Validation Recommendations L1 ATLID, MSI & BBR

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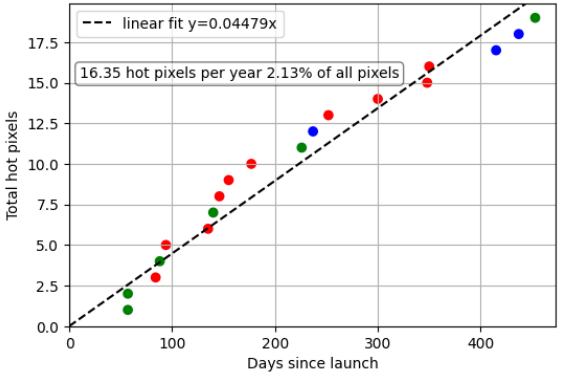
EarthCARE L1 validation

- CAL/VAL data from many diverse sources is playing an important role in the L1 & L2 evolution!
- **We cannot thank enough for all the work performed by the Cal-Val teams & campaign teams to enable us to create the best possible L1 products.**
- The good news this workshop is the clear move towards validating L2 products and science now that the L1 is becoming more stable and calibrated.

ATLID Monitoring

ATLID monitoring is ongoing.
The most important parameters are provided in daily & monthly reports (Raul Diez-Garcia)
16 calibration processors are being maintained by the ICMF (Amanda Hall)



HP keep occurring

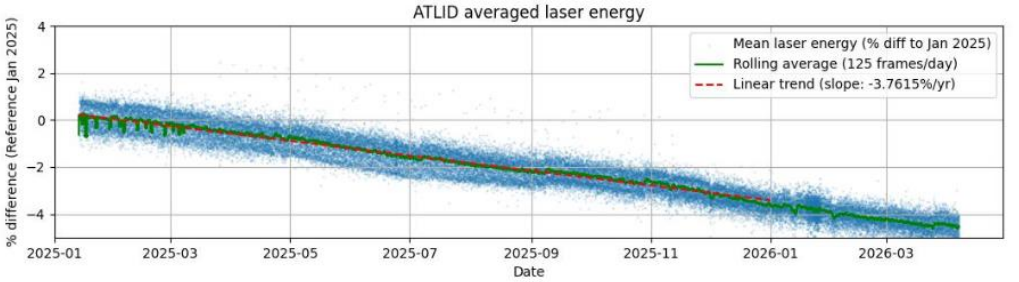


Figure 7-12: Laser Energy Monitoring

Laser behaving well

Lidar calibration constants stable

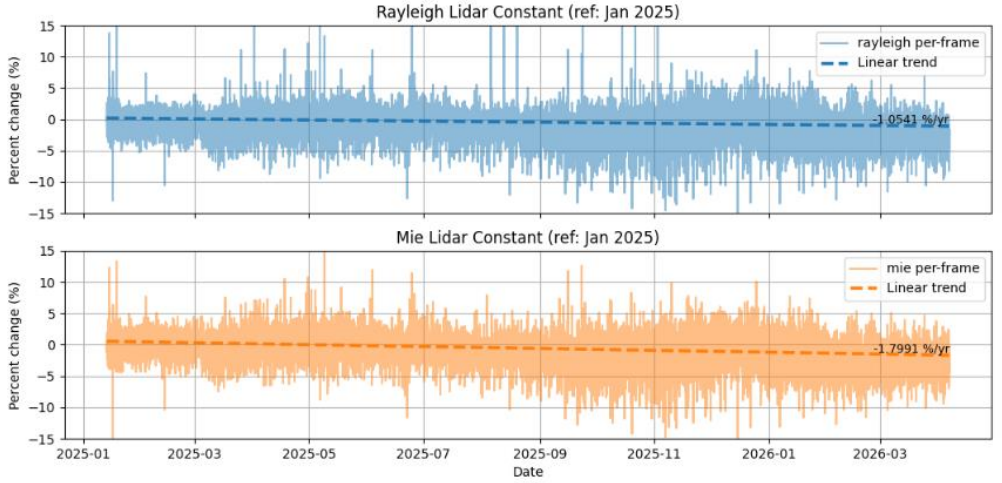
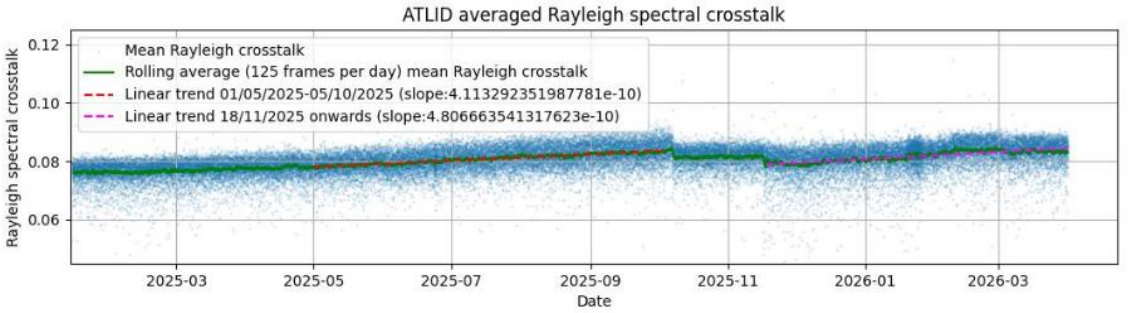


