

## ***Interactive comment on “Sulfur dioxide retrievals from TROPOMI onboard Sentinel-5 Precursor: Algorithm Theoretical Basis” by N. Theys et al.***

**Anonymous Referee #2**

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### **- General Comments**

This manuscript describes the SO<sub>2</sub> retrieval algorithm of TROPOMI onboard Sentinel-5P. It well summarized the current status of the SO<sub>2</sub> retrieval techniques, requirements, its error estimates, and validations. The retrieval strategy looks well-planned and this manuscript would be important for the future users of TROPOMI. Hence I would recommend publication of this manuscript for AMT after minor revisions below.

### **- Specific Comments**

Page 18, lines 12-17 : The surface reflectance from Kleipool et al. (2008) generally provides reliable information, but there might be the better option for TROPOMI which has better spatial resolution (which is important for small urban and point source areas). At least discussion related to the spatial resolution of the surface reflectance and

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alternatives for the database would be helpful for this moment of ATBD.

Page 25, lines 23-27 and Page 26, lines 11-14 : The measurement accuracy/uncertainty is major error source of SO<sub>2</sub> retrieval with its measurement sensitivity as the author stated. Thus, it is valuable to add more details of the predicted measurement uncertainties. It might be challenging to evaluate/anticipate the measurement errors at this moment, but at least the authors could add brief discussion based on the requirements of L1b measurement and prior missions so that how much improvements would be expected. The radiometric calibration might include spectrally high-frequency errors such as the stray light and polarization sensitivity (particularly for window 1, from 312 to 326 nm). This might be included in Error source 8, but I would recommend to list those specifically since they are known high-frequency error sources.

- Technical corrections Page 17, line 16 and Page 19, line 8 : Please check if the  $A_c$  is defined in the manuscript. Please clarify the definition of  $f_c$  and  $f_{eff}$  which are used for “effective cloud fraction”.

Page 23, line 14 : I would recommend to use different symbol for error to distinguish from the absorption cross section.

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