

Response to Referee #2

We thank Referee #2 for the careful review and many useful comments. The comments have helped us improve the manuscript. Our detailed responses are provided below.

1. General Comments

Comment: This is an important and timely case study that highlights the devastating flooding caused by prolonged extreme rainfall from a relatively weak tropical cyclone (TC Senyar). To improve this Brief Communication, adding more emphasis throughout on the early warning system (EWS) currently in place (I assume from the discussion that this is intensity/wind-based) and how it could be evolved to account for similar moisture-dominant events in the future.

Response: We appreciate the reviewer's encouraging comments and suggestion. The early warning aspect will be discussed more clearly in the revised manuscript. The Senyar event shows that severe flooding can occur even when a tropical cyclone remains relatively weak in terms of wind intensity. We will also include a short discussion that moisture transport, persistent rainfall, and antecedent rainfall may provide additional information for flood early warning in similar events in equatorial regions.

Comment 1 (Abstract)

Comment: The significance of the >400 mm rainfall totals should be explicitly placed into context with the region's climatology or previous records to highlight the rarity of the event.

Response: We appreciate this suggestion. More climatological information will be included in the revised manuscript. The rainfall totals will be compared with available historical records and regional climatology so that readers can better understand how unusual this event was.

Comment 2 (Abstract)

Comment: If the authors choose to expand on the EWS implications, this should be reflected within the abstract.

Response: The abstract will be updated to briefly summarize the implications of this event for early warning systems, consistent with the expanded discussion in the main text.

Comment 3 (Introduction)

Comment: The aims at the end of the Introduction should be revisited for clarity and alignment with the results presented.

Response: Thank you for raising this point. We will revise the final paragraph of the Introduction to make the study objectives clearer. The aims will also be adjusted so that they match the results presented in the manuscript.

Comment 4 (Methods and Results)

Comment: The synoptic and rainfall evaluations are sound, though the exclusion of SSTs as a driver for regeneration is a notable omission.

Response: We appreciate this comment. SST was not examined in this study, but it is recognised as one of the environmental factors that can influence tropical cyclone development and regeneration. A short discussion on the possible role of SST will be added, together with a few relevant references. The main focus of this Brief Communication remains on the atmospheric circulation, moisture transport, and the hydrometeorological impacts associated with the event.

Comment 5 (Methods and Results)

Comment: The links to hydrology remain qualitative, relying on assumptions regarding soil saturation. The manuscript would be strengthened by providing evidence or proxy data from similar events where soil saturation was measured, or by referencing established saturation-excess thresholds for this geographical region.

Response: Thank you for raising this point. Soil moisture was not measured during the Senyar event, so we could not evaluate soil saturation directly. This analysis is beyond the scope of the present Brief Communication. We will include a short discussion with references from similar studies that discuss saturation-excess runoff and antecedent rainfall conditions. We will also explain more clearly that our interpretation is based on the observed rainfall pattern and flood development, not on direct soil moisture observations.

Comment 6 (Writing Style)

Comment: The manuscript is generally well-structured and clearly explained. However, there are significant issues with redundancy; several sentences and one entire paragraph are repeated verbatim. A thorough re-reading is recommended.

Response: We appreciate this comment. The repeated sentences and duplicated paragraph will be removed. The manuscript will also be checked again to improve the flow and avoid unnecessary repetition.

2. Response to Specific Comments

(From Supplementary PDF)

Comment 1: How does this compare to historical records for the region?

Response: Thank you for this comment. This point is addressed in our response to the corresponding Abstract comment above. We will compare the observed rainfall totals with available historical records and regional climatological information to better highlight the rarity of this event.

Comment 2: Chen et al., 2025 doesn't support this claim of exponential increases of impacts, please rephrase.

Response: We appreciate this comment. The sentence will be revised because the cited reference does not support this statement. We will use more appropriate wording to avoid making a stronger claim than the reference supports.

Comment 3 (line 50): Can you add why Senyar subsequently intensified locally? What were the drivers?

Response: Thank you for this comment. The processes contributing to the local intensification of Senyar were not explained clearly enough in the previous version. We will expand this discussion by describing the environmental conditions that likely supported the regeneration and subsequent intensification of the system, including persistent moisture supply, favourable low-level circulation, and the possible contribution of warm sea surface conditions.

Comment 4: Incorrect terminology of physicochemical.

Response: Thank you for pointing this out. We will replace the term "physicochemical" with the correct meteorological terminology.

Comment 5: I think you are examining the rainfall hazard from TCs here, rather than impact pathways or risk management approaches. It is the interpretation of the synoptic situation and interaction with land-surface features leading to extreme rainfall and flooding that are interesting findings. Or

otherwise, you will need to add what the current cyclone risk management practices are and how these were inadequate for this event.

Response: Thank you for this comment. Our intention was to explain the meteorological processes associated with the Senyar event, not to discuss cyclone risk management. This part will be rewritten to make this clearer. The discussion will focus on the synoptic conditions, moisture transport, and the influence of the regional topography on the heavy rainfall and flooding.

Comment 6 (page 4, line 100): Also note limitations associated with IMERG and ERA5 in detecting extreme TC rainfall

Response: Thank you for this comment. The limitations of IMERG and ERA5 were not discussed in the previous version. We will add a short discussion on their limitations in detecting extreme tropical cyclone rainfall and include the suggested reference (Hooker et al., 2026).

Comment 7: Please rephrase for clarity to this statement “approach in a comparative–descriptive manner to”.

Response:

Thank you for pointing this out. The sentence will be rephrased to make it clearer.

Comment 8: Any limitations with SAR for flood detection?

