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Interactive comment on “CEFLES2: the remote sensing component to quantify photosynthetic efficiency from the leaf to the region by measuring sun-induced fluorescence in the oxygen absorption bands” by U. Rascher et al.

Anonymous Referee #2

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General comments:

The paper gives a very comprehensive overview of the activities performed in the frame of the CEFLES2 campaign. As such, it is good that everything is documented in detail somewhere, but I doubt whether the particular details about certain instrumentation that was used in the campaign are very interesting for most readers of this journal. Instead, it might be an idea spending a little more room at the physical and photochemical backgrounds of the measurement of chlorophyll fluorescence, and to accuracy issues in particular.

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It seems that the final results consist mainly of some fluorescence spectra in "arbitrary units", and the documentation on quantitative relationships with fluorescence quantum efficiency and photosynthesis is still very poor. The only quantitative results that are reported are in Figures 5(B,C), 6, 10 and 11. However, different units are applied all over. Sometimes one mentions the term fluorescence flux, without giving a clear definition, while from the unit on the Y-axis one must conclude that it should be a spectral radiance (Figs. 5B, 10). So I definitely recommend a thorough rechecking of units, and a more correct naming of physical quantities. For spectral quantities, the wavelength to which it applies should always be mentioned.

Specific comments:

Page 2222, line 6: What is meant by "canopy and field scale"? Is there a difference?

On page 2222, line 13 it is mentioned that ChlF is only 1-5% of the total reflected light "at a specific wavelength". What is meant by this? At 687 nm (the red peak) the fluorescence contribution to the apparent reflectance at this wavelength can be 30% or more, which indicates much better prospects for its detection. So it is not clear what is meant by this 1-5% here.

Section 2.2.3 explains the FLD principle from a more theoretical point-of-view, while the surrounding sections are all dedicated to instrumentation in the field and in the lab. Maybe it is an idea to move this section forward, for instance as part of the introduction to section 2 on page 2223.

Page 2237, line 8: The term "environmentally moderate" is rather vague. Could it be replaced by something more descriptive?

Page 2240, line 18: I do not agree that the relationship in Fig. 6 can be called "hyperbolic". Please find a better term to describe the relationship, or its absence.

Page 2244, line 21-22: According to the Figure (11) this is a radiance, not a flux. Also include the wavelength to which it applies.

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Page 2245, line 14: "atmospheric scattering in the NIR regions vary with path length between sensor and Earth surface". Only in the NIR? This happens everywhere, particularly at short wavelenths. And I do not see what this argument contributes to the statement made about the fluorescence signal derivation.

Page 2246, line 5-8. "By incorporating ... was met". The logic of these lines is totally obscure. Please rephrase if possible.

Page 2249, lines 16-18: This reference is not referred to in the main text.

Technical corrections:

Include the word "the" wherever appropriate.

P 2221 L 6: constrains » constraints

P 2221 L 8: at leaves » for leaves

P 2221 L 8: to close » and close

P 2221 L 9: evolved » developed

P 2222 L 1: changes » variation

P 2223 L 22: aimed to quantify » aimed at quantifying

P 2225 L 26: "Desiccation stress was performed" » "Desiccation stress experiments were performed" (?)

P 2234 L 2: Differential Reflectance » Difference Vegetation

P 2236 L 22: , » ;

P 2237 L 13: 1971, 1973 » 1972, 1977 (if the Ref. list is correct)

P 2238 L 15: potential » photosynthetic (?)

P 2242 L 9: into » in

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P 2245 L 13: variation » dependence

P 2246 L 25 power full » powerful

P 2259 L 4 of Figure legend: flight » flown

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