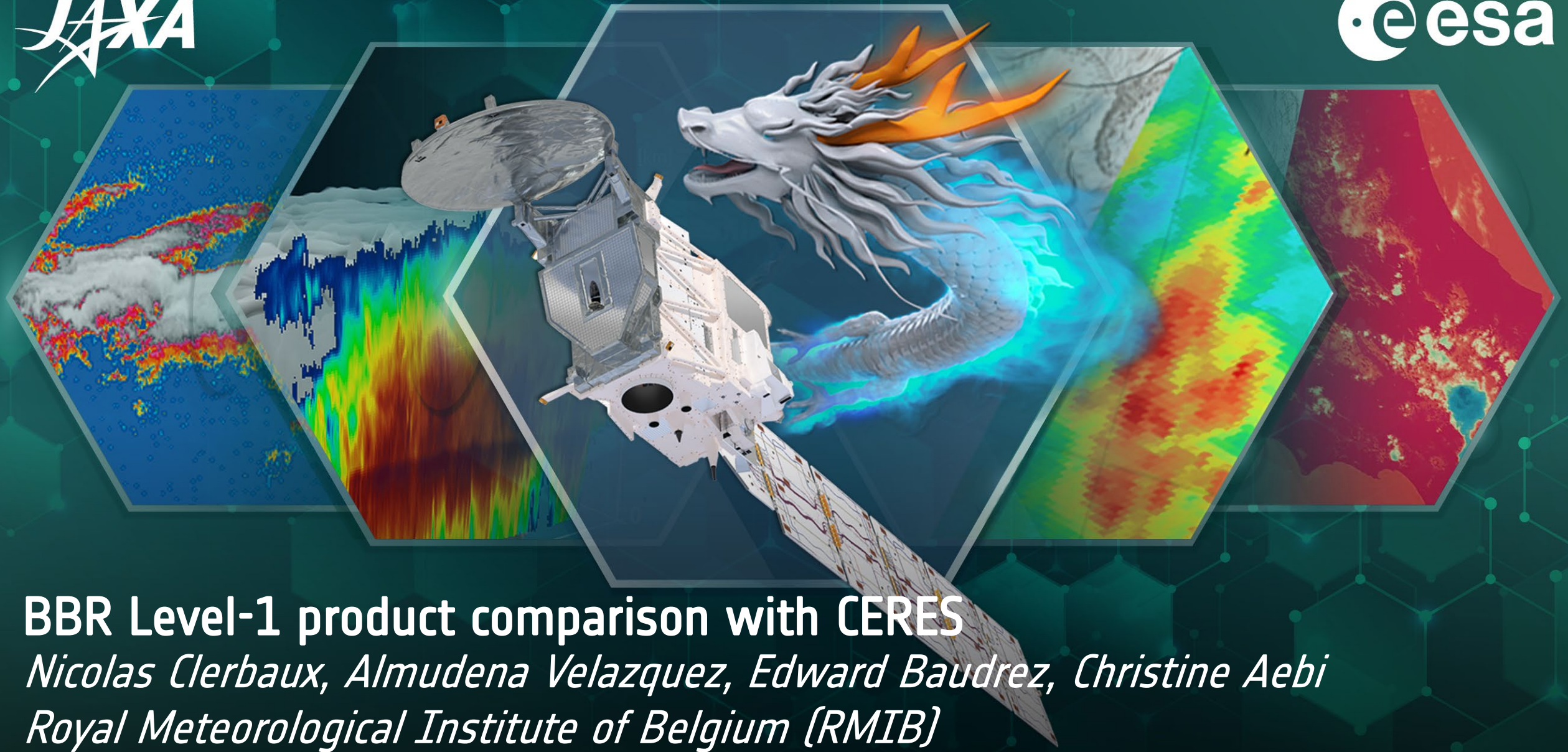

# BBR Level-1 product comparison with CERES