Figure 7-13: Lidar Constant Evolution

Cross-talk coefficients stable



ATLID validation recommendations

- There is need for a higher number of Ice cloud calibration targets for depolarization evaluation
- A first RTS hot-pixel has been identified, methods defined for Aeolus need to be adopted. More thorough hot/cold pixel mitigation needs to be put in place.
- Underflights incl. lidar remain important for validation of the ATLID signals
- Some guidance for ground-Based cloud validation (Feofilov A. presented by Chepfer H.)
  - If the cloud is opaque or multi-layer – NO
  - Colocalizations with high cloud inhomogeneity (15%) - are not directly comparable
  - The closest profile is not always the best profile for colocalized data
  - Geostationary data analysis will help tracking the comparable volumes
  - Colocations with Compatibility Scores (see presentation) > 60 (subvisible to semi-transparent) – YES.

MSI validation (Anja Huenerbein)

MSI's earth-view measurements are stable!

- Significant improvements were made to pixel geolocation and inter-band co-registration,
- Comparisons FCI revealed systematic radiance offsets in MSI data.
- An additional ad-hoc vicarious calibration was applied, successfully reducing relative biases to below 1% (BC).
- Across-track reflectance variations were traced to issues in measured solar irradiance data from onboard diffusers.
- Replacing measured solar irradiance with theoretical values improved the radiometric consistency and stability of the MSI Level-1 products.

MSI validation (Anja Huenerbein)

- Comparisons for SWIR1 with FCI and other imager (BA & BC) show underestimation of SWIR1 (Muto, VICALOPS-team). Update additional ad-hoc SWIR1 gain BD (start 23 Apr 2026)
- MSI monitoring is ongoing showing no degredations (Raul Diez-Garcia).

New paper in discussion (10-6-2026)

EarthCARE MSI Level-1 Data: First In-Orbit Calibration and Validation

Sebastian Bley, Anja Hünerbein, Edward Baudrez, Nils Madenach, Nicole Docter, Rene Preusker, Michael Eisinger, Fabien Marnas, Antje Ludewig, Manuel Ángel Ruiz Saldaña, Cameron Bean, Shweta Agarwal, Lennart Zimmermann, and Timon Hummel

→ongoing activities for vicarious calibrations

BBR Status (Nicolas Clerbaux)

- Overall the BBR instrument is performing well and is stable.
- Until Nov. 2025 excellent data availability, but now in intermittent operation mode (5 days NOM + 15 days STB)
- Since baseline BA, the level-1 products (B-SNG, B-NOM) are deemed to be useful for scientific uses.
- BBR level2 data are already successfully used in the European/Japanese closure assessments. The BBR signals allowed to highlight different points to be improved in the scene reconstruction and the radiative transfer simulations.
- No visible trends beside the geophysical seasonality (Raul Diez-Garcia)

- Radiometric levels wrt CERES SSF
  - SW higher by ~2% (radiance and flux)
  - LW lower by about 1% (radiance) -2% (flux).

