

Response to referee #2

We thank the reviewer for his/her evaluation of our paper and useful comments that helped improve the manuscript. We appreciate reviewer's time and effort in reviewing the manuscript. Below are our responses to each comment. Reviewer's comments are in the standard font while the responses are in the italic font.

On behalf of the authors,

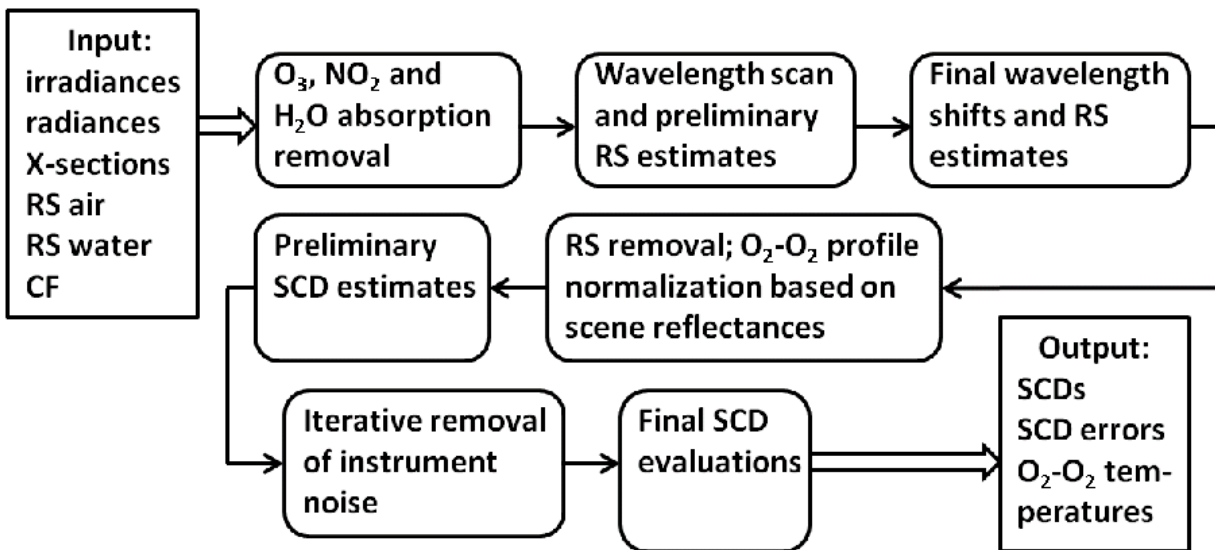
Alexander Vasilkov

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Comments:

First, while the detailed steps of the spectral fitting and cloud algorithms (section 2.2-2.3) are well describe, I still feel difficult to follow. So, I would suggest add a flowchart of algorithm procedures, which will help readers better follow the text.

*Agree. We added the following flowchart of the SCD algorithm:*



*Fig. 1. Flow diagram of the O<sub>2</sub>-O<sub>2</sub> SCD retrieval algorithm. The algorithm input comprises: the OMI monthly-mean solar irradiances, the radiances (wavelength, line-of-sight (row) and position (along-orbit) -dependent), the laboratory cross-sections of O<sub>3</sub>, NO<sub>2</sub> and H<sub>2</sub>O (X-sections), the atmospheric (RS air) and liquid-water (RS water) Raman scattering spectra (all X-*

*sections convolved with the row- and wavelength-dependent OMI instrument line-shape functions), the OMI cloud-fraction (CF) estimates provided by an independent retrieval. RS denotes the amplitudes of the combined air and water Raman scattering spectrum.*

Second, (page 8, line 25) what's the reason for higher OCP retrievals based on your algorithm? I assume it is because different spectral wavelengths are used. But is that also related to the definition of cloud pressure (e.g., OMCLDO2 uses cloud top pressure?)?

*The definition of cloud pressure is same for both algorithms because the both algorithms are based on the MLER model (i.e. OMCLDO2 does not use the cloud top pressure). The both algorithms retrieve OCP from O<sub>2</sub>-O<sub>2</sub> SCD estimates. However, our SCD algorithm is quite different from OMCLDO2. The reason for higher OCP retrievals from our cloud algorithm can be related to slightly higher SDC estimates and also to differences in the effective cloud fraction. We added in the text:*

*Higher OCP retrievals from our algorithm as compared to OMCLDO2 can be related to slightly higher O<sub>2</sub> - O<sub>2</sub> SDC estimates and also to differences in ECF which affect the OCP retrievals. .*