EC BBR Level 1 Products Assessment within BRAVO Project

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Royal Meteorological Institute of Belgium (RMIB)

1st ESA-JAXA EarthCARE In-Orbit Validation Workshop

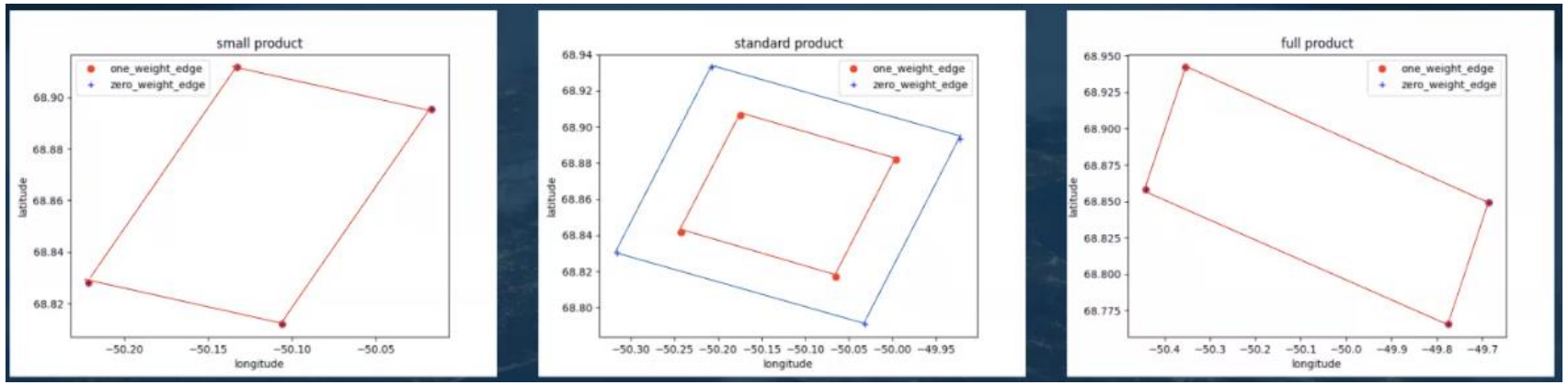
14 – 17 January 2025 | VIRTUAL EVENT

Introduction BBR Level-1 Products

- B-NOM

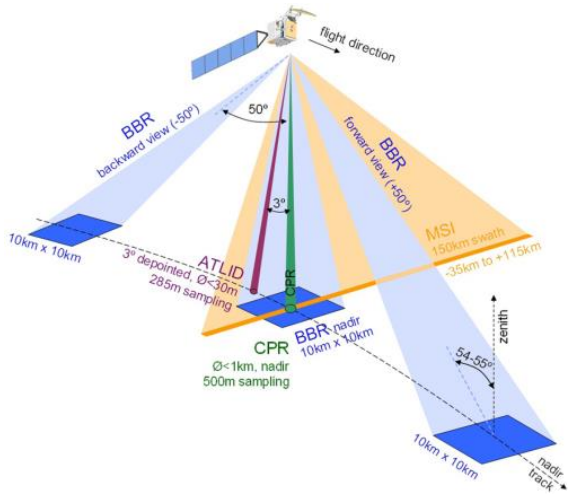
SW and **LW** filtered radiance integrated over three resolutions:

Resolution	along-track (km) x across-track (km)
Small	10 x 5 (configurable)
Standard	10 x 10
Full	Nadir: 10 x ~17 Off-nadir: 10 x ~ 28



- B-SNG

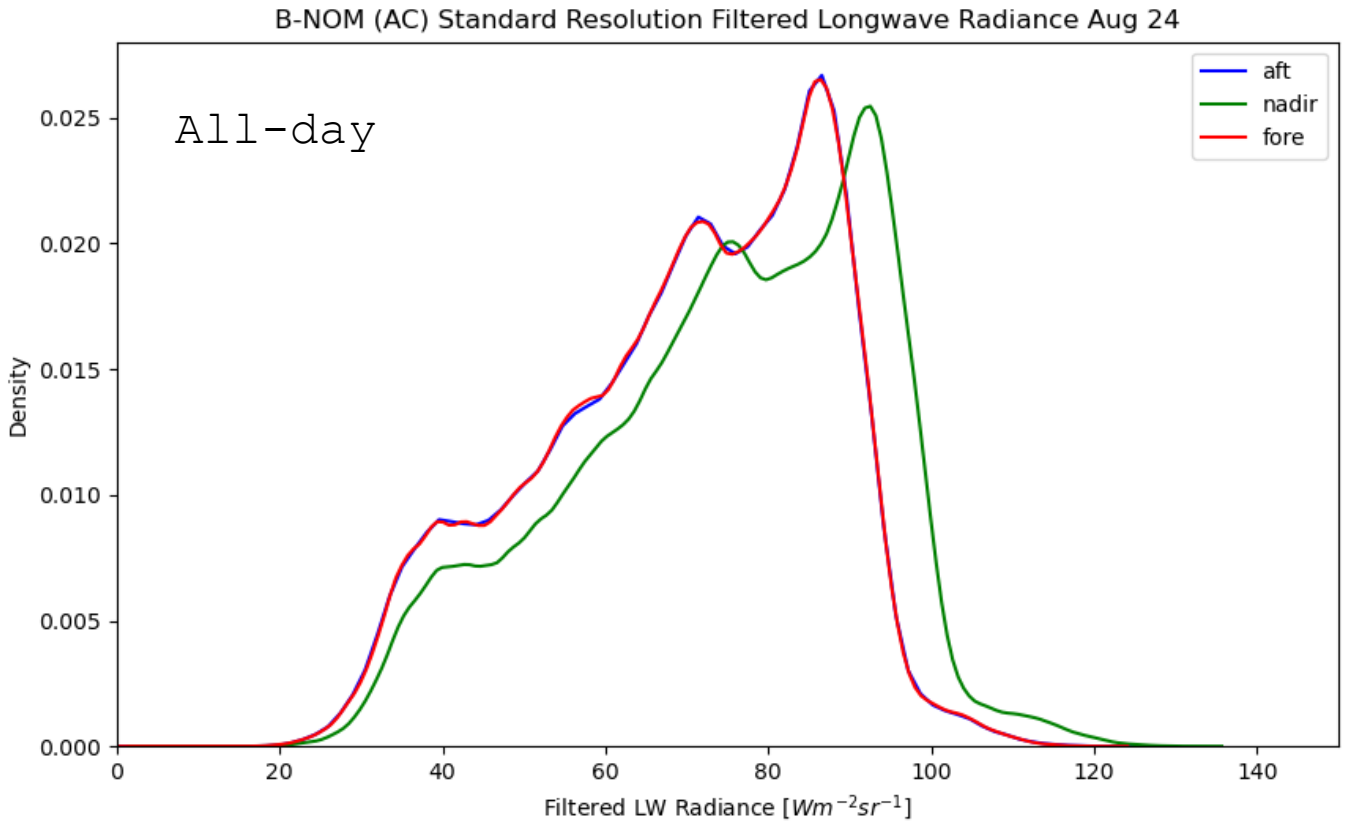
SW and **TW** filtered radiance at pixel level



B-NOM Analysis

- Shortwave (SW) and longwave (LW) filtered radiance.
- Data used from Aug 1, 2024 to Dec 31, 2024.
- Baseline AC (newest one available).
- Frames which contain obvious erroneous data were removed from the analysis (up to around 30 frames per month or less than 1 %).
- Selection of daytime and nighttime:
  - Daytime: SZA < 80°
  - Nighttime: SZA > 100°

Distribution LW Radiance, Aug 2024



Standard Resolution

All values in $Wm^{-2}sr^{-1}$

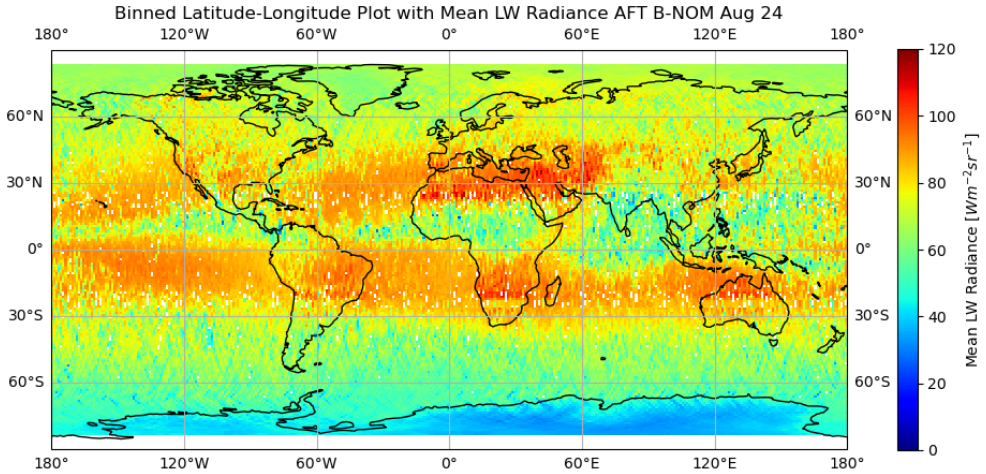
View	Mean	Std	Median
Aft	69.41	17.42	71.85
Nadir	74.45	18.43	76.75
Fore	69.40	17.40	71.82

