# Review of *Environmental Characteristics Associated with the Tropical Transition of Mediterranean Cyclones*

By Bernini et al., submitted to *Weather and Climate Dynamics*

In this paper, the authors highlight the large-scale environmental conditions that are specific to the formation of warm-core Mediterranean Tropical-Like Cyclones (MTLCs) compared to the more typical cold-core Extra-Tropical Cyclones (ETCs) that form over the same basin. To do so, they composite the structure and environment of ETCs, intense ETCs and MLTCs from ERA5. This paper offers a good and comprehensive analysis of environmental factors related to MTLCs in the Mediterranean, utilizing a systematic climatological analysis that has been largely lacking in the Mediterranean Cyclones literature to date. As such, this is an important paper that fits within the scope of WCD. Should my main concerns be addressed, I would recommend it for publication.

## Major Comments

1. My main concern is that composites, on which the paper relies for a significant portion, can be challenging and misleading, especially given the large number of samples. Indeed, a large number of samples are at risk of blurring out information when averaged. Here are suggestions to improve the robustness of the analysis:
   - Highlight significant areas, e.g. areas where the difference in a given variable between Intense ETCs and MTLCs is significant, or areas where an anomaly is significantly different from zero.
   - Provide composites of land-sea mask (in SI) to give an idea of how much land is included in these snapshots.
   - Does it make a difference if you orient the snapshots along the direction of propagation?
   - The 10° box is quite large for the Mediterranean, where it corresponds to the whole width of the basin, and the cyclones usually span a few hundreds of kilometers. Could you justify this choice? While averaging over a large area for environmental factors makes sense, I don't think it does for characterizing the cyclone itself (in particular when defining intensity).
2. Emanuel et al. 2025 used a modified version of the PI for identifying CYCLOPs, justifying that it was better suited for similar cases. Why not use it?

3. While I understand the CPS is the most commonly accepted way to classify MTLCs at the moment, you need to acknowledge ongoing debates in the Mediterranean Cyclones community and beyond regarding the limitations of the CPS.
4. Would your results change if you used wind instead of pressure for classifying he intensity?

## Minor Comments

Most of these do not require a specific answer. I am highlighting in bold and with a star those I would like an answer to.

5. L. 28 you write "their cyclogenesis is different", however, some TCs in the Atlantic also form from Tropical Transition (see McTaggart-Cowan et al.).
6. L. 37 for clarity of the structure, I would not start a new paragraph here.
7. L. 66 "first occurrence" -> "the first time this minimum is reached": more clear.
8. L. 67 and several afterwards: the word "despite" is misused. In this case, replace with "even though"? Check and fix all following occurences (L. 186).
9. L. 96, 126, and several times afterwards: ETC<u>s</u> should take an s when plural.
10. **\*L. 96-98: Can you explain your choice to add a tolerance for $-V_u$ only? Why not $-V_l$? And why six hours?**
11. L. 106-107: This is a very long list of references, most of which are unrelevant to the present work. I would advise to cut it down with only a few that are closest to the present work and adding "e.g.".
12. L 124: ETC is Extra-Tropical Cyclone, so "ETC Cyclones" is a repetition.
13. L. 127: "These represent 192" or "There are 192 such/intense cyclones". Otherwise unclear.
14. L. 130-138: This remark is very relevant and appreciated.
15. **\*L. 141: How long does the warm core itself last for?**
16. L. 146: Precise "(not shown)".
17. Figure 1:
    a. **\*For the "intense ETCs" lines : the fact that numbers drop sharply on each side on the peak suggest to me that a small but significant portion of them have their maximum intensity at the very beginning or very end of their track. This might not be desirable. Can you investigate this?**
18. L. 158: I think it should be said earlier that you include the Black Sea in your analysis, as it is not necessarily obvious that you would. Also when comparing your frequencies to other papers, caution must be taken whether they included it or not.

19. **\*L. 166: I would expect the maximum in intense ETCs to be in winter. Can you explain why it is not the case? Please compare to other references with similar analyses.**

20. Figure 3:
    a. I would recommend superimposing the three plots into one panel for easier comparison.
    b. Number seem low compared to the total frequency, especially for ETCs: You announce 23 cyclones per year, but the sum of all the bars is far from it. Can you explain this discrepancy?
    c. Do you count the cyclones at their genesis, maximum intensity, or something else?

21. Figure 4:
    a. The choice of colors for temperature is unsettling. Can you use a blue-to-red colormap?
    b. You need to explain what the bottom panel is in the caption. It is also true for all following figures with this panel.

22. L. 182: Discuss limitations associated with ERA5's precipitation. Potentially (but I understand this is more work and might be out of your scope), you may consider retrieving precipitations from other sources, e.g. IMERG.

23. **\*L. 196: This is a very large box compared to the typical cyclone size, especially over the Mediterranean sea, where cyclones' size are usually a few hundreds of kilometers, and given 10° is basically the width of the whole basin. Taking the average is also disputable since you may average more or less lad depending on the position of the storm. Can you explain these choice? A usual choice is to take the maximum within 2° of the cyclone's center. Why not do this? I would recommend using a box no larger than 5° in any case, and also preliminarily masking all winds over lands, as they may be spuriously high due to orography, or overall low due to friction.**

24. L. 210: This could be discussed in light of the significance tests I suggest above.

25. L. 213: "indicating" -> "suggesting" seems a better level of confidence given your evidence.

26. L. 216-… : Please rewrite the start of this paragraph, which is unclear. I only understood what you are doing after reading the corresponding results.

27. L. 224-229: Did you se the CAPE as provided in the tcpypi package, or did you compute it separately. In my experience, tcpypi's CAPE does not equal the CAPE computed by other packages e.g. MetPy, so if you used different packagesit might lead to discrepancies.

28. L. 238-… : The insertion of figure 12 in this paragraph is confusing. I would suggest restricting this paragraph to what you read from figure 11, and then adding what you learn from figure 12 later.

29. In fact, figure 12 does not seem to be discussed anywhere else? If you do not wish to, it should be moved to the SI.

30. L. 270 Did you mean "In the case of hurricanes, the reduction in CAPE leads to lower PI" and you investigate whether this is the case for MTLCs?

31. L. 276-278: It is not clear to me what role the shallow mixed layer plays in this case, could you detail slightly more?

32. L. 287: Extra ')' after citation.

33. L. 291: "Intense ETCs develop in winter": You said they developed predominantly in spring in the corresponding paragraph.

34. L. 298: What do you mean "hurricane CAPE"?