

## ***Interactive comment on “On the climatological probability of the vertical propagation of stationary planetary waves” by K. Karami et al.***

**Anonymous Referee #2**

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Recommendation: Acceptable for the publication in ACP after minor revisions

General comments:

In this paper, the authors introduced a new PDF (mPDF) for positive refractive indices as a function of zonal and meridional wavenumbers taking account of the fuzzy logic in order to assess the propagating property of planetary waves from the zonal-mean flow configuration. The correspondence to the meridional distribution of vertical component of E-P flux is better for the obtained mPDF of the refractive index in comparison with the PDF derived by Li et al. (2007) taking account of only the sign of the refractive index. They also argued the dependence of the mPDF on the given meridional wavenumber of planetary waves. Hence, this paper proposed a valuable method to assess the propagating property of planetary waves and should eventually be published. However,

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there are some issues that need some minor clarification if the paper is to be read and understood by a wide audience.

Specific comments:

1. P. 32294, L. 14: Please clarify the definition of the meridional wavenumber. Specifically, how long is the meridional wave length corresponding to  $l=1$  ?
2. P. 32294, L. 12: In this paper, the time mean refractive index squared (MRIS) is defined by the time average of the refractive index squared computed for the daily zonal-mean field. Hence, the meridional distribution of MRIS displays a noisy structure. However, if the refractive index squared is computed for the time averaged zonal-mean field, it would have a well-defined structure in comparison with MRIS, and is more suitable to assess the propagating property of planetary waves. Please display the refractive index squared for the time averaged zonal-mean field, and argue the difference of its meridional structure from MRIS.
3. P. 32298, L.23 – P. 32299 L. 2: Fig. 5 shows that the planetary waves in the lower stratosphere just below 100 hPa easily propagate upward around the latitudinal bands from 50-70N. This is not well described by the meridional distribution of mPDF, which has a local minimum there as shown in Fig. 8 for  $(k,l)=(1,1)$ . Moreover, mPDF has local maxima south of 40N and north of 80N. Please comment on this discrepancy.
4. P. 32299, L. 25: I do not understand the logical connection of the sentence “and is not a function of the background zonal regime” with the previous sentence of “The critical strength depends on the scale of the wave”. What is the meaning of the “background zonal regime” ?
5. P. 32300, L. 24: The authors insist that both WVR and SVR show similar patterns in comparison to the climatology (Fig. 8). However, there is no specific comment on this similarity. Please describe more specifically the similarity of both regimes to the climatology.

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6. P. 32302, L. 6 - L. 11: The authors insist that the newly developed diagnostic tool is capable of demonstrating the enhancing influence of positive vertical shear on the propagation of stationary Rossby waves from the troposphere to the stratosphere. However, I do not find any evidence in all the figures of this paper to support this conclusion. Please specify the evidence related to this conclusion.

7. P. 32302 Conclusions: The authors should describe some implication for the better performance of mPDF in comparison with the PDF of Li et al. (2007) in Conclusion as follows: The better performance of the mPDF suggests that relatively small but positive numbers of the refractive index squared play an important role to offer an favorable propagating condition for planetary waves in the stratosphere.

Technical corrections:

1. P. 32290, L. 2: assess in a -> assess a
2. P. 32290, L. 2: framework the -> framework of the
3. P. 32293, L.26: Kalnay et al. (1996) -> (Kalnay et al. 1996)
4. P. 32294, L. 6: Andrews et al. (1987) -> (Andrews et al. 1987)
5. P. 32296, L. 7: refracted -> reflected?
6. P. 32296, L. 20: MVF -> Membership Value Function (MVF). Please do not use an abbreviation without the original unabbreviated term.
7. P. 32297, L.5: suggest -> suggests
8. P. 32299, L. 12: places which are -> places, which is?
9. P. 32299, L. 18, L. 19: The high value of mPDF does not necessarily correspond to a favorable condition of the upward propagation for planetary waves. It suggests a favorable condition for the propagation of planetary waves including the meridional direction.

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10. P. 32299, L. 29: "(3.3)" should be "(2,3)"?
11. P. 32300, L. 4: "latitude" should be "altitudinal"?
12. P. 32300, L. 5: "(3.3)" should be "(2,3)"?
13. P. 32300, L. 15: SVR -> Strong Vortex Regime (SVR)
14. P. 32300, L. 15: WVR -> Weak Vortex Regime (WVR)
15. P. 32301, L. 6: "are found" -> "are found for WVR"?
16. P. 32301, L. 16: "this analyses" -> "these analyses"
17. P. 32301, L. 17: "wave-mean flow interaction" should be "propagating property of planetary waves"
18. P. 32302, L. 14: Please delete "therefore".
19. P. 32302, Eq. (A1): The denominator of the right hand side term should be "n".

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