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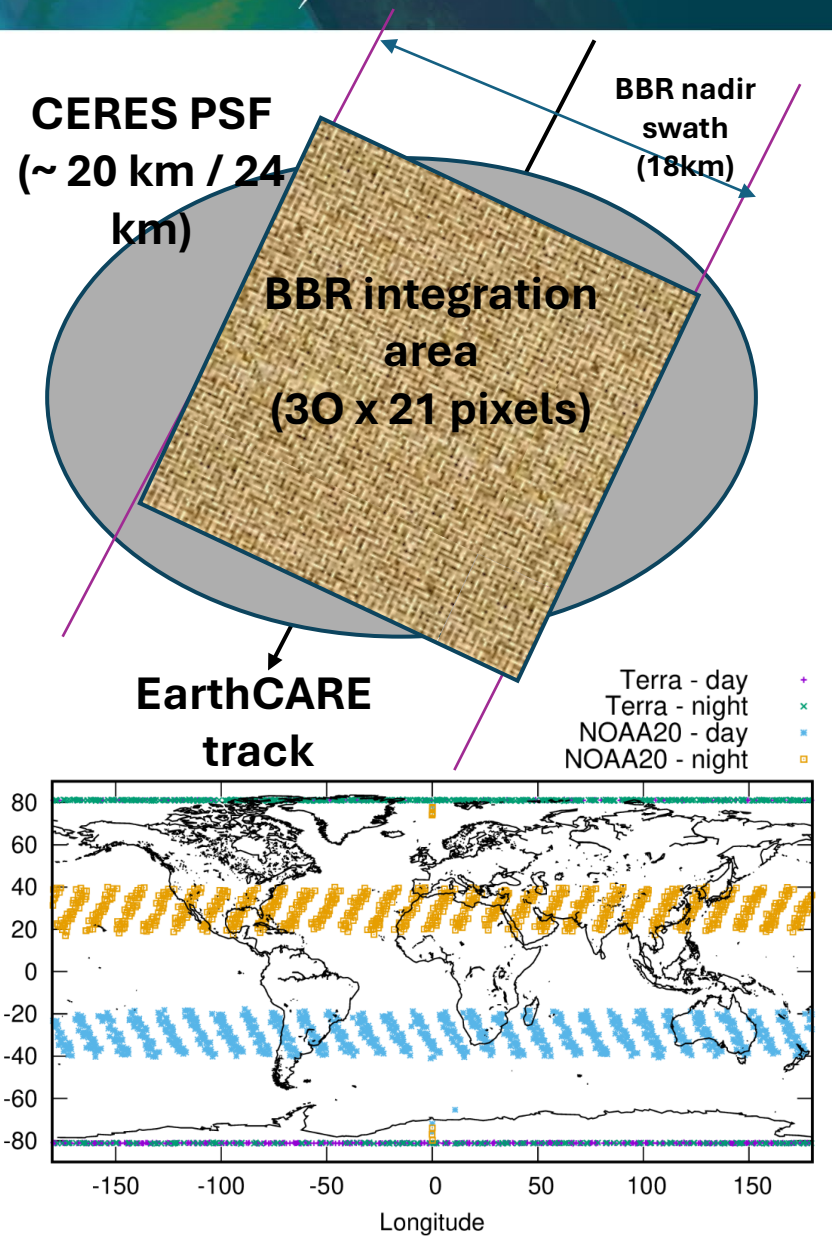
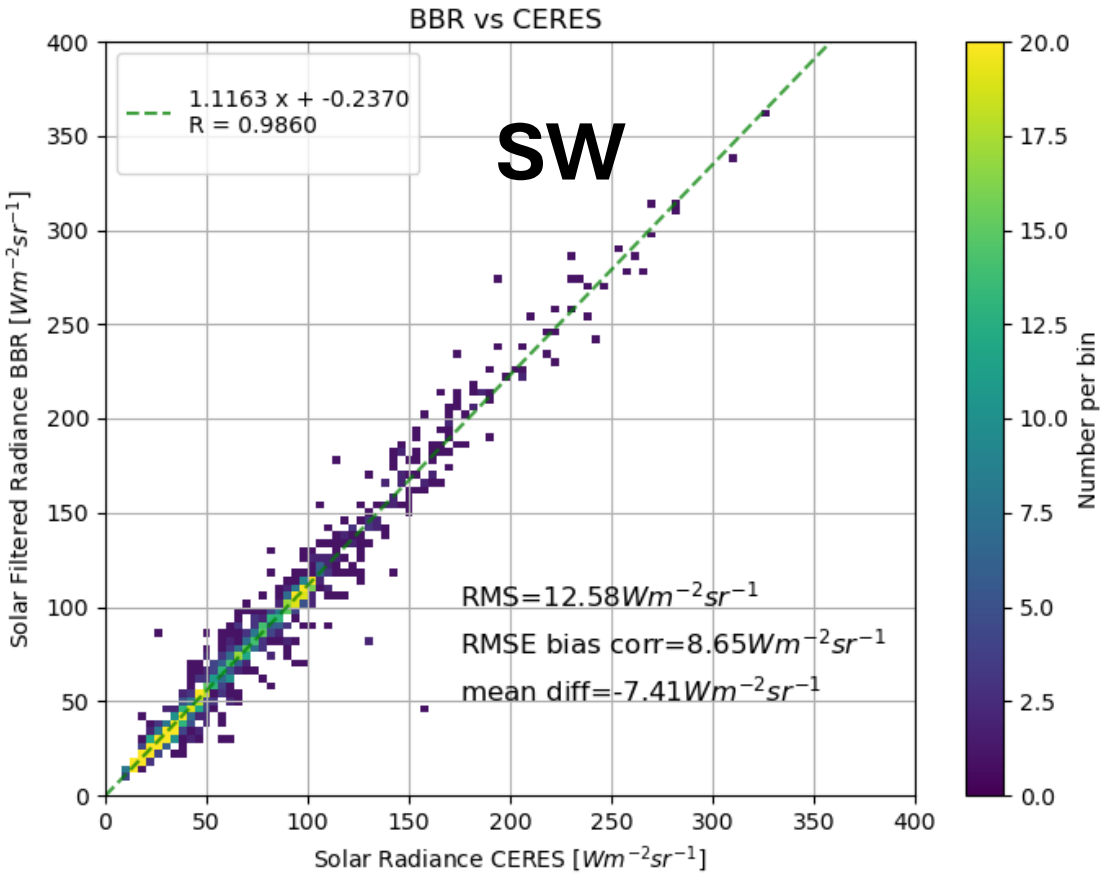
2nd ESA-JAXA EarthCARE In-Orbit Validation Workshop
17 – 20 March 2025 | ESA-ESRIN | Frascati (Rome), Italy

