

Diabatic effects on the evolution of storm tracks

Marcheggiani and Spengler

Authors response

Thanks for the detailed responses and helpful revisions of the manuscript. In my opinion, the manuscript is now ready for publication. I only have a few technical comments, as detailed below.

We are happy to hear that we have addressed the concerns raised by the Reviewer and would like to thank them again for reviewing our work.

Just one additional general remark: One thing that has become clearer to me through the revision is that the advection term does play an active role in your storyline, in particular, in the lower troposphere, as, for instance, discussed in the responses to the other reviewer and the revised conclusions ("cold air masses bring anomalously steep slope into the spatial domain"). Maybe, in your future research, you may consider this term more explicitly in the budget; but I don't think this is required for the present manuscript.

Yes, we agree that , at the surface, the advection term becomes more relevant in understanding the dynamics behind the phase space circulation. We plan to look into cold-air outbreaks and how the slope diagnostics evolve during these events, which we believe are the main contributors to the average picture we have gathered so far.

Technical comments:

(line numbers refer to the manuscript version with tracked changes)

L 194: I still think that this formulation is unclear. "increases both with DIAB and TILT" would mean that the highest slope values are obtained for high DIAB and high TILT, while actually they are found for low (strongly negative) TILT. Please rephrase.

TILT is mostly negative, so we refer implicitly to its magnitude when we say it increases. We understand it might result confusing at times so we have rephrased relevant lines to make it more explicit: "The mean isentropic slope in the near-surface troposphere over the GSE region increases with the magnitude of both DIAB and TILT, ..."

Also more in general, the wording is not always clear in this context, for instance, if you refer to a "maximum" in TILT and actually mean the lowest values (technically a minimum), or "TILT has subsided" when it approaches zero, but actually increases (due to the dominantly negative values).

We primarily refer to the magnitudes of these terms and in that sense the verb 'subside' is perhaps the most appropriate to use, as we focus on intensity. Therefore, we have decided to keep 'subside'. However, we have rephrased the text where we refer to an increase in TILT to say explicitly that it is its magnitude/intensity we are referring to.

L 196: "lower quadrant" is also a bit awkward, because there are two lower quadrants.

We changed 'lower quadrant' to 'lower half'.