N = 12 755 456

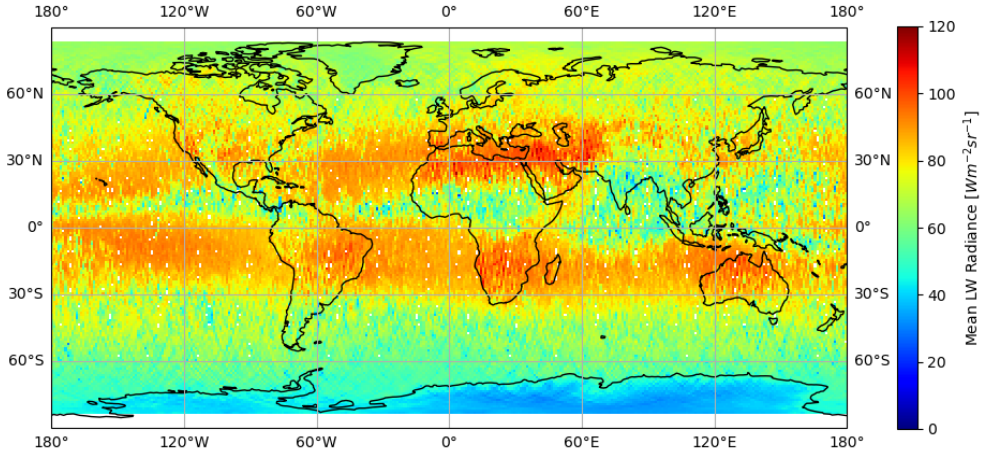
- AFT and FORE views are in good agreement.
- NADIR view slightly higher due to limb darkening.

LW Radiance per 1°x1° Lat.-Lon.-Bin, All-day, Aug 2024

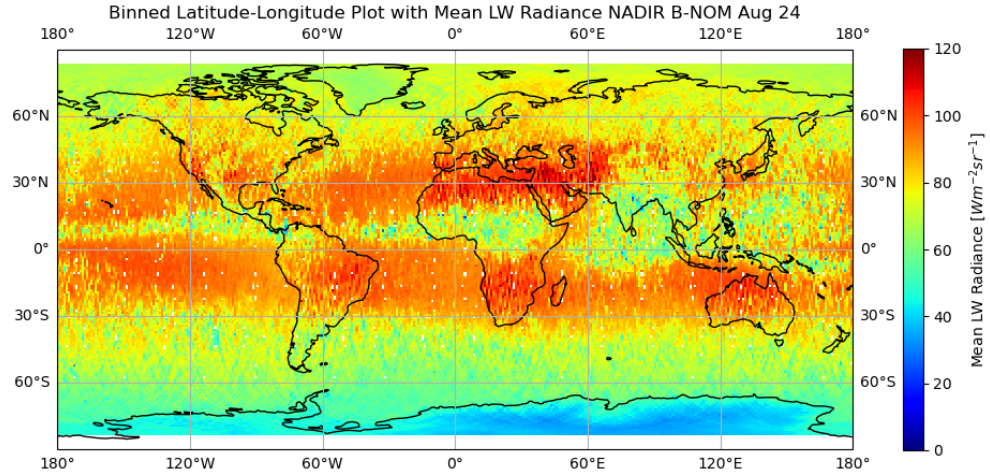
AFT



FORE



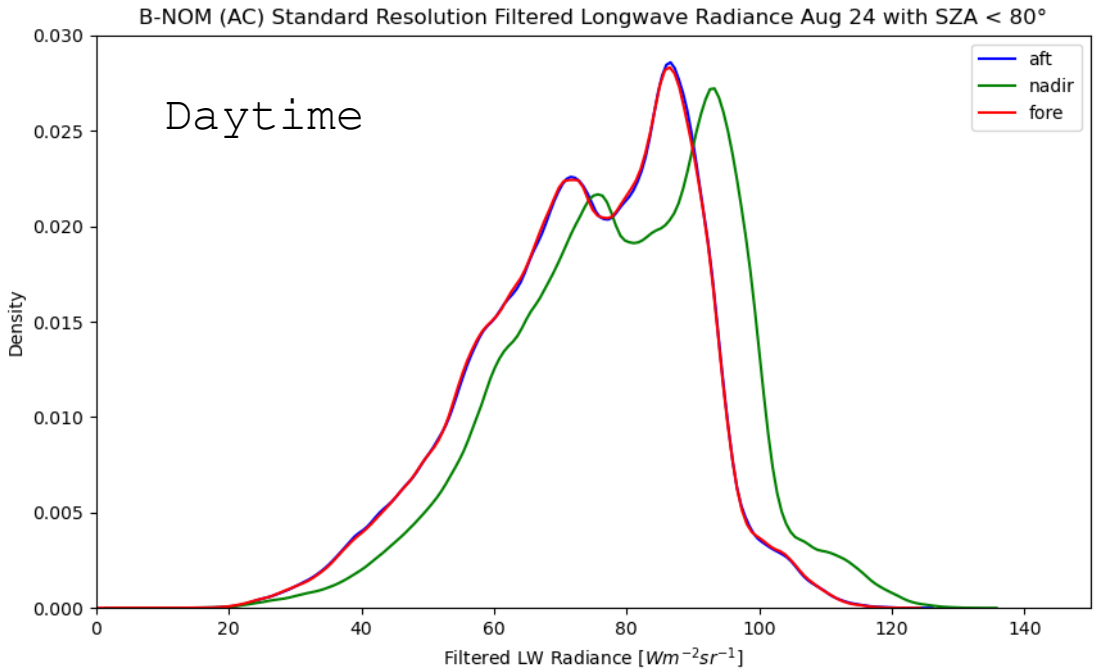
NADIR



- Good consistency in the AFT and FORE views.
- Limb darkening.

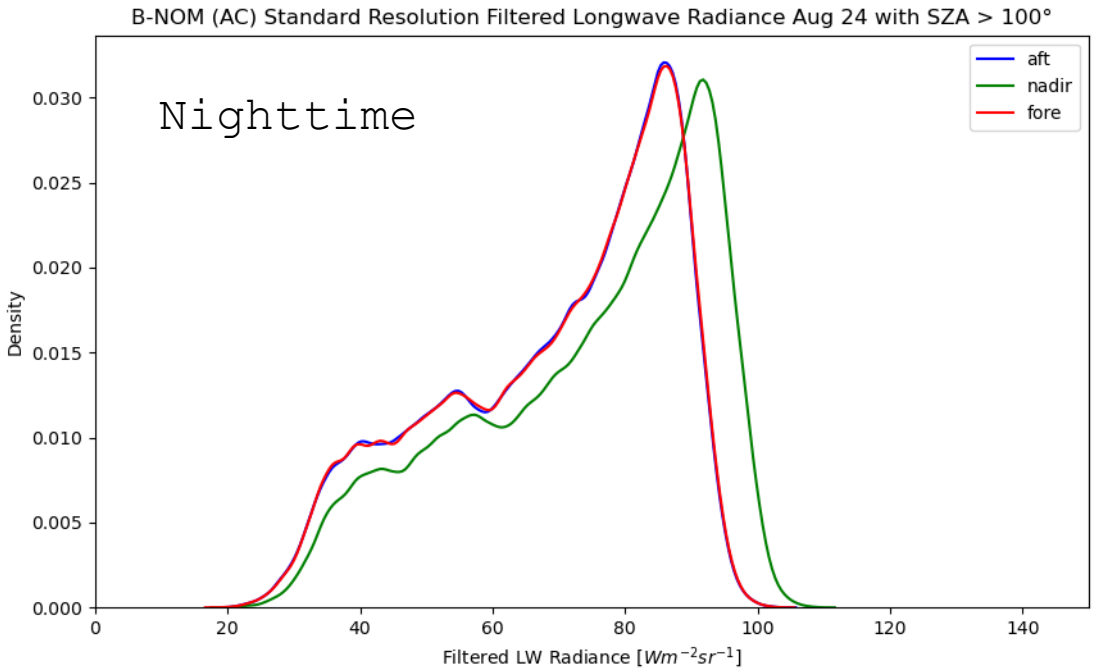
Distribution LW Radiance, Aug 2024

Standard Resolution



View	Mean	Std	Median
Aft	73.59	15.93	75.13
Nadir	79.31	16.63	80.55
Fore	73.54	15.92	75.07

