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## ***Interactive comment on “The GOME-2 instrument on the Metop series of satellites: instrument design, calibration, and level 1 data processing - an overview” by R. Munro et al.***

**Anonymous Referee #2**

Received and published: 5 November 2015

Section 1 The authors should provide a high-level list of requirements (more than just spectral range and resolution) that govern the instrument design and characterisations. The various requirements can be distributed in the various subsections, but are needed to motivate why the instrument is designed, characterised, operated, and corrected in a particular way.

The authors neglect to discuss the accommodation of GOME-2 on their respective spacecrafts. How is the instrument oriented? Data rate? etc.

Page 2, Lines 21-24 Please indicate along-track and cross-track for dimensions.

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Page 3, Line 20 It might be helpful to the reader to mention that the dispersion direction is across-track. Then, in Section 2.4 this can be referenced as a reason why there is no concern over inhomogeneous slit illumination.

Page 3, Line 26 The authors might consider indicating that the 3rd beam bypasses the prism.

Page 4, Line 8 It is not entirely clear what an open-loop temperature control is and how that determines the ultimate PMD temperature.

Page 5, Line 4 Please refer to Band 4, or Bands 1b and 4.

Section 1.3, paragraph 1 Documents that are not publicly available are not generally cited as references. If these are available, please cite a location. If not available, please remove.

Page 6, Lines 5-12 Unnecessary information. Can't the authors simply say that the slit function is characterised at sub-pixel resolution pre-flight? Does the reader need to know that this work was somehow "additional"?

Section 1.6, Line 23 It is not clear what is meant by "scanning the ground at constant speed". Do the authors mean across-track speed? Perhaps if they explain very briefly how the scan mirror actually operates (continuous vs. stepped motion) in Section 1.5.1 it will help the reader to understand this discussion. How are the photons collected that make up a reported spectrum?

Page 10, Line 1 The pronoun "Their" should be replaced with its antecedent.

Page 13, Line 19 Please explain how dark currents can be calculated for different integration times without separating the offset and time-dependent components. Is it because Earth-view timing is employed when measuring darks in eclipse? If so, this should be mentioned somewhere (Section 1.5.2?).

Page 13, Line 25. Can the authors cite comparable performance results to back up

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this claim? Or at least be more specific about what aspect of this detector makes the quoted rate normal.

Page 13, Line 26 Can the authors be more specific what they mean by "noise pattern"? Is this the standard deviation of a single pixel's signal, or is it a measure of DSNU (dark signal non- uniformity)?

Section 2.3 Please motivate the need for a PPG correction. Why doesn't the pixel-by-pixel ground calibration obviate the need for such a correction? And why does this need to be monitored if the primary cause of PRNU is pixel size?

This paper does not discuss the type and wavelength of the LEDs. So it is not clear from the discussion here that the LEDs are capable of accurately detecting changes in photon response for a given channel.

Page 14, Line 8 Please clarify what is meant in this sentence. Would it be clearer to say "changes" rather than "increases"? Increases in what?

Page 15, Lines 2,3 Please explain or rephrase this sentence.

Page 16, Lines 3 Is there a way that temperatures from Figure 10 can be instead included in Figure 9?

Page 16, Line 17 Change the word Four to For.

Page 17, Lines 11,12 The authors provide a tantalizing reference to sun-normalized radiances, but go no further. Is this ratio something that's provided in the Level 1 product? If not and the user is expected to perform this calculation, how is he expected to do it? For example, the authors have previously discussed the spectral instability through an orbit. I assume that the spectral scale is provided for each Earth spectrum. I also assume that a separate scale is provided along with the SMR. Is it the user's responsibility to adjust the two spectra to the same scale?

Page 21, Lines 24-27 Can the authors speculate why this may be occurring? Do they

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think it plausible that increased contamination on a specific optical surface or surfaces may be to blame? Since the optics prior to the entrance slit are usually the ones that degrade, how do they explain an increase in spectrometer stray light?

Page 26, Lines 23-26 The authors mention stable scene results as a validation of changing Earth radiance calibrations. It would be very informative to provide a comparison of those results with the changes observed through the calibration approaches discussed in this paper. At the very least, the authors should cite references for that work.

Page 27 This would seem an opportune place to go into a little more detail regarding in-flight calibration errors that can affect the accuracy of the Level 1b product. The authors describe various degradations and inconsistencies in qualitative terms but do not provide plots or hard numbers. How is the reader supposed to evaluate the potential uncertainties in the Level 1b radiance product? My comment here may or may not be relevant depending on the authors' intent for this paper (something that is not entirely clear to me; see next comment).

Page 27, Lines 26-28 The abstract states that the quality of the Level 1 data product will be presented. That appears inconsistent with these lines of text. It is also inconsistent with what I have read throughout the paper, esp. in Section 4. This paper appears to be an instrument/algorithm description paper rather than a Level 1 product paper. The authors should remove any suggestion in the introduction that this paper deals with product performance.

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Interactive comment on *Atmos. Meas. Tech. Discuss.*, 8, 8645, 2015.

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