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Data quality of Aeolus wind measurements

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The European Space Agency (ESA)'s Earth Explorer Aeolus was launched in August 2018 carrying the world's first spaceborne wind lidar, the Atmospheric Laser Doppler Instrument (ALADIN). ALADIN uses a high spectral resolution Doppler wind lidar operating at 355nm to determine profiles of line-of-sight wind components in near-real-time (NRT). ALADIN samples the atmosphere from 30km altitude down to the Earth's surface or to the level where the lidar signal is attenuated by optically thick clouds.

The global wind profiles provided by ALADIN help to improve weather forecasting and the understanding of atmospheric dynamics as they fill observational gaps in vertically resolved wind profiles mainly in the tropics, southern hemisphere, and over the northern hemisphere oceans. Since 2020, multiple national and international weather centres (e.g. ECMWF, DWD, Météo France, MetOffice) assimilate Aeolus observations in their operational forecasting. Additionally, the scientific exploitation of the Aeolus dataset has started.

A main prerequisite for beneficial impact and scientific exploitation is data of sufficient quality. Such high data quality has been achieved through close collaboration of all involved parties within the Aeolus Data Innovation and Science Cluster (DISC), which was established after launch to study and improve the data quality of Aeolus products. The tasks of the Aeolus DISC include the instrument and platform monitoring, calibration, characterization, retrieval algorithm refinement, processor evolution, quality monitoring, product validation, and impact assessment for NWP.

The achievements of the Aeolus DISC for the NRT data quality and the one currently available reprocessed dataset will be presented. The data quality of the Aeolus wind measurements will be described and an outlook on planned improvements of the dataset and processors will be provided.

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