

Short comment: *Algorithm Theoretical Baseline
for formaldehyde retrievals from S5P
TROPOMI and from the QA4ECV project* by
De Smedt et al., AMTD 2017

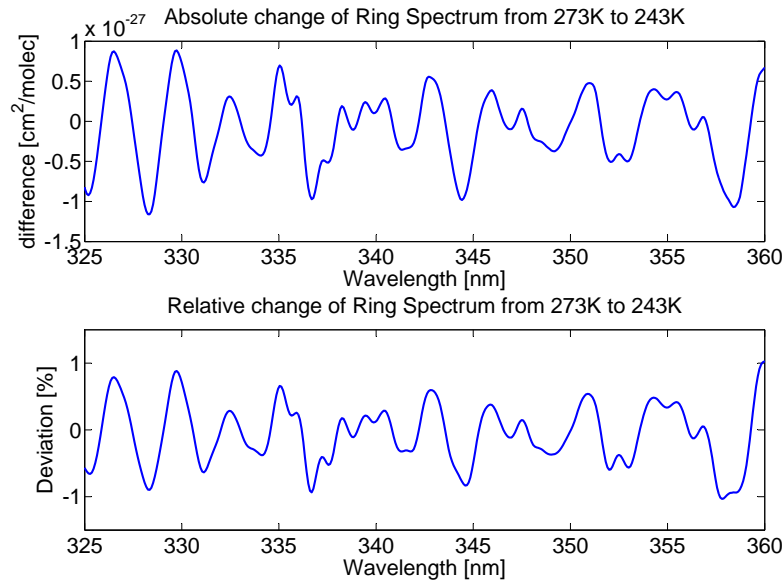
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The manuscript *Algorithm Theoretical Baseline for formaldehyde retrievals from S5P TROPOMI and from the QA4ECV project* shows nicely the state of the TROPOMI HCHO product and relates it to other approaches.

I have a few short comments on technical aspects of the paper.

1. [Chance and Orphal, 2011] used the cross-section by [Meller and Moortgat, 2000] to rescale the higher resolved cross-section by [Cantrell et al., 1990], basically combining the advantages of both publications. Is there a specific reason why to use [Meller and Moortgat, 2000] alone?
2. At the lower end of the fitting interval O_4 absorption might play a role as reported in e.g. [Salow and Steiner, 1936] and shown for MAX-DOAS in [Lampel et al., 2017b]. How large is the impact on the retrieved HCHO SCDs? In this context: Maybe a typical (not smallest) residual could be included in figure 4 as an overlay in all subfigures to illustrate for a certain instrument the relation between noise and fitted structures, maybe using a comparable instrument or scaling the residual appropriately.
3. Figure 4 is missing a 'SCD' (if you want to call it like that) for the Ring.
4. At which temperature was the Ring spectrum calculated? For air-borne DOAS measurements the temperature dependence of the Ring effect can be significant (see [Volkamer et al., 2015]) and for ground-based measurements also two temperatures for the Ring spectrum were necessary (e.g. [Lampel et al., 2017a]) in order to avoid systematic structures of up to 5×10^{-4} . For ground-based measurements of HCHO, e.g. in the marine boundary layer, this is significant. The correction of this effect reduced also the HCHO/BrO cross-interferences for ground-based observations. I attached a plot for the absolute and relative difference of the Ring spectrum for a temperature difference of 30K (Ring(243K) - Ring(273K)), see item 4. In Figure 4 you show that the OD attributed to the Ring is of the order of 4 %. A change of 2% of this signal is then of comparable magnitude as the OD attributed to HCHO.



5. Just curious: While vibrational Raman scattering (VRS) of liquid water plays up to 360nm no role (see [Peters et al., 2014] and references therein), does VRS of N₂ play a role in this spectral range (compare Figure 1)? For ground based measurements it is relatively hard to detect, but as residual spectra from satellite based retrievals keep looking better and better ... has this been tried? The largest part of it (the constant one in intensity space) will be compensated by the offset-polynomial, but then there is still the differential part, which should to some extent correlate with the overall signal of inelastic atmospheric scattering. Is this observed?

References

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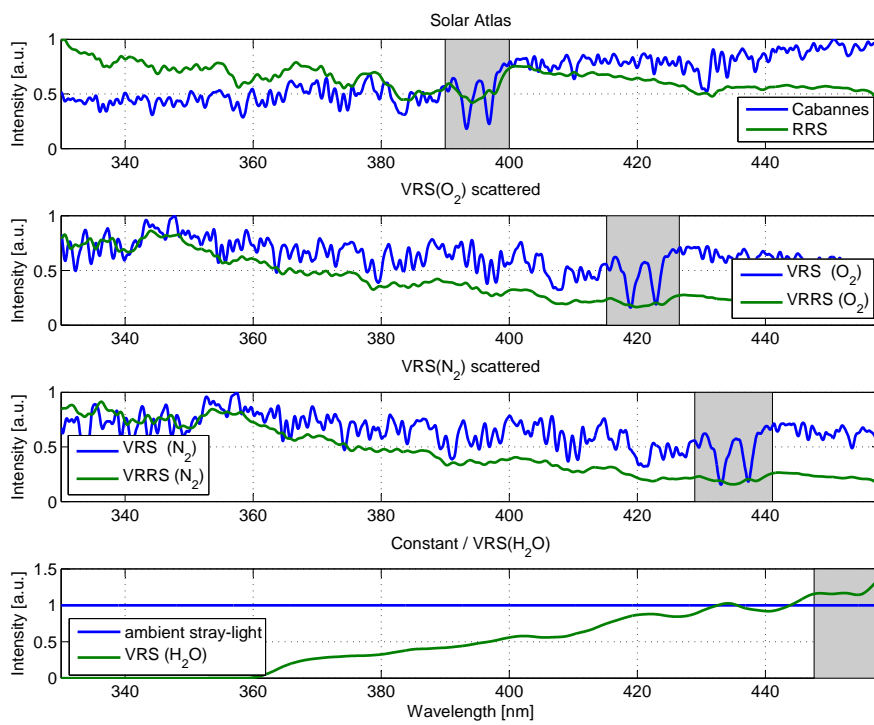


Figure 1: Figure 2 from [Lampel et al., 2015] showing the contribution to the overall intensity by rotational, vibrational and vibrational-rotational Raman scattering on N₂, O₂ and liquid water.

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