

## ***Interactive comment on “Simultaneous and co-located wind measurements in the middle atmosphere by lidar and rocket-borne techniques” by Franz-Josef Lübken et al.***

### **Anonymous Referee #2**

Received and published: 20 June 2016

#### **General comment:**

As the title is saying the paper compares simultaneous and co-located wind measurements in the middle atmosphere by lidar and rocket borne techniques. Data have been obtained at the arctic location of Andoya at 69° north during one night in March 2015. The altitude range covered where both techniques deliver reliable data extends from approximately 30km to 65km. In case of the lidar horizontal wind is obtained by analyzing the Doppler-shifted backscattered signal at a wavelength of 532nm whereas in case of the rocket sondes the backscattered radar signal of a starute is analyzed. In addition also wind information beyond approx. 30 km altitude is obtained from a conventional radio sounding.

C1

Wind measurements in the middle atmosphere are very sparse and every new technique or comparisons of techniques are very valuable.

The paper is clearly written with adequate reference to the literature. All the figures are of high quality and illustrate clearly what has been deduced from the data analysis.

The paper merits publication with some minor corrections.

#### **Specific comments:**

The comparison of horizontal wind profiles is based on data from one night only. Though it is understandable that rockets are only launched during specific circumstances it would be of interest to know how the techniques would compare during day. How well is the lidar technique suited to retrieve the wind profile during day. Also it would be interesting to know how well the technique would compare when the edge of the vortex is close to the observation site. The reviewer would appreciate if the authors could spend a few sentences about these aspects even if they do not have any data to compare with.

The authors give quite some details about the uncertainty analysis in case of the floating radar target in the atmosphere (drag coefficients etc). They also indicate an uncertainty due to radar tracking and refer to a publication of a conference that the reviewer was unable to find. Two or three sentences here explaining what is the problem would be helpful.

The lidar is observing with quite a small zenith angle (20 and 30 degrees) for the detection of horizontal wind. Is there any possibility to retrieve vertical wind? Is there any possibility to have the lidar beams with higher zenith angles in order to reduce errors?

Also the reviewer who is not familiar with rocket sondes would have been grateful to find a small description of the concept of a starute or even see an image of these devices. The authors give reference to papers but most of them are very old and not accessible

C2

through the web. It took the reviewer some time to finde a description of what a starute is.

Page 5, line 25: Please also indicate the uncertainty of the starute measurements at 30 and 40km altitude.

The only paragraph where the reviewer was not able to follow the argumentation of the authors is on page 6 and Figure 7 dealing with the repeatability of the profiles measured by the lidar. Deviations of the individual wind profiles from a heavily smoothed one by spline fitting is shown. I just do not see what the authors want to tell here. What kind of profile is the smoothed one.

Minor comments:

The first sentence in the abstract says that a comparison of the lidar technique with data from insitu observations is performed. Either techniques are compared or data from different techniques but not a technique and data. Please rephrase.

page 2 second line: the covered altitude range of the lidar and the rocket is closer to 30km and 65 km. If the authors also consider the radio soundings then the altitude range is of course larger. However they state upper stratosphere. So 20km and upper stratosphere somehow do not match.

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C3