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Geoscientific Model Development Discussions

Interactive comment on "Tracking winter extra-tropical cyclones based on their relative vorticity evolution and sensitivity to prior data filtering (cycloTRACK v1.0)" *by* E. Flaounas et al.

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We would like to thank the Reviewer for his comments and corrections. Here we answer point by point to his/her queries.

–General comment: The paper documents a new algorithm for extratropical cyclone tracking and the effect of the initial filtering for dataset. In my opinion, to scientific journals such as Journal of Climate or Climate Dynamics, this paper has an insufficient material for new findings in meteorology and does not clarify the point. However, I guess that this journal is just for a technical report, and then, in this meaning, I really evaluate this paper as publication with a single major comment and a couple of mi-

nor comments. Major comments: The authors only mentioned the sensitivity of initial filtering, but there are many tuning parameters in the tracking algorithm. Though the authors claimed as few parameters implemented in the algorithm as possible, I found many subjective settings there. The sensitivity for other parameters should be additionally commented in the discussion. Satake et al. (2013) might be a good reference.

>Tracking cyclones is certainly a delicate issue where several subjective criteria need to be set. Indeed, in all tracking methods there are different approaches that are based on the fact that there is no strict mathematical or physical definition of a cyclone. In our approach there are six main constraints/criteria used to track cyclones:

1) a spatial filtering is performed 2) tracking is based on a cost function 3) a relative vorticity threshold of 3x10-5 s-1 is set for defining cyclones 4) tracking is done within a 10° spatial window 5) relative vorticity of consecutive track points must differ of no more than 50% 6) consecutive displacements have to present an angle greater than 90°, if displacements are longer than 3°.

In the original submission of the article we mainly focus on the data filtering operation (first point), since we consider this to be the most determining element of our method for the tracks number and form.

To further explore the sensitivity of our method, in this revised version of the article we included two new sets of sensitivity tests on the 2nd and 5th point. The sensitivity tests are now presented and discussed in section 3. The other points correspond to constants for all different applications of the code.

Satake et al, (2013) is indeed a good reference for our work and is now cited.

–Minor comments:

–1) Equation (1) is a mathematically incorrect expression. Is 1/X to be 1/(2X+1)? Moreover it should be remarked that a spatial filter of 1-1-1 by 1-1-1 used here is not always a good spectrum property.

>The equation is now corrected. There are many options for filtering relative vorticity, such as b-spline techniques (Hodges, 1995), time band-pass filtering (Hoskins and Hodges, 2002; Inatsu, 2009), 1-2-1 filters as the one proposed in Satake et al, (2013) and others. Here we use an alternative approach, been aware that all filters present advantages and disadvantages. It is for this reason that we performed sensitivity tests (filter3, filter5 and filter7) in order to explore the limits and "technical behavior" of our method. The smoothing operation we use here has been tested for several case studies providing realistic results.

Hoskins, Brian J., Kevin I. Hodges, 2002: New Perspectives on the Northern Hemisphere Winter Storm Tracks. J. Atmos. Sci., 59, 1041–1061.

Inatsu, M. (2009), The neighbor enclosed area tracking algorithm for extratropical wintertime cyclones. Atmosph. Sci. Lett., 10:Âă267–272. doi:Âă10.1002/asl.238

Hodges, K.I.: Feature tracking on the unit sphere, Mon Wea Rev, 123, 3458–3465, 1995.

–2) Figure 7 (including legend) and related sentences in the body do not use PDF but frequency distribution because these are not density.

>Legend and text is now corrected.

Interactive comment on Geosci. Model Dev. Discuss., 7, 1245, 2014.