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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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Review of paper "Airborne wind lidar observations over the North Atlantic in 2016 for the pre-launch validation of the satellite mission Aeolus" by Lux et. al.

The authors discuss aircraft campaigns with the A2D in preparation for launch of the first Doppler wind lidar in space: Aeolus. The processing of observed data with Aeolus to winds is known to be challenging in particular in dynamically complex scenes, including strong wind shear and varying cloud conditions. The measurements done in this campaign near Iceland are therefore of particular interest to the algorithm development teams to prepare for processing challenging real data from space to winds. In addition,

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the importance of, and challenges for, zero wind calibration were demonstrated and an improved scheme discussed.

Overall, the paper is very well written and very clear. Also the differences between the A2D and the satellite (Aeolus) have been well explained.

General comments âĂć The authors spend a substantial part of the paper on ground detection and zero wind calibration. Clearly, high quality calibration is crucial for the quality of the final product, the wind profile. Despite the proposed solution, calibration will still be challenging, also for a space borne instrument. Systematic errors due to imperfect differentiation between atmospheric and ground return signals will be hard to avoid. Is it true that the wind difference between adjacent bins (i.e. wind-shear) does not suffer from these systematic errors? In that case, rather than producing a wind profile, one could produce a profile of wind-shear for use in NWP, clearly at the expense of losing one bin, but without systematic errors from calibration issues. Can the authors please elaborate on this wind-shear option. âĂć Wind-shear profiling may also resolve the curtain issue discussed on page 14: “The introduced error is identical for all the atmospheric range gates” âĂć In section 4.1.4 the authors discuss the issue of comparing A2D Rayleigh winds and 2 micron lidar data. The fact that the 2 micron lidar does provide measurements between 9 and 10 km altitude suggests the presence of particles in this region and hence contamination of A2D Rayleigh winds. This explains part of the poorer statistics of A2D Rayleigh winds, as the authors correctly mention in section 4.1.5. Also, from Figure 9d, it appears that the range of wind speeds is largest in this area and thus largest wind variability. It may therefore be the most challenging region for wind measurements, where Mie winds have a relatively “easy job” further down in the troposphere. Considering, in addition, the height assignment error (unknown location and distribution of cloud and/or aerosols inside the bin) apparent for Mie winds in particular, the remark on page 15: ”Mie wind is preferred due to the generally lower systematic and random error (see next sections)” may be too strong based on the presented results. Can the authors please comment on this? Also how these

conclusions translate to Aeolus? Can you please comment?

minor comments âĂć Page 2, replace “as it will close the gaps in the wind data coverage” by “as it will contribute to close the gap in wind profile data coverage” âĂć Page 2, line 19 “aircraft” => aircrafts âĂć Page 5, line 14; replace “from moving particles (cloud particles, aerosols, molecules)” by “from particles (cloud droplets, aerosols) and molecules with move with the ambient wind” âĂć Page 6, x0, ïĄĎx and k have not been clearly defined near equation 2. Please do. âĂć Caption of figure 2: “the respective transmitted intensities the respective transmitted intensities”. Should “transmitted” here not be replaced by “received”? âĂć Caption of Figure 4. I do not understand the last sentence: “Orange bins are identified as ground bins and thus considered for the determination of the ground response function.” Which orange bins? Please explain or correct.

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