BRAVO Progress Report

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22 November 2024

1 Introduction

The present report is ongoing and is updated whenever new results are available. More figures and explanations for the WP2 will be added after the progress meeting of the 29 November 2024.

2 WP1

2.1 Analysis of the occurrence of collocated/coangular observations with GERB and CERES instruments

Currently, there are two of the Geostationary Earth Radiation Budget (GERB) instruments measuring at two different locations: GERB-3/MSG-3 at 0° longitude and GERB-1/MSG-2 at 45.5° longitude. Both of the GERB instruments have been in sun avoidance since 07 August 2024 (GERB-3) and 1 August 2024 (GERB-1). However, due to an issue with the instruments there were no data from GERB-1 since 15 July 2024, but there would be GERB-3 data between 9 June 2024 to 7 August 2024. At RMIB, an internal product, the so-called GERB-like product is produced and available also during the sun avoidance seasons. The GERB-like product is based on a narrowband-to-broadband conversion from SEVIRI/MSG data.

First collocations between GERB-like (at 0° and 45.5° E) and B-SNG filtered radiances have been performed for the time period of 10 August 2024 to 9 September 2024, for daytime and nighttime separately. The collocations for GERB-like/MSG-3 and BBR during daytime are shown in Figure 1.

The B-SNG filtered radiance values for one month (10 August 2024 to 9 September 2024) have been collocated with radiance data from the CERES FlashFLUX SSF product. The first results look promising. In the future it is aimed at comparing the BBR data with the CERES Single Scanner Footprint (SSF) product. However, this latter dataset is only available

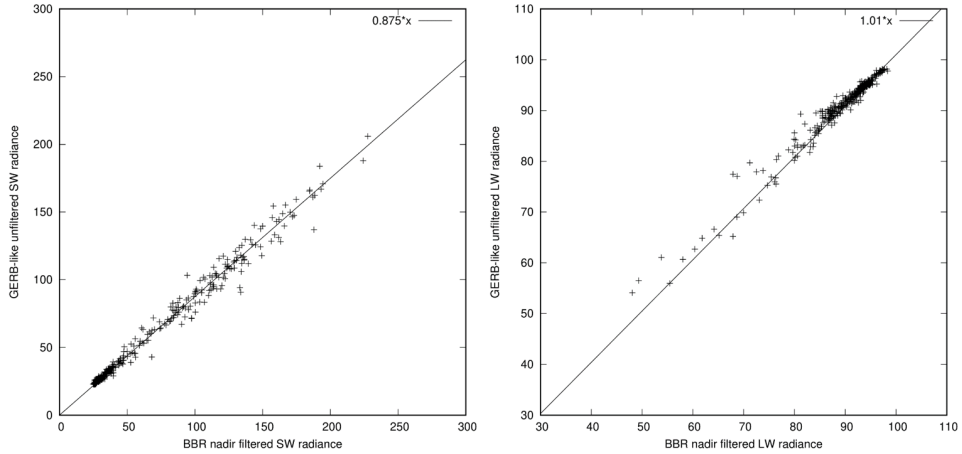

Figure 1: Collocation of GERB-like/MSG-3 SW (left) and LW (right) radiances and the corresponding BBR B-SNG nadir radiances for the time period 10 August 2024 to 9 September 2024.

after a time period of three to four months. CERES SSF data are available from the flight models (FM) one to six that are placed on different satellites.

2.2 Prepare CERES RAPS/PAPS data matching campaigns in collaboration with the CERES team - possibly attend CERES Science Team Meeting in May 2024

Nicolas Clerbaux attended the CERES Science Team Meeting in May 2024 and initiated some first discussions with people from the CERES team. There is an interest from the CERES team to organise matching campaigns with the EarthCARE mission. However, it is too early to already define a concrete date because the BBR data are only since very recent available to the CERES science team.

2.3 Develop algorithm to enable BBR-like filtered and unfiltered broadband estimates from MSI (i.e. narrowband-to-broadband)

The algorithms to perform the narrowband-to-broadband conversion have been developed and also the regressions are available. There is a set of regressions available for the unfiltered radiances and a second set of regressions available to estimate the filtered radiances as expected from the instruments. Although the regressions are available, at the time of the first progress meeting, the reprojection is still missing, i.e. BBR-like radiances would be available on the MSI-grid, but not on the BBR-grid yet. Since very recent, the method to do the reprojection is available as well.

