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Geoscientific Model Development Discussions

Interactive comment on "TITAM (v1.0): Time Independent Tracking Algorithm for Medicanes" *by* Enrique Pravia-Sarabia et al.

Anonymous Referee #2

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Summary

The article presents a set of criteria designed to detect mesoscale cyclones in the Mediterranean Sea and surrounding areas that have characteristics similar to barotropic tropical cyclones despite being located at latitudes where baroclinic cyclones are most common. Successful demonstrations are presented for a few selected datasets that are known to contain these "medicane" cyclone features. The results are also shown in the "phase space" model advocated by Hart (2003).

General comments

The greatest contribution of this article are the criteria it uses to distinguish medicanes from typical extratropical cyclones. The use of the "cyclonic potential," and its moti-

vation via connection to quasi-geostrophic theory is (to my knowledge) novel and a strength of the article. These criteria are actually independent of the algorithm and software employed by the authors which, as the title suggests, is a main focus of the article.

Unfortunately, the software and algorithms advocated by the article are not new. Indeed, the algorithm is the same as the commonly used 2-step search that is described in greater detail by Bosler et.al. (2016), Ullrich Zarzycki (2017), Wernli Schweirtz (2006), and Zhao et. al. (2009), and each of these references succeed previous implementations of the same basic algorithm (e.g., Blender et.al. (1997), Hodges (1994), and Vitart et.al (1997) that are themselves successors of even earlier work. Even this list of references is, therefore, far from complete, and more specialized studies using this algorithm that are also relevant to this work include Hanley Caballero (2012), which (like the present work) addresses multiple circulations within the same larger system. None of the references in this review are cited by the current article, which is a significant omission, as it is not clear how (if at all) the present work distinguishes itself from them.

As a consequence, I cannot recommend this article for publication.

However, I would like to encourage the authors to reexamine their work from the context of their specific search criteria, which appear to be very successful at identifying medicanes. These methods could be applied to a larger dataset to examine the climatology of such storms, as in Zhao et. al (2009); the sensitivity of these climatologies could be examined with respect to different threshold values or criteria choices, as in Horn et. al. (2014). I also commend the authors for employing the cyclone "phase space" model as an analysis tool, and encourage them to continue to use it as this work matures. The focus in this ongoing work should not be on software. While writing software is undoubtedly where the authors spend much of their time and effort, this is the nature of modern science. The algorithms and code accompanying this article is not novel; it is simply one of many software packages that have been developed for

similar applications in recent (and not-so recent) years. Instead, the application the authors have chosen is an excellent topic for additional study, particularly as resolution (both model and data set) increases to the point that medicanes are well-resolved.

Specific comments

1. Figure 2(a): The legend label (SLP) is incorrect; the field shown is $\nabla^2(SLP)$.
2. Line 298 reports that detected storms are shown in Figure 2(c). These are not visible in my .pdf copy. Also, it appears that there are many (56?) such detections — why? How does this number correspond to the number of time steps in the data set?
3. Line 305: What is gained by not using the SLP minimum as the location of the storm? In figure 4, the SLP minimum produces a clearly smoother track.
4. Line 324: In what sense is the current method more “robust" than one that uses all the same criteria but chooses to define the location of the storm as the SLP minimum? This is one of many unquantifiable comments in the article that are better characterized as “sales" than scientific analysis.
5. For a study intended to identify medicanes, the ability to distinguish a North Atlantic storm seems (as shown in Figure 7) seems irrelevant. A better example would be an extratropical cyclone, associated with a digging trough, in one part of the Mediterannean basin and a separate system elsewhere in the region that contained a medicane, presuming such a situation can be found or simulated.

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