

## ***Interactive comment on “Chlorophyll fluorescence remote sensing from space in scattering atmospheres: implications for its retrieval and interferences with atmospheric CO<sub>2</sub> retrievals” by C. Frankenberg et al.***

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Here, we would like to close out the remaining concerns raised in this short comment point by point:

1) There seems to be a misconception. Yes, the Jacobians are represented graphically. However, the fit residuals in the GRL paper are displayed after the fit. It was shown that the Fs signal can be fitted without even taking it into account (just not in the Fraunhofer lines). Hence, the retrieval is partially ill-posed. The short comment here should also

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not be used to question a previous peer-reviewed paper. In the manuscript here, we just corroborate the findings of our GRL paper. If you look at the plots carefully, you will see that the inclusion of the O<sub>2</sub> lines make the Fs fit worse. Adding data-points can indeed make fits worse if there is substantial interference with other state vector elements. This is the case in the A-band, where aerosol variability is the culprit of adding more trouble than benefit when you want to use the A-band (alone) to fit Fs. We think we have made this very clear in our publications.

We are of course open to sharing our simulations (GOSAT-like format) so that everybody can try their own routines and prove us wrong if doubts exist.

2) I think the term doesn't warrant such a tedious discussion. The core of the lines is saturated and in fact, we would wish the Fraunhofer lines were saturated, it would make our life so much easier. Hence, we don't understand why you associate something bad with the term saturated. Accusing us of a biased position for calling the O<sub>2</sub> A-band saturated is biased, not our statement. We really don't follow any political agenda and are tired of having to prove this over and over again (or keep being accused of that).

3) We are looking forward to the peer-reviewed papers you mentioned. In our paper here, we don't really claim anything but focus on the retrieval part itself. In the other GRL paper, we (empirically) found a good linear correlation with current best estimates of GPP.

4) The retrieval itself under cloudy conditions is not more difficult than under cloud-free conditions (to stress this again: IF you use the Fraunhofer lines only). The statement about photosynthesis through clouds is just referring to the potential (based on the empirical findings before). Again, please don't use non peer-reviewed statements to refute our findings.

5) We take a pragmatic take on that as the main purpose of this paper is the mitigation on its effect on XCO<sub>2</sub>. For this, the direct contribution (unscattered) of Fs is the prime component and we have shown that we can indeed retrieve a bias-free XCO<sub>2</sub>. For the

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Fs signal itself: All retrievals are provided with viewing and solar angles. Eventually, this information can be used to evaluate the total Fs flux (see also Guanter et al, 2012, regarding the findings of BRDF effects in Fs). For this paper, however, it is of minor importance.

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