Verification of different peak centroid analysis algorithms based on airborne wind lidar data in support of ESA's Aeolus mission

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Abstract: The Aeolus mission by ESA was operational from August 2018 to July 2023. Aeolus carried the direct-detection Atmospheric LAser Doppler INstrument (ALADIN). To support the preparation of Aeolus, the ALADIN Airborne Demonstrator (A2D) instrument was developed and applied for the last two decades. Both ALADIN and A2D consist of so-called Rayleigh and Mie channels used to measure wind from molecular and particulate backscatter signals. The Mie channel is based on the fringe-imaging technique, which relies on determining the spatial location of a linear interference pattern (fringe) being imaged on the detector. The accuracy of the retrieved winds depends on the analytic algorithm used for determining the fringe location.

In this paper, the performance of two non-linear-fit-based algorithms is investigated by applying them to airborne A2D data. For performance validation, the data of a highly accurate heterodyne-detection wind lidar are used as a reference. In addition, a fast and non-fit-based algorithm based on a four-pixel intensity ratio approach (R_4) has been developed and yielded similar accuracy with a much faster computation time. The studies are of relevance for the Mie wind retrieval applied in Aeolus data reprocessing as well as for the preparation of the follow-on mission Aeolus-2.

Suggested session:

Joint CLRC/ILRC session: airborne and spaceborne wind lidar missions (Aeolus etc.)

Preferred way of presentation:

poster