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Atmospheric Measurement Techniques Discussions

Interactive comment on "Overview of the O3M SAF GOME-2 operational atmospheric composition and UV radiation data products and data availability" *by* S. Hassinen et al.

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The manuscript provides an overview of the operational products available from the METOP GOME-2 series of instruments and their performance. It gives references (articles and web sites) for more detailed algorithm descriptions and validation analyses as well as product access. The results are well-referenced and give a good introduction to the different products available from different program components and their validation. The paper is well-written and logically ordered with good thought to the selected figures.

There is not a section devoted to the Level 1 Product quality or validation. Some discussion should be included giving the status of the measurements – long-term stability, scan angle dependent errors, and polarization corrections. These should be related within the rest of the paper to individual product's sensitivities to such errors. For example, the ozone profile and surface reflectivity products are sensitive to drifts in the radiance/irradiance measurement ratios.

Some additional details should be included for the total ozone column algorithm. Where does the algorithm get its cloud height and cloud faction information? (The ozone profile retrievals use Cloud pressures retrieved from O2 A-Band measurements. The Level 1 products contain some cloud information. If this is used in the product retrievals, then its theory and validation should be in this paper.) How is this information validated, and is its accuracy stable over time? What are the principle quality/error flag considerations (Aerosols? SO2? SAA?) in terms of frequency and severity for the total column ozone and ozone profile products? Does the product output file include the assumed profile and a one-dimensional averaging kernel to allow comparison and interpretation of the results with respect to other column ozone measurements or forecasts? If not, is this under consideration for future improvements?

Given the variety of approaches used to separate stratospheric and tropospheric NO2 columns, another sentence or two should be added expanding on the sentence beginning on Page 7004, Line 24. As for the total column, details on where cloud information is obtained should be provided. I do not understand the statement starting on Page 7005, Line 29. While on any given day the two instruments will make measurements at different times for a specific location, over the 29-day orbital cycle, I would expect that these variations would be similar. That is, that a given location would be seen at a variety of scan positions to the east or of the nadir tracks west (earlier or later than the local overpass time at nadir for that latitude which is the same for both Metop-A and -B) for both instruments over the course of a month. It was the case that cross-track biases in the Absorbing Aerosol Index for OMI were aliased into an orbital-track aligned set of

features in monthly maps associated with the EOS-Aura's 16-day orbital track repeat cycle but these were very small.

For the H2CO discussion on Page 7008, Line 15, clarify whether this is primarily due to increase noise caused by decreased throughput or some other factors affecting the measurements. This could be handled be referring to an expanded Level 1 section where the GOME-2A signal level changes would be discussed. Besides the use of BrO (Page 7008, Line 20) estimates used for the H2CO retrieval, are there any other combined retrievals in use or planned, e.g., for the new OClO and Tropospheric BrO Page 7019 Line 18? There could be complications from O3, SO2, NO2, and H2CO absorption features depending on the wavelength intervals selected.

Are the SO2 flagged pixels described on Page 7009, Line 20, used to set quality flags for any other products? Can you provide an overlay contour (say at 2 DU) for the SO2 product for Figure 19? That is, show how the AAI and SO2 products see the dispersions of the volcanic ash and SO2 clouds, respectively?

Since the GOME-2 instruments measure both radiance and irradiance, you should provide more information on the source of the "Degradation" mentioned on Page 7015, Line 26. How large would the calibration drifts in radiance/irradiance ratios for GOME-2A have to be to produce the trends seen in Figure 18? Given the large differences between the two ozone profile products apparent in Figure 17, are there any on-going efforts to adjust the two GOME-2 Level 1 products to agree with each other? Is similar degradation expected for the GOME-2B (Page 2016, Line3 "show this effect yet.") and if so what is its source? Will reprocessing (Page 7019, Line 13) help to remove these drifts and differences?

Are there any adjustments made to the Level 1 measurements or Level 2 products to reduce cross-track biases in the AAI products? That is, are "clean" atmospheric regions examined to check for scan dependent biases in these products? I suspect not as Figure 19 shows a cross tack bias of approximately 1 unit at the Equator with

middle scans lower than edges. Are these expected from some path-length dependent properties of the AAI retrieval? How do these cross-track biases relate to the target 0.5 index accuracy? (Note: the scale for Figure 19 does not identify a value for pink. The reader should not have to assume that the color is used for values > 4.) Are any time-dependent adjustments made to the AAI products? Are any adjustments made to bring the GOME-2A and GOME-2B products into agreement?

How are the changes in the GOME-2A instrument which produce trends in the radiance / irradiance ratios taken into account in the LER computations over the entire mission (Page 7017, Line 14 et seq.)? Do the dates when minima are found show any temporal patterns?

Unless the photolysis product (Page 7018, Line 5) is not made for GOME-2A, it should be simple to fill in the gaps in Figure 21. If so, this option (as used for Figure 2) should be noted.

What is the purpose of the reprocessing (Page 7019, Line 13)? Are there newly reprocessed Level 1 data sets? How much do they change from the operational ones, what were the sources of the errors, and what artifacts or errors will be removed or reduced in the products?

Editorial comments:

The paper introduces the shorthand GOME-2A and GOME-2B for Metop-A GOME-2 and Metop-B GOME-2 but sometimes has "Metop-A degradation" or "GOME-2 A and B" or "for Metop-B" or "GOME-2 on the Metop-A" instead (E.g., see Page 7008.). Make these consistent.

Page 6995, Line 15, "quarantined" -> guaranteed"

Page 6999, Line 3, "build" -> "built"

Page 6999, Line 16 "The Metop satellites are flying on a sun-synchronous orbit with an equator crossing time of about 09:30 LT (descending node) and a repeat cycle of

29 days." —> "The Metop satellites are flying in sun-synchronous orbits with equator crossing times of approximately 09:30 LT (descending node) and a repeat cycle of 29 days."

Page 7015, Line 27. The "tropospheric" and "at most altitudes" do not go together. Remove one of them. Also, 25-30 km is mid-stratosphere not higher.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6993, 2015.