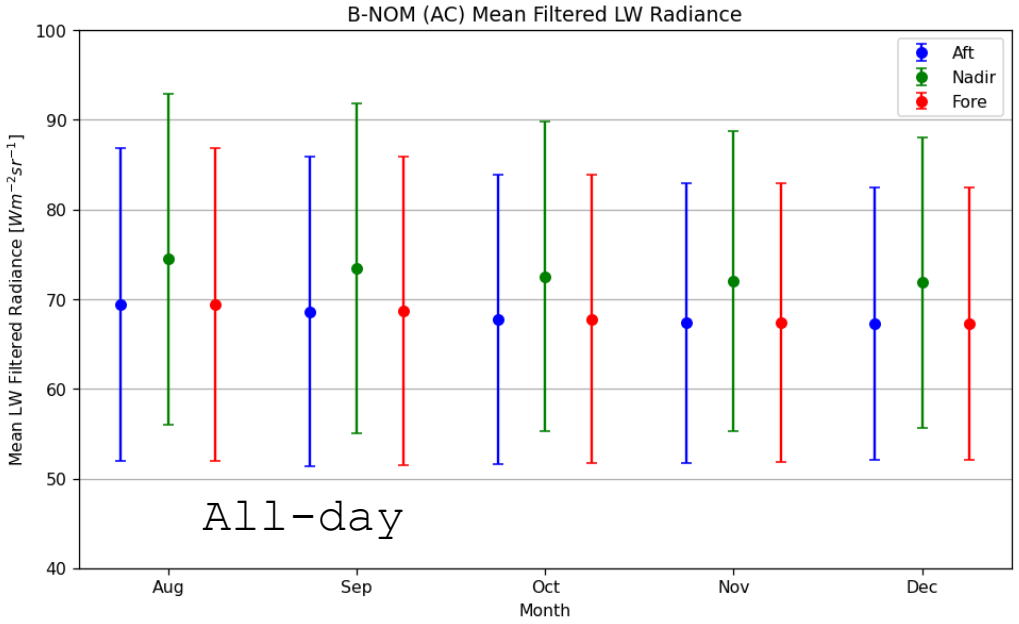
N = 5’616’186



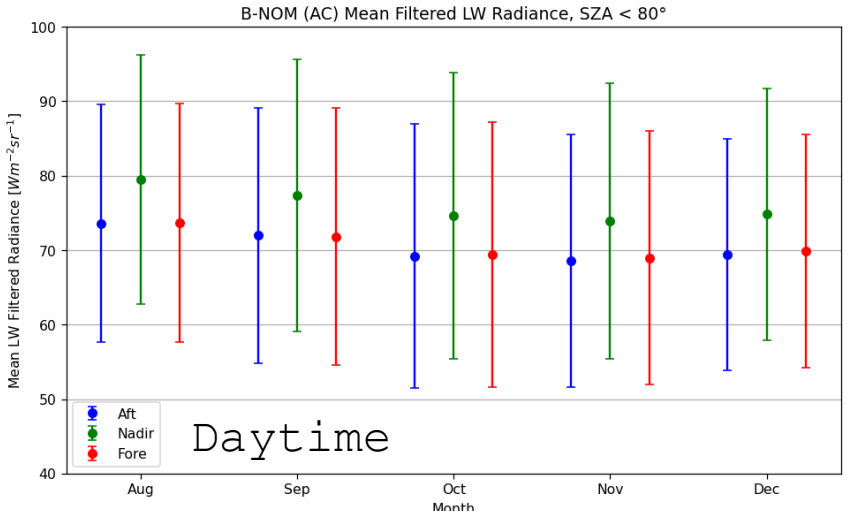
View	Mean	Std	Median
Aft	69.24	17.44	73.33
Nadir	74.17	18.25	78.61
Fore	69.27	17.45	73.40

