

Interactive comment on “Medicane Zorbas: Origin and impact of an uncertain potential vorticity streamer” by Raphael Portmann et al.

Anonymous Referee #3

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This interesting paper deals with the predictability of the Medicane Zorba, which affected the central Mediterranean in September 2018. ECMWF ensemble forecasts are used in this effort. The limit in the predictability of the cyclone is analyzed and discussed in connection with the upper-level PV, which also affected the low-level evolution.

This is one of the first paper that clearly identifies the relevance of PV features in the predictability of Medicanes. The results are a relevant contribution in the field; however, the analysis should be substantially improved. Some points are indicated hereafter.

Major points:

- Line 27, Line 154-157: I would like to see some clarifications about the definition of

C1

Medicanes. Although there is no general consensus, in most of the literature (e.g., Miglietta et al., 2011; Picornell et al., 2014; Cavicchia et al., 2014), a Medicane is considered as an extra-tropical cyclone that acquires a symmetric, deep warm core in the Mediterranean region. At the same time, the presence of a deep, warm core is not always an indication of tropical-like processes going on: as discussed in Fita and Flounas (2018) and Mazza et al. (2017), a deep warm core is not necessarily associated with a WISHE mechanism, but it can also be induced by a warm seclusion. However, Miglietta and Rotunno (2019) have shown that the intensification of the same cyclones discussed in the latter two papers cannot be explained without considering the sea surface fluxes and the latent heat release, in analogy with the WISHE mechanism typical of tropical cyclones. For these reasons, I suggest to remove “occasionally” (Line 27) and the sentence “Warm seclusion have been previously linked to Medicane formation” (Lines 155-156). Also, at Line 317 and 321 you “investigate potential precursors of a low-level warm core”: however, the low-level warm core is not relevant for the following development of the cyclone in itself (see also Line 365, 396), but because of the high values of equivalent potential temperature that are responsible for potential instability and favor the development of convection at later times. - Figure 10: I found the understanding and interpretation of Figure 10 quite difficult; in particular, I did not understand if the backtrajectories you show are averages over all the ensemble members, since this is not mentioned in the Figure caption and not clearly reported in the text (Line 334); also, the presence of high percentages far from the plotted trajectories (purple shading) is counterintuitive; - Line 350-355: for a more comprehensive analysis of the trajectories in Fig. 10, some information should be included about the change of height along them;

Minor points: - Line 115: please provide the definition of ACC; - Line 130: red instead of blue; - Lines 143-145: the role of upper level PV anomaly in the generation of Medicanes is also discussed in Miglietta et al. (2017); - Line 201: were instead of is; - Line 202: severely instead of severly; - Line 207: please can you provide an approximate indication of the height the isentropic = 325 K corresponds to? - Line 214: why do you

C2

give less weight to the regions of strong gradients? - Line 221: explain why “stratospheric” side; - Line 311: favorably instead of favorable; - Line 317 and elsewhere: Mediane or tropical-like, not Mediane-like! - Figure 5 caption: why do you use only 46 members for the second ensemble? - Figure 6: change contour line colors to facilitate interpretation; - Figure 7 caption: please indicate that the black contour refers also to captions (a-d); - Figure 8 caption: (e,i) instead of (e,f); the black contours around the teal patches create confusion; - Supplement material, Line 9: “The results show that significant differences of QG are located in the region of strong QG on 1800 UTC 24 Sep 2018”: it does not seem to be the case, at least at that time.

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