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Interactive comment on “Aerosol profile information from high resolution oxygen A-Band measurements from space” by A. Geddes and H. Bösch

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We would like to thank the reviewer for the helpful and detailed comments. We have revised the manuscript according to the suggestions and we address the reviewers comment with a point-by-point response below. Changes in the manuscript as per your comments are highlighted in yellow in the supplement.

The paper is clearly written and provides a good range of conditions for simulations within the O₂-A band. The simulations shown go beyond what has been previously published. The main problem I have with the paper is a lack of explanation about why

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the results come out as they do since they are not always intuitive. It is not necessary or useful to rehash the results presented in figures and tables with words in the text, so the manuscript could be substantially shortened in this respect; however, more interpretation and explanation of the results is needed. Just one example: p. 6033, L24: Can you please provide some insight as to why S-5P behaves this way.

- Instrument with high spectral resolution and low spectral resolution will behave somewhat different. The aerosol weighting functions tend to change their shape between low and higher altitude for the high resolution instrument due to the strong saturation within the line centres for low altitude (which then do not add information). In contrast, the shape of the weighting function remains similar with altitude for the low resolution instrument. For higher solar zenith angles, this effect is further amplified due to the larger air mass. We have added this explanation to the manuscript. To illustrate this, we show figures 1 and 2 in the response to the reviewer, which give the aerosol weighting functions for OCO-2 and S-5P for SZAs of 30 and 70 degrees. In addition we have also included explanations of various other observations as highlighted by the other reviewers.

I am confused about Table 1: I am looking at Table 1 from Veefkind et al. (2012) and accompanying text that states that S-5P has “a spectral resolution to sampling ratio of at least 2.5–3”, but their table 1 is indicating a spectral sampling of 0.1 nm or a sampling per FWHM of 5 for the relevant O2-A band channel which is double what is listed in your table 1. Further, the spectral range listed in Veefkind et al. (2012) is larger than what is listed in your Table 1. I believe this warrants recalculation of results at least for S-5P. When I calculate the number of pixels based on the range and sampling, I get about the same number for GOSAT and OCO-2, but not for CarbonSat and S5-P (unless I am not understanding or have made a mistake). Please check this.

- The sampling and SNR has been taken from the SRD (Buscaglione, F. and Maresi, L, 2011) of S5-P and we have replace the reference to Veefkind et al (2012) with a reference to the SRD. We acknowledge that a different spectral sampling might change

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the results we point this out in the text of the manuscript. - There has been a mistake in the table for CarbonSat that has been corrected. (See response from 14 July 2014)

Technical points:

Table 1: The ESA web page has listed the S-5P launch date as in 2016, so this should be updated. -DONE

p. 6043, L2: Did you mean “low” here or high? – This should be “high”. This is corrected in the text.

p. 6043, L28, Did you mean S5P or OCO-2? – This should be “S5P” as it refers to the possibility of mapping plumes.

p. 6022, L13 abstract: Accurate retrievals -> accurate retrieval – Sentence was reworded slightly as its a question of precision rather than accuracy in this case

p. 6027, OCO-2 is now launched so this can be updated. - DONE

Please also note the supplement to this comment:

<http://www.atmos-meas-tech-discuss.net/7/C2805/2014/amtd-7-C2805-2014-supplement.pdf>

Interactive comment on Atmos. Meas. Tech. Discuss., 7, 6021, 2014.

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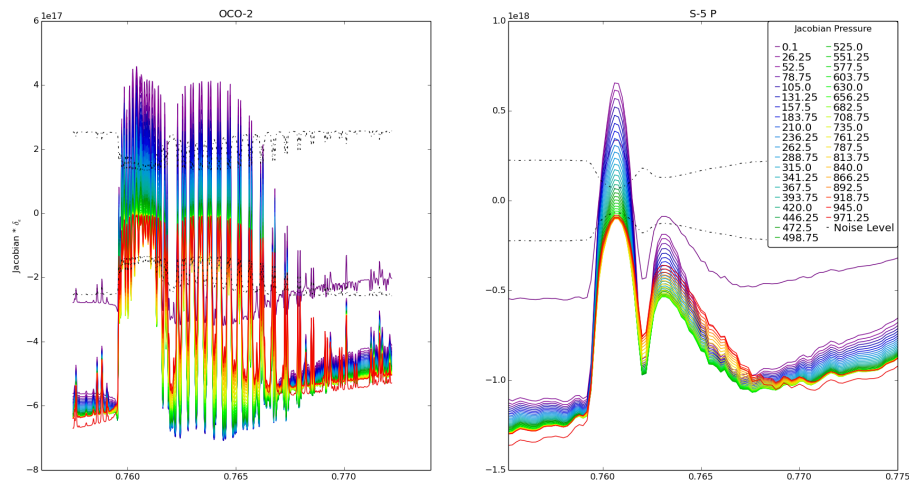
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Fig. 1. Figure 1: Aerosol weighting function * Delta (extinction of $1e-5$) for a SZA of 30 degrees for OCO-2 and S-5P

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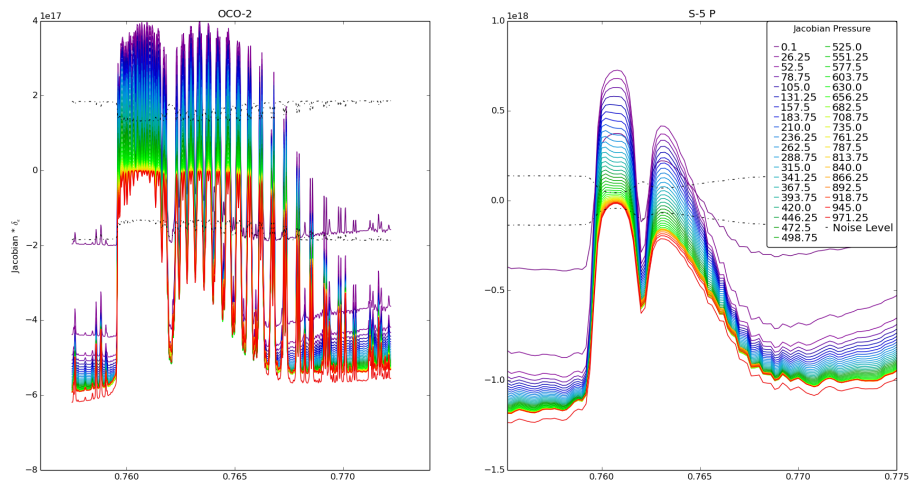


Fig. 2. Figure 2: As above but for SZA of 70 degrees

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