Response: Thank you for this comment. The limitations of SAR-based flood mapping were not discussed in the previous version. We will add a short discussion on the main limitations of Sentinel-1 SAR for flood detection, including vegetation cover, urban areas, and image acquisition timing. The suggested reference (Hooker et al., 2025) will also be included.

Comment 9: flood inundation (since river discharge was not analysed).

Response: Thank you for this comment. The term "hydrologic responses" is not appropriate because river discharge was not analysed in this study. We will replace it with "flood inundation" to better match the scope of our analysis.

Comment 10: Move this statement to the Conclusion section: *“Furthermore, this analysis is highly relevant to equatorial hydrometeorological risk assessments.”*

Response: Thank you for pointing this out. This statement fits better in the Conclusion section and will be moved.

Comment 11: Section 3.1 Evolution and regeneration of TC Senyar: Did you also look at SSTs during this time?

Response: Thank you for this comment. We did not examine SST in the present study. A short discussion on its possible contribution to the regeneration of TC Senyar will be added, together with a few relevant references.

Comment 12: Rephrase: *“while the rest recorded some regions of Aceh Province to very heavy rainfall (50-...”*

Response: Thank you for this comment. The sentence will be rephrased to make it clearer.

Comment 13: *It would be helpful to show orography/elevation on these maps (Figure 2).*

Response: Thank you for this suggestion. We will add elevation information to Figure 2. This will make it easier to relate the rainfall distribution to the Bukit Barisan mountain range.

Comment 14: *“extremely rare 24-hour accumulation for Aceh.” How rare? What is the climatology? Previous record?*

Response: Thank you for this comment. We will compare the observed 24-hour rainfall with available historical records and regional climatology to show how unusual this event was. The wording will also be revised to avoid making a stronger claim than the available evidence supports.

Comment 15: *On November 27 and 28, rainfall remained extensive and influenced many of the major river basin areas. Where is the evidence for this?*

Response: Thank you for this comment. The statement will be revised because the available data do not directly support this interpretation. We will limit the discussion to what can be inferred from the observed rainfall distribution.

Comment 16: *Produced significant antecedent wetting, which in turn increased soil saturation and reduced the infiltration capacity throughout the entire catchment areas. "How can this be verified? I also wonder what the hourly rainfall rates were in the areas where extreme totals were recorded. Where the topography is flat, it is likely that the direct rainfall led to surface water flooding in situ".*

Response: Thank you for this comment. We did not measure soil moisture, river discharge, or infiltration during the Senyar event, so these processes cannot be verified directly. We will revise this part of the discussion and avoid interpreting these processes as confirmed mechanisms. Instead, we will explain that the interpretation is based on the observed rainfall pattern and flood inundation. We will also discuss the possibility that, in low-lying areas, intense rainfall may have caused surface water flooding directly.

Comment 17: *"...in a significant way." and "hydrological preconditioning".*

Response: Thank you for these comments. Both expressions will be revised. We will remove the statement about river discharge because it was not analysed in this study, and replace the term *hydrological preconditioning* with wording based on the observed rainfall evolution and antecedent rainfall.

Comment 18: Was there any storm surge during the event?

Response: Thank you for this comment. Storm surge was not included in this study because our analysis focused on rainfall and satellite-derived flood inundation. We will clarify this in the manuscript and explain that the discussion is limited to rainfall-induced flooding.

Comment 19: *This is quite a confusing sentence – suggest rewording.*

Response: Thank you for this comment. The sentence will be rewritten to make it clearer.

Comment 20: *Flooding was more strongly linked to cumulative rainfall than to wind damage: storm surge driven by strong winds?*

Response: Thank you for this comment. Our intention was to emphasise the role of persistent rainfall in the observed flooding, not to compare rainfall with other cyclone-related hazards. We will revise this statement to make this point clearer and avoid confusion about the possible role of storm surge.

Comment 21: *"May explain" is speculative – suggest "may contribute towards".*

Response: Thank you for this suggestion. We will replace "may explain" with "may contribute to".

Comment 22: *"Antecedent soil moisture saturation" – Not shown here.*

Response: Thank you for this comment. Antecedent soil moisture was not analysed in this study. We will revise this statement and focus on the observed antecedent rainfall instead.

Comment 23: *Please use meteorological terminology.*

Response: Thank you for this suggestion. We will replace this expression with standard meteorological terminology.

Comment 24: How could these be improved? e.g., suggest that Anticipatory Action could also be triggered by IVT thresholds rather than just wind-speed categories?

Response: Thank you for this suggestion. Our intention was not to propose a new operational early warning framework, but to point out that events such as Senyar are not always well represented by warning systems based mainly on cyclone intensity or wind speed. In the revised manuscript, we will expand the discussion to note that additional indicators, such as moisture transport or IVT, may provide useful complementary information for anticipatory action and future early warning strategies in equatorial regions.

3. Editorial Comments (grouped by page and line numbers)

Comment 1: Several minor editorial suggestions, including English corrections, missing words, wording improvements, sentence clarity, and additional references (Lines 23, 24, 32, 59, 66, 72, 96, 98, 193, 197, 210, and 303)

Response: Thank you for these comments. We will revise the English, improve the wording where needed, and correct the missing words. The suggested references will also be added.

Comment 2: Several sections contain repeated sentences or duplicated explanations (e.g., Lines 130–132, 144–145, 217–225, 250–251, and other marked locations in the supplementary PDF).

Response: Thank you for these comments. We will remove the repeated sentences and duplicated explanations. The manuscript will also be edited to improve the flow of the text and reduce unnecessary repetition.