We thank the reviewer for pointing out several places in which the manuscript can be improved. The reviewer raises several concerns which she/he considers major. In the following we briefly summarize these concerns and outline how we will take them into account in the revised manuscript.

**Comment 1: The reviewer questions the general relevance of the paper because the observational filter presented might be too focused on a particular method**

Infrared limb sounders are one of the most important instruments for generating climatologies of gravity wave momentum flux (GWMF). They contributed, for instance, to the recent SPARC climatology of GWMF. In order to fully exploit such climatologies it is necessary to determine the observational filter (cf. reply to comment 3). A comprehensive description of an observational filter has the size of a full paper. This is shown by the current manuscript. Also for other instruments and instrument types (for instance nadir sounders, super pressure balloons) dedicated papers have been published. It is therefore adequate to dedicate a full paper to the description of the observational filter for infrared limb sounders. This was also pointed out by reviewer #1.

The reviewer rightly notes that the paper gives the impression that it is tailored for a special evaluation method. However, this is only true for the profile-pairing selection and for the vertical filtering, which removes waves with vertical wavelengths of longer than 25 km. As shown in the manuscript, these two steps (profile-pairing selection and the vertical filtering) have very minor influence on all three assumed distributions (MF1, MF2, and MF3). Therefore the described observational filter can be used generally. Other evaluation techniques might, however, need to use additional steps. Except for profile-pairing and vertical filtering the observational filter described here only refers to restrictions which are inevitable for HIRDLS and SABER.

In response to the reviewer we will add a section "Applicability of the method to other instruments" in which we will describe briefly which modifications are necessary to adapt the observational filter to other related techniques such as GPS, MLS or potential future limb sounders/limb imagers optimized for sounding mesoscale structures. This will also summarize which effects cannot be avoided by any improved means of an evaluation method of a given instrument.

**Comment 2: The reviewer requests for a better motivation of the selected parameters of the convective GW model. She/he inquires whether an application of the filter of MLS would be feasible in the frame of this paper.**

For the real atmosphere the preferential horizontal wavelengths are unknown. From the generation mechanism, all discussed temporal and spatial scales (MF1, MF2 and MF3) are plausible. In this paper in AMT we are not trying to solve this question, but only to provide a tool for reliably estimating whether such waves are visible and, most importantly, for quantitatively determining to which extent they are visible. Of course we had expected qualitatively that longer horizontal wavelengths are better visible to limb sounders. However, an accurate quantification of the observational filter including all relevant processes for a given, specific model was missing until present. This accurate quantification is only possible in a forward way, i.e. for a specific model where all properties of the individual waves (horizontal and vertical wavelengths, propagation direction, ...) are known. It should be further noted that here we use the convective source model and the various parameter sets as only one example for

the application of the filter. Our aim in this paper is to show how the different steps of the observational filter act on different wavelength scenarios and which steps are the most important ones independent of the scenario chosen.

A modification of the observational filter for MLS is beyond the scope of this paper, but in the added section (cf. reply to comment 1) we will briefly describe how the filter would have to be modified.

**Comment 3: The reviewer asks for a more detailed strategy for the improvement of global GW modeling by comparison with observations and which role the observational filter takes.**

The reviewer is correct that we need to strengthen the paper in this respect and we will modify the introduction and the discussion section accordingly. The point is that observations, in general, can see only the projection of reality, for instance only a certain part of the full spectrum. If we compare this projection directly to a model, all potential loss of the information becomes part of the uncertainty range. Based on this approach, Ern et al. (2004) estimated the uncertainty range of their GWMF to be a factor 2 to 5. Even larger differences between models and measurements hence remain insignificant. For instance, Geller et al. (2013) find between different models and measurements a spread in the decrease of GW momentum flux from 20 km and 40 km altitude of a factor of 6. Still, even such large differences cannot be used to rule-out some of the models. This strongly restricts our knowledge on GWs and, in the end, restricts the reliability of climate projections (Sigmond and Scinocca, 2010).

However, as demonstrated in this paper, the largest part of the uncertainty is caused by effects such as the visibility filter and aliasing, which Ern et al. (2004) can only roughly estimate because the true atmospheric spectrum is unknown. On the other hand, if we assume a certain model, this model provides a GW spectrum and we can calculate these observational filter effects to a good accuracy. In other words, assuming that the model were true then we know what we should observe with much better accuracy than we know the actual value of true GWMF from the measurements alone.

In this way we still cannot determine the true GWMF spectrum, but we are able to falsify models. Following this approach we need to improve our physical understanding until, hopefully, filtered model results and observations match for the right reasons. Since we can estimate spectra, seasonal variations and global coverage the chance of incidental matches are likely to be small (Preusse et al., 2009).

**Comment 4: The reviewer asks to check the use of symbols in Figs 5 and 8 for consistency.**

We have checked the use of the variables: they are used for the same quantities. Some confusion might have been introduced by the fact that $\beta$ and $\beta$+180° are not distinguished. This will be clarified in the new version.

**Comment 5: The reviewer asks whether it would be possible to correct aliasing effects.**

In Ern et al. (2004) such a correction was actually made. However, the correction relied on some assumptions of the true spectrum and hence inflated the error range. As discussed in the reply to comment 3 the better way is to accurately calculate this effect based on a specific model which we want to test.

**Concerning detailed comments:**

We thank the reviewer for his comments on additional literature and presentation style and will take them account in the revised manuscript.

**References:**


1. Ern, M., P. Preusse, M. J. Alexander, and C. D. Warner (2004), Absolute values of gravity wave momentum flux derived from satellite data, J. Geophys. Res., 109, D20103, doi:10.1029/2004JD004752

2. Geller, M. A., Alexander, M. J., Love, P. T., Bacmeister, J., Ern, M., Hertzog, A., Manzini, E., Preusse, P., Sato, K., Scaife, A. A., and Zhou, T.: A comparison between gravity wave momentum fluxes in observations and climate models, J. Climate, 26, 6383–6405, doi:10.1175/JCLI-D-12-00545.1, 2013. 10773, 10796, 10801

3. Preusse, P., S. D. Eckermann, M. Ern, J. Oberheide, R. H. Picard, R. G. Roble, M. Riese, J. M. Russell III, and M. G. Mlynczak (2009), Global ray tracing simulations of the SABER gravity wave climatology, J. Geophys. Res., 114, D08126, doi:10.1029/2008JD011214.

4. Sigmond, M., and Scinocca J. F., (2010): The Influence of the Basic State on the Northern Hemisphere Circulation Response to Climate Change. J. Climate, 23, 1434–1446. doi: http://dx.doi.org/10.1175/2009JCLI3167.1