

EarthCARE BBR Validation Results within the BRAVO Project

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Introduction

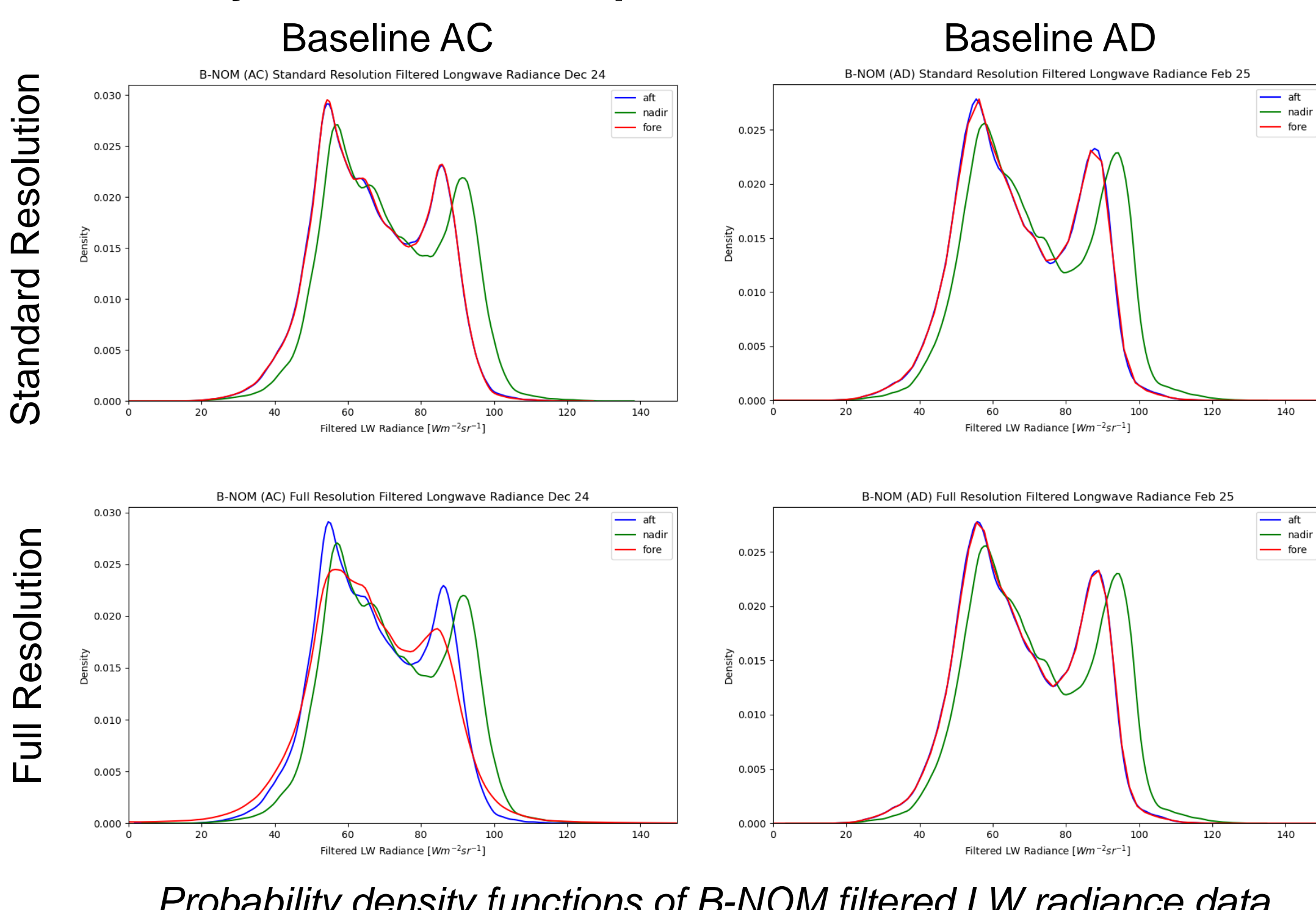
- The BroadBand Radiometer (BBR) on board the EarthCARE satellite is composed of three telescopes (NADIR, FORE and AFT), positioned along-track, with a fixed viewing angle each.
- The BBR is measuring the (filtered) shortwave (SW; 0.25 – 4.0 μm) and totalwave (TW; 0.25 – >50 μm) radiance. The longwave (LW; 4.0 – >50 μm) is thereafter calculated from the two aforementioned radiances.
- There are different BBR products provided as level-1 (B-SNG, B-NOM) and level-2 (BM-RAD and BMA-FLX).
- Within the Broadband Radiometer VerificatiOn (BRAVO) project, the BBR solar and thermal radiances and fluxes (level-1 and level-2) are validated and, among others, compared to data from various instruments, such as GERB or CERES.
- Shown here are first validation results of the B-NOM and the BM-RAD products. B-NOM is providing filtered radiances, whereas BM-RAD is providing unfiltered radiances.

