Response to Reviewers

Dear Editor,

We appreciate the time and effort that you and the reviewers have dedicated to providing valuable comments. It owes to your valuable and insightful comments to have led our paper to possible improvements as the current version. The authors have carefully considered and tried our best to address the comments. Below we provide the point-by-point responses. All modifications in the manuscript have been highlighted in blue.

Comments from Reviewer 1

Comment: *I only suggest that the authors include some images of evanescent waves even if they may not be visible. I think other readers may be curious as well.*

Response: Thank you for this suggestion. It would have been considerable if the image taken at Bohyun were comparable to those of previous papers including

1. Nielsen, K., Taylor, M. J.,Hibbins, R.E., Jarvis, M.J. and Russell III, J.M.: On the nature of short-period mesospheric gravity wave propagation over Halley, Antarctica, J. Geophys. Res., 117, D05124, doi:10.1029/2011JD016261, 2012, and
2. Isler, J. R., Taylor, M.J., and Fritts, D.C.: Observational evidence of wave ducting and evanescence in the mesosphere, J. Geophys. Res., 102, 26,301–26,313, 1997.

The referring papers present vivid images of evanescent waves with carrying excellent outlines of the waves. However, it is unable to easily grasp with bare eyes any outlines of wave forms in the raw images, which were directly taken by camera at Bohyun. Instead, we revised with adding the citations at the points delivering the results of evanescent and ducted waves, as in lines 226-228

"The evanescent waves (e.g., Nielsen et al., 2012; Isler et al., 1997) may be formed by the wave upward propagating from the lower atmosphere…".

Comments from Reviewer 2

Comment: *The authors have incorporated all the suggestions within their limitations and the quality of the paper is improved. Therefore, I recommend this manuscript for publication*

Answer: Thanks for the considerable recommendation.

Minor Comments /Suggestions:

Comment: *1. Line -19-20: "The majority of observed waves are found to be freely propagating, and thus can be attributed to wave sources in the lower atmosphere"*

Why can sources of freely propagating waves be attributed in the lower atmosphere? In my opinion, the filtering effect and preferential direction of GWs propagation in the MLT region should be attributed to identifying the source in the lower or upper atmosphere.

Response: Thanks for the pointing this out. We agree with your suggestion, and we reflected your suggestion in the manuscript as in lines 19-20

"The majority of observed waves are found to be freely propagating, and thus can be attributed to wave sources in the lower or upper atmosphere."

Comment: *2. I am wondering why most of the waves are free propagating at Mt. Bohyun (36.2°N, 128.9°E). In contrast, a previous study by Isler et al., 1997 indicates a preponderance of duct or evanescent waves up to 70 % of recorded events at Hawaiian Island.*

Reference:

Isler, J. R., Taylor, M. J., & Fritts, D. C. (1997). Observational evidence of wave ducting and evanescence in the mesosphere. Journal of Geophysical Research: Atmospheres, 102(D22), 26301-26313.

Response: The observational results given by Isler et al. (1997) were from the images taken in a Fall season only from October 6-22, 1993. In addition, they used four different filters to estimate the vertical propagation of gravity wave, covering wider altitudinal range from 87±10km (OH) to 96±10 km OI (557.7 nm). In comparison to this, our observation was taken except for Fall due to instrumental and weather problems with using single filter of OI (557.7 nm). Besides, Korean Peninsular is located at a continental region in which geographical location and climate effect are different from those of Hawaii Island. Therefore, the characteristic results of vertical gravity wave propagation should be different between two sites.