

## ***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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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”.

Response: Thanks for pointing this out. We have modified the manuscript and added these references.

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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 nonsignificant 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?

Response: The reviewer makes a reasonable observation here, but the timing of the recovery (EPS vs. Chl:Car) is really the key. This issue has also been independently addressed using other sensors and a longer time-series dataset in Wong and Gamon (2015a,b). The results presented here are consistent with Wong & Gamon (2015a,b), and also show that EPS increases precede both the pigment pool size changes and PRI changes. So we conclude that it is the chl:car pigment pools (not EPS) that drives spring PRI changes. Our focus here was really to show that the SRS sensors can also detect these seasonal transitions, and we refer to Wong & Gamon (2015a,b) for a more detailed argument of the timing of these transitions.

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?

Response: Seasonal changes in solar elevation would presumably affect the cross

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calibration independently of the sky conditions (as discussed in the paper). In our short-term tests combining sky conditions with elevation effects over the course of a day, it was difficult to get a good correction, most likely because of the complex and rapidly changing light fields at extremely low solar elevation angles. Clearly, more work is needed to evaluate the individual and combined effects of solar angle and sky conditions on the cross calibration, and this is a key recommendation of this paper.

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Interactive comment on Biogeosciences Discuss., 12, 2947, 2015.