2.4 Definition, selection and characterization of relevant Earth targets for calibration tracking and transfer (e.g. deep convective clouds, desert, ocean)

Typical regions to calibrate the instruments are deep convective clouds, desert regions and the clear ocean. Potential selection criteria would also be to filter very high or low radiance values, to define a certain region by coordinates, to look at the ocean and land mask or also to look at the cloud cover and cloud phase of the images.

This task has not been performed yet, because the focus has been on the level-1 BBR products so far. However, the level-2 BBR products will contain additional information about cloud coverage, cloud phase and the ocean and land mask. Therefore, we would like to shift this task to the third phase (WP3) of the BRAVO project.

2.5 Prepare tool for statistical comparison of the three views (e.g. histograms)

First tools have been developed in python to read and analyse the level-1 products B-SNG and B-NOM as well as the level-2 products BM-RAD and BMA-FLX. Some first results have been shown in the progress meeting that took place on the 24 September 2024. Figure 2 is showing the distribution of the LW filtered radiance values for the three views in the B-NOM product in the time period 7 August 2024 to 9 September 2024. As expected, the aft and the fore view agree quite well and the nadir LW radiance values are in average slightly higher than the off-nadir views. That the off-nadir views agree quite well is also demonstrated in Figure 3.

Figure 4 is showing the same as Figure 2, but for the filtered SW radiance during daytime. Daytime data have been selected by the threshold of the solar elevation angle higher than 40°. Another analysis that has been performed was to calculate the mean LW and SW filtered radiances from the B-NOM product per 1° latitude bin (Figure 5 and Figure 6).

All the figures can be found in the presentation of the progress meeting of the 23 September 2024 on the ECVT Confluence page (https://ecvt.csde.esa.int/confluence/display/ECAOPI/23-09-2024+PM1).

3 WP2

3.1 Visualization of actual BBR products over several orbits, with context given by the MSI (colour composite)

The python scripts to visualise the actual BBR products over several orbits with context given by the MSI are written. Example figures of single frames will be shown at the progress meeting of the 29 November 2024.

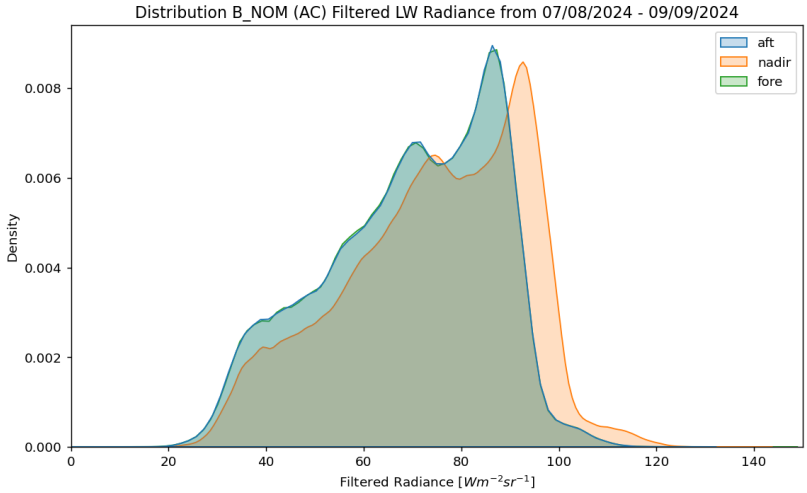

Figure 2: Distribution of the LW filtered radiance of the three views aft (blue), nadir (red) and fore (green) in the B-NOM (baseline AC) product in the time period 7 August 2024 - 9 September 2024.

