Validation of the Aeolus L2A products with the eVe lidar during ASKOS/JATAC campaign

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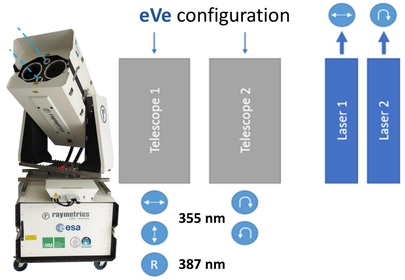
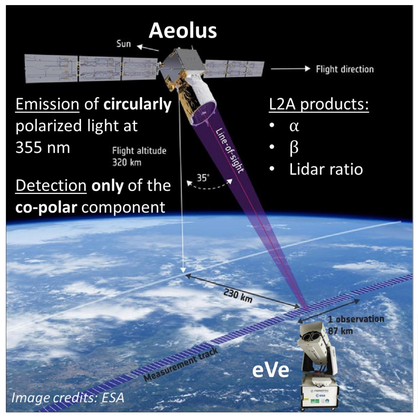
Towards the Aeolus L2A validation with eVe lidar



- *Emission*: linearly and circularly polarized light at 355 nm
- *Detection*: a linear analyzer (EARLINET lidar) with Raman channel and a circular analyzer (similar to Aeolus)
- *Pointing geometry*: off-zenith and azimuth rotation
- *Products (355 nm)*:
  - ✓ β (from linear and circular emission)
  - ✓ α (nighttime; from linear and circular emission)
  - ✓ lidar ratio (nighttime; from linear and circular emission)
  - ✓ linear depolarization ratios
  - ✓ circular depolarization ratios

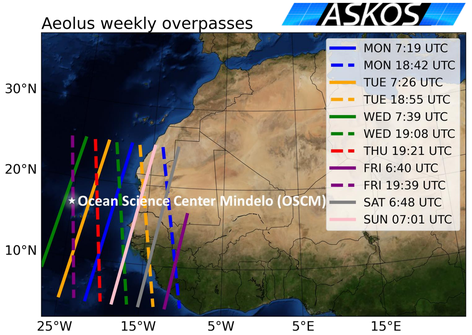


Algorithms for retrieving Aeolus L2A:

1. Standard Correct Algorithm (SCA)
   - ✓ Main L2A processor
   - ✓ Two vertical resolution scales (Rayleigh bin / Mid bin)
2. Maximum Likelihood Estimation (MLE)
   - ✓ Integrated to L2A processors in Baseline 14
3. AEL – PRO
   - ✓ Algorithm from EarthCARE developments
   - ✓ Available profiles from Baseline 12
   - ✓ Integrated to L2A processors in Baseline 13

Harmonize eVe products with Aeolus L2A…

- $\beta_{Aeolus\ like} = \frac{\beta_p}{1+PCDR}$
- $LR_{Aeolus\ like} = LR(1 + PCDR)$



The Campaign:

Joint Aeolus Tropical Atlantic Campaign (JATAC) for the validation of Aeolus products. **ASKOS** is the ground-based component of JATAC

When:

- Phase I : July and September 2021
- Phase II: June and September 2022

Where:

Ocean Science Centre Mindelo (OSCM), Mindelo, Cabo Verde

eVe Dataset on ASKOS

- ✓ **14 collocated measurements with Aeolus** during closest overpass from site(**Friday 19:39 UTC**)

Acknowledgements

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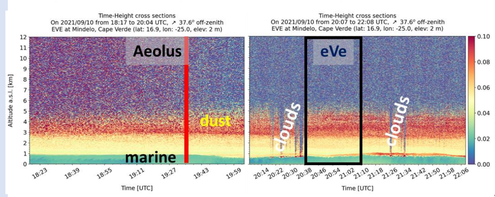
Aeolus L2A vs eVe

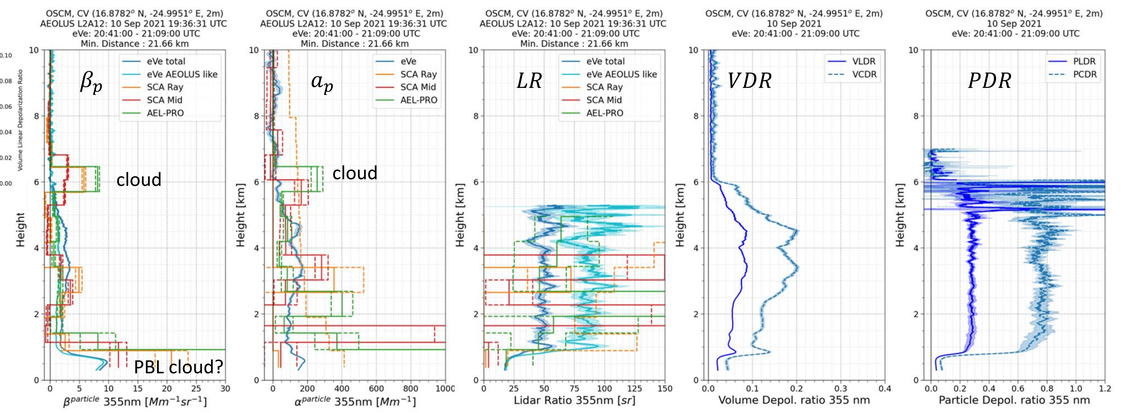
10 September 2021 (Aeolus Baseline 12)



