News Archive Space 2010

DLR conducts ADM-Aeolus pre-launch campaign in Iceland

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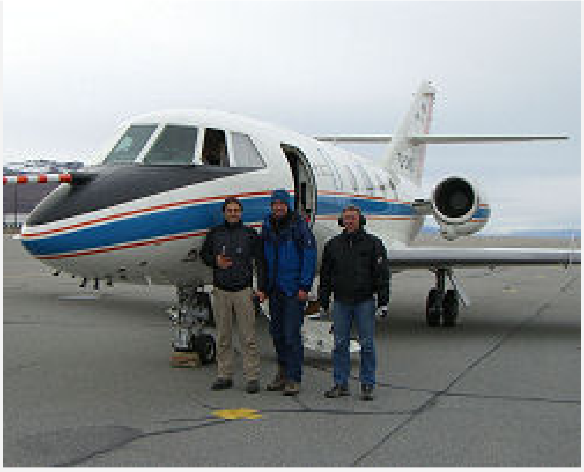
Greenland ice sheet viewed from the research aircraft

Scientists from the German Aerospace Center's (Deutsches Zentrum für Luft- und Raumfahrt; DLR) Institute of Atmospheric Physics (Institut für Physik der Atmosphäre; IPA) travelled to Iceland for the last of a series of DLR-led technology demonstration campaigns for ESA's meteorological satellite mission, ADM-Aeolus. Its closeness to Greenland and the Atlantic storm track region made the island a perfect base for the test flights with DLR's Falcon research aircraft.



DLR's Falcon 20E research aircraft

The DLR team spent two weeks in Iceland, performing a total of six flights over Iceland, over the ocean between Iceland and Greenland and over the Greenland glacier plateau. The aim of this DLR-led campaign with A2D was to investigate details of the instrument operations strategy and to refine the ADM-Aeolus data processors that will provide the mission's wind products.

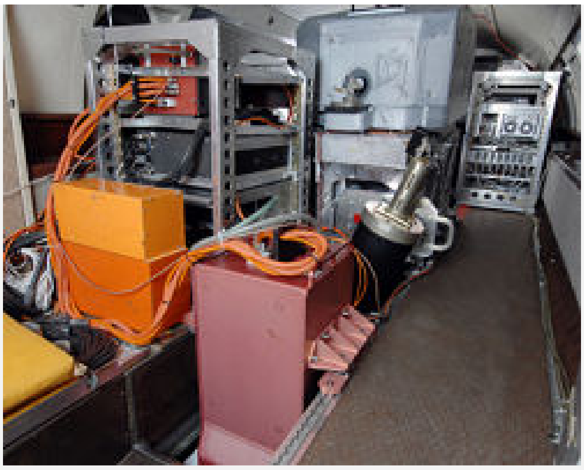
Two different wind lidar instruments – the ALADIN Airborne Demonstrator (A2D), a prototype version of the instrument that will fly on ADM-Aeolus, and a reference wind lidar operating at an infrared wavelength of two microns – were operated onboard DLR's Falcon 20E aircraft, and both performed well throughout the campaign.

DLR pre-launch campaign team

During the flights, spectacular measurements of very strong winds flowing off the Greenland plateau and over the northern Atlantic Ocean were made. These are referred to as katabatic winds and are narrow, strong regions of wind blowing from the cold mountain plateau of Greenland down the steep mountainsides and out over the ocean, causing large waves. The campaign also included measurements over sea-surfaces with strong surface winds and over the heart of a low-pressure region.

"The weather conditions were excellent and we obtained measurements of high wind speeds in the jet stream, as well as strong katabatic winds flowing down the Greenland ice sheet. Both of the wind lidar instruments performed very well and we achieved the ambitious objectives of the campaign. It was the first time that calibration measurements have been performed above the Greenland ice sheet, which is foreseen for the ALADIN satellite instrument. The team was very excited by the first quick look at the data," said Oliver Reitebuch from DLR.

Iceland's unique position, in the middle of the northern Atlantic Ocean, makes it a perfect starting-point for meteorological campaigns studying severe weather conditions as well as the effect of some of the world's largest glaciers on weather and climate.

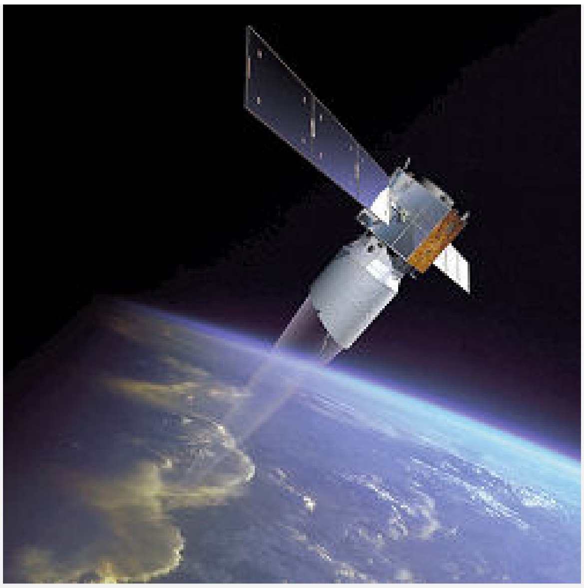

A2D and the two-micron lidar in DLR's research aircraft

The measurements from the campaign are being analysed at the time of writing.

Measuring wind profiles from space

ESA's ADM-Aeolus satellite will be the first space mission to directly measure wind profiles on a global scale. By doing so, the mission will improve the accuracy of weather forecasting and advance our understanding of atmospheric dynamics and processes relevant to climate variability.

In order to probe Earth's atmosphere from space to measure wind speeds, ADM-Aeolus will carry a sophisticated instrument that utilises a phenomenon called 'light scattering' and the Doppler effect to acquire data. The innovative instrument is called ALADIN, short for Atmospheric Laser Doppler Instrument.


Artist's impression of ADM-Aeolus

ALADIN is a lidar, which transmits light from a laser source onboard the spacecraft. Short, powerful pulses of light are emitted from the laser down into Earth's atmosphere. As the light pulse passes through the atmosphere, it interacts with molecules of gas, dust particles and droplets in clouds. This results in some of the light being returned or 'scattered back' to the instrument.

The movement of the molecules of gas, particles or droplets with the local wind cause a shift in the frequency of the returned laser light. This is called the Doppler effect, which is well known from every-day phenomena like the change in the sound of a passing vehicle. By measuring the frequency shift of the returned light, the local wind speed can be calculated.

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