Resolutions B-NOM and BM-RAD Products

Resolution	Along × Across Track	Product
Small	10 × 5 km ²	B-NOM, BM-RAD
Standard	10 × 10 km ²	B-NOM, BM-RAD
Full	10 × ~17 km ² (nadir) 10 × ~28 km ² (off-nadir)	B-NOM, BM-RAD
Assessment Domain	5 × 21 JSG	BM-RAD

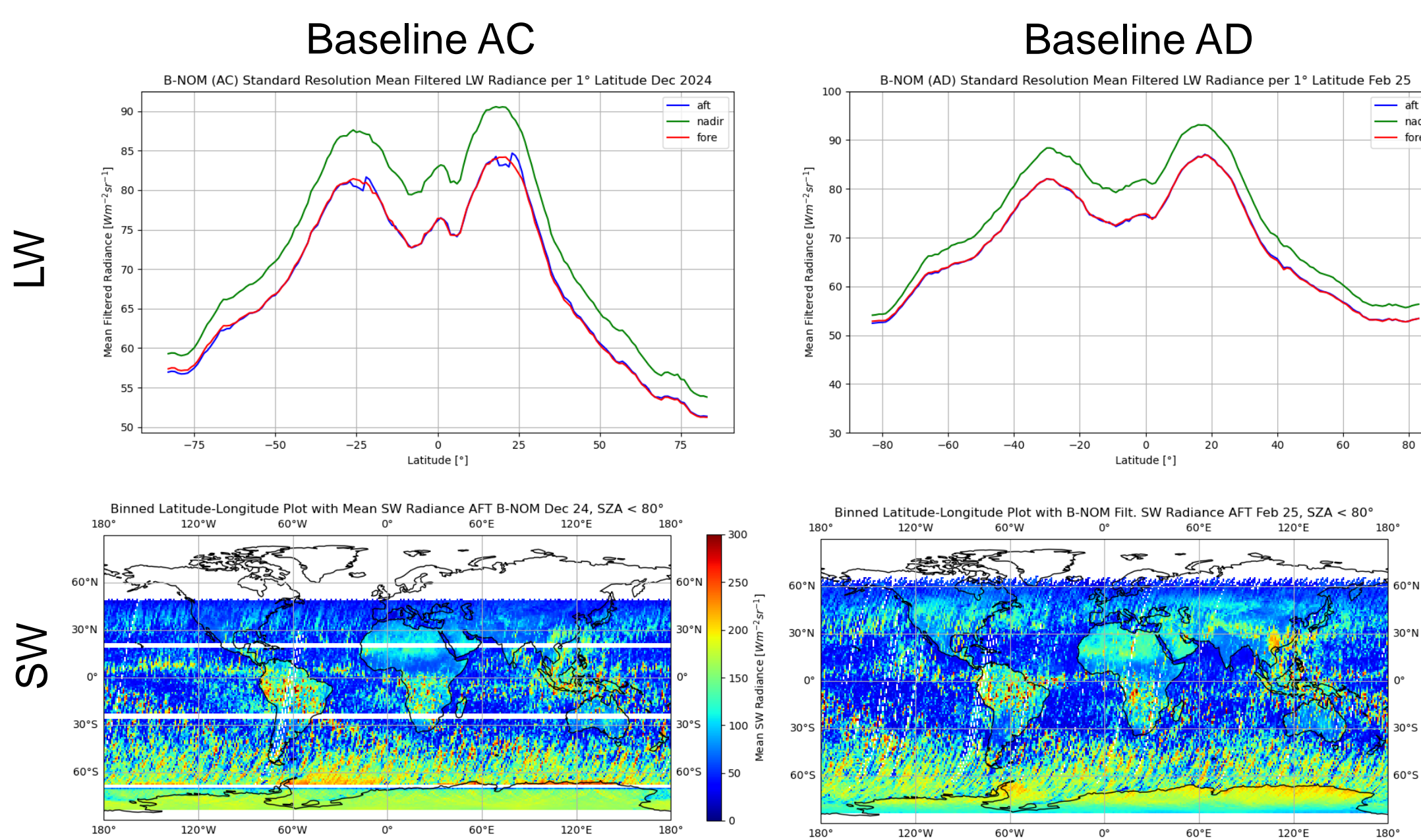
B-NOM: Quality Checks and Improvements with new Baseline