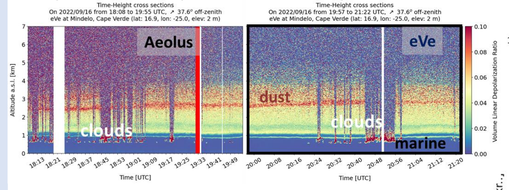
Dust layer → 1 – 5.5 km
- LR ~ 53 sr
- PLDR ~ 0.27

Marine PBL < 1 km
- LR ~ 25 sr
- PLDR ~ 0.03

Aeolus L2A (Baseline 12)
- ○ SCA (Rayleigh bin)
- ○ SCA (Mid-bin)
- ○ AEL-PRO



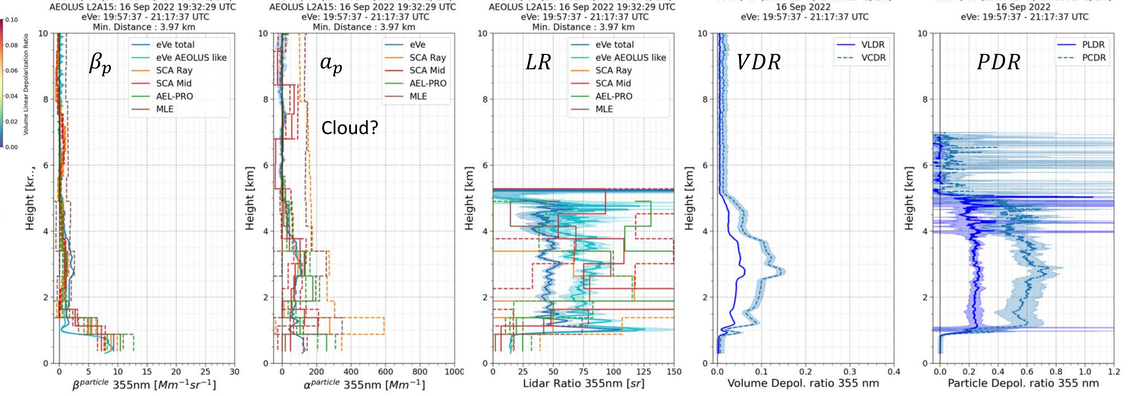
16 September 2022 (Aeolus Baseline 15)



Dust layer → 1 – 5.5 km
- LR ~ 53 sr
- PLDR ~ 0.25

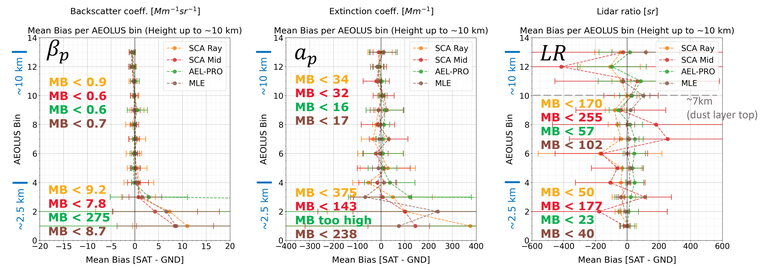
Marine PBL < 1 km
- LR ~ 20 sr
- PLDR negligible

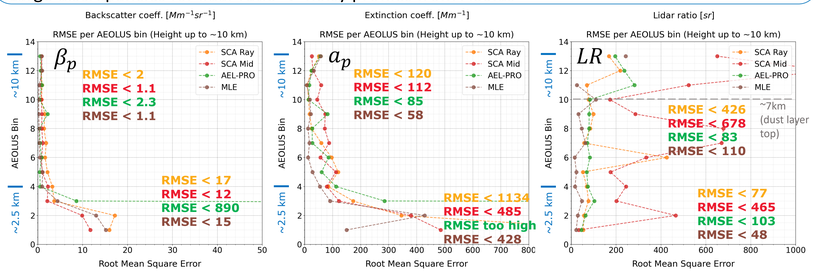
Aeolus L2A (Baseline 15)
- ○ SCA (Rayleigh bin)
- ○ SCA (Mid-bin)
- ○ AEL-PRO
- ○ MLE



Statistics

- Mean bias and root-mean-square-error over Aeolus Bin for the **14 eVe-Aeolus collocations**
- Aeolus L2A profiles → B12 (8 overpasses); B14 (4 overpasses); and B15 (2 overpasses)
- Aeolus algorithms → 14 SCA profiles; 12 AEL-PRO profiles; and 6 MLE profiles





Summary:

- Better agreement above 2.5 km for β (RMSE< 2.3Mm^{-1}sr^{-1}) and α (RMSE < 120Mm^{-1}) profiles
- Discrepancies below 2.5 km → cloud-screening only for eVe; PBL spatial inhomogeneity
- Large discrepancies for lidar ratio → noisy profiles from Aeolus