# BBR-SNG Comparison with CERES FLASHflux - method

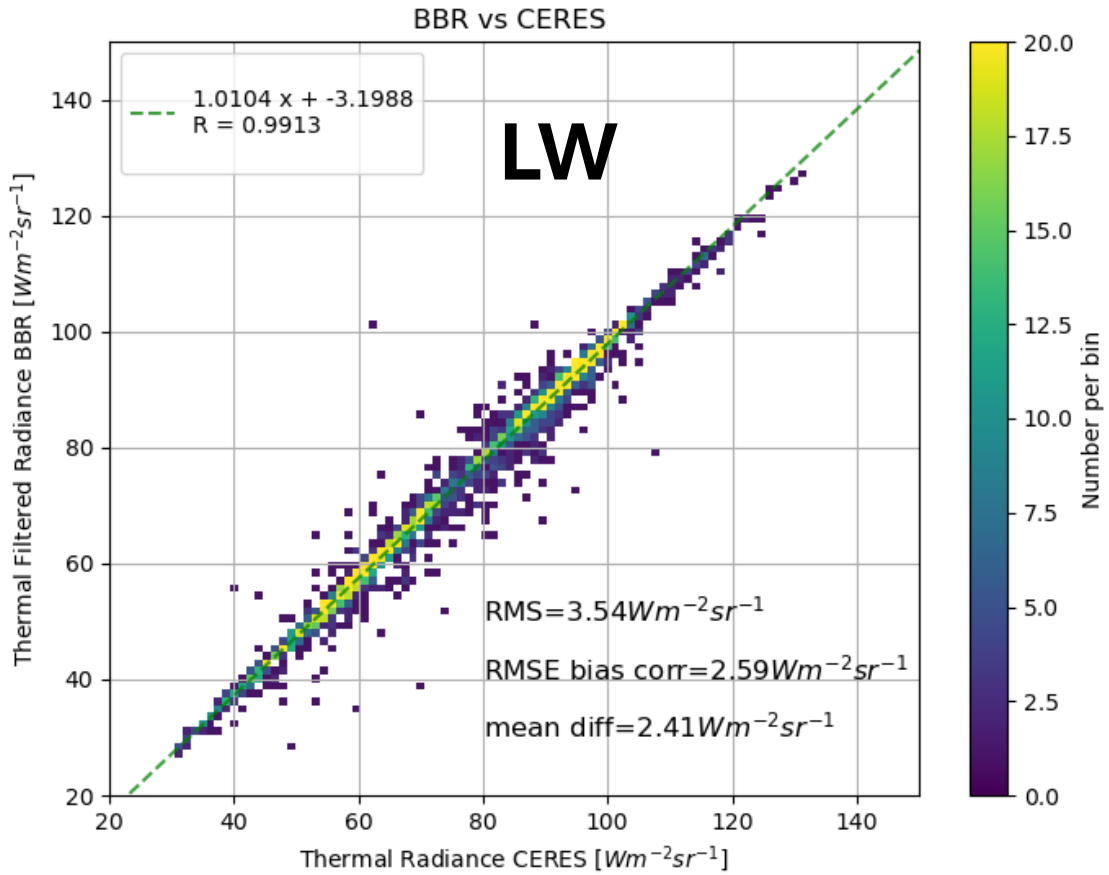
- CERES : Cloud and Earth Radiant Energy System
- Level 2 SSF (Single Scanner Footprint) product
- Currently only FLASHFlux (Fast Longwave And SHortwave Flux) products available from across-track instruments on:
  - FM1 on Terra (descending 10:30 morning drifting)
  - FM6 on NOAA20 (ascending 13:25 afternoon)
- CERES PSF of ~20 km (Terra, Aqua) or ~ 24 km (SNPP, NOAA20) -> larger than the BBR swath (~18km)
- B-SNG integration area : 30 (across track) x 21 (along-track)
- Collocation criteria
  - Time difference < 300 seconds
  - distance between PSF centers < 3km
  - Angle between viewing directions < 3°
- Dates : 10 Aug. 2024 – 03 March 2025



