Review for Atmospheric Measurement Techniques

Title: Exploring geometrical stereoscopic aerosol top height retrieval from geostationary satellite imagery in East Asia

By Minseik Kim, et al.

General comments:

This study assessed the application of different viewing geometries for a pair of geostationary imagers, AHI-AGRI and AHI-AMI to retrieve aerosol top height (ATH) information. The stereoscopic algorithm is presented, which converts the lofted aerosol layer parallax, calculated using image-matching of two visible images, to ATH.

What is strongly missing in the manuscript is a discussion on the required ATH quality for different applications. I am not an expert in utilizing the ATH data but knowing the PBL processes I assume that 1-2km offset between calculated and measured on the ground or retrieved from CALIOP ATH is too high and further improvements of the retrieval approach are needed to produce a product of the required quality.

The insufficient quality of a product is a cause for my decision to reconsider the manuscript after major revision, when a better (required for certain applications) quality of the product has been achieved.

Specific comments:

How is ATH defined in the study? How it differs from aerosol layer height? This question came to my mind on P8 L 232

P2, L 31. How narrow? Please, provide numbers or refer here to Sect. 2.2.1
P2, L 31. Please, specify more exactly bypasses time
P2, L 35. I suggest using the word “distribution” instead of “structure”
P2, L 59. Remove “data”
P2, L 62-64. Is it lack if channels or lack of the stereoscopic view, which is insufficient?
P4, Sect 2.1.2. Please, add bands characteristics, as in 2.1.1
P4, L 96. The Advanced Meteorological Imager (AMI) ….
P4, L 97. Please specify new channels if they are used in the study. If not, it is not necessarily to mentioned added channels here.
P4, L 99. Please, clarify: The AMI spectral bands are similar to those of AHI, except for a VIS and IR band; the center wavelengths and spatial resolutions of the VIS bands of AMI and AHI are similar.
P4, L 117-118. Please, rephrase
P4, L 120. CALIOP product is less accurate compared to the ground-based measurements. I suggest naming of the inter-comparison with CALIOP as evaluation, instead of validation. I also suggest discussing first an opportunity for validation with ground instruments and second mention the evaluation with satellites (which in general have an advantage in

coverage, though CALIOP coverage is quite small, but may allow evaluation in the conditions where ground instruments are missing)
P6, Sect. 3.1 Have you considered to develop two approaches, one for land and one for ocean, to resolve the ocean/land contribution at different wave lengths?
P6, L 160. Please, start with the definition of the parallax, then continue with the description of how is was calculated.
P6, L 167. Please, provide short definitions here
P7, L 191. Based on what the AOD lower limit of 0.6 was chosen?
P8, L 228. Based on what the limit of 10km for the ALH was chosen? Can all pixels in the moving window be checked on the presence of AOD data? This will allow avoiding the influence of clouds.
P9, L 242. What is INR error? Is it calculated based in instrument specifications?
P9, L 273. Agree. Why "a simple cause of retrieval uncertainty was involved here?" (L 242)
P10, L 302. Please add the definition for EC
P11, L 308. Please, replace "valid" with "retrieved" or "provided".
P11, L 309. Please, replace "valid" with "retrieved" or "calculated".
P11, L 306-309. Please add to the text the reference to Fig. 6a and 6b .
P11, L 310. The difference of 2 km in the ATH estimation is significant, when one think about the location of aerosol layer regarding the planetary boundary layer (PBL). The knowledge on that (within or above PBL) is important for predicting the further aerosol transport directions and intensity. This is more critical for high AOD loading episodes, which you consider.
Why 1 and 2km difference was chosen as criteria for evaluation? This is very big offset, if we think about possible applications of the calculated ATH. What are typical criteria for CALIOP ATH evaluation? Other ATH products?
P11, L 315-331. Can you discuss the conditions in which the disagreement between two products is most pronounced? And provide plot for AHI-AGRI vs AHI-AMI ATH.
P12, L 342 overestimated…. or aerosols were distributed evenly along the height
P13, Sect.5. To my understanding, collocation of geostationary satellite with ground measurements provides an opportunity for considerably higher number of collocations than with CALIPSO. However, only two cases are considered. To make a conclusion on the validation results, statistics (bias!) should be calculated using all possible collocations. Scatter plot as Fig.8 as well as frequency distribution plot are needed to be presented and discussed.
P13, L 397. Why AOD limit of 0.6 was applied, if "…. not affected by variations in aerosol….

Figure 4. Please, check the location of AMI
Figure 6 c,d. Please change the color scale to see better the difference between two pairs.