

Interactive comment on “Observation of Kelvin-Helmholtz Instabilities and gravity waves in the summer mesopause above Andenes in Northern Norway” by Gunter Stober et al.

Anonymous Referee #1

Received and published: 16 January 2018

General Comments

The paper presents new PMSE data obtained with MAARSY radar in Northern Norway and simultaneous meteor radar winds. The data suggest the presence of two brief Kelvin-Helmholtz (KH) events on one particular day. The authors also present the analysis of 15 short-period gravity wave events based on volume velocity processing (VVP) of the multi-beam Doppler radar data.

The manuscript is very difficult to review since the authors did not process the figure numbers correctly. Almost all figures are called Figure 6.

The KH billows are not easy to see, presumably due to the relatively low height and

C1

time resolution. They are inferred from the observed aspect ratio and wind shear. The authors quote earlier MST observations in the troposphere and mesosphere. It should be included that the SOUSY radar observed KH events in the mesosphere three decades ago (Reid et al, Nature, 1987).

The VVP method has been described already in 2013. Nevertheless, the identification of short period and short wavelength gravity waves is an achievement with the MST radar.

The discussion is kept general, since no other simultaneous measurements are available. There are many other observations of KH in the mesosphere (e.g. airglow, NLC), so it is not a new discovery. It is, however, the first report of KH from the MAARSY radar.

The comparison of the observed wave characteristics with the model results from Hori-nouchi et al (2002) seems only of limited usefulness, since they describe very different dynamical conditions.

I recommend to accept with minor revisions.

Specific Comments

p. 3. Praise: It is appreciated to include detailed description of the outlier treatment.

p. 5 l. 23. Why not use a local climatology of temperature (Lüben, Falling Spheres?)

p. 8 l. 5. For completeness, it would be good to include the relation for intrinsic and Doppler shifted quantities.

p. 8. l. 29. I doubt that an old theoretical result (Lindzen 1988) can do justice to interpreting the observations compared to more modern simulations of GW breaking (e.g. Fritts, Hickey, Snively). The authors should try to compare with these more comprehensive models.

p. 8 l. 5. For completeness, it would be good to include the relation for intrinsic and

C2

Doppler shifted quantities.

Technical Corrections

AGAIN: All Figure references must be fixed!

p. 6. l. 1. no red boxes

p. 6 l. 6: $\lambda_h = 10.7$ km (horizontal)

Fig. 10. Better use same y-scale for counts.

Interactive comment on Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2017-1170>, 2018.