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Interactive comment on “Retrieval of the photochemical reflectance index for assessing xanthophyll cycle activity: a comparison of near-surface optical sensors” by A. Harris et al.

Anonymous Referee #2

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This is an interesting study on a key topic. For the last years different initiatives (Spec-Net, EUROSPEC, OPTIMISE) have worked on the integration and standardization of in situ optical sampling. However, the wide range of sensors commercially available, both multi and hyper-spectral, makes it difficult to achieve comparable data unless an appropriate characterization of sensor features and measurement protocols are implemented. This study clearly contributes to this research field as it compares two instruments, able to measure the narrow bands required to calculate PRI and commonly used in field spectroscopy to long term in situ vegetation monitoring. The research questions addressed are very relevant and clearly fall within the scope of Biogeosciences.

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The manuscript is clear and well written. Abstract and introduction are concise and properly summarize relevant research to provide context. Regarding methods and results, authors clearly identify and describe the procedures followed and the results obtained and they order them in a meaningful way. However I would recommend including a more complete description of some specific analysis as is the case for the method used to convolve the Unispec spectra in order to make it comparable with the SKR data. Additional information is needed in order to explain how the spectra acquired with an instrument having larger FWHM are transformed to one of higher spectral resolution. This will allow their reproduction by fellow scientist. Finally, in the discussion section, authors include an interesting analysis on the differences found between PRI measured from different instruments and also on the correlation between PRI and EPS at leaf and canopy scales. However, throughout the manuscript, and specifically in this section, the discussion on the instrumental differences between the two sensors is focused on the SRFs. Other technical differences (FOV, cosine response, etc) and their potential role on the discrepancies found in PRI measurements should be further discussed here as, in my opinion, the comparison between sensors is one of the most important contributions of the paper.

Specific comments:

Abstract

Authors references to lower cost vs expensive instruments should be clarified in the abstract and all through the text. Cost is related to sensor characteristics (multispectral versus hyperspectral sensors) and this should be clarified in the text, otherwise it can cause confusion.

Authors affirm that their results illustrate that “small differences in instrument configuration can have a large impact on the PRI measurements”. But, can the differences between the two compared instruments be considered small?

Correlation values obtained from the Unispec (and not only for the SKR 1800) should

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be also included in the abstract.

Methods

Table 1 should include more information on technical characteristics of the instruments compared: operating temperature range, radiometric resolution, sampling interval, etc, in order to make it fully informative on the differences between them.

The use of four different instruments (1 SKR 1800, 1 Unispec DC and 2 different Unispec SC should be clarified in section 2.2.2.

In table 1, I suggest to replace operating range by Wavelength range

If possible change (Jin and Eklundh, 2013) in page 11910 line 20 for other reference that can be more widely accessible.

The spectralon targets used with Unispec DC and SC and Skye SKR where all calibrated panels? Please specify.

In page 11913 line 11 authors state that the area viewed by each instrument was approx. 20 cm in diameter. Was a FOV characterization of the instruments performed in order to confirm the area viewed by each of them or was this area calculated relying on manufacturer specifications? Unless few researchers have acknowledged that it is necessary to characterize the FOV of a spectroradiometer, some authors have demonstrate that these may have great variability which, in this case, can affect the comparison, especially when the target is heterogeneous as is the case for most vegetation covers.

Why different time intervals (1 and 15 min) were used for SKR and Unispec measurements during the diurnal experiment?

Figure 7: It is not easy to visually discriminate between Unispec SC leaf, canopy and SKR 1800 cross-calibration lines. The same for Unispec 531 and 570 HCRF in figure 8.

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In figure 9. PRI values are those measured with the Unispec SC instrument at the canopy level? Please clarify in the figure caption.

Discussion and concluding remarks

Regarding the statement in page 11921 lines 21-27, it would be interesting to include in the text the correlations found for the leaves sampled from plants facing south in comparison to the main values analyzed in figure 10.

In page 11923 authors state that a “full characterization of these sensors is necessary if the data are to be compared across geographical locations, over time and between instruments”. I fully agree with this statement but, in view of the results obtained, authors should be more specific about recommendations on how to approach this characterization and which instrumental factors should be analyzed, specially in the context of the outdoors unattended systems explored in this paper as they can face wide ranges of environmental conditions in terms of temperature, irradiance or sun height among others.

Page 11919 lines 9-11. Review sentence. R2 values correspond to leaf and canopy respectively and not canopy and leaf as stated?

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