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Atmospheric Measurement Techniques Discussions

Interactive comment on "GOCI Yonsei aerosol retrieval version 2 aerosol products: improved algorithm description and error analysis with uncertainty estimation from 5-year validation over East Asia" *by* Myungje Choi et al.

Anonymous Referee #3

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The paper describes an improved algorithm version for the multi-spectral AOD retrieval from geostationary GOCI observations over East Asia. With its capability of monitoring hourly AOD comparable to MODIS (two-time daily) observations the new version algorithm provides important temporal resolution and good coverage in particular for air quality applications and thus covers a highly relevant topic for AMT. The quality of the new dataset is thoroughly analysed with a 5-year dataset and significant improvements (accuracy, coverage) are documented. A specific strength of the paper is its discussion and definition of a parameterized uncertainty function, which is of particular

importance for data assimilation of the datasets. The algorithm improvements benefit from experiences with algorithms for similar multi-spectral radiometers onboard polar platforms (MODIS and VIIRS), which are correctly cited and suitably adapted to the GOCI sensor. Several images and some aspects of discussions should be improved (see further comments). I therefore recommend a minor revision.

Further comments: The paper needs a thorough native speaker English correction, since there are quite a lot of cases where the article ("the") is miss-used or other incorrect sentence structures occur. The paper introduces aerosol properties AE, FMF, SSA as side variables, but does not discuss the information content of the measured "spectra" and the value of those properties as output – this discussion should be added (while not overstating the weak information content for those, in particular SSA) – without proper discussion the output of those properties must be named as simple diagnostics (output not validated) or removed. In the conclusion the paper refers back to air quality applications, but misses to strongly state the importance of this retrieval with all its relevant positive aspects (hourly resolution, NRT capability, predicted uncertainties, thus well suited for data assimilation and regional air quality monitoring applications) – I recommend to strengthen this discussion in the conclusion before the outlook. Table 2 values of mean bias (MB) have too many significant digits, which should be reduced to a realistic level of detail within AERONET accuracy (e.g. 2 or 3 digits maximum); e.g. a value 3.22E−05 is exactly zero. I suggest that several figures can be improved to help better reading and avoid miss-interpretation. In fig. 2 I recommend to remove the linear fit (solid lines), which is not appropriate for AOD distributions. I suggest to reduce the y-axis range of figures 7, 8, and 9 to [-0.2, 0.2], so that the main information (average lines) becomes clearer (I think we can compromise on a small part of the 16th / 84th percentile). The same applies for fig. 10, where the y-axis range would suffice up to 1.0 and the legend could be outside the plot. In section 4.1.5 I get confused how the fraction of pixels analysed after cloud masking is interpreted as cloud fraction. What does it mean that 3 plots with 3 different proxies for cloud cover in fig. 8 show different dependencies of the AOD error? In section 3 it would be of high interest to split off

the analysis of coastal sites from the one over land and present a separate analysis for coastal areas.

Detailed comments: p.2 / l. 7: this sentence needs rewording, since surface does not belong to aerosol properties p. 2 / l. 11: define PM when it is first used introduction: I recommend to shorten the discussion of air quality, since it is too detailed for this paper where it is only relevant as application domain, but not further discussed p. 2/ l. 32: I suggest to reword accuracy to agreement – an established satellite dataset is used as reference, which is valuable inter-comparison, but not validation (this would require a ground-based reference measurement) p.4 / l. 4-7 would benefit from a bit more detail on the unified aerosol model as in fig. 1 (e.g. how many types) p. 4 / l. 16 / 17 would benefit from more explanation as in fig. 1 (how average least difference models to obtain AE, FMF, SSA p. 4 / l. 27 for more detail better refer to “next sub sections” rather than “thereafter” p. 5 / l. 15 provide definition / formula of the GEMI p. 5 / l. 20-30 motivate why you use AODmax=3.6; briefly discuss the use of negative AOD p. 5 / l. 20-25 why do you use 1%-3%; also discuss the possible impact on algorithm outcome with a 5-year climatology in case of a major land use change during that period p. 10 / l. 1 reword “whole” to “all” p. 10 / l. 3 reference to numbered section p. 10 / l. 5: remove “of” p. 11 / l. 4 an increase of the correlation from 0.88 to 0.89 is absolutely insignificant and thus meaningless! One should avoid such over-interpretation p. 10 / l. 16f and p. 11 / l. 7ff “counterpart” should be reworded p. 11 / sec. 3.6 – what does “mode near 0.11 (0.10-0.12)” mean section 3.6 the ocean mode looks not identical in the plot, but in the text you give identical numbers – please provide calculated values of modes p. 12 / l. 1 correct wrong wording “per each” p. 12 / l. 1 the terms are somewhat mixed up. I think that systematic and random or one pair of terms, while bias and noise are the other pair fig. 7 colours red and rose are hard to distinguish – please use two more distinc colours sec. 3.7 discussion of fig. 5 I see practically only very little change – one could therefore consider removing sec. 3.7 and fig. 5 p. 13 / l. 18 word more cautiously: you use one specific set of non-spherical parameters (which is better than assuming spherical particles), but there are many types of non-spherical

particles, which you are not taking into account – the sentence on POLDER and MISR is somewhat out of context –you seem to try to say that those are better suited for non-spherical particles, but this is self-evident by information theory p. 15 / l. 13 explain / define LEO

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