

Interactive comment on “First tomographic observations of gravity waves by the infrared limb imager GLORIA” by Isabell Krisch et al.

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Received and published: 31 August 2017

1 General comments

The manuscript describes the analysis of temperature data measured by the GLORIA instrument during a flight over Iceland conducted January 2016. The authors describe how they retrieve gravity wave (GW) parameters (wavelengths, amplitudes and momentum flux) from this data using ECMWF operational analysis for background wind estimation.

Based on this data the origins and future propagation paths of the waves are determined using a ray-tracing model. Thanks to the 3D nature of the tomographically

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retrieved data this can be done with a much higher accuracy than previous studies, illustrating the importance of 3D reconstruction for studying GWs.

Finally the authors comment that the waves measured deposit their momentum at horizontal distances over 1000 km from their origin. They show that the altitude at which this momentum is deposited in their model depends on whether this horizontal transportation is taken into account. This illustrates the importance of this transport for correctly modelling the influence of GWs on the dynamics of the atmosphere.

In general I find that the manuscript is well written, is interesting and that the underlying data and analysis methods (including error analysis) support its conclusions, and thus will recommend its publication with some minor comments/questions from my side.

2 Specific comments

P4L7: *"As a-priori field x_a a temperature field from the European Centre for Medium-Range Weather Forecasts (ECMWF) operational analyses at resolution T1279/L137 was used, which was smoothed in all spatial directions to remove GW signatures."*

What smoothing filter was used (type and fwhm)?

P4L4: *"The vertical resolution can be defined as the full width at half maximum of the averaging kernel matrix and is around 200 m at an altitude of 11.5 km"*

Are you simply looking at the elements in the row of the AVK matrix corresponding to the grid points directly above the grid-point of the row, or are you collapsing (i.e. performing a summation) the two other dimensions (x,y) before this FWHM is calculated?

If the first approach is used, some description of the elements located diagonally above and below the grid-point should be included, as these can (in principle at least)

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indicate information leakage from higher altitudes that the elements directly above.

P8L8: *"To classify this event, a comparison of all GW events in January 2016 has been performed in the operational analyses of ECMWF (Fig. 5)."*

How are the GW located in the ECMWF data and how are the occurrence frequencies calculated? a bit more details on how this was done would be good to include.

P17L17: *"In Fig. A1 left column the instantaneous value $\xi_{z=11.5}$ at the middle point of the fitting volume of each individual ray is compared to an average value ξ over the full height range of the S3D fitting volume (comparable to the S3D fitting result);"*

What is meant by full height range of the S3D fitting volume? Does it refer to each individual fitting volume i.e. 160 km x 160 km x 3.6 km?

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-644>, 2017.

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