

## **Review of Lux et al. 2019 “Intercomparison of wind observations from ESA’s satellite mission Aeolus and the ALADIN Airborne Demonstrator”**

The paper by Oliver Lux and coauthors reports the results of an airborne campaign dedicated to Aeolus wind product validation using its airborne demonstrator A2D operating onboard Falcon aircraft together with DWL lidar. The presented cal/val experiment is an important contribution and a tremendous effort towards improvement of direct-detection sensing of wind from space. The paper is carefully written, the experimental setup and validation methodology are thoroughly and comprehensively described, the graphical material is prepared with care, whereas the conclusions and recommendations are well substantiated.

That said, the general issue of this paper, in my opinion, is that its content is excessively biased towards methodological aspects of the intercomparison. I assume that most potential readers of this article would be rather interested in the Aeolus validation part (since the airborne lidars and their performance are already described elsewhere), however they would have to read a long way to get to what they are looking for.

The title of the paper promises a long-awaited result of Aeolus validation using its airborne demonstrator within a dedicated validation campaign carried out by the renown experts in the off-ground lidar technique. However, the results of A2D-Aeolus validation are mixed together with the A2D-ECMWF-AEOLUS statistical figures. It gets worse when the key results of intercomparison are reported as lidars’ biases with respect to ECMWF. This raises a valid question i.e. what the Falcon-Aeolus underflights are for, if both lidars are finally referenced to the model.

I recommend the authors to address the following remarks, in order to reconcile the inconsistencies between the title and the content.

- In the introduction (l.57-58), the authors claim their study a methodological reference for the airborne experiments on Aeolus validation. With that, the cal/val experiment is restricted to Rayleigh wind measurements. What are the other clear-air airborne Doppler lidars involved in Aeolus validation? If there are none, this methodological reference could be restricted to internal use. Please be more specific regarding the scope of potential applications of the presented methodology.
- The key example of Aeolus-A2D intercomparison is presented in Fig. 9, however the panels a) and c) are difficult to compare as they are interspersed by the panel 9b, which should belong to the section describing the intercomparison setup.
- Apart from the spatial curtains in Fig. 9, it would be useful to show a few examples of individual wind profiles measured by both lidars, probably also at their native vertical resolution. This will give a much better feeling on the capacities of different lidars than the tabulated numbers.
- The results of A2D-Aeolus intercomparison should be presented in a separate section devoted to lidar-lidar intercomparison. The key figures of Aeolus-A2D intercomparison statistics (which is the title of the paper) should be provided in the abstract and conclusions. The comparison against ECMWF should be reported in a specific subsection of the manuscript.

- The discussion on the representability of the Aeolus cal/val results could be better developed in the context of the preliminary nature of L2B wind product.