LW Quality Check and Comparison of the different B-NOM Resolutions



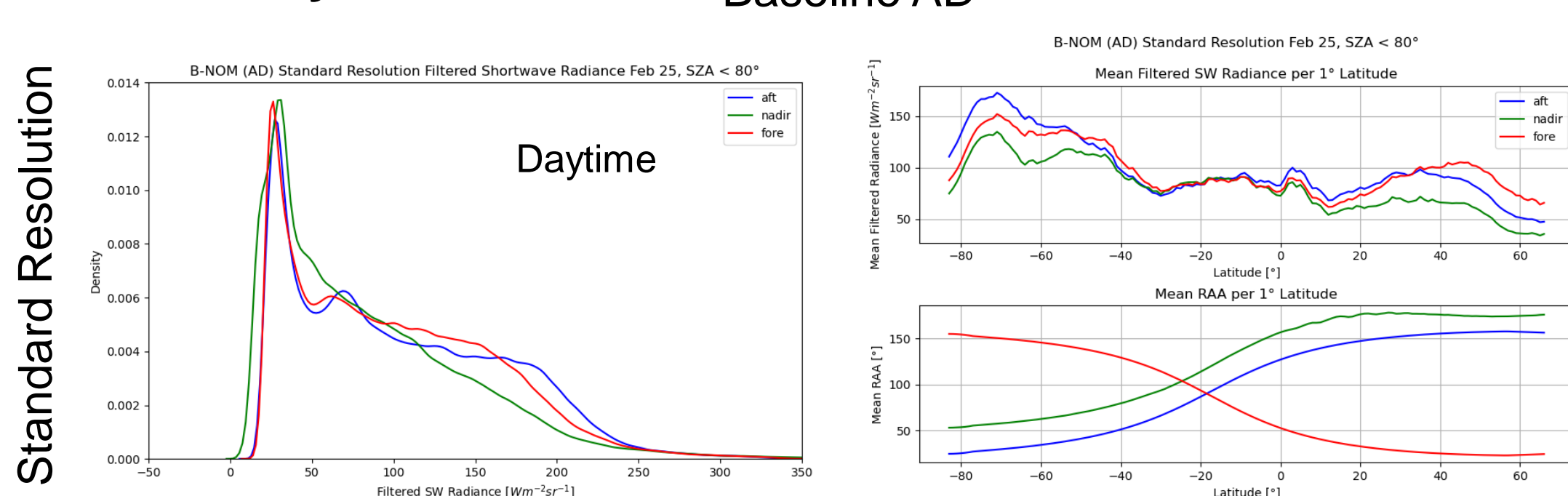
- As expected, the two off-nadir views (FORE and AFT) show a good agreement.
 - Limb-darkening is visible.
 - The issue in the FORE view (inclusion of dead pixel value in the full resolution) has been resolved in the newest baseline AD release.
- From the release of baseline AD onwards, B-NOM data in all three resolutions are reliable to be used.

Quality Check: Missing Data at beginning of each AFT Frame



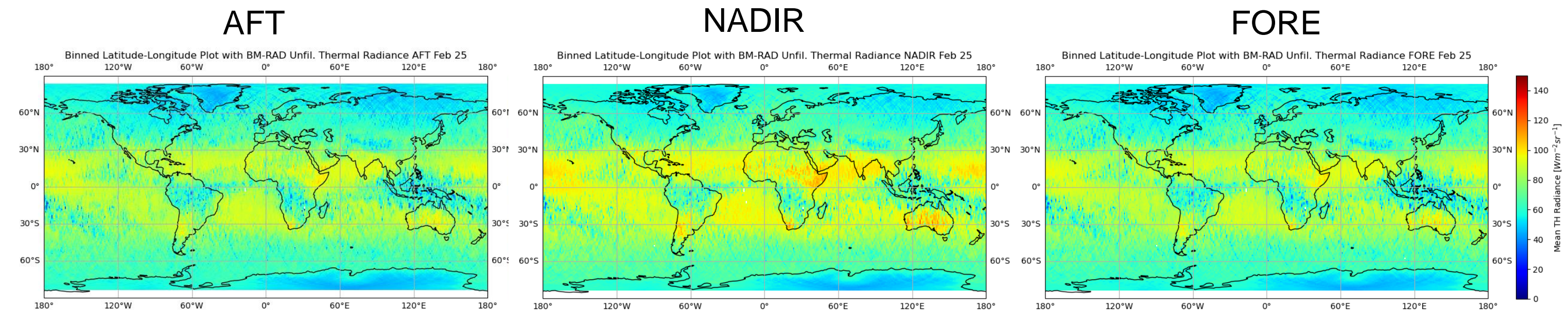
- There were missing data at the beginning of each frame in the AFT-view in the baseline AC, causing the missing data in the map-plots.
- Issue is also resolved in the newest baseline AD.