# B-SNG Comparison with CERES FLASHflux - Results

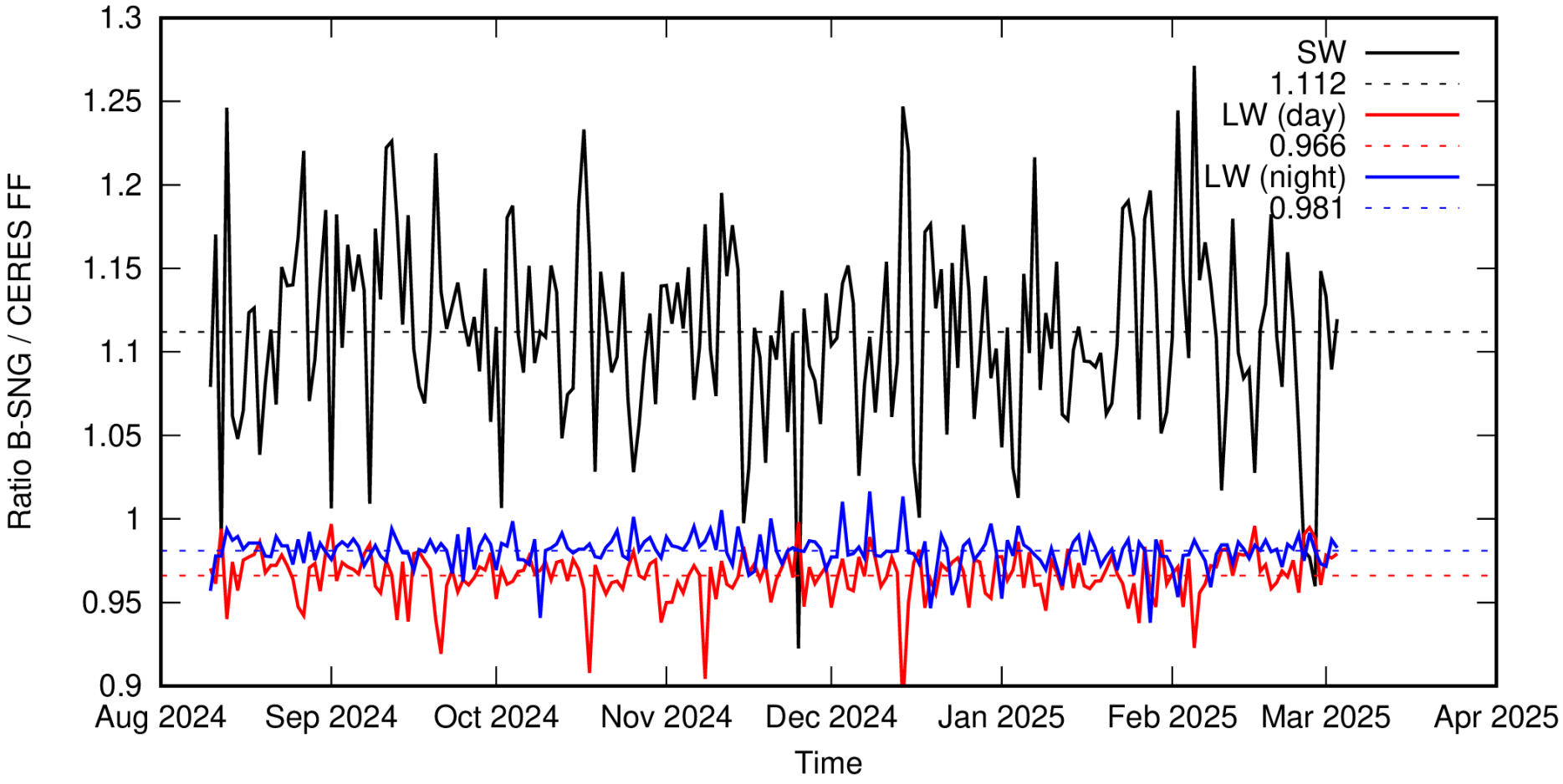



**SW brighter ~9%**




**LW lower ~ 3% (~2.4 W/m$^2$/sr)**

# Temporal Stability – BBR versus FM6/NOAA20




→ **No indication of temporal degradation so far.**

# Shortwave ground calibration revisit

- SW ground calibration done using a reference laser source at λ=0.532 µm
- Need to convert gain $G_{laser}$ to $G_{SW}$= C * $G_{laser}$
- A value of C=0.9278 seems to have been used in the CCDB instead of C~1.0 obtained with latest spectral response.

$$G^{S}_{SW} = \frac{G_{laser}}{r_{SW}(\lambda_{laser})} \frac{\int r_{SW}(\lambda).L_{Planck}(\lambda,5800).d\lambda}{\int L_{Planck}(\lambda,5800).d\lambda}$$

- Using C=1 will reduce the SW radiances and flux by ~7.2%
  → Better agreement with CERES