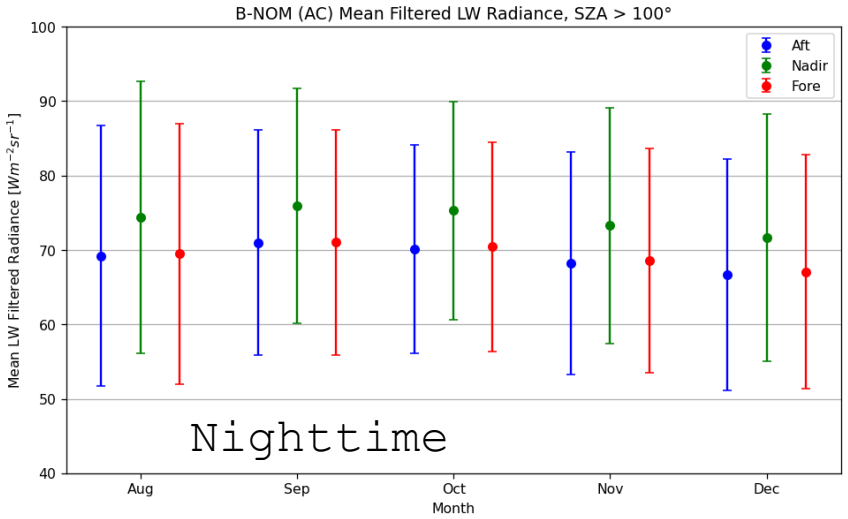
N = 5’585’059

Mean Values of LW Radiance per Month



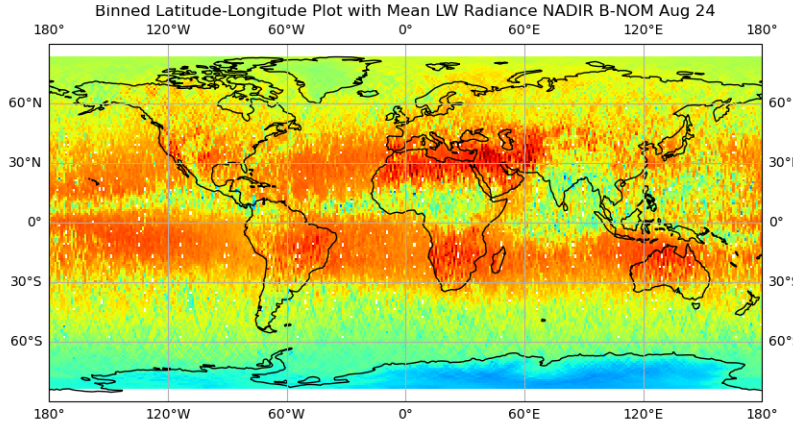
Standard Resolution



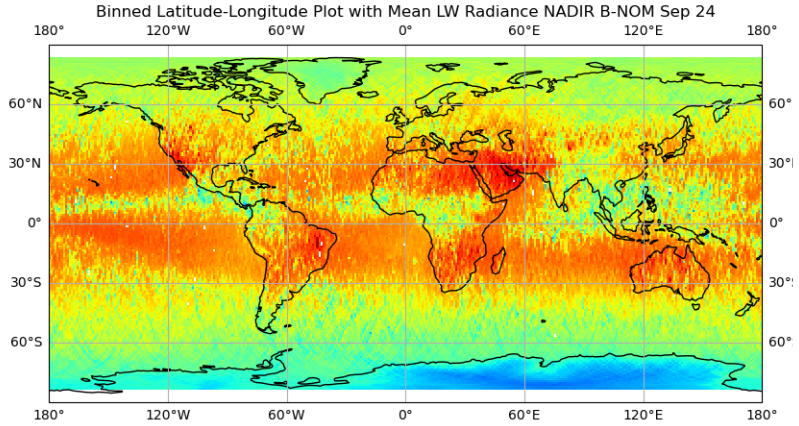


LW Radiance per 1°x1° Lat.-Lon.-Bin, Nadir View, Aug - Dec 2024

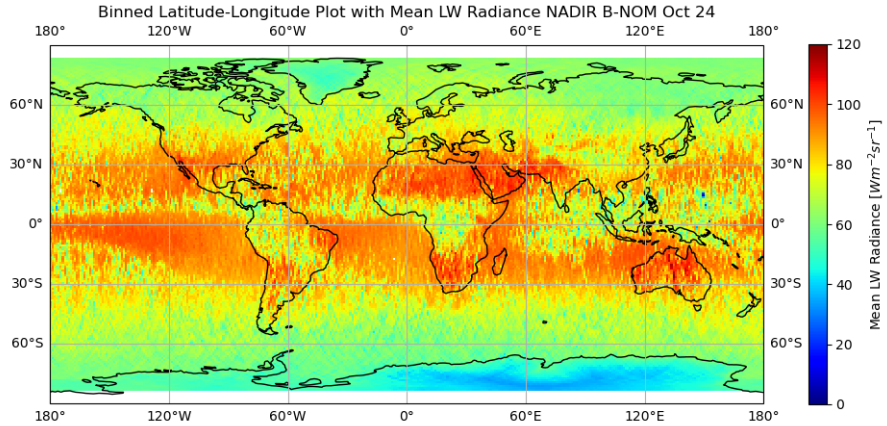
Aug 24



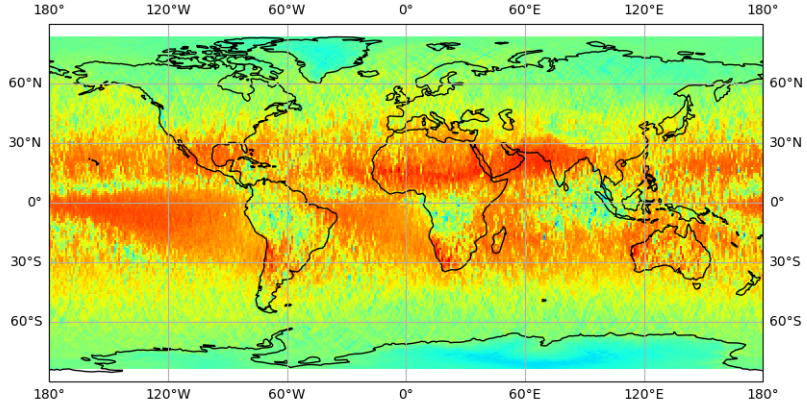
Sep 24



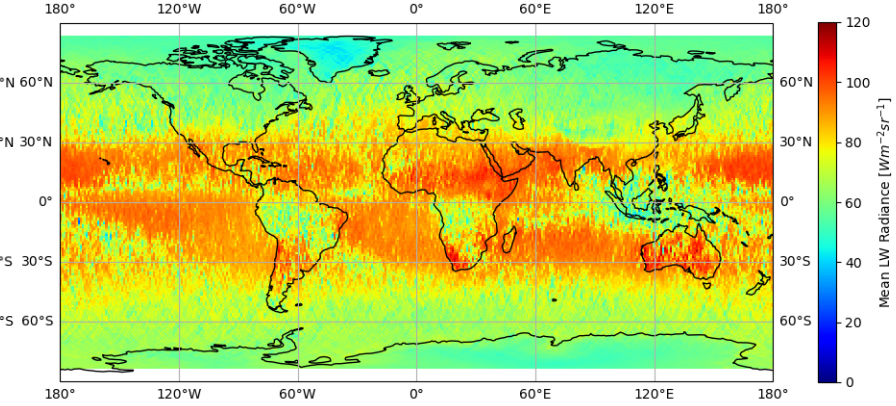
Oct 24



Nov 24

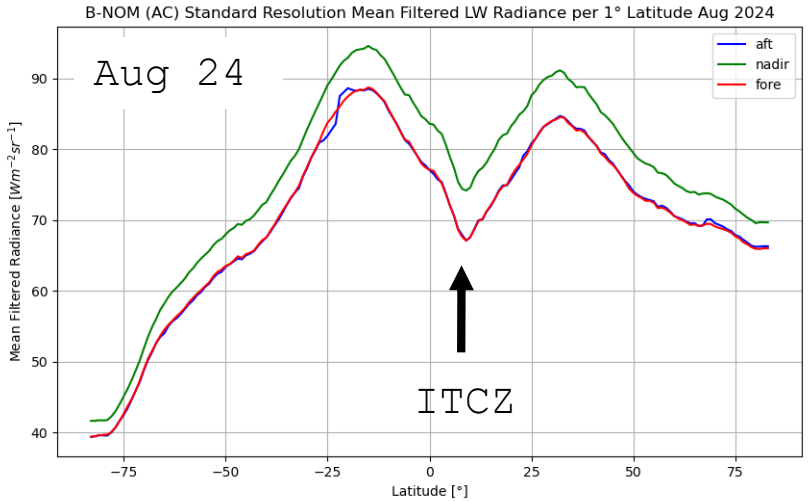


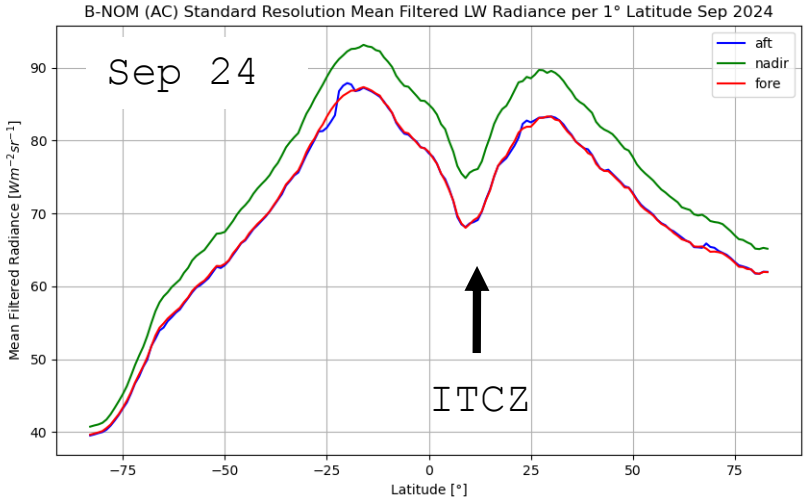
Dec 24

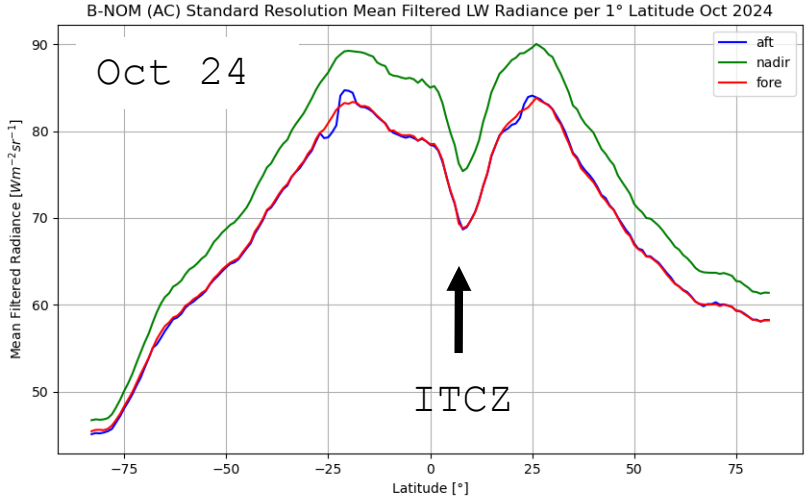


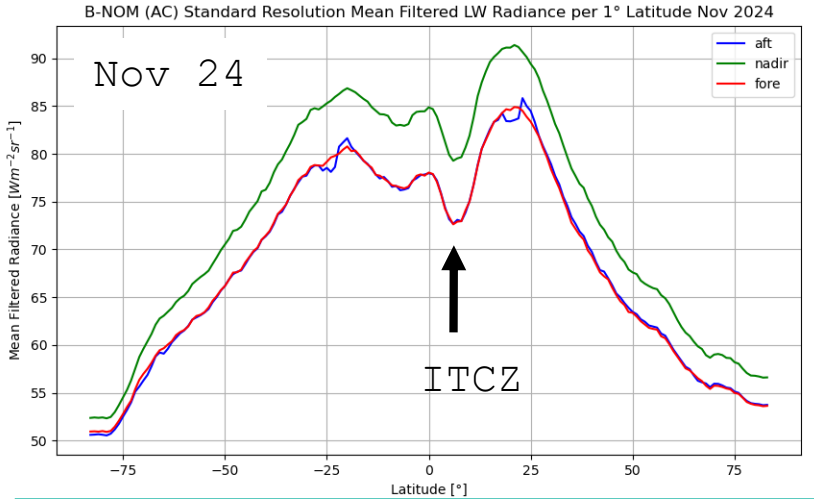
- Decreasing mean LW radiance values from August to September 2024.
- Differences rather over the land than over the ocean.

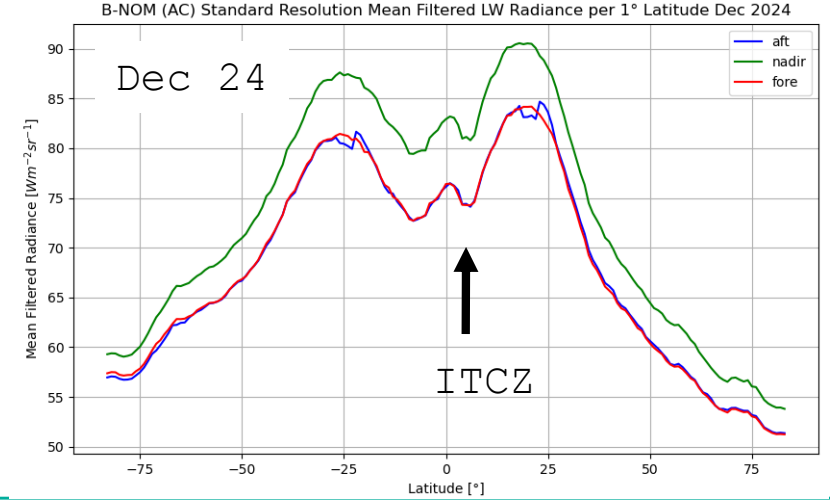
LW Radiance per 1° Lat-Bin, All-day, Aug – Dec 2024







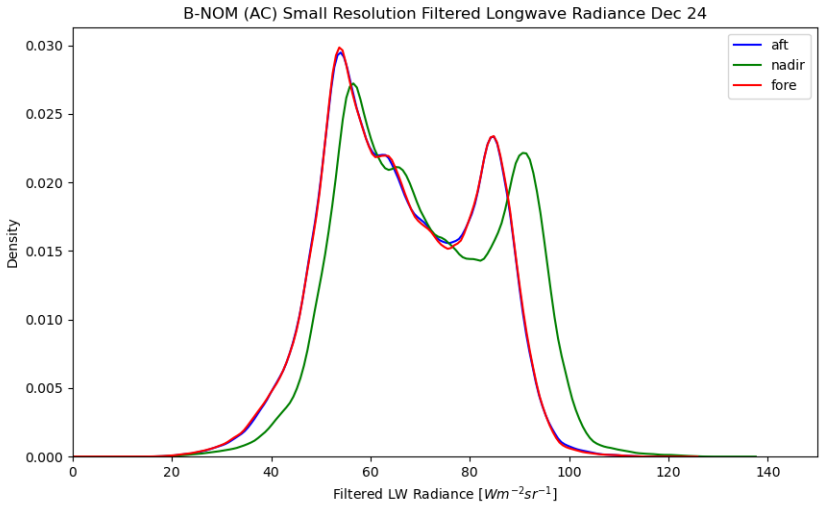




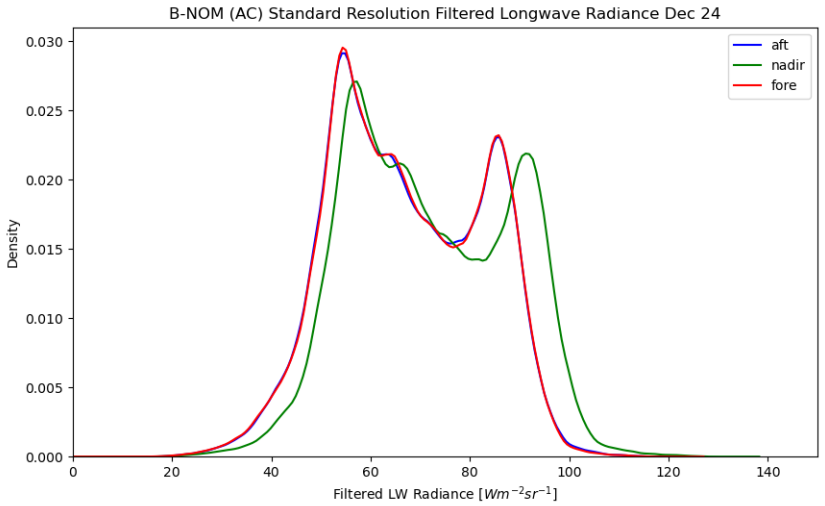
- Gaps in the AFT view at the beginning of each frame – will be corrected in baseline AD.

