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Geoscientific Model Development Discussions

Interactive comment on "Normal-mode function representation of global 3-D datasets: an open-access software for atmospheric research community" *by* N. Žagar et al.

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Response to the comments of Referee 1 on

"Normal-mode function representation of global 3D datasets: an open-access software for atmospheric research community"

by N. Žagar, A. Kasahara, K. Terasaki, J. Tribbia and H. Tanaka

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We would like to thank Referee for his/her comments on the manuscript.

In response to his/her comments we have performed manuscript updates at several places. We hope that corrections following English proofreading make the reading easier.
Below we reply to the comments and questions raised by the Reviewer using the same organisation as in the review.

Minor comments

1. I think it would be useful to also discuss how the modes are separated into balanced and unbalanced motions

In response to Referee's suggestion, we have added a new paragraph in section 2.3 which summarized the derivation of Hough functions as follows:
" The general algorithm for solving system (18) as used by Kasahara (1976) involves the replacement of the wind components by velocity potential and stream function variables by using the Helmholtz theorem and the assumption that new non-dimensional dependent variables are proportional to harmonic functions in longitude with zonal wavenumber and in time with the dimensionless frequency. The meridionally dependent variables are expressed in terms of series of the associated Legendre polynomials of order n and rank k. Resulting equations for the three expansion coefficients as functions of k and n contain two independent systems. In one case, the velocity potential and the geopotential height are symmetric with respect to the equator whereas the stream function is antisymmetric. In another case, velocity potential and height are antisymmetric with respect to the equator and the stream function is symmetric. In each case, the frequency is obtained as the eigenvalue of the matrix problem. Two dispersion relationships describe the frequency of two kinds of solutions, the so-called first kind and the second kind of Hough solutions. So-called

solutions of the first kind describe high-frequency westward and eastward propagating inertio-gravity waves. Solutions of the second kind describe low-frequency, westward propagating, predominantly rotational waves of Rossby-Haurwitz type. We denote the two kinds of solutions IG and ROT for inertio-gravity and Rossby–Haurwitz type of motions, respectively. "

2. Line 155: Here it is stated that IG energy is about 10% of total wave energy. But later is stated that unbalanced variability is about 33% of total variability. I don't understand this. This should be explained in more detail.

We have replaced "variability" by "circulation". Now we state that "in current analysis datasets about one-third of global wave circulation is associated with unbalanced modes."

3. While the manuscript is easy to read there still a few grammatical mistakes. Especially the use of "the" seems to be rather random. I suggest that the manuscript is carefully proof-read by a native speaker.

A poor use of definite/indefinite articles is due to Slavic origin of the leading author. We apologise if this has made the reading difficult. The revised manuscript was proof-read by native speakers.

4. Line 776: I don't understand this sentence. Is there only one 'separation constant' or is there one for each equivalent depth? Also what exactly is meant by a separation constant?

In section 3.2 we discuss how the vertical structure function is solved in practice and describe its solutions for the case of ERA Interim dataset. We removed the sentence "These values represent a separation constant coupling the vertical and

horizontal structure equations." as it may be confusing. Instead, we clarify that values of equivalent depths "define M values of the constant γ (Eq. 21) for M systems of the horizontal structure equations (18)."

5. 'more flat' should be 'flatter'

Corrected as suggested.

6. 'more steep' should be 'steeper'

Corrected as suggested.

7. 'in contrary' should be 'in contrast'

Corrected as suggested.

Yours sincerely,

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Interactive comment on Geosci. Model Dev. Discuss., 7, 8805, 2014.