SW Quality Check

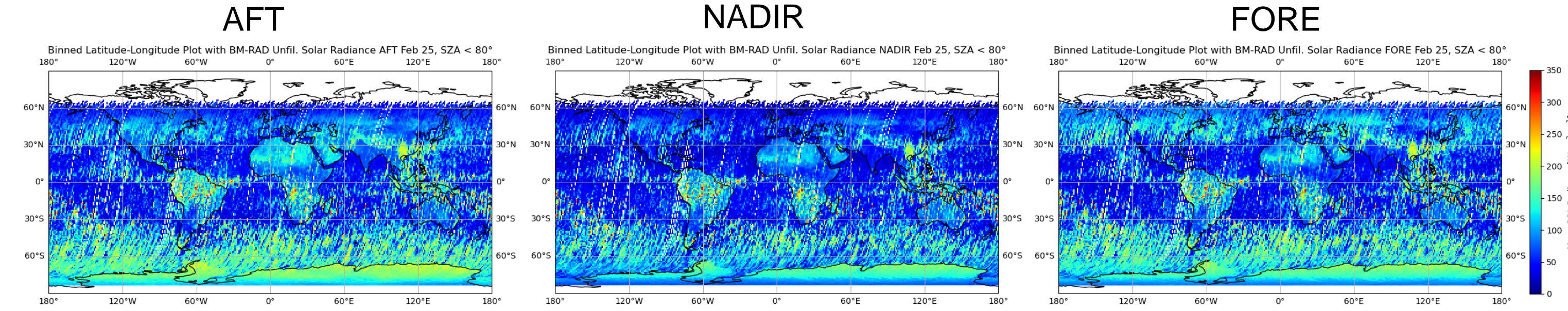


BM-RAD Validation

Three Views: LW Radiance

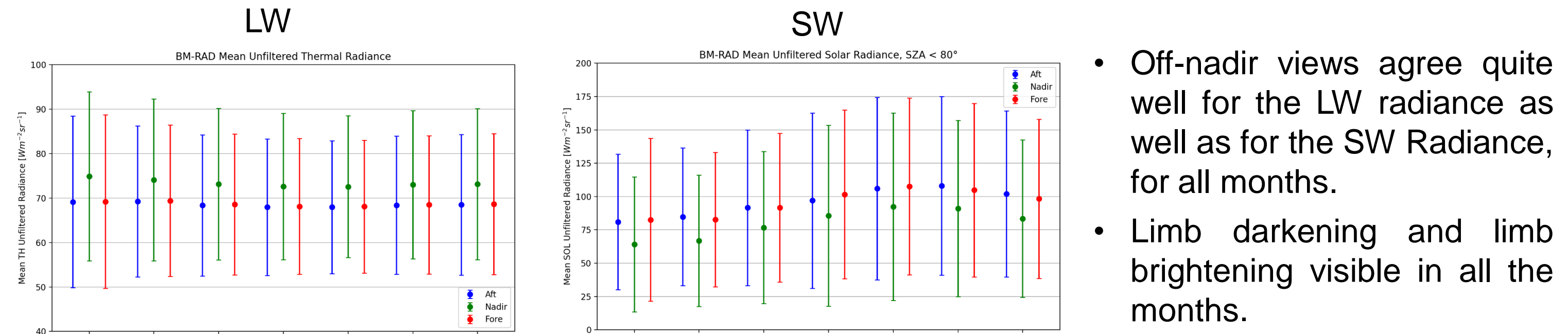


Three Views: SW Radiance



