

7 December 2020

Dear Editor,

Subject: Review of MS No.: wcd-2020-48

Following is my review of the manuscript "A process-based anatomy of Mediterranean cyclones: From baroclinic lows to tropical-like systems" by E. Flaounas, S. L. Gray and F. Teubler.

The manuscript presents a comprehensive quantitative study of the dynamic and thermodynamic factors involved in the evolution 100 most intense Mediterranean cyclones during 2008-2017. The authors analyze the PV tracers representing the various cyclogenetic factors and evaluate their contributions through PV inversion. They show the interplay of the upper troposphere PV anomaly, related to the baroclinic forcing of cyclone development, as the major factor and the lower tropospheric diabatic latent heating as the secondary. They demonstrate various evolution scenarios through 10 selected cases. They devote a special section to Medicanes and show that, unlike their tropical counterpart, they develop under the influence of both baroclinic and diabatic processes.

I find the study **highly important**, and **strongly recommend publishing it**, after considering several comments specified below. There is no need for further review.

line	Item	Comment
93-94	"..and then sections 3 and 4 present our main results. Finally, section 5 hosts ..	Change the number "3" to "4" and so on.
161	Setting the initial conditions 36 hours before the cyclone's mature stage...	It would be of help if you specify the average rate and its STD of the vorticity increase during that time.
189	" .. q_{co} anomalies have been defined as differences from three-day averages of q_{co} , i.e. the duration of each simulation."	In the Mediterranean region, there are cyclones that are slow moving, In such a case the 3 days average may be anomalous with respect to climatology and your signal may be found too weak. Refer to this point.
272	mountains plausibly act as a reservoir of relatively high PV	Change "reservoir" to "spurge"
Fig. 5	b, d	What do the contours mean?

I take this opportunity to urge the authors to extend their research beyond this paper, and to inquire the following issues:

1. The emphasis given to the most intense cyclone is reasonable from the energetic point of view. But, since the weather in the Mediterranean, and the rain in particular, may be severe also when the cyclones are not extremely intense, it would be of benefit to extend the analysis to less intense cyclones.
2. The diabatic heating, which was found second most important cyclogenetic factor here, is expected to depend on the SST, which has a seasonal distinct course. I suggest you to inquire the dependence of this factor on the time of the year.
3. The baroclinic factor is influenced by the topography surrounding the Mediterranean. Hence you may find a geographical variability in the contribution of this factor in the various parts of the Mediterranean.

Baruch Ziv