

Replies to Reviewer #1 Comments/suggestions

The paper presents an interesting study to infer GW sources by reverse ray-tracing. The paper is well structured and the evidence shown is convincing. The English should be improved with the help of the copy-editing service of Copernicus. A few minor comments which should be taken into account and a few suggestions for better readability are given below.

Reply: First of all we wish to thank the reviewer for going through the manuscript again and offering suggestions for further improvement. We tried our level best to minimize the grammatical mistake to the best possible extent. We also have taken care all the comments/suggestions made below.

Minor comments:

1. L495 For "likely" there is too sparse evidence presented in the paper. The wave also may reach a critical level from below and a different kind of source (associated or non-associated with a potential wave from below) generates the new wave reaching the MLT. A potential explanation is that the waves ...

Reply: We have modified this sentence as suggested.

2. L314 Background wind ... this condition is already contained in 4). You should not need to use an additional condition

Reply: We are omitted this line from the manuscript.

A few suggestions for the abstract (and please don't use successful, for the technical part it is straight forward!)

Sources and propagation characteristics of high frequency gravity waves observed in the mesosphere using airglow emissions from Gadanki (13.5oN, 79.2oE) and Hyderabad (17.5oN, 78.5oE) are investigated using reverse ray tracing. Wave amplitudes are also traced back including both radiative and diffusive damping. The ray tracing is performed using background temperature and wind data obtained from MSISE-90 and HWM-07 models, respectively. For the Gadanki region the suitability of these models is tested. Further, a climatological model of the background atmosphere for the Gadanki region has been developed using nearly 30 years of observations available from a variety of ground-based (MST radar, radiosonde, MF radar), rocket-, and satellite-borne measurements. ERA-Interim products are utilized for constructing background parameters of the individual meteorological condition of the observations. By the reverse ray tracing method, the source locations for nine wave events could be identified to be in the upper troposphere, whereas, for five other events the waves got terminated in the mesosphere itself. Uncertainty in locating the terminal points in the horizontal direction is estimated to be within 50-100 km and 150-300 km for Gadanki and Hyderabad wave events, respectively. This uncertainty arises mainly due to non-consideration of the day-to-day variability in tidal amplitudes. Conditions prevailing at the terminal points for each of the 14 events are provided. As no convection in-and-around the terminal points is noticed, convection is unlikely to be the source. Interestingly, large (~9 m/s/km) vertical shears in the horizontal wind are noted near the ray terminal points (at 10-12 km altitude) and are thus identified to be the source for generating the observed high phase speed, high frequency gravity waves.

Reply: Thanks for your patience and providing corrections in the abstract. We have changed this in the revised paper.

real-time or near real-time is used to express that a data set can be processed in a very limited time:http://en.wikipedia.org/wiki/Real-time_computing

Reply: We do not understand in which context referee is pointing this statement.

L57 confined to low ground-based frequencies and phase speeds

Reply: We have changed this in the revised paper.

L72 omit indirectly

Reply: We have removed that from revised paper.

L105 the ray path including radiative and turbulent damping in order to identify the sources for the observed waves.

Reply: We have changed this in the revised paper.

L115 with a 24 mm Mamiya fish eye lens

Reply: Modified.

L141 Coriolis was a person and the frequency / parameter named after him => Capital http://en.wikipedia.org/wiki/Gaspard-Gustave_Coriolis

Reply: Corrected.

L171 All wave events observed at Gadanki and Hyderabad correspond to high frequency high phase speed gravity waves as seen from their large vertical wavelengths, small periods and high phase speeds listed in Table 1.

Reply: Corrected.

L189 a grid extent of $5^\circ \times 5^\circ$ is considered to be adequate. ?

Reply: As the observed wave parameters correspond to high phase speed and high frequency waves, they will propagate very fast in the vertical than horizontal having higher vertical and lower horizontal wavelengths. This aspect is added in the manuscript.

L227 frequently in the troposphere

Reply: Modified.

L310 I find the combination 1) m^2 slightly confusing: ... ray 1) when m^2 becomes ... 2) when the intrinsic ... 4) when the vertical wave number m becomes

Reply: Corrected.

L413 As expected, This is one of your main findings that you can exclude convection in a radius wider than that indicated by the backward trajectories. You shouldn't devalue your conclusion by saying it is expected, in particular when it is not really that clear.

Reply: Corrected.

L431 From figure 11 it can

Reply: Corrected.

L454 this wave event also could propagate down to ~16 km in the reverse ray tracing.

Reply: Modified.

L470 please omit successfully: You apply this on a theoretical basis and whether this is successful in terms of describing the reality is not shown.

Reply: Omitted.

We once again thank the reviewer for going through the manuscript carefully and offering potential solutions for improving the manuscript content further.

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