Comparison of different resolutions B-NOM product: LW Radiance

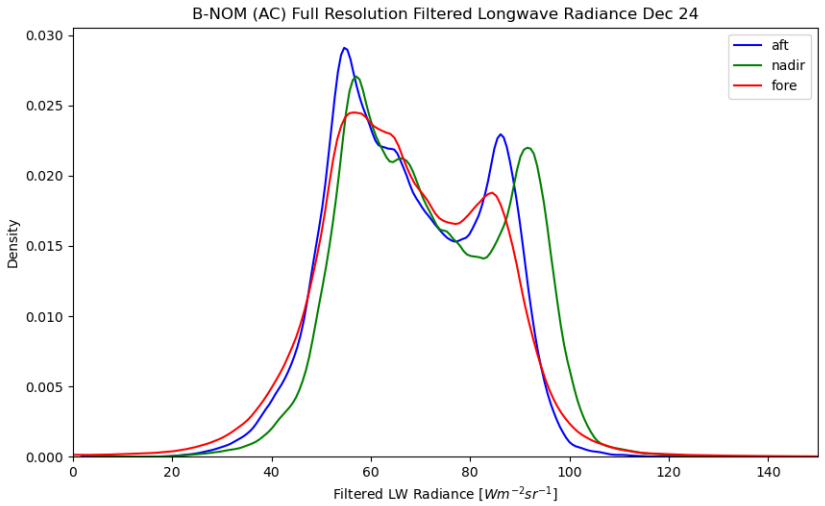
Small Resolution



Standard Resolution



Full Resolution



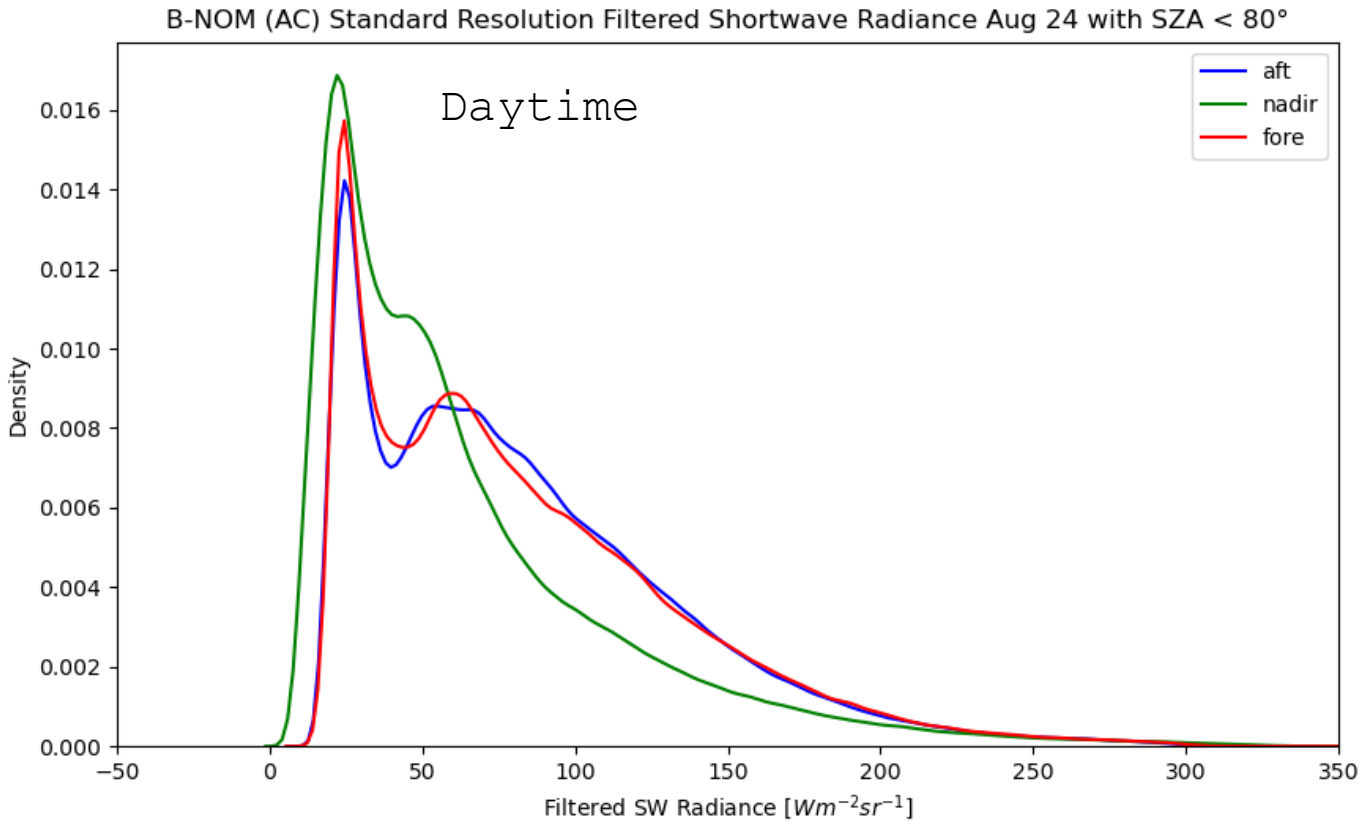
Dec 2024

- Good consistency between the small and the standard resolution.
- FORE view in the full resolution shows some issues (due to a dead pixel).

Distribution SW Radiance, Aug 2024

Standard Resolution

All values in $Wm^{-2}sr^{-1}$



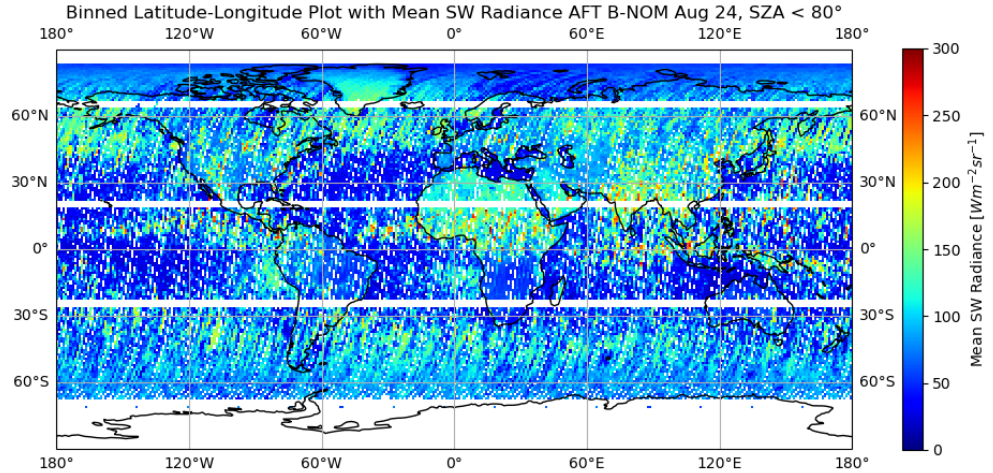
View	Mean	Std	Median
Aft	82.74	50.54	72.83
Nadir	64.69	50.34	49.73
Fore	82.27	51.37	71.09

N = 5 616 186

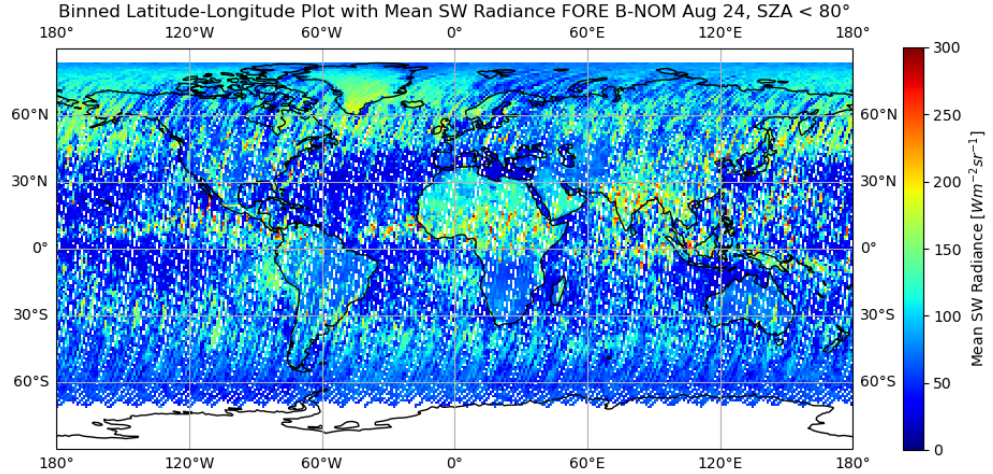
- All three views show (slightly) different distributions.
- NADIR view slightly lower due to limb brightening.