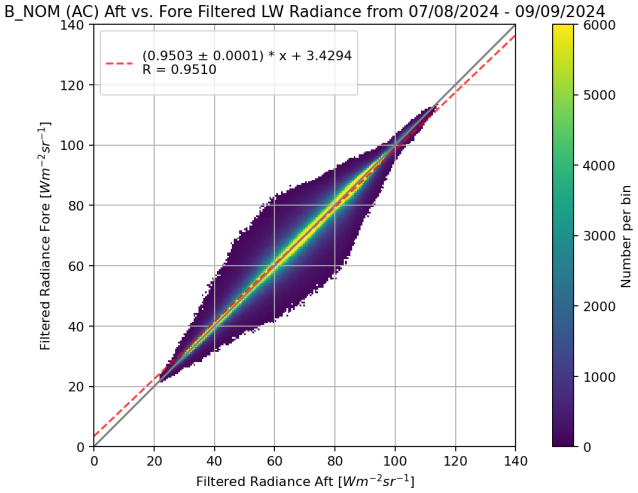

Figure 3: Correlation between the LW filtered radiance of the B-NOM (AC) aft view and the LW filtered radiance of the B-NOM (AC) fore view for the time period 7 August 2024 to 9 September 2024.

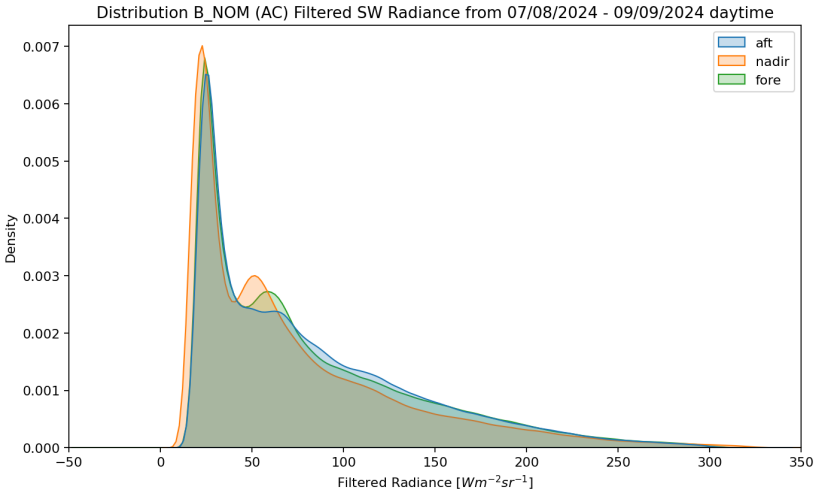

Figure 4: Same as Figure 2, but for the filtered SW radiance data during daytime.

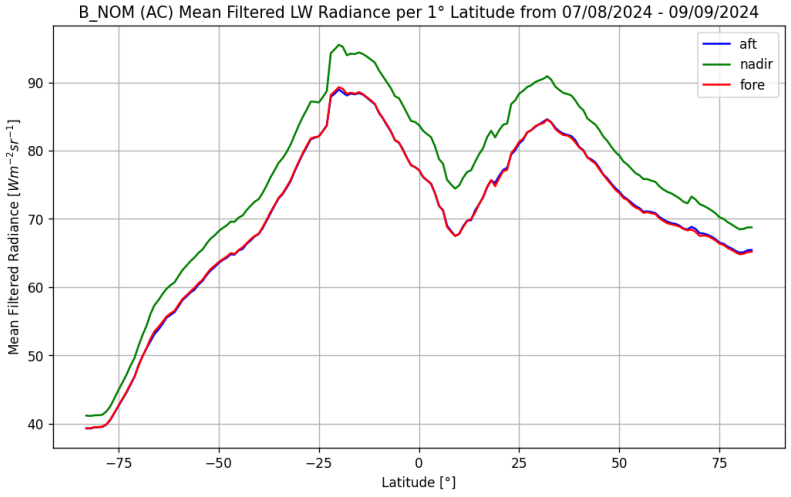

Figure 5: Mean filtered LW radiance per 1° latitude bin for the three views aft (blue), nadir (green) and fore (red) of the B-NOM product for the time period 7 August 2024 to 9 September 2024.