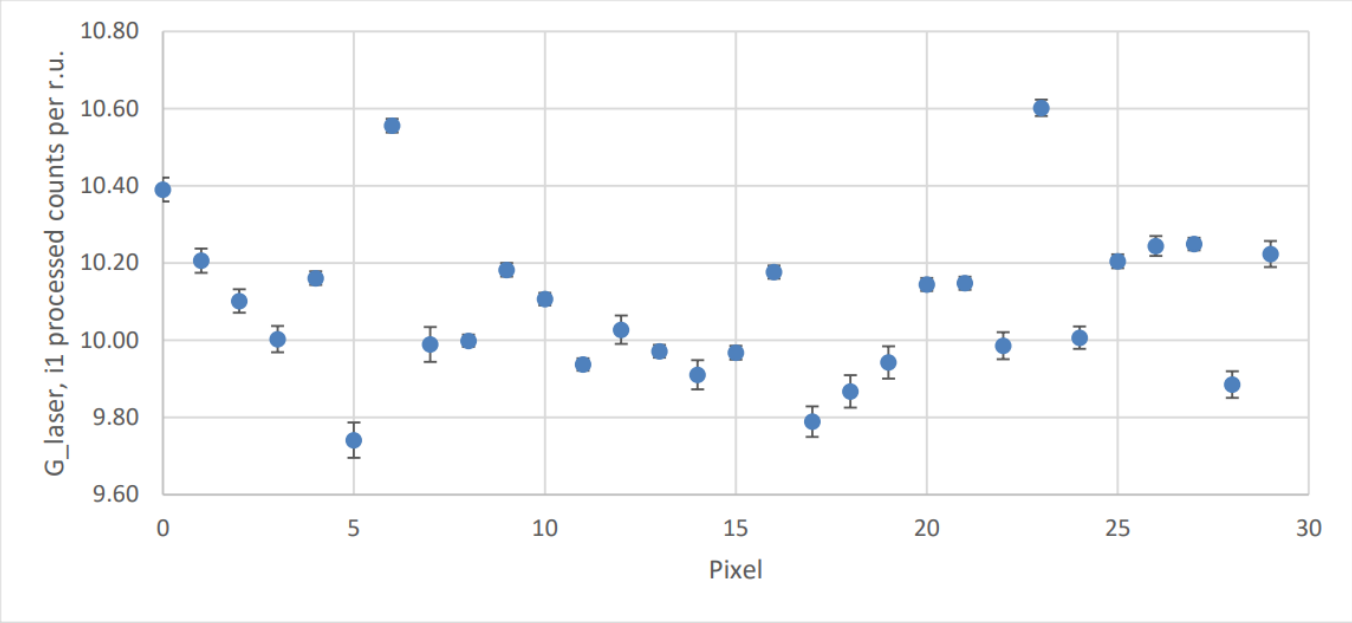
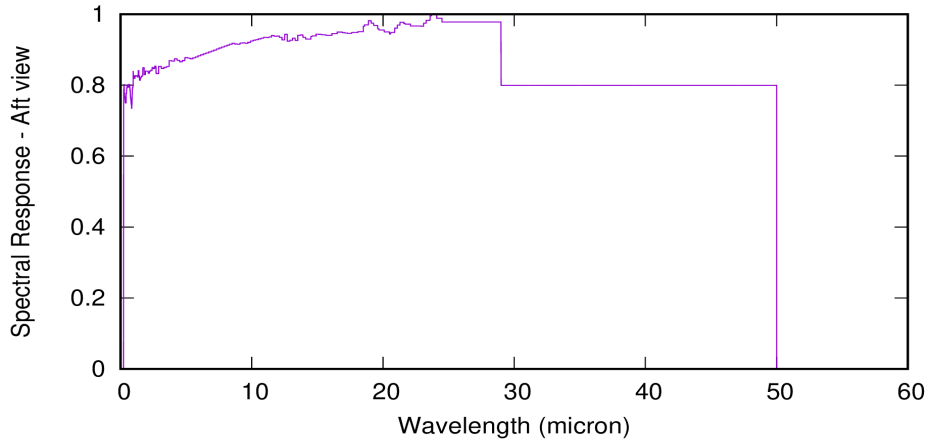


