

A review of EGUSphere-2026-4895 (Diabatic contribution to extratropical storm intensification across seasons and its modification under warming) by Abel Shibu et al. (2026)

Recommendation: Major reviews

Shibu et al. (2026) builds upon previous efforts to assess the impact of diabatic processes on cyclone development in the Southern Hemisphere in CAM4 experiments. PV tendencies are calculated over novel cyclone masks that vary with height to best capture the 3D structure of a cyclone. Results of this work suggests that diabatic heating accounts for most of the PV changes in a cyclone, with more intense cyclones having a stronger contribution. They also found that strong wintertime cyclones show the largest increase in diabatic heating in a warmer climate, suggesting a broadening of expected cyclone intensities.

The analysis is well done, with many components coming together to help show the important role of diabatic processes in cyclone development. I do find that there are some areas where the methodology is unclear (especially section 5), where I wanted to see deeper analysis into which diabatic processes are relevant in certain areas/time of development, and where the paper does not discuss how these results compare to the broader literature. More details describing the methods, results, and a broader discussion on how these results compare will make this a successful paper that adds to the literature on cyclone dynamics.

General comments

- Section 5 (cyclone masking) is difficult to follow for me. Given that this is a key step in your novel approach to assessing diabatic processes, I think some clarification would help ensure your results are reproducible.
 - Lines 147 and 154: What data are being considered for the percentile calculations? Are these from a local climatology of Q_{rel}/PV , or are they cyclone specific?
 - Line 158: What groups are referenced here? Is a group all cyclone masks at different pressure levels?
- There are several steps in the analysis taken to maximize the diabatic contribution being captured in your composites (i.e., selecting bounds of roughly equal PV values for equation 8). But the analysis does not go into the various diabatic processes, which as a reader would help to contextualize these results in the broader field of cyclone dynamics. Line 218 is a good example of a brief mention of what process is most important for that level without going into greater depth. Adding more of this style of context to your analysis would be greatly appreciated.

- Similar to the above comment, I think there could be more comparison and discussion of how your work fits in with the broader literature on diabatic processes within cyclones.
 - You reference a few papers (specifically by Büeler and Pfahl) that create similar diagnostics, but do not come back to compare your results to theirs.
 - The conclusions mention that this study has a stronger theoretical basis and is more broadly applicable than other similar papers, but without much discussion of how and why. I do not dispute this claim per se, but I would like to hear more of the authors analysis on what this method improves, what new information is learned about diabatic processes in cyclones, and how these results may differ from other methods of estimating the role of diabatic processes in cyclone development.
 - Discussion about how well CAM4 can represent diabatic processes and any known biases it has in the storm track/large-scale circulation could help readers to contextualize these results further.

Line-by-line comments

- Line 20: Please clarify what you mean by “features closely associated with these systems”.
- Line 76–77: There should be a hyphen after 850.
- Lines 89–91: What does “conservatively interpolated” mean in this context? What is the benefit of this interpolation?
- Figure 9: The colorbar and shading intervals do not match for Figures 9a and 9c.
- Line 387: There is a missing word after “real”.