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Atmospheric Measurement Techniques Discussions

Interactive comment on "Airborne wind lidar observations over the North Atlantic in 2016 for the pre-launch validation of the satellite mission Aeolus" *by* Oliver Lux et al.

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This is a very well-written and thorough paper describing a flight campaign to validate techniques and instrumentation that will be used in the Aeolus mission to measure winds from space. The paper is important because it provides an indication of performance and potential issues associated with Aeolus measurements and also provides a direct comparison of winds measured by coherent and direct detection wind systems observing the same volume of atmosphere.

The only section of the paper for which I have some question was the part on use of the ground returns for correcting the velocity, which I found a bit unclear. My points on

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Discussion paper

this section are included in the list of comments shown below.

Specific comments on the manuscript, which I consider minor points, are as follows:

Page 3, line 30: Given that other characteristics of the transmitter are stated, it would be useful to know the bandwidth or frequency uncertainty of the transmitted pulse.

Page 4, line 3: Why are the receiver electronics triggered 60 microseconds before laser pulse emission?

Page 4, line 25: It wasn't clear to me exactly what the EOM does. Does it simply switch between the internal reference and the atmospheric signal after the pulse has been transmitted?

Page 8, line 18: It would be useful to know why the response function for the satellite instrument is only performed for a single range gate. How is that gate determined? Is the satellite attitude varied so that instrument looks vertically?

Page 9, line 20: I found this paragraph a bit confusing. What does "a visual inspection of intensities" mean, and why does a summation lead to an underestimation of the actual ground signal? Because the paper places quite a bit of emphasis on the improvement of the new technique for dealing with ground return, I think a better characterization of the old technique is necessary.

Page 10, line 31: I assume that delta h is computed from the DEM data for Table 2, although it isn't totally clear to me from the text.

Page 16, line 25: Because the coherent Doppler lidar measures return from aerosols, and the Rayleigh channel is sensitive to the presence of aerosols, is a comparison between the two valid? Doesn't this potentially overestimate the error in the Rayleigh winds, unless the effect of aerosol on that channel is negligible. Perhaps this should be discussed some more.

Page 17, line 1: The removal of the "bad" measurement from the Rayleigh dataset is

done based on comparison with the coherent lidar. How would this be handled for the satellite measurement, where no comparison source will be available, to avoid sending bad data to the assimilation algorithms?

Page 18, line: 23: Why exactly does a heterogeneous cloud structure contribute to random error? Is it a range-weighting effect in the presence of shear, or some other optical effect? Probably a bit more explanation is needed here.

Figure 4: The caption refers to "orange bins" in (c) and (d). I'm not sure what bins this refers to; I don't see any orange bins.

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