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Biogeosciences Discussions

Interactive comment on "First observations of global and seasonal terrestrial chlorophyll fluorescence from space" *by* J. Joiner et al.

Anonymous Referee #2

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With their manuscript the authors present the first global maps of chlorophyll fluorescence and also were able to extract the first seasonal cycles of vegetation fluorescence from selected areas. They use spectrally high resolution data from a Fourier Transform Spectrometer on board the satellite GOSAT, which originally was not intended to monitor vegetation fluorescence. The authors realized the potential of this satellite for fluorescence retrieval, adjusted the retrieval algorithm and could quantify the fluorescence signal. By selecting relevant areas they could show that the fluorescence signal contains additional information about the functional status of vegetation that cannot be monitored by classical optical remote sensing. This information is discussed for its potential to better understand and parameterize vegetation-atmosphere exchange. From my perspective this is an excellent manuscript that definitely should be published in Biogeosciences. The methods and approaches are accurate and are carefully tested.

The results are highly innovative and address a timely topic of remote sensing and may greatly contribute to the field of research. The conclusions, which are derived from the results, are carefully discussed and well imbedded in the current literature. It is especially noteworthy that the authors discuss their results critically. The satellite was not built for fluorescence retrieval and thus the data may be subjected to measurement errors. The authors, however, are fully aware of this problem and very carefully discuss the various problems that may occur by using the presented data as face values. The data presented in this manuscript are a landmark in science and I personally spent a lot of time checking on the data presented here and I found a lot of thought-provoking phenomena. The authors provided critical explanations and discussions to guide my thoughts. I think this is remote sensing at its best: it provides a new view on the processes of our globe and I have no doubt that this manuscript will greatly contribute to our understanding of dynamic changes of terrestrial vegetation. The data are not validated yet, but this is not a problem, considering the plan for future work the authors give in their conclusions. I am looking forward to the follow-up publications of this group. All the points mentioned above make this manuscript an outstanding contribution, which should be published as it is with high priority.

There are only a few minor points, which might improve the paper.

Page 8284, lines 15/16 and 27/28: There is a repeat of the statement that reflectance and fluorescence must be differentiated.

Page 8287, chapter 3: I assume that the simulation was performed for top-of-atmosphere (TOA) data and not for top-of-canopy (TOC). Please add one sentence to make the problem of the reabsorption on the oxygen lines clear to the broader audience (vs no atmospheric effects in the K I line).

Page 8292, line 4: The statement that fluorescence may have high potential especially in overwintering, ever-green plants is very true. They may also include the work from Soukupová et al (2008) [Functional Plant Biology, 35, 63-76] here.

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Page 8294f: In some aspects different behavior of fluorescence over Australia: Could there be an effect of the ascending and descending satellites?

Interactive comment on Biogeosciences Discuss., 7, 8281, 2010.