

## ***Interactive comment on “Full-physics carbon dioxide retrievals from the OCO-2 satellite by only using the 2.06 $\mu\text{m}$ band” by Lianghai Wu et al.***

### **Anonymous Referee #1**

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Interactive comment on the manuscript “Full-physics carbon dioxide retrievals from the OCO-2 satellite by only using the 2.06  $\mu\text{m}$  band” by Lianghai Wu et al. The manuscript “Full-physics carbon dioxide retrievals from the OCO-2 satellite by only using the 2.06  $\mu\text{m}$  band” contains important new material and it covers the topics appropriate for Atmos. Meas. Tech. The presented results are of practical interest in terms of reducing computational costs as well as optimizing the configuration of the measuring tools for monitoring atmospheric carbon dioxide. The manuscript is well structured and written. The abstract clearly summarizes the paper and main results. I recommend the manuscript publication provided some minor comments would be considered. 1) The proposed algorithm modification (reduction of the input spectroscopic data from three bands to one 2.06  $\mu\text{m}$ - band) has been implemented for RemoteC algorithm. Specific

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feature of this algorithm is using a priori (meteorological) surface pressure. The authors mentioned it (“We do not retrieve the dry air column but compute it using the ECMWF meteorological data”, page 3, line 8). To my opinion, the importance of this feature for the implementation of 1-band version should be clearly noted in the discussion. In the similar algorithms (e. g., ACOS, NIES-GOSAT, and TANSAT) that retrieve surface pressure, the excluding the oxygen A band from the input spectroscopic data is hardly possible.

2) The modified (1-band) algorithm is supplemented by new cloud filtering procedure. The algorithm itself was previously tested on simulated OCO measurements. Has the filtering procedure been tested in the similar way?

3) As follows from table 4, light-scattering by aerosols for the collocated OCO-TCCON observations mostly reduces optical path-length both over ocean (quite predictable), and over land. This reduction is rather successfully corrected by 1-band algorithm in terms of XCO<sub>2</sub> biases (table 3). To demonstrate algorithm accuracy under different aerosol conditions, it would be useful to show the XCO<sub>2</sub> biases (in addition to SD values) for the Sahara region, where we can expect an increase in optical path-length by light-scattering.

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