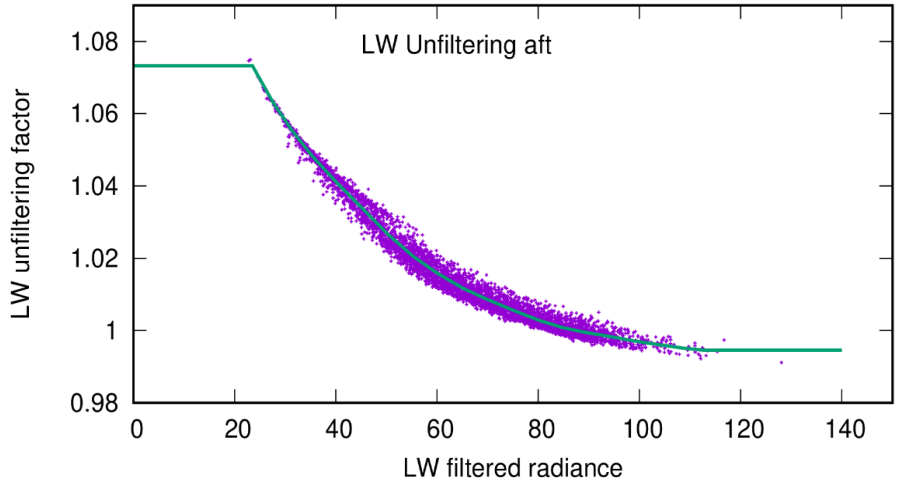

Figure 6-7: Gain of each pixel at the wavelength of the laser source, and averaged for all TestIDs

# Longwave calibration revisit

- The LW calibration uses a CCDB table between filtered radiances and blackbody temperature
- To construct this table there was no interpolation of spectral response, and no sensitivity in the far IR (λ>50μm)
- This assumption necessitates higher unfiltering factor, especially for cold scene (up to 7%-8% unfiltering correction)

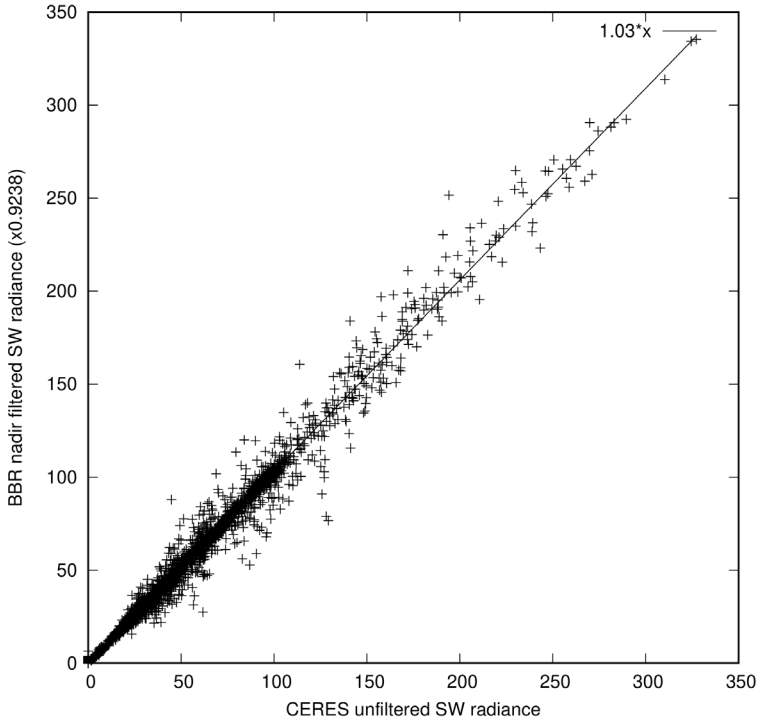
Propose to rebuild the CCDB table with interpolation and extrapolation up to λ=500μm
→ Better agreement with CERES (lower difference and scene type dependency)



