

Airborne Doppler Wind Lidar Missions in the Arctic: Calibration and Validation of Existing and Future Space-based Wind measuring Platforms

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Recorded Presentation

The launch of ESA's Atmospheric Dynamics Mission (ADM), the first space-based Doppler Wind Lidar, is currently scheduled for the second half of 2016. Although ESA has conducted preliminary cal/val studies of the predicted instrument utilizing ground-based lidars (2006, 2007) and airborne lidars (2007, 2008, and 2009), there was a desire to conduct a series of prelaunch exercises during the spring of 2015 that would include joint USA-ESA airborne DWL flights near Greenland.

Thus, as part of two individual field campaigns designed to both study lower level atmospheric circulations in Arctic regions and to also prepare for future calibration/validation of the ESA AEOLUS ADM space-based wind lidar, NASA Langley's DAWN Airborne Doppler Wind Lidar (ADWL) was flown over and around Greenland and Iceland during three week periods in Oct-Nov 2014 and May 2015.

During the 2014 campaign based in Kangerlussuaq, Greenland, DAWN was flown on board the NASA Langley King Air 12-C while the NASA DC-8 was used to fly DAWN during May 2015. ESA/German DLR also flew their 2 micron coherent detection lidar on board a separate Falcon Aircraft during this time period. Out of the 10 missions flown during May 2015, the lidars and the aircraft flew in tandem on five occasions.

The November 2014 campaign was mainly used to demonstrate the readiness of DAWN to participate in the joint ESA/NASA exercises in the spring of 2015. However, there were many missions during both campaigns where we conducted underflights of currently orbiting sensors to refine techniques for calibration and validation between a space-based lidar and an airborne set of sensors. As an example, the ADWL wind and aerosol measurements would also provide validation for remotely sensed winds (MODIS Cloud Motion Vectors) and aerosols (CALIPSO) that have had few comparisons in the Arctic regions.

A larger part of the missions were to simulate ADM scanning strategies and data collection over different land surfaces and during different wind regimes. In particular, the NASA DC-8 and the DLR Falcon worked in formation to obtain returns from the Greenland ice cap and coastal ice sheets that will be used to develop calibration procedures for the ADM lidar. Examples from these co-flights will be presented along with plans for further ADM related airborne DWL missions.

