

## ***Interactive comment on “Winds and temperatures of the Arctic middle atmosphere during January measured by Doppler lidar” by Jens Hildebrand et al.***

### **Anonymous Referee #1**

Received and published: 26 April 2017

The paper presents wind and temperature measurements by lidar technique at the arctic location of Andoya (69°N). The data are from three Januarys in 2012, 2014 and 2015. The measured night time profiles extend from approx. 30 km to 85 km altitude with a temporal resolution of 1 hour. Profiles are compared with corresponding ones from ECMWF and HWM07. Significant differences in temperature and wind between the models and the measurements are reported. In a second part of the paper the authors deduce potential and kinetic gravity wave energy densities based on the measured temporal fluctuations of temperatures and winds.

The paper is carefully and clearly written and easy to follow. Figures are clear and document well the results.

C1

It has to be noted, and the authors clearly summarize this in the introduction, that measured wind profiles are very rare and accordingly very few papers present measured data. Further, the number of publications showing datasets over some extended periods are even more scarce. This paper presents extended data for three Januarys and therefore significantly contributes to an area of middle atmospheric research where the data amount is small so far. This is particularly important as in recent years experimental techniques suffer from declining interest and more weight is put on modeling. Data with high quality as presented in this paper are therefore of extreme value for the validation and improvement of models and they merit to be published. This is particularly true for the data discussed in the current paper.

I therefore recommend to publish the paper with some minor modifications or corrections.

In the section about data, page 3, lines 28 etc. it is not clear how the measurement uncertainties are defined. On the one hand they say that typical values are 0.5 K and 3 m/s for temperature and wind resp. However then it is said that data with uncertainty values roughly ten times higher are also considered. Please clarify why this large range of uncertainties exists and why you take all these data with high uncertainty into consideration.

Section 4 about results shows high variability in temperature and wind from night to night. The January variability particularly in wind significantly depends on where the measurement is taken with respect to the vortex edge. Indeed the authors several times say that the position of the vortex is important but they do never show where it actually is. Unfortunately it is not possible to find out when the measurement was inside or outside of the vortex. I strongly recommend that the authors separate the data set in two, one with profiles from inside and the other one from outside the vortex. Also the comparison with the models might then change. The large differences between model and data might be explained by such an inappropriate comparison. Section 4.2 as well is linked to the polar vortex and the authors say that a reformation of the vortex took

C2

place. Unfortunately again it is not clear how the situation was at Andoya where the observations took place. Please expand this section regarding the vortex.

Technical corrections:

Abstract line 16: The sentence "The total LWED." does not make sense. Something is lost here . page 3, line 25: . . . was acquired during the nights in January 2012. . .

page 6, line 12: either use "this discrepancy" or "these discrepancies"

---

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2017-167, 2017.