SW Radiance per 1°x1° Lat.-Lon.-Bin, Daytime, Aug 2024

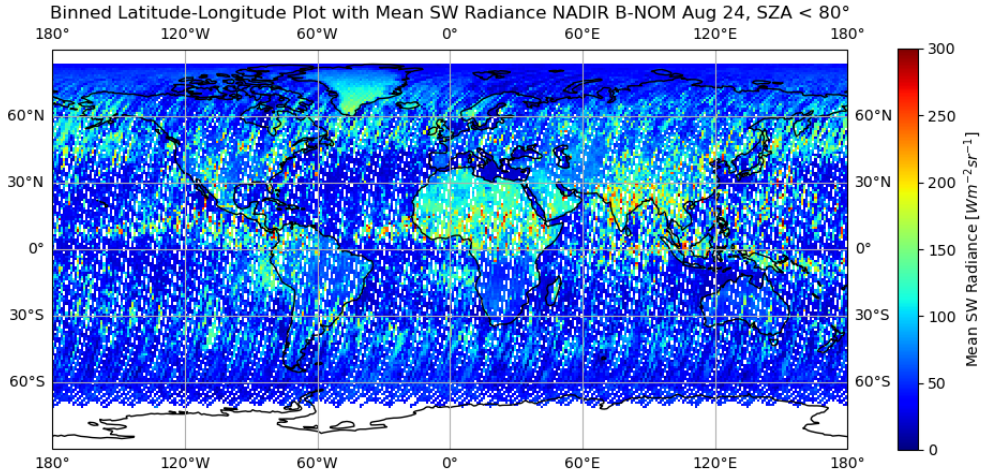
AFT



FORE



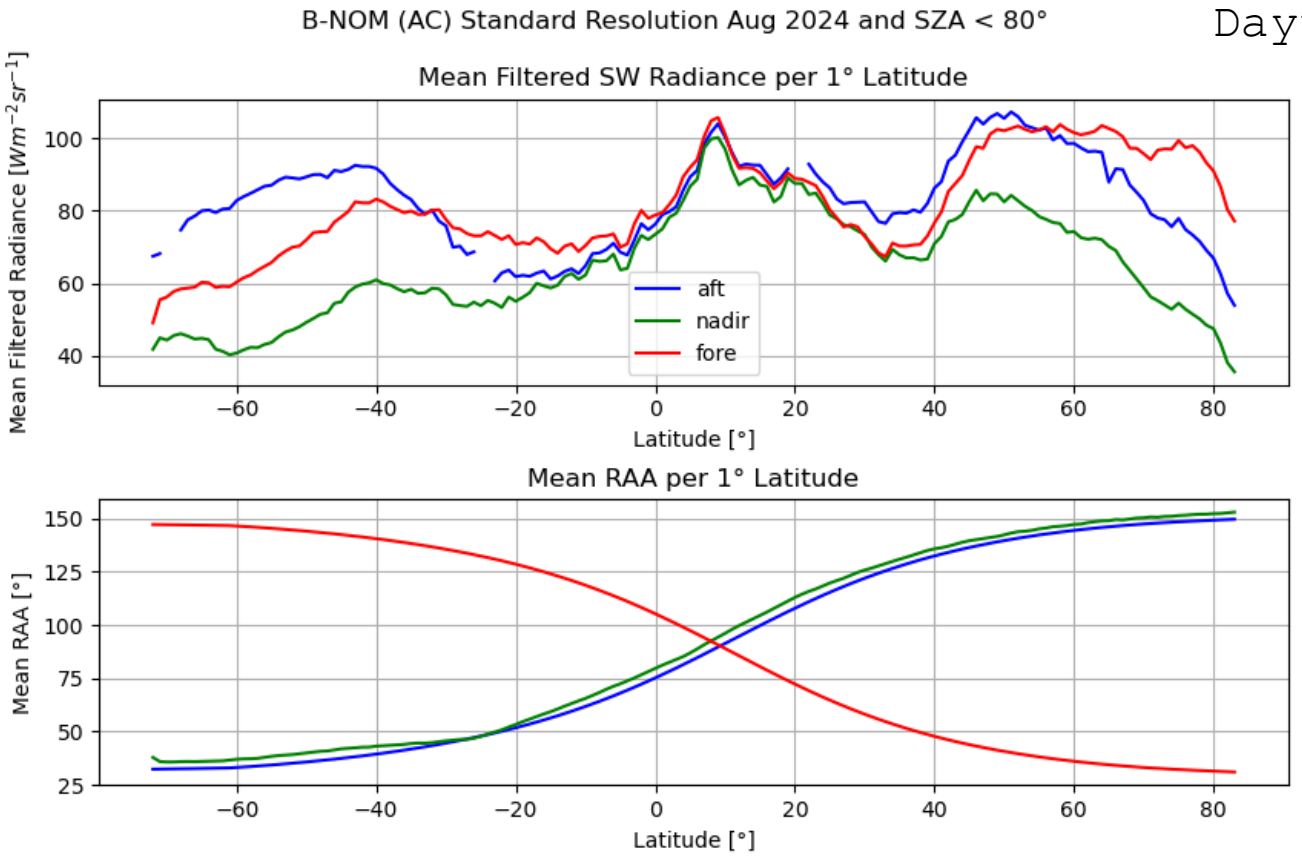
NADIR



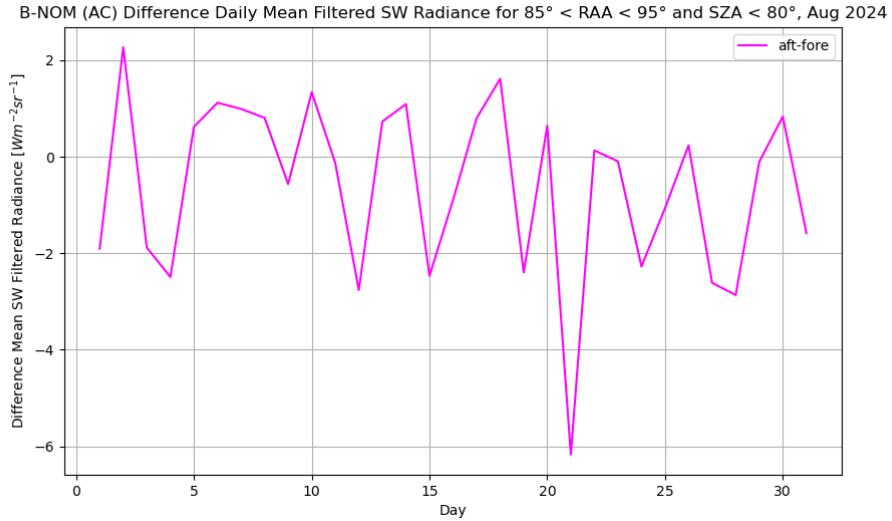
- Good consistency in the AFT and FORE views.
- Missing data in AFT view (latitudinal bands).
- Limb brigthening.

SW Radiance and Relative Azimuth Angle per 1° Lat-Bin, Aug 2024

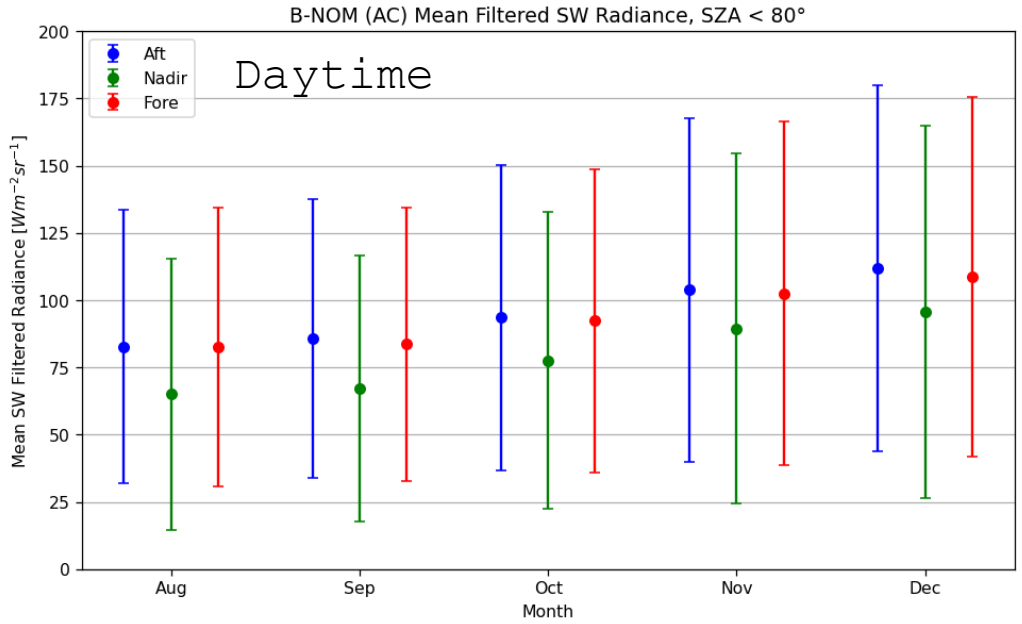
Daytime



Difference SW AFT – SW FORE for cases with RAA between 85° and 95°:

