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Session C.02.01 Aeolus Mission: 5 years of advancing atmospheric understanding through spaceborne lidar technology

Achievements and Lessons Learnt from ESA's Aeolus Mission

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Launched in August 2018, ESA's Earth Explorer mission Aeolus was the first to measure atmospheric wind profiles on a global scale. As the first-ever Doppler Wind Lidar instrument in space, Aeolus significantly contributed to the improvement in numerical weather prediction (NWP) by measuring one component of the horizontal wind vector until the end of its operational mission phase on 30 April 2023. Following an instrument test period until 5 July 2023, where a new record in ultraviolet (UV) laser energy of 182 mJ over 33 h was achieved, the Aeolus satellite re-entered into the atmosphere on 28 July 2023. Aeolus achieved its mission objectives, demonstrating a clear positive impact on weather forecasts across several NWP models.

These accomplishments were made possible through the critical contributions from the Aeolus Data Innovation and Science Cluster (DISC). The DISC supported the mission with a wide range of activities, including instrument and product quality monitoring, retrieval algorithm and operational processor enhancements, and NWP impact assessments using wind and aerosol products from Aeolus. Coordinated by DLR, the Aeolus DISC brought together expertise from ECMWF, KNMI, Météo-France, TROPOS, DoRIT, ABB, S&T, Serco, OLA, Physics Solutions, IB Reissig and Les Myriades, involving more than 40 scientists and engineers within the DISC. The contributions of the DISC will continue in phase F of the Aeolus mission until end 2028.

The presentation will discuss the achievements of the Aeolus mission during its almost 5-year lifetime. The focus will be on the ALADIN instrument performance and the evolution of the quality of the wind observations. We will highlight some Lessons Learned from this mission for future Earth Observation missions. The presentation will discuss the objectives of the Aeolus DISC contributions in the on-going phase F of the mission and discuss the expected benefits and improvements for data quality and scientific applications.