

Interactive comment on “Chlorophyll fluorescence remote sensing from space in scattering atmospheres: implications for its retrieval and interferences with atmospheric CO₂ retrievals” by C. Frankenberg et al.

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Dear Wouter Verhoef,

Regarding your comment about the cloud problem:

But my main point is the next step, namely the one suggesting that Fs would be a proxy for photosynthesis. This relationship is certainly not as direct as you seem to suggest, and for the 755 nm region it is even doubtful whether Fs can actually be

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related to photosynthesis, see point 3) above. So altogether your picture of sensing photosynthesis through clouds is imaginative but also based on much speculation I am afraid.

Our main point in the discussion of the cloud problem was that retrieval of Fs under cloudy conditions is indeed feasible. The statement was more related to the retrieval aspect than to GPP itself. We consider this fact as very important and it was indeed also surprising to us. Why is it important? Many optical remote sensing parameters such as NDVI or LAI can be heavily contaminated by atmospheric aerosols, thin cirrus, etc. Hence, they will also provide a biased APAR and greenness estimate. If Fs is rather unbiased by thinner clouds, it is important to state that as many researchers may be skeptical about the robustness of the Fs retrieval in scattering atmospheres. Here, we made that point very clear but also underlined that this robustness is only valid if the retrieval is based on the Fraunhofer lines only (and we removed the reference to FLEX here).

Some more personal thoughts on the cloud problem: You refer to the possibility that Fs is not really a good indicator for GPP and that we are overstating the value. It may be true that Fs correlates so well with global GPP because it is a good index for "greenness". In fact, one reason why it is better than other optical parameters may well be that the true APAR is implicitly included in Fs while fPAR derived from EVI and/or LAI may be prone to error (see numerous Turner et al papers comparing remotely sensed fPAR with ground-based observations). Especially in the presence of clouds, the true APAR should be highly uncertain and just having this sort of information included in Fs is, in my opinion, highly valuable.

Sincerely, Christian

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