Atmos. Meas. Tech. Discuss.,
doi:10.5194/amt-2020-202-RC1, 2020

Atmospheric Measurement Techniques Discussions
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EGU

Interactive comment on "On the relationship between wind observation accuracy and the ascending node of sun-synchronous orbit for the Aeolus-type spaceborne Doppler wind lidar" *by* Chuanliang Zhang et al.

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Received and published: 13 July 2020

The authors provide suggestions for future Aeolus-type follow-on missions, with different local overpass times compared to Aeolus' 6/18 UTC (dawn-dusk) and taking into account increased solar background radiation in measured Aeolus signals, hence reduced data quality, as a consequence of selecting different sun-synchronous orbits.

Main comments ===============

The presented results are interesting and potentially useful input for discussions on an

Aeolus follow-on mission. The main question, which has not been answered in the paper is: why selecting orbits other than dawn-dusk, given that 3 satellites in a dawn-dusk orbit gives already quite good global coverage, without reducing wind quality due to increased solar background? See Fig.4 of Marseille et al (2008). Is there some indication that different local overpass times would be favorable for NWP? Please elaborate on this in the paper.

In connection to this. Line 43: "The future spaceborne DWLs may operate on different orbits which should be related to their observation purposes". Which observation purposes are related to 12:00 or 15:00 local overpass times? See also line 72: "Assuming the future Aeolus-type spaceborne DWLs will operate on the sun-synchronous orbits with different LTAN". Based on what assumption?

The realism of the simulations can be largely improved by comparing Aeolus measured SBR with simulated Aeolus SBR. Information on Aeolus measured SBR and the impact on Aeolus wind quality is found in the attached supplementary material. Based on this information, the authors can test the realism of their simulations.

Minor comments ============

line 60: "The received SBR of Aeolus ranges from 0 to 169 mWâŃĔm−2âŃĔsr−1âŃĔnm−1". That is worse than "On the two new orbits, the increments of averaged SBR received by the new spaceborne DWLs range from 39 to 56 mWâŃĔm−2âŃĔsr−1âŃĔnm−1" (line 14). Can the author please comment.

Figure 1b is misleading since it suggests that all three Aeolus-type instruments operate during daytime at equal time intervals.

line 108: "Figure 1(b) shows that the solar zenith angle of the observation points of the two new Aeolus-type instruments is low compared to that of Aeolus". How can that be seen from the figure?

The simulations would be more useful if the operational Aeolus instrument would be

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used for reference 1. one measurement is composed of 20 accumulated shots on-board; 1 observation is obtained from averaging 30 measurements. 2. Assuming around 60mJ laser energy, which is consistent with current operational Aeolus laser-B 3. optical throughput is a factor 2-3 lower than expected.

The authors can do simulations based on both this unexpected signal loss (worst case scenario) and without this loss, assuming that the problem can be identified and solved before the launch of the Aeolus follow-on mission (best case scenario). With the above settings 0% of Aeolus data would meet the mission requirement, rather than 88.01% as mentioned in Table 5. So, it would be interesting to extend Table 5, by presenting both best and worst case scenarios.

line 118: "we focus on the simulation of the wind retrieved method on Rayleigh channel, and assume that the cross-talk effect between Mie channel and Rayleigh channel is negligible". Based on this assumption, you can remove mentioning over scattering ratio in section 3.1.

Derivation of Eq. (7) in Appendix could have been done more simple, by substituting A=B in Eq.(3) => sigma_R_ATM = sigma_a/(N_a*sqrt(2)) Substituting Eq. (4) in Eq.(6) and setting A=B => SNR_Ray = (N_a*sqrt(2))/sigma_a

Figure 2. For the 15:00 and 12:00 UTC orbits, half the orbit is in full darkness (so no SBR contribution), the other half in full daylight (a large SBR contribution). How is this reflected in figure 2?

Also in Figure 3, I would expect bi-modal accuracy statistics with very good quality at the dark part of the orbit (no SBR) and low quality in the day-light part (high SBR). So, what is exactly displayed in Figure 3? Please present both statistics separately. In the caption of figure 3, mention that this is winds from the Rayleigh channel in clean air conditions.

Please also note the supplement to this comment:

https://www.atmos-meas-tech-discuss.net/amt-2020-202/amt-2020-202-RC1-supplement.pdf

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