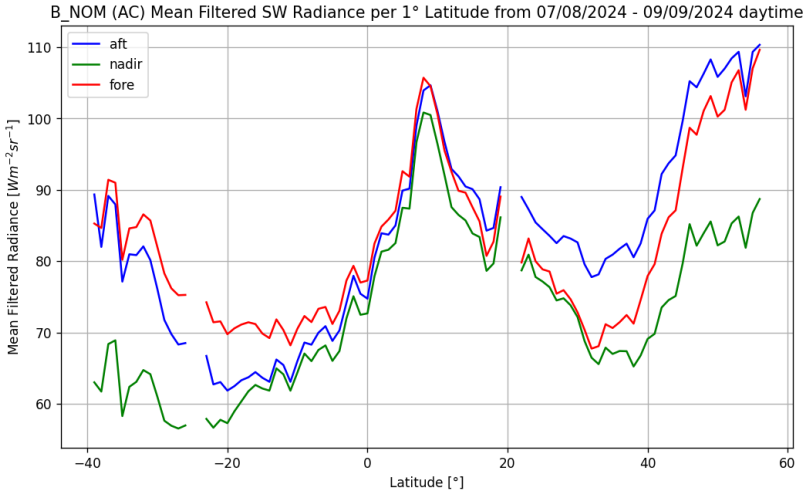

Figure 6: Mean filtered SW radiance during daytime per 1° latitude bin for the three views aft (blue), nadir (green) and fore (red) of the B-NOM product for the time period 7 August 2024 to 9 September 2024.

3.2 Statistical analysis of data from several orbits to highlight outliers, effect of observational conditions and differences between telescopes and pixels

Many of such analyses have already been shown in the first progress meeting at the 23 September 2024. The python code to read data over several orbits has been improved in order to make it more generic for a longer time period of data. Additionally, many more variables have been added. Some new analyses have been performed with focus on the level-1 B-NOM product. There are various frames that contain erroneous data. Quite some time has been spent to detect such frames and exclude them from the data set.

Figure 7 shows the mean LW filtered radiance per 1° lat-lon bin from the B-NOM product for the nadir-view for October 2024. The same plots are also done for the other views, for the SW radiance as well as for other months. In order to check and compare the quality of the different parameters of the B-NOM product, several histograms have been produced of various variables such as the sun-glint, the relative azimuth angle etc.

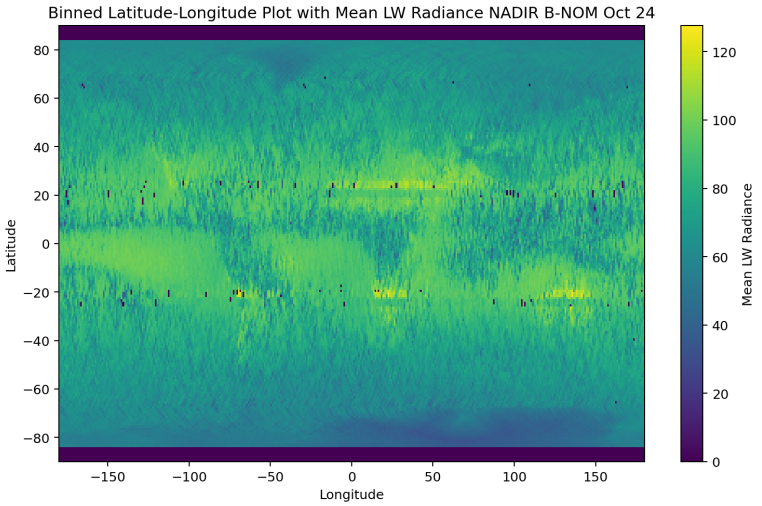

Figure 7: Mean LW filtered radiance per 1° lat-lon bin from the B-NOM (AC) product for the nadir-view for October 2024.

3.3 Analysis/visualisation of ratio between BBR and MSI-based BBR-like data

There are no results of this task yet, but we are hoping to be able to show some very preliminary figures by the meeting on the 29 November 2024.

3.4 Additional studies to address extreme and challenging conditions, e.g. sun-glint, high contrast changes during or close to the acquisition period

The sun-glint has been calculated and some histograms have been generated. Otherwise, no additional studies showing extreme and challenging conditions have been performed yet, but we would include some additional analyses in the framework of WP3.