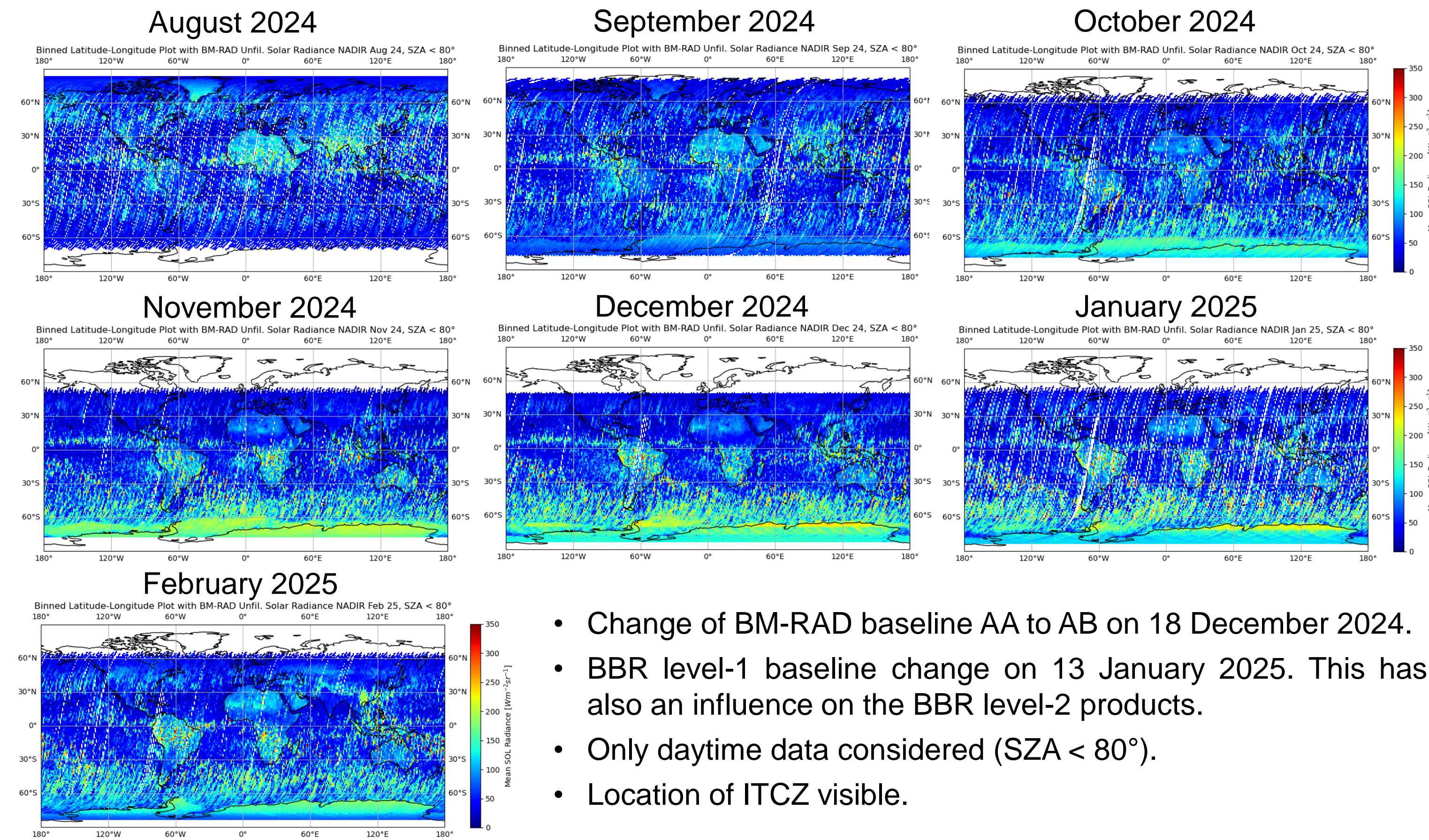
- Off-nadir views agree quite well for the LW radiance as well as for the SW Radiance.
- Limb-darkening and limb-brightening visible for the LW and SW radiance, respectively.