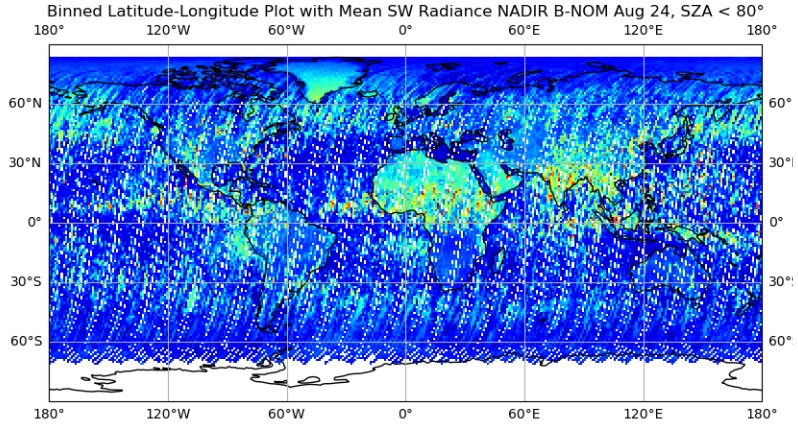


Mean Values of SW Radiance during Daytime per Month

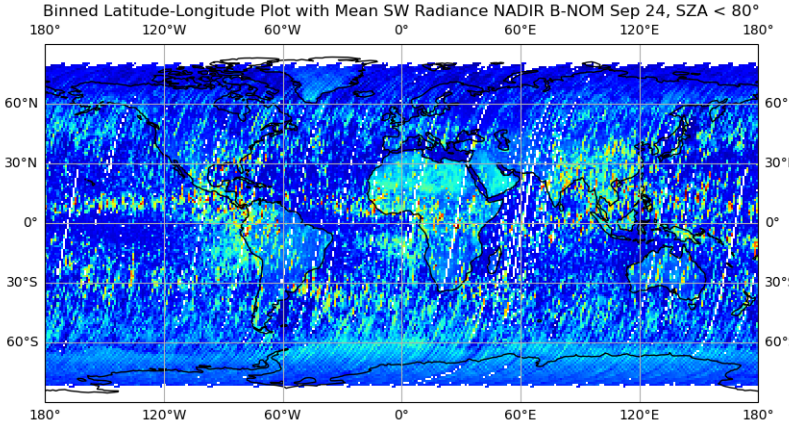


SW Radiance per 1°x1° Lat.-Lon.-Bin, Nadir, Daytime, Aug - Dec 2024

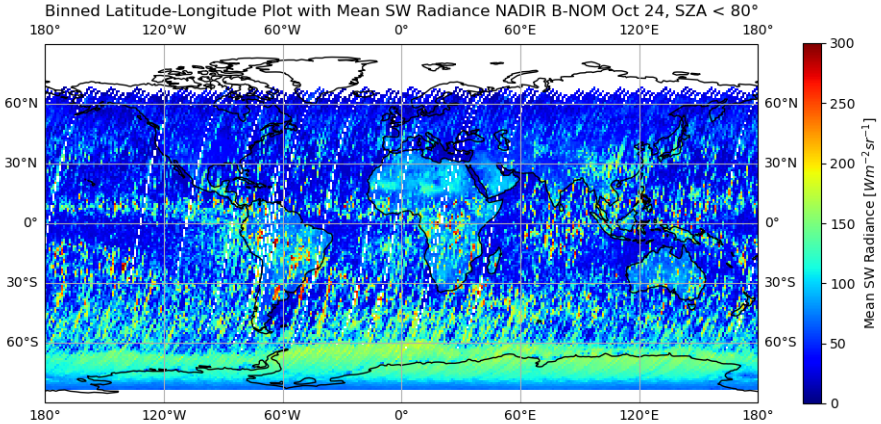
Aug 24



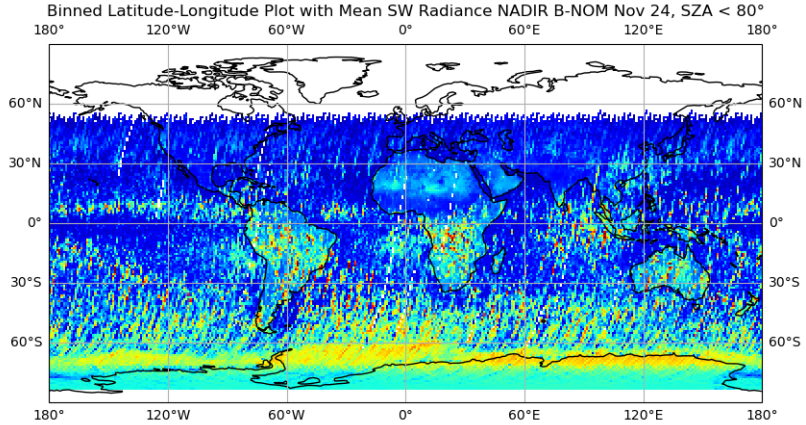
Sep 24



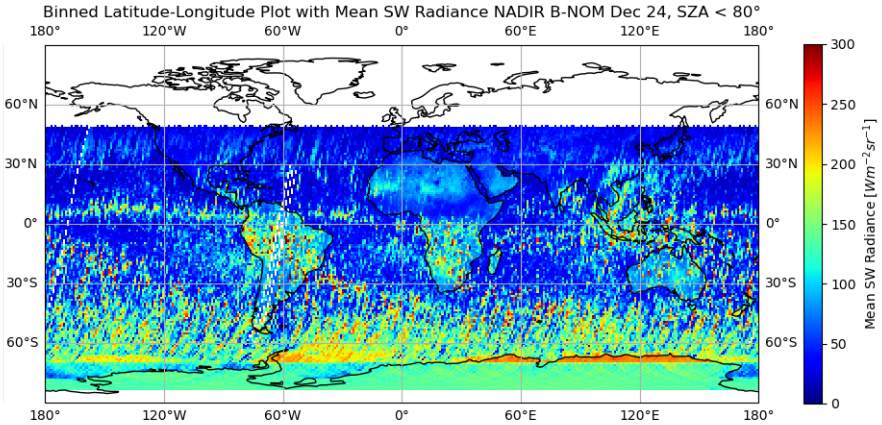
Oct 24



Nov 24

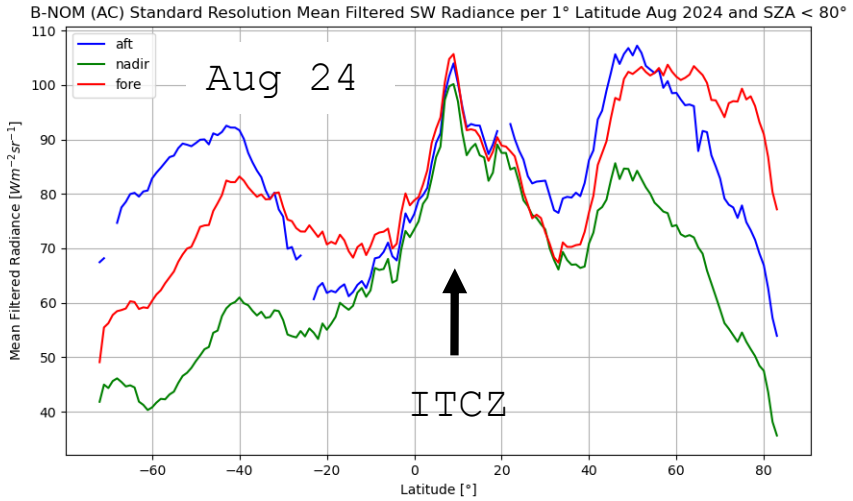


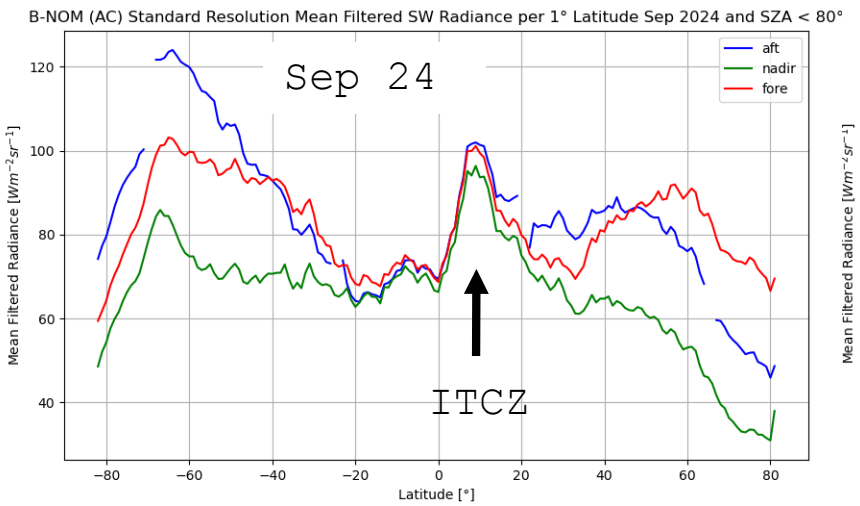
Dec 24

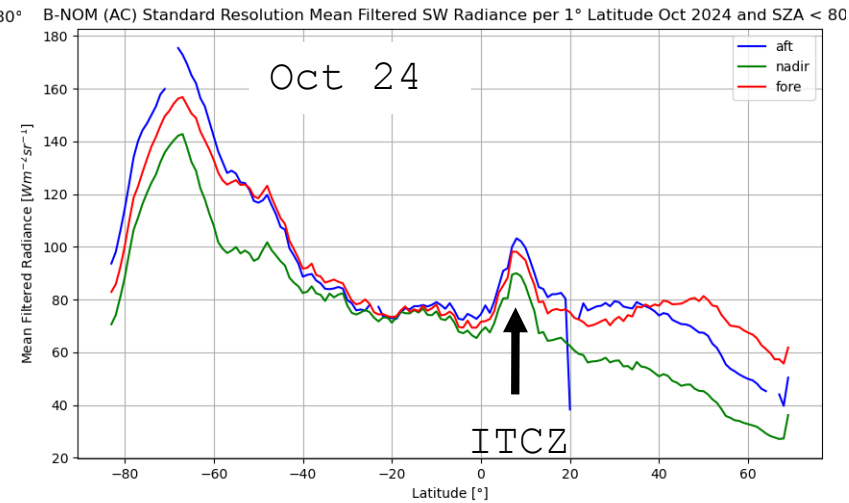


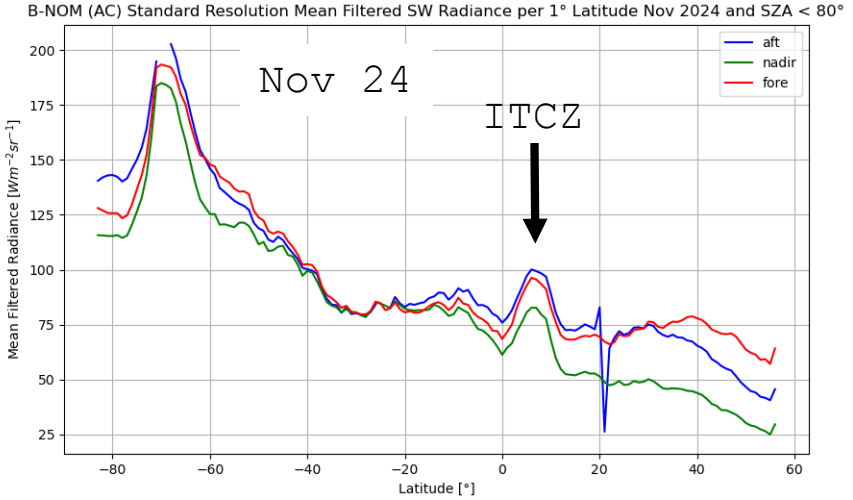
- Largest changes are detected over the Southern polar regions.

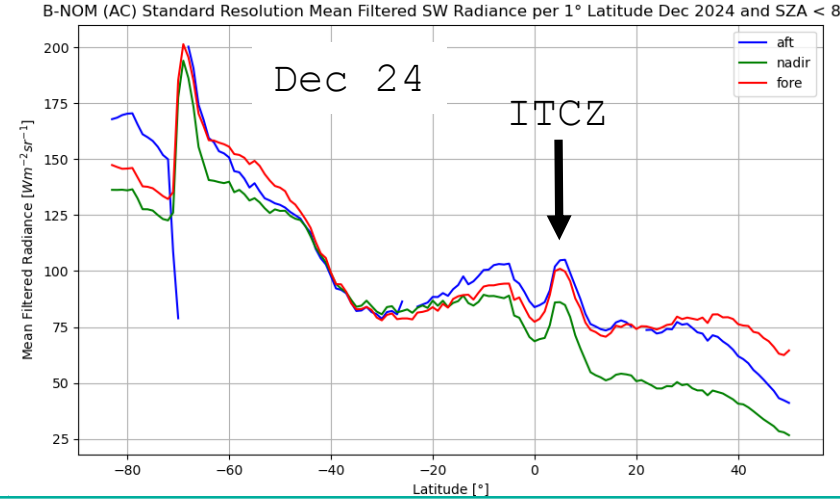
SW Radiance per 1° Lat-Bin, Daytime, Aug – Dec 2024











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Comparison of different resolutions B-NOM product: SW Radiance

