First results of Aeolus comparison to a ground-based Wind Lidar at Alaiz (Spain)

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First results of Aeolus comparison to a ground-based Wind Lidar at Alaiz (Spain)

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Introduction

- The Atmospheric Dynamics Mission Aeolus, an ESA Earth Explorer Core Mission launched in August 2018, carries the Atmospheric Laser Doppler Instrument (ALADIN) to obtain global observations of wind profiles.
- The ongoing New European Wind Atlas (NEWA) project aims to create and publish a European wind atlas of unprecedented accuracy [2].
- The measurement campaigns of NEWA have been massively instrumented with scanning lidars and meteorological masts to measure various meteorological parameters [3]. The last of these campaigns occurred at the Alaiz mountain range, near Pamplona in Spain [1].
- This study focuses on the comparison of wind speed retrievals between Aeolus (L2B, Mie channel) and the measurements derived from the ground-based instruments, as a part of the Aeolus Cal/Val activities.

Aeolus & Leosphere WLS70

ALADIN
- Incoherent direct detection lidar
- UV spectral region (355 nm)
- Fringe-imaging receiver: aerosol & cloud backscatter (Mie)
- Double-edge receiver: molecular backscatter (Rayleigh)
- Doppler shift from relative motion of scatter elements along the sensor line of sight
- 7 s sampling
- Integrated within a 50 km along-track distance
- Gap of 21 s (150 km) before next obs

Vaisala LEOSPHERE Windcube 70 (WLS70)
- Pulsed wind lidar (wavelength 1.543 µm)
- Line-Of-Sight velocity (sampling frequency 250 MHz)
- Four azimuthal positions separated by 90°
- Inclination of 15°
- Vertical resolution 100 m:100 m:2000 m
- Probe volume ∼30 meters
- Sampling rate 6 s (10-min averages available)
- Location 42.79 N, 1.63 W in Pamplona, Spain (≤400 m above msl)
- Campaign: November 2017 - July 2019

Data Availability

- Period of investigation: 09/2018-05/2019
- Bin according to North & South wind direction

Aeolus L2B availability

<table>
<thead>
<tr>
<th>Day</th>
<th>Wed</th>
<th>Thurs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time</td>
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<td>06:22</td>
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<tr>
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<td>100</td>
</tr>
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<td>35</td>
<td>34</td>
</tr>
<tr>
<td>N. profiles (≤ 100 km)</td>
<td>North 5 (3)</td>
<td>5 (2)</td>
</tr>
<tr>
<td></td>
<td>South 5 (3)</td>
<td>5 (2)</td>
</tr>
</tbody>
</table>

Alaiz data availability

- Time Zone: UTC+1
- 10-min averaged measurements
- ± 1 hours from Aeolus pass
- 12 10-min measurements for each Aeolus available profile

Profile examples

- Wind profiles from Aeolus (red dots) and the WLS70 (blue) for two example passes with North wind direction on the 13/03/2019 (left) and South wind direction on 24/04/2019 (right).

Conclusions

- Aeolus L2B horizontal wind speed compared to the horizontal wind speed from WLS70. 2D wind vector measured by WLS70 projected to the azimuth direction of Aeolus’ LOS.
- Below 2000 m, Aeolus retrieves one measurement every 250 to 500 m depending on the orbit and sometimes measurement heights are negative.
- Current Aeolus ground track variability complicates data matching. Next step to re-evaluate criteria for orbit matching.
- Currently, few profiles to derive robust statistics

References


Acknowledgements