Monthly Mean Unfiltered Radiance Values: LW and SW, August 2024 – February 2025



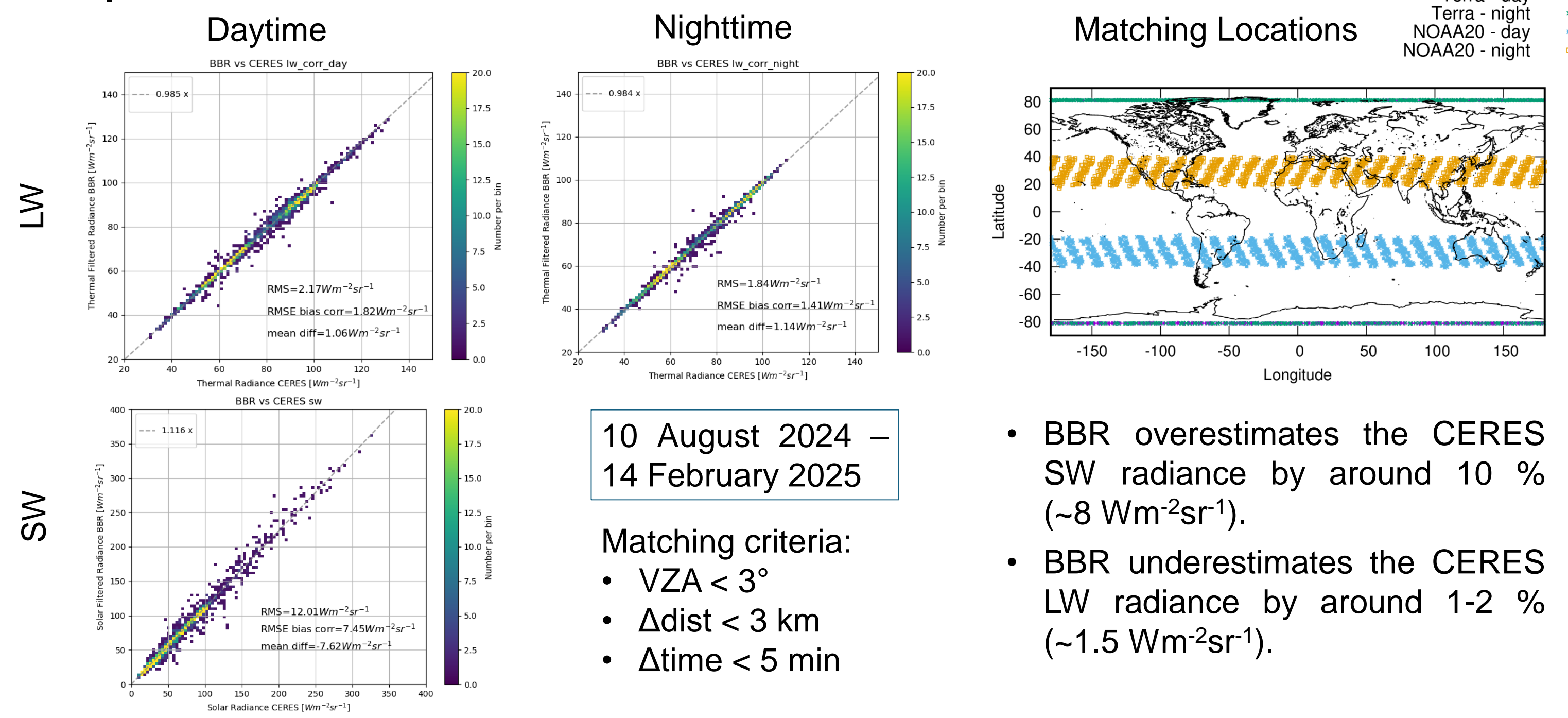
- Off-nadir views agree quite well for the LW radiance as well as for the SW Radiance, for all months.
- Limb darkening and limb brightening visible in all the months.

Monthly Mean Unfiltered SW Radiance Values: August 2024 – February 2025



- Change of BM-RAD baseline AA to AB on 18 December 2024.
- BBR level-1 baseline change on 13 January 2025. This has also an influence on the BBR level-2 products.
- Only daytime data considered (SZA < 80°).
- Location of ITCZ visible.

Comparison BM-RAD – CERES FlashFLUX Radiances



- BBR overestimates the CERES SW radiance by around 10 % (~8 Wm⁻²sr⁻¹).
- BBR underestimates the CERES LW radiance by around 1-2 % (~1.5 Wm⁻²sr⁻¹).

Summary and Outlook

- The BBR is operating stable and the first months of data look very promising.
- Several issues, that were present in older baselines, have been resolved in the newest baseline releases of B-NOM and BM-RAD.
- Comparisons with the more validated CERES SSF product will be performed as soon as those data are available.
- It is also planned to perform comparisons with data from the GERB instruments.

Acknowledgement

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