

## ***Interactive comment on “Note on rotational-Raman scattering in the O<sub>2</sub> A- and B-bands: implications for retrieval of trace-gas concentrations and terrestrial chlorophyll fluorescence” by A. Vasilkov et al.***

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This manuscript reports on a sensitivity analysis of the impact of rotational Raman scattering (RRS) on high-resolution near-infrared measurements from space. This analysis evaluates whether or not the filling-in of the O<sub>2</sub>A- & B-bands by RRS can lead to biases in estimations of trace-gas concentrations (typically CO<sub>2</sub> and CH<sub>4</sub>) and chlorophyll fluorescence for retrievals making use of those bands.

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In my opinion, the manuscript deals with a topic of high relevance to both the greenhouse gases and the chlorophyll fluorescence retrieval communities. The question of to what extent RRS may introduce significant errors on one or the other type of retrieval has been open since some time ago, and especially in the last years due to the availability of NIR high spectral resolution measurements by the GOSAT TANSO-FTS and the upcoming OCO-2. I consider that the manuscript tackles this problem in a rigorous way and provides concise yet clear conclusions. I therefore recommend it for publication in AMT.

Some minor comments which might be helpful to improve the paper:

- Sioris et al: the authors should refer to two papers by Sioris et al ("Filling in of Fraunhofer lines by plant fluorescence: Simulations for a nadir-viewing satellite-borne instrument" DOI: 10.1029/2001JD001321, and "Impact of rotational Raman scattering in the O<sub>2</sub>A band" DOI: 10.1029/2000GL012231) dealing with exactly the same topic. Even though it is now more than 10 years since Sioris et al works, I think a critical comparison of methods and results between the this work and that by Sioris et al should be included in the manuscript. Please, rephrase L21 accordingly.

- RRS and trace-gas retrievals: the references to trace-gas retrievals in the title and in the introduction of the manuscript seem not to be justified by the contents, given that no explicit analysis of the potential biases in trace gas retrievals by RRS in-filling is performed. The authors only speculate about the possibility of those biases by assuming that the spectral effect of RRS can be similar to that of fluorescence, which was shown by Frankenberg et al (2012) to have an impact on XCO<sub>2</sub> retrivals. I understand that an end-to-end simulation of this effect is out of the scope of this paper, but still adding some simple analysis of how RRS in O<sub>2</sub>A would actually affect photon path length in O<sub>2</sub>A and trace gas retrievals (impact on the estimations of O<sub>2</sub> columns?) might be good to illustrate quantitatively to what extent RRS is important.

- Figures: a total of 12 figures may be excessive for such a short technical note. Some

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of them could be grouped in single figures with several sub-figures (e.g. Figs. 4-7 and 8&9 or 9&11). Also, either Fig.4 or 5 could be removed. Please, give the spectral window of the calculations (O2A) in Fig. 8.

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Interactive comment on Atmos. Meas. Tech. Discuss., 5, 8789, 2012.

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