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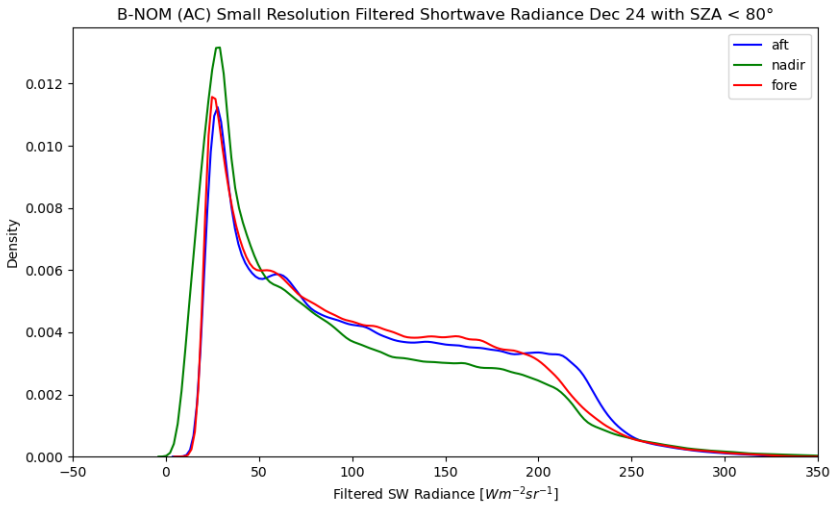
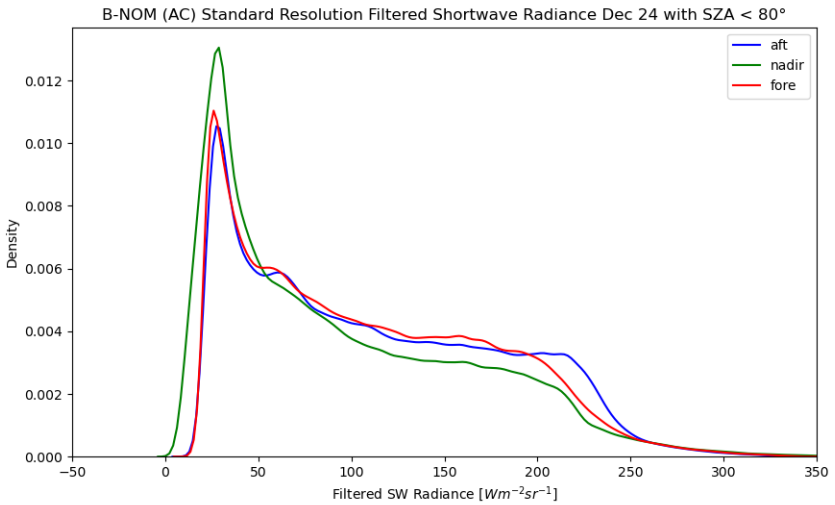
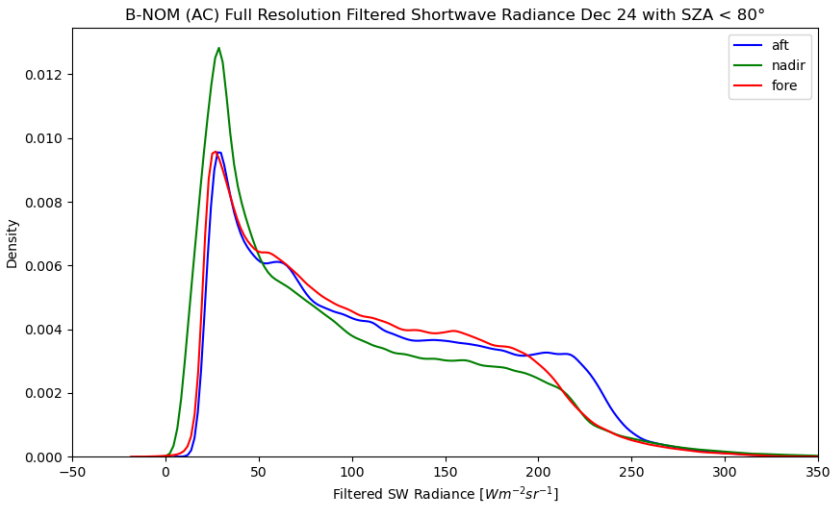


Standard Resolution



Full Resolution



Daytime, Dec 2024

- Good consistency between all three resolutions.

Summary

- B-NOM filtered radiance from Aug 1, 2024 to Dec 31, 2024, baseline AC.
- AFT and FORE views show good agreement.
- Limb darkening and brightening visible.
- Small and standard resolutions are promising, full resolution has currently several issues in the FORE view:
  → Should be solved in a next baseline release.
- Since B-NOM is providing filtered radiances, for scientific studies, it is recommended to use the BM-RAD product that accounts for scene-dependent unfiltering.

Summary

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Thank you