

The manuscript titled by "Retrieval pseudo BRDF-adjusted surface reflectance at 440 nm from Geostationary Environmental Monitoring Spectrometer (GEMS)" shows detailed explanation of GEMS surface reflectance retrieval algorithm. The manuscript describes well for the purpose of algorithm, application, and its validation results. However, some correction points have remained, such as confused word using or lack of detailed figure captions. Therefore, this manuscript will be revised before accepting the journal.

Detailed comments are listed below

- 1) Some words are rarely used in the algorithm fields. The algorithm is just estimation and guessed values from several assumptions. Therefore, 'calculation' is rarely used. In addition, 'outputs' in section 2.2 is also not frequently used for the retrieval products, and 'generation' in section 3.3 is also rarely used. Please check the word related to the retrieval and retrieved dataset explanations and correct it.
- 2) P1 L19: land surface reflectance is essential to the satellite remote sensing, but the surface signal is negligible to the 'ground' remote sensing. Therefore, please change the 'remote-sensing' to 'satellite remote sensing'. Also, many points in the manuscript have similar word using. Please correct it.
- 3) P2 L32-L41: From this manuscript, all the satellite algorithms are based on the minimum reflectance technique. However, it is doubtful that the minimum reflectance technique is one of the method for the surface reflectance retrieval. In addition, the GOME and OMI climatological surface reflectance data is partly different to identify the maximized surface signals. The detailed previous retrieval algorithms and other reflectance identification techniques are required.
- 4) P2 L42-58: For the Level 2 scientific product explanation, the author needs to include the references, such as ATBDs or papers of AMF errors.
- 5) P3 L60: References will be added with respective to the different products of LER.
- 6) P3 L84-91: The author shows the suggestion of the methods. However, the purpose of this study and importance of study are not included in the Introduction. Please include the purpose of study and also describe the sections.
- 7) P4: Please change the order of section. Section 2.1 will be shown after the Section 2.2.
- 8) P4 L104: Level-1C → Level 1C (L1C)
- 9) P4 L110: 'it does not provide an official cloud mask': The GEMS officially provides the cloud product (GEMS CLD). It is confusing to the reader. What is this sentence means?
- 10) P4 L110-111: For the clear-sky identification, is this study uses the CCP > 1000 hPa,

addition to the $ECF < 0.2$ and $CCP = 1013\text{hPa}$? It has advantage of clear-sky identification from falsely detected as cloudy pixels. However, how about the cloud conditions in real, but cloudy from GEMS CLD?

- 11) Change "R-value" to 'r'
- 12) P4 L116-117: The author shows the accuracy of GEMS AOD at 443 nm. However, I am doubtful that this accuracy results is not guaranteed different spectral AOD accuracy. During the spectral conversion of AOD, the error will be enhanced. Why don't the author use the 443 nm AOD values?
- 13) P5 L125-130: For the supplement of GEMS AOD gap, this study used the CAMS AOD values. However, the CAMS AOD have significant biases as compared to the GEMS AOD. The AOD bias between GEMS and CAMS will be affected to the discontinuous spatial distribution of AOD, and thus affecting to the surface reflectance calculation. How much this bias affecting the surface reflectance estimation? In addition, how did this study correct the AOD bias between CAMS and GEMS?
- 14) Section 3: Before beginning the section 3, the author needs to the definition and calculation process of Top-of-Canopy from GEMS.
- 15) P5 L147: what is the 'traditional minimum reflectivity method'? Please add the details and references.
- 16) Figure 1: Change the caption to "Flowchart of GEMS BSR algorithm."
- 17) Equation 1-5 and related sentences: For the equation writing, please use the subscript. All the equation variables are not use the subscript and it may confusing to the equation. In addition, all the equation variables will be clarify in the manuscript.
- 18) P6 L160: For the 6SV RTM, How to adopting the spectral response function of GEMS?
- 19) Table 1: For the Aerosol type, what is "continental"? Do you have any detailed aerosol optical and physical properties, or related references? In addition, the TCO value range is too narrow. In East Asia, the total ozone is ranged from 200-600 DU based on the daily data. 250-350 DU ranges are too narrow. Do this narrow TCO range affect the surface reflectance retrieval?
- 20) P9 L231: This study uses the 15-day period for the clear-sky identification. However, 15-day is too narrow temporal window. From the below reference, the 30-day temporal window is essential to identify the clear-sky conditions.
Park, S. S., Yu, J. E., Lim, H., and Lee, Y. G.: Temporal variation of surface reflectance and cloud fraction used to identify background aerosol retrieval information over East Asia, *Atmos. Environ.*, 309, 119916.

- 21) Figure 3: The intercomparison has been done by using the GEMS TOC. By the comparison with GEMS TOC, how to be explain the significance of accuracy improvements?
- 22) P11 L275: GEMS SFC is not defined in this manuscript.
- 23) P13 L299: Please add the references and detailed products used in this study.
- 24) P15 L315: From Table 1, the AOD bin range is not exceeded to 1.5. How to be analyzed the AOD ranges up to 2.0?
- 25) Figure 8: Is it possible to include the direct comparison between GEMS BSR and LERs?