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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Stationary planetary wave propagation in Northern Hemisphere winter – climatological analysis of the refractive index" *by* Q. Li et al.

Anonymous Referee #2

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General comments

The authors have developed a new method of studying the climatology of vertical propagation conditions for stationary planetary waves in the mean zonal flow of the atmosphere. They apply the method to waves with zonal wave number 1, 2 and 3 in the troposphere and stratosphere up to 10 hPa. 44 northern hemispheric boreal winters were analyzed. The method is based on the estimation of the frequency of occurrence of negative refractive indices squared (probability density f) as a function of latitude and pressure. This procedure is new and attractive since, as shown by the authors, it leads to a much clearer representation of wave propagation conditions than the use of

averaged refractive index squared values. Comparison of the f-distribution with E-P-flux estimates confirms - among other arguments - that f is a convenient parameter for the study of wave propagation climatology. The paper deserves publication after some major and minor revisions recommended below.

Specific comments

Abstract: It should be formulated in a more concise way. What is mentioned on line 5 (This analysis ..) to line 8, on line11 (In northern Ĕ) to line 16 and on line 17 (AnomaliesĔ) to line 19 are statements about well known facts, which stand alone without explanation why they are needed in the context of the f-method description and application. They could therefore be omitted or should be replaced by statements related to specific results of the analysis.

Discussion of large f above subtropical tropopause (p9042, lines 1 - 10): It is argued that a high f area above the subtropical tropopause is related to an area with extreme negative vertical wind shear. The centre of the former area is found at 37N, 70 hPa, the latter one at 30N, 100hPa. Regarding the large difference of position I doubt that a relationship exists if there are not given convincing dynamical reasons for such a conclusion.

Summary, p9045, lines19-25, and p9052, lines 12 - 16: These phrases summarize what was known before the introduction of the f method. It has no relationship to the specific work and can be omitted (compare the comment on the abstract).

“Correlation” analysis (Sect. 4.3): What is discussed in this section is not correlation but scatter of E-P-flux or mean E-P-flux (Fig. 10d) as a function of f. This also applies to the “correlation” Figures 10 and 11.

p9052, line 28: explain what is meant by “propagation structures of planetary waves”.

Terminology: Since f just describes “propagation conditions” I recommend checking if terms like propagation properties (e.g. p9034, line 4) or propagation characteristics

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(e.g. p9054, line 13) should be replaced by “propagation conditions” in order to be more precise.

Expression p9035, lines 24 - 25: “Ĕ winds based on the Ĕ. theorem Ĕ” . Revise this phrase.

Figures: The labelling of contour lines is not readable. Also numbers of scales and axes are too small in most cases and make the interpretation of the plots difficult. Fig. 1, legend, line 2: “RIS Ĕ..for mean of 44 boreal winters Ĕ.”. The text (p9057, l 8) says “mean refractive index squared”. Which version is correct?

Technical corrections

p9034, l 10: forcing of zonal

p9038, l 19-20: is not (quadratic vertical wind shear). See also p9043, l 8 and legend of Fig. 3.

p9046, l 19 -21. Incomplete sentence

p9047, l 11: Ĕ.(65o N))

p9050, l 25: Ĕ troposphere to stratosphere

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Interactive Comment