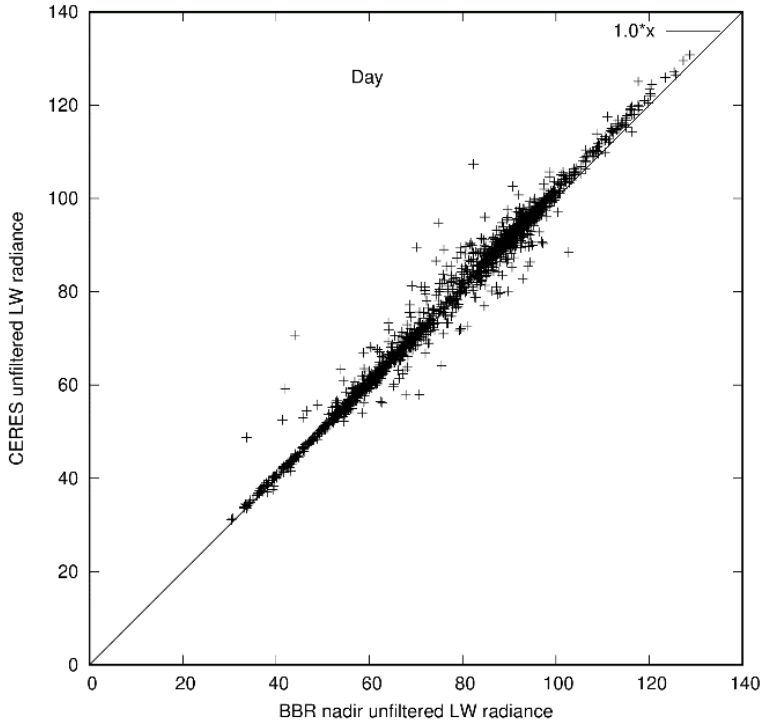
# Shortwave and Longwave calibration revisit

## Shortwave (day)



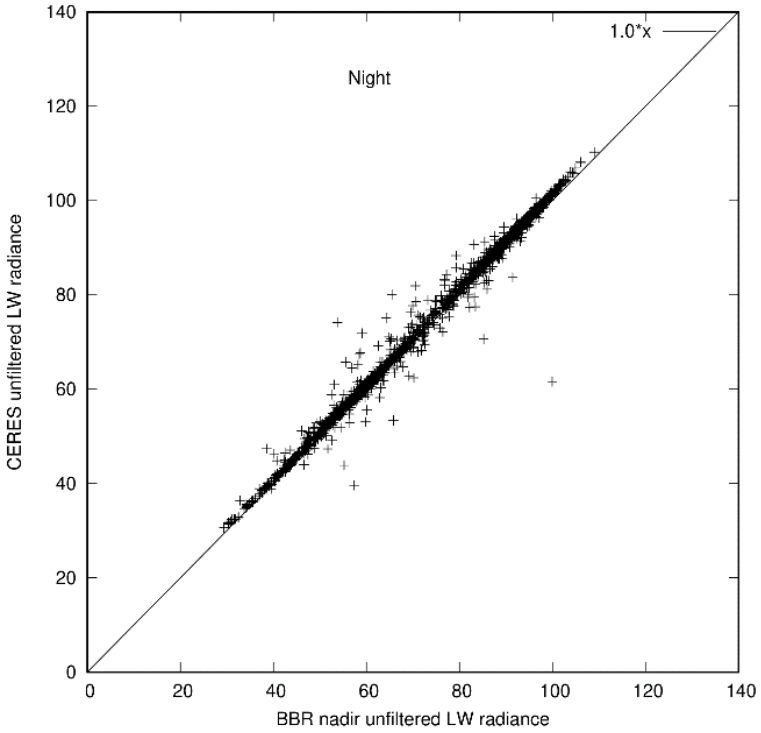

best fits day: $L_{BBR} = 1.03\ L_{CERES}$

## Longwave (day)




best fits day: $L_{BBR} = 0.984\ L_{CERES}$

## Longwave (night)




best fit night: $L_{BBR} = 0.985\ L_{CERES}$

**→ Target to have the CCDB update ready for end of March.**

# Summary – comparison with CERES

- CERES is the best BB measurements available for BBR validation (GERB also used but less reliable).
- Simultaneous Nadir Overpasses (SNO) with NOAA2 for each orbit crossing.
- Significant biases with respect to CERES FLASHflux the current L1 baseline (AD).
- Will be reduced by CCDB updates. Expected improvements:
  - BBR SW ~9% -> ~2% brighter
  - BBR LW ~3% -> ~1.5% lower