

## ***Interactive comment on “The role of aerosol layer height in quantifying aerosol absorption from ultraviolet satellite observations” by Jiyunting Sun et al.***

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Received and published: 27 August 2019

### GENERAL COMMENTS

The manuscript (v3) has improved significantly. It is recommended to be published after the remaining issues listed below have been addressed.

#### Main comment

The choice of data used for training, testing, and evaluating the SVR algorithm needs to be explained more clearly and upfront e.g already in the introduction, or in a dedicated subsection in section 3 (similarly to Section 2.1.2 for Experiment I). Is the scheme

C1

trained and tested on OMEARUV (augmented with CALIOP) and AERONET data? Is the scheme applied in case studies to UVAI and ALH data from S5P/Tropomi observations and AOD from MODIS?

#### Minor comments

Line 10-11: sentence incomplete

Line 18-19: the sentence “This empirical method is free from the uncertainties triggered by a priori assumptions ...” need to be reformulated. A) uncertainties are not “triggered by a priori assumptions”. You might consider a formulation like “uncertainties due to imperfection a priori assumptions”; B) You can state that a priori assumptions do not appear explicitly in this empirical method, but it needs to be acknowledged that unknown variability in micro-physics contributes to the uncertainty of the results obtained using the empirical method.

Line 24: sentence incorrect “is better agrees”

Line 35/36: add that the index is sensitive to ELEVATED absorbing aerosol. This feature is important in the present study.

Line 75-76 the sentence “From our perspective, ML techniques can avoid making assumptions on poorly-understand aerosol micro-physics as that in the first experiment. ...” need to be reformulated. Proposed: “We employ ML techniques in order to avoid explicit assumptions on aerosol micro-physics as made in the first experiment.”

Line 83-84: We will present the capability to retrieve SSA from UVAI of USING this empirical method with multiple case studies.

Line 85 replace “implemented” by e.g. “outlined”

Line 91 replace “implement” by e.g. “outline” or “report results from”

Line 197: sentence incorrect “from as an alternative”

C2

Line 199: replace "understanding to" by e.g. "knowledge of"

Section 3.4 introduces SVR hyper-parameters tuning and explains theoretically the potential need for different values of the parameter 'p' to account for statistical differences between training and test data sets. The text remains vague about whether this is actually needed in the present case. Table 3 lists only one single value for p, which suggests it is not needed here. Please clarify, and streamline.

Line 421: remove "d" in "potential to retrieved SSA"

It is repeatedly mentioned that "The input features are selected by the Spearman's rank correlation coefficients", which raises more questions than it answers. The rationale should be explained more clearly. (Near Line 265 it is explained that AAOD is chosen as output parameter of the SVR scheme rather than SSA in view of the difference in the correlation coefficients. Is that what is meant with selection of input features?)

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2019-96, 2019.