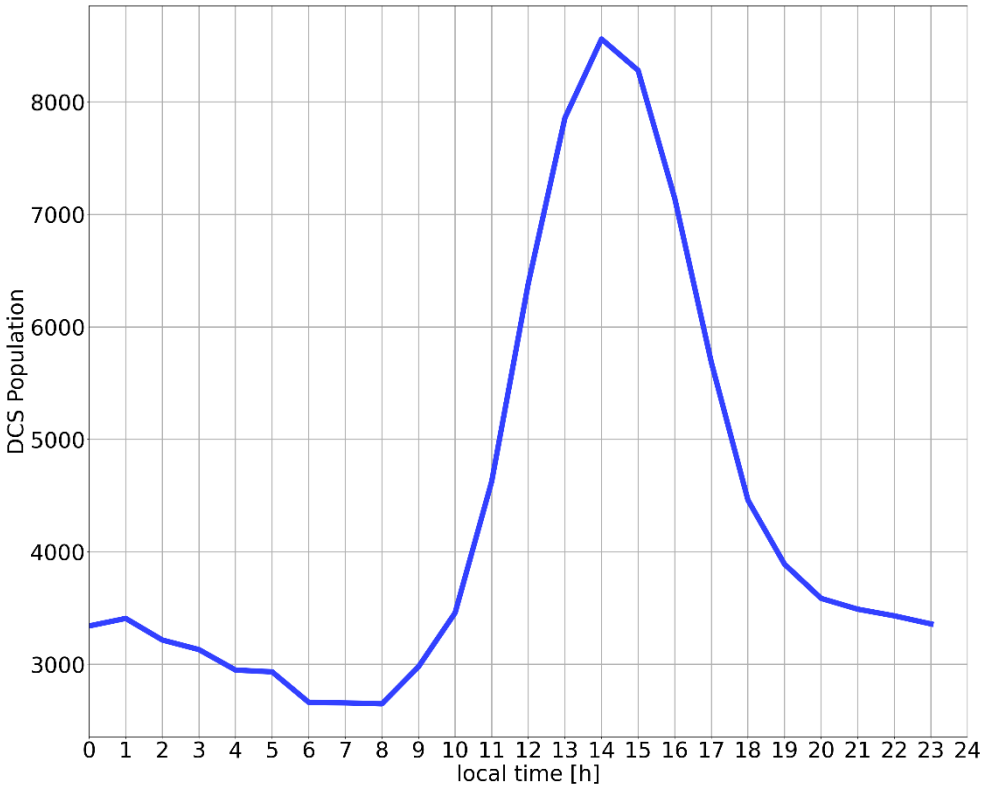

Figure: Diurnal cycle of the initiation of DCS occurence over the 40°W-40°E; 30°S-30°N region in June-September 2012.

The figure shows the diurnal cycle of DCS initiation over the 40°W-40°E; 30°S-30°N region from June to September 2012, revealing that the majority of DCS initiate predominantly in the afternoon. It clearly indicates that having a gap of successive missing data in the afternoon is much more impactful than having it between midnight and 5 AM.

Actually, as discussed in the response tp the Reviewer #1, Several scenarios arise for the DCS facing such a time period of consecutive missing images. DCS that were supposed to initiate during this missing data gap are either detected at the time of resumption, in which case their duration is artificially shortened, or they cannot be identified at all. DCS that were supposed to dissipate during this period of missing images could dissipate at the time of resumption, in which case their lifetime duration is artificially extended. There is the case of DCS that started before the series of missing images and are expected to persist thereafter can still be tracked despite this interruption. Some DCS cannot survive the period of missing data and then dissipate artificially. Smaller systems may not survive this interruption, reducing their lifetime, or their lifetime may be artificially extended due to data replication.

The maximum period of a 3-hour consecutive missing image interval was mainly chosen to ensure continuity in tracking large systems, particularly during eclipse periods affecting METEOSAT-7 observations in India, which occur in the evenings between August and September, as well as between February and March. The bias for long-lived systems (Figure 7) suggests that DCS can still be monitored despite the interruption if they possess sufficiently extensive cloud cover and if the convective situation evolves minimally during the gap.

This is now conveyed in the 3.2.b section in a more detailed form.

15) Line 437: What do you mean by the total cold cloudiness? Cold cloudiness area?

With total cold cloudiness, we aimed to refer to the geographic area covered by clouds with temperatures below a certain threshold (e.g., 235K).

However, you are correct. "Cold cloudiness area" appears to be a more dedicated term. We have replaced 'total cold cloudiness' with 'cold cloudiness area' in the text.

16) Line 453: “Similarly, to” to “Similar to”.

Done

17) Line 455: Add “in“ before “Fig. 9c”.

Done

18) Lines 481: Correct the sentence!

Done

Line 497: Roca and Fiolleau (2020) have shown that a couple of DCS impacts significantly each daily 1°x1° grid box, while most of the other systems have very small contributions to the cold cloudiness.

Citation: https://doi.org/10.5194/essd-2024-36-RC2