

Interactive comment on “Monitoring seasonal and diurnal changes in photosynthetic pigments with automated PRI and NDVI sensors” by J. A. Gamon et al.

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This article presents a very detailed experiment where the authors assess the potential of PRI and NDVI indexes to track spring phenological changes in two contrasting canopies (evergreen and deciduous). While doing so, they also test the performance of new low-cost SRS sensors, now commercially available. The novel aspect in this article is the comprehensive treatment they do of the various aspects that underlie the interpretation of this type of optical data: 1) the authors carefully present, evaluate, and discuss the mechanisms that control the signals at different temporal scales, as well as for evergreen and deciduous species; 2) the authors highlight and demonstrate the im-

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importance of sensor cross-calibration, present two different methods to conduct it in the field, and discuss the ways in which these calibration schemes could be implemented; and 3) the authors discuss the potential of exploiting the complementarity between PRI and NDVI when deploying these type of measurements across ecosystems. Overall, this is a timely and carefully designed study presented in a very informative way that will certainly help towards standardizing these type of measurements. The article addresses a relevant question (remote sensing of vegetation phenology) and should be therefore of interest for BG readers. I have only a few minor comments:

Specific comments: 1) Page 2951, Lines 1-2. Note that there are also Spectrometer-based systems that have been successfully deployed in the field for several years, at least: “ Rossini et al. (2012) Remote sensing-based estimation of GPP in a subalpine grassland. *Biogeosciences* 9, 2565-2584” and “ Drolet et al. (2014) A temperature-controlled spectrometer system for continuous and unattended measurements of canopy spectral radiance and reflectance. *IJRS* 35:1769-1785”.

2) Page 2961, Lines 3-5. And Page 2962, Lines 8-9. It could be argued that these statements are biased towards getting a better correlation with Chl:Car compared to EPS because the changes in EPS took place before their intensive sampling started. In Fig. 3A one can see that PRI has increased from -0.2 to about -0.14 during a three week period outside from their analysis during which EPS has recovered and Chl/Car remains rather constant. Would the relationship between PRI and EPS be still non-significant if that period would have been included in the analysis?

I too believe Chl/Car is the main control behind leaf level PRI dynamics at the seasonal scale, but can we conclude from this data that the dramatic re-organization undergone by the photosystems during spring recovery (which unlocks the xanthophyll-cycle and gradually shifts the system from sustained to reversible) produces no optical signal effecting the PRI? Perhaps the sentence in page 2962 could be re-written using less conclusive terms?

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3) page 2965, Lines 18-19. How would seasonal changes in sun elevation interfere with this calibration scheme that considers only cloudiness? Would a combination of both calibration methods help bypassing these limitations? e.g. calibrating over a few days at start of experiment to obtain sufficient data so that one could build a function that considers both cloud cover and sun elevation?

Technical corrections: -Page 2950, Lines 6 and 8. The authors here seem to use “Structure” and “morphology” in the context of canopy, do these mean different things? if not, why not to stick to the same term?

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