Poster

Atmosphere, Climate & Carbon: 32296 - Lidar Observations from ADM-Aeolus and EarthCARE - Validation, Study of Long-range Transport of Aerosol and Preparation of a Future Chinese CO2 Lidar Mission

Airborne Wind Lidar Observations of the North Atlantic Jet Stream Using the ALADIN Airborne Demonstrator

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In preparation of ESA's upcoming Earth Explorer mission Aeolus which strives for the global observation of wind profiles from the ground to the lower stratosphere deploying the first-ever satellite-borne wind lidar system ALADIN, the ALADIN airborne demonstrator (A2D) has been developed at DLR (German Aerospace Center). Due to its representative design and operating principle, the A2D provides valuable information on the wind measurement strategies of the satellite instrument as well as on the optimization of the wind retrieval and related quality-control algorithms. Hence, it represents an essential testbed for the planned calibration and validation activities after the launch of Aeolus which is scheduled for end of August 2018.

The A2D was successfully employed for wind observations in the North Atlantic Waveguide and Downstream Impact Experiment (NAWDEX) conducted in Iceland in autumn 2016. Within the scope of the campaign, which aimed to study the influence of diabatic processes on the evolution of the North Atlantic jet stream, 14 research flights were performed extending the wind and calibration dataset of the A2D. In particular, the recording of very high wind speeds above 80 $m \cdot s^{-1}$ and strong wind shear of 10 $m \cdot s^{-1} \cdot km^{-1}$ was obtained by sampling an intensified jet stream close to Scotland on 27 September 2016. Broad vertical and horizontal coverage across the troposphere was achieved thanks to the complementary design of the A2D receiver comprising a Rayleigh and Mie channel for analysing both molecular and particulate backscatter signals. Validation of the instrument performance and retrieval algorithms was conducted by comparison with DLR's coherent wind lidar which was operated in parallel on-board the same aircraft. The systematic error of the A2D line-of-sight (LOS) wind speeds was determined to be less than 0.5 $m \cdot s^{-1}$ for both receiver channels, while the random errors range from 1.5 $m \cdot s^{-1}$ (Mie) to 2.7 $m \cdot s^{-1}$ (Rayleigh). This work will present the operation principle of the A2D and demonstrate selected wind results obtained during NAWDEX.