

This paper is in good shape, but here are a few suggestions:

Scientific comments

Eqs.1-2: Why are the authors integrating over λ_0 rather than λ ?

Eq. 18: Where does the factor of 2 come from? Is it because the optical depth is quantified peak-to-peak?

Table 2: Relative uncertainty on the dSCD is larger for case 4-6 than case 1. If the relative errors are improved by accounting for the tilt-effect when measuring glyoxal, this might be the better molecule for Table 2.

p2: I suggest a rewording of “not directly related to spectral undersampling”. How about “not related to Doppler shifts”? I think spectral undersampling worsens the tilt-effect as spectrally wider pixels are equivalent to worsening the spectral resolution and this study already shows the dependence on spectral resolution. If the authors could test the effect of coarser spectral binning, this would improve the paper (relates to p2L14-15). Currently it appears as if the authors dispute the conclusion of Haley et al. of a relationship with between tilt-effect and spectral undersampling, based on p2L22. In any case, this statement at p2L22 (“As it turns out, ...”) should be in the conclusions section, not in the introduction.

Also there should be a caveat stated that the derivation has some limits: if the spectral resolution is so poor that the solar/telluric absorption features are no longer resolved, I would expect the tilt effect to be less important for such an extreme situation.

Conclusion: Do the authors think the tilt-effect could extend to lab spectroscopy where extinction is important (e.g. high pressure measurements, or in cases where there is some condensation/aerosol)?.

Minor corrections

p3L14: "In section 2 "-> "In section 2,"

p3L23: might be appropriate and more consistent with the start of the sentence to refer to g_1 and g_2 rather than "dashed, red and blue".

Eq. 5: Even though this is a well-known equation, σ should be defined. Note that σ_{fit} appears later (p11). This could be confusing.

p9, Eq. 17. I assume that “eq: shiftdef” is some kind of leftover from latex conversion? Otherwise this notation is strange to me.

p11: Table 2 caption: de6inition -> definition

dSCD should be defined as “differential slant column density” in this caption since this is the first appearance of the abbreviation. σ_{fit} should be defined and maybe a symbol other than σ should be used

(see earlier comment relating to Gaussian equation). The last two sentences of the current caption should be moved into the main body of the paper. I am confused whether 1.14 ppm is the shift for case 1 since an extra significant digit is provided. To which case does the squeeze value in the last sentence of the caption apply? It seems like it is case 1, but then the squeeze values are inconsistent (10^{-6} vs 10^{-7}). Most importantly, extra words are needed somewhere in the caption. What I have understood is that the first row below the header row indicates whether a tilt-effect calculated correction has been applied (i.e. cases where this correction has been applied are marked with an 'x'). If I have understood correctly, then it should be stated in the caption or in the text when Table 2 is first referenced (not at p15L22) that any case with an x has been corrected for the tilt-effect *before the DOAS fit*.

p12L5: This sentence mentions 5 cases "...where a DOAS fit is performed "without considering the tilt-effect". Yet, in Table 2, certainly cases 4-5 appear to include the tilt-effect in the fit.

P12L5: The presentation would be improved if the 19th equation in the current manuscript appeared before P12L5.

Section 4 title: tilt-Effect -> tilt-effect

p14L25: corrected for -> corrected

p15L20: fit shown -> fit results shown

p17L27: function -> functions

p18L17: is with 0.07 ppm -> is 0.07 ppm,

p19L15: simulated, synthetic -> simulated

Haley et al. ref: O3 and NO2 should contain subscripted numbers.

Sioris et al. (2006) ref: {NO2} -> NO₂