BMA_FLX SW flux vs CERES SSF:

Aft : BBR = 1.037 * CERES

Nadir: BBR = 1.024 * CERES

Fore : BBR = 1.024 * CERES

Combined: BBR = 1.023 * CERES

BMA_FLX LW flux vs CERES SSF:

Aft : BBR = 0.979 * CERES

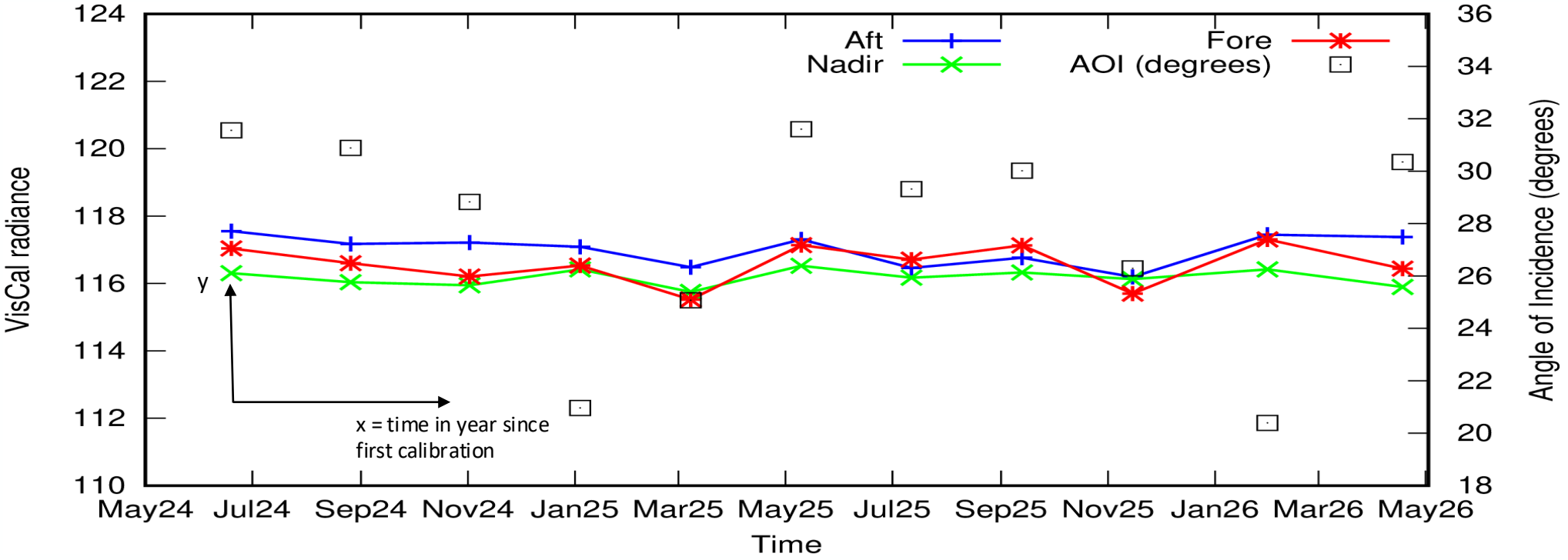
Nadir: BBR = 0.976 * CERES

Fore : BBR = 0.979 * CERES

Combined: BBR = 0.979 * CERES

Note : SW flux in CERES EBAF is ~2% higher than in CERES SSF → the BBR SW flux would agree with the EBAF radiometric level.

New monitoring item – VisCal observations to follow degredation



Best fits (y=VisCalRad, x = time in year since "20240626"):

- **Aft : y = 117.15 (±0.26) – 0.16 (± 0.25)* x (RMSE=0.43 W/m²/sr)**
- **Nadir : y = 116.17 (±0.15) + 0.01 (± 0.14)* x (RMSE=0.24 W/m²/sr)**
- **Fore : y = 116.55 (±0.34) + 0.03 (± 0.33)* x (RMSE=0.56 W/m²/sr)**

(uncertainty at 1σ , no autocorrelation)

- **No significant drift / jump in signal between the campaigns so far**
- **The BRDF seems to correctly account for the dependency in AOI**

Ongoing validation

(Christine Aebi – BRAVO project)

- Stable Earth targets like the deep convective clouds are a good tool to observe the stability of the instrument.
- Narrowband-to-broadband product is a helpful tool to check for ageing, and might also be useful to fill the data gaps (since end of November 2025) of the BBR.
- Geo-Ring analysis potentially helpful for gap-filling as well as validation purposes.
- Radiative closure studies at ACTRIS groundbase datasets allow for TOA comparison against BBR measurements. Match-ups become harder with BBR only on for 25% of time (Nils Madenach)