

## ***Interactive comment on “Validation of the Absorbing Aerosol Height Product from GOME-2 using CALIOP Aerosol Layer Information” by Veerle De Bock et al.***

### **Anonymous Referee #3**

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In this paper, authors presented results from validation of GOME-2 Absorbing Aerosol Height (AAH) product against aerosol layer height from CALIOP Vertical Feature Mask (VFM) product for a selected suite of volcano cases. The objective of this paper is clear, which intends to present the performance evaluation of GOME-2 AAH product. However, there are several issues and challenges related to validation, which authors themselves also identified as well. First of all, AAH from GOME-2 represents centroid height of absorbing aerosol layer, while CALIOP identifies the height of each detected aerosol layer, so, it is not clear that how GOME-2 performs for a single layer vs. multi-layers of aerosols presented in the atmosphere. In another words, it is strongly suggested to authors to clarify how the maximum and minimum height is derived from CALIOP for

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these two situations and how GOME-2 performs. Secondly, the authors' intention is to validate the performance of GOME-2 AAH for volcanic ash, which is the reason that the validation cases are specifically selected for volcanic eruptions. However, as noted by authors as well, CALIOP have troubles to give the correct type for volcanic ash, therefore, the analyses of GOME-2 performance for different aerosol types identified by CALIOP, seems to me, do not have any merit, and the type actually pre-defined due to case selection. Thirdly, the authors claimed that the performance of GOME-2 AAH does not have dependence on the distance and time in the matchups. This seems to be not convincing, since the analyses were performed when both factors are tangled together.

Some comments and questions are given as follows.

Major comments:

1. Figure 1 and subsequent figures shows one AAH values corresponds to multiples layer height values from CALIOP, it is evident that this is caused by the criteria used for matchups. So, instead of plot all points, why the authors cannot plot mean value and standard deviation from CALIOP for each GOME-2 AAH values? And also those large outliers are from matchups with a large distance difference or a large time difference? It is worth to investigate. . .
2. Analyses of Figure 2 and 3 seems have two factors tangled together. To clearly demonstrate the claim that the degree of agreement between GOME-2 and CALIOP does not have dependence on the difference in both space and time, the authors should bin one variable when analyzing the variability of the other variable.
3. It is understandable that matchup of GOME-2 with CALIOP is challenging, but the matchup criteria between GOME-2 and CALIOP might be too loose, which may lead to these large scatters in the results. Authors are encouraged to explore a relative tight criteria, it is ok to have less matchups, but do not want to include the matchups which really smear the results.