

# Main processor improvements for Baseline 16

Aeolus DISC, 14 April 2023

## L1b Processor V7.14.1:

- **Update of Rayleigh signal-to-noise-ratio (SNR) calculation:** The dark current offset and read-out noise are added to the Rayleigh SNR calculation (will probably also follow in Mie in B17). Please be aware that this has **significant impact on the Rayleigh estimated errors** in the L2B product.
- **New dark current offset (DCO) correction using orbital means:** This slightly improves the random errors of the wind products (~1-2%).
- For the **DCMZ mode**, a new **QC (Quality Control) based on sun elevation angle** has been introduced.
- Due to a new **hot pixel issue in range gate 16** appearing in December 2022, a **new flag** has been introduced **to turn off the hot pixel correction for single pixels**. This will hopefully remove the bias observed in this range gate since December 2023.
- **New estimated Mie signal response (EMSR, describing the illumination on the Mie spectrometer on the atmospheric path)** values are derived for the FM-A laser and the **EMSR correction will be switched on** for the first time now. This will improve the Mie winds and L2A products.
- A **bug** in the calculation of the **parameter Rayleigh\_Average\_Ground\_Wind\_Bin\_Thickness** has been **fixed**, which describes the depth of the altitude layer above ground for the Rayleigh channel.

## L2a Processor V3.16.1:

- **New QC in MLE subBRC:** A quality flag calculated like the one for the observation (basic repeat cycle BRC) level MLE (Maximum Likelihood Estimator) results has been added to the higher horizontal resolution (subBRC) MLE PCD (Product Confidence Data).
- The **Aeolus Feature Mask (AEL-FM) and Aeolus Profile (AEL-PRO) products are now both flagged valid**.
- **Improved Cloud/aerosol discrimination in AEL-FM / AEL-PRO processing:** New parameters have been added to the processor configuration file (AUX\_PAR\_2A); basically, the atmosphere is now split into three different regions with their own discrimination parameters (clouds, aerosols, clear air). Processing is also performed separately for these three regions.
- **New quality flag in AEL-PRO:** A new quality flag has been added to the AEL-PRO PCD (Product Confidence Data) data set for data retrieval on measurement level.
- The fringe position within the MSP (Mie spectrometer) useful spectral range since the recent switch back to FM-A laser affected the generation of the **MSP-only attenuated backscatter signals** (used by AEL-FM and AEL-PRO). This issue has now been solved.

## L2b Processor V3.90:

- A **new residual threshold option** has been added as QC for the **Mie Core output**. This removes a lot of gross errors in the low signal Mie winds (e.g. in aerosols), which are otherwise hard to detect (without using the O-B (observation minus model background) statistics from the NWP model).
- A new **Rayleigh channel wind bias correction based on the Mie channel emitted frequency** has been added. This reduces wind biases in the Rayleigh channel caused by oscillations in the pressure inside the laser housing, which impact the laser frequency. The bias caused by this pressure oscillation had a magnitude of roughly  $\pm 0.6$  m/s with a period of 4.3 hr at the end of 2022.
- A **correction was applied for start/stop latitude/longitude values**. The new calculation adds half a measurement length to the reported accumulation to give a better estimate of the accumulated region. This also **solves the problem of having identical start/stop locations in case a wind is derived from a single measurement**, which has become much more common now that we are using the N=5/P=114 setting (N: number of measurements per observation, P: number of pulses per measurement).