Response to the Anonymous Referee #1

Summary
This study calibrates the EPIC imager channels with corresponding MODIS band calibration using two different methods. They apply SBAF and show that the regression offsets are closer to a zero offset in version 2 EPIC, which has accounted for stray light. The EPIC absorbing channels were calibrated using lunar targets after adjusting for a small spectral shift. The absorbing channel calibration using this method was compared to ROLO and was found to be within 10%. This paper is ready for review after the following issues have been addressed.

I appreciate the authors adding a section of how the EPIC observations can be used scientifically.
I have few more minor comments. After these have been addressed I approve the paper for publication. I do not need to review the revised paper.

We are grateful for the Referee's detailed and insightful comments. Below we provide our responses.

Specific Comments

Page 2 line 8. glints-> glint

We have corrected the typo.

Page 3 line 12. EPIC has 12-bit radiometric resolution. It samples the Earth 10-20 times a day. It combines 4 pixels (8^2 km) into 1 pixel (18^2 km). It seems odd, to lower the spatial resolution, rather, than lower the radiometric bit rate from 12 to 10 bits, or to increase the number of Earth images per day. Many geostationary instruments have only 10-bit resolution. Can the authors explain why keeping a 12-bit resolution is so important for the EPIC retrievals?

We share the referee's curiosity. While we do not feel sufficiently qualified to discuss specific spacecraft design decisions in the paper, we understand that a number of factors, not necessarily of purely scientific nature, may have contributed such as the amount of on-board storage and the availability of the deep-space communication antennae.

Page 3 line 21. For a sensor at L1 it seems quite odd to make the spectral response functions extremely narrow, especially if you are trying to capture as much light as possible in order to increase the signal to noise ratio. The MODIS sensor is capable of retrieving clouds, aerosols, land use properties, with broad spectral bands. What retrievals need such narrow spectral response functions?

Similarly to the previous comment we do not feel sufficiently qualified to provide a definitive answer. From our discussions with people involved in EPIC design, we understand that the spectral width of EPIC channels is not linked to the gases, clouds or aerosol retrieval requirements but rather to its filter-wheel design. Specifically, please see “Rotating shutter and exposure times” section at https://epic.gsfc.nasa.gov/epic which states that “In the refurbished design, the filter widths were adjusted ... to improve the uniformity of exposure across the CCD.”

Page 3 line 27. Is there a reference that describes the Version 2 improvements?

We are not aware of any publications that detail the differences between Version 1 and Version 2. The version 2 improvements have been briefly described in the manuscript titled “Earth Observations from DSCOVR/EPIC Instrument” that has been recently submitted to BAMS" We added this reference to the text of the paper.

Page 4 line 7. What is the dwell time to make an observation? How much does the Earth rotate underneath during the measurement time?

We added the following explanations:
The exposure time varies between 0.046 second for the 443nm channel to 0.025 second for the 780 nm channel. During these times the Earth rotates less than 20 meters. Compared to many low-orbit radiometers that perform cross-track scans to create an image, EPIC filter-wheel design means that image acquisition is nearly instantaneous. However, there is a delay of ~3 min between blue (443 nm) and green (551 nm) and ~4 min between blue and red (680 nm). In 4 min a point on the equator will rotate approximately 110 kilometers. The geolocation algorithm ensures the spatial collocation of the spectral channels for each pixel.

Figure 4. Are these all the EPIC and MODIS matches from June 2015 and March 2017? Please state this in the figure caption.

We added the following sentence to the caption: “The matches between June 2015 and March 2017 are shown.”

Page 4 line 28. The pixel homogeneity was the greatest limiting factor. Less than 5000 matches were found, during a time period of 1 ¾ years. The pixel homogeneity of both MODIS and EPIC must be small. This is one way to avoid having to deal with navigation differences.

Has the version 2 navigation improved over version 1? What makes the navigating this sensor so difficult?

The accuracy of the geolocation did indeed improved in Version 2. The much larger distance between the Earth and the spacecraft compared to the low earth orbit instruments and strong effects of the Earth’s sphericity complicate EPIC geolocation. We added the following to the end of section 4: “An improved agreement between the two methods for Version 2 data may partially be attributed to more accurate geolocation algorithm. Other factors such as the straylight correction and spectral correction are discussed in the following sections.”

In the acknowledgements, you state that Karen Blank helped out with the EPIC image geolocation. Is this an improvement to the version 2 navigation that she implemented? To make the EPIC data more useful, how was the EPIC data for this study navigated improved upon, which was found in the version 2 data?

Karin Blank is the person responsible for the EPIC geolocation algorithms for both version 1 and 2 EPIC data. She developed and implemented a number of improvements to the geolocation algorithm. It is briefly described in the manuscript titled *"Earth Observations from DSCOVR/EPIC Instrument"* recently submitted to BAMS.

Page 5 line 4. It is fortunate that the EPIC sensor is not degrading over time. If it were degrading the first approach could not be used to monitor the degradation. Also, if one picks a reflectance threshold using the same channel that needs to be calibrated, and it is degrading, the true sensor degradation would be underestimated. Would it not be better approach to use a frequency threshold, as you suggested as 10% or 15%?

The threshold requirement is only applied to the matching MODIS pixels which are assumed to be well calibrated and stable. The only requirement for the matching EPIC pixels is the homogeneity of the neighborhood (small relative standard deviation). We added this clarification to the text.

Page 5 line 12. But the first approach is crucial since it verifies that the sensor response is linear. However, the lack of sampling over the dynamic range, the linearity of the sensor cannot be verified, using approach one in its current form. But, I do agree that approach one does show that the stray light corrections are causing the linear regressions offset to be closer to zero.

We agree.

Figure 5. The 780nm M/E ratio in the caption of 1.141 does not match the M/E in the plot of ~1.4.

We have corrected this typo.

Page 7 line 10. SCHIAMACHY -> SCIAMACHY

Corrected.

Page 9 line 13. Did the full moon and new moon data provide the same channel ratios? Which ratios are provided on line 15? Can the lunar phase symbols be used rather open circles to assure the readers that the ratio is the same for new and full moon conditions?

The data in Fig. 9 are all for full moon. The new moon data were used on day 609 not shown in Fig. 9. The new moon data provided the same channel ratios as the full moon data.
We added the above information to the figure caption.