Biogeosciences Discuss.,
https://doi.org/10.5194/bg-2019-126-RC1, 2019


Biogeosciences Discussions

# *Interactive comment on* "Using Remote Sensing to Monitor the Spring Phenology of Acadia National Park across Elevational Gradients" *by* Yan Liu et al.

**Alison Donnelly (Referee)**

donnela@uwm.edu

Received and published: 3 June 2019

General comments This is potentially a very interesting paper in which the authors compared satellite-derived greenup with direct observations of spring phenology across an elevational gradient in Acadia National Park, USA. The paper is generally well written, and the table and figures are generally useful, informative and well presents. It would be useful to have a clearer statement of the key message(s) and conclusion(s) from the study. Specific comments P1S30 The papers cited for the definition of 'spring phenology' are possibly not the original ones. Chmielwiski and Rotzer 2001 IJB and Menzel et al. 2006 GCB should be considered as citations for 'changes in phenology



are sensitive indicators of ecosystem response to climate change'. P2S5-10 Consider including some classic European references. Indicate whether in situ observations or satellite-derived phenology are being referred to. Ground observations may be laborious but they are also necessary to validate remotely sensed phenology. P2S15 The paper by Liu et al. 2016 IJB examining changes in greenup derived from EVI2 across different elevations on the Tibetan Plateau would be useful here and also in the discussion. P3S10 Would it be possible to provide hypotheses to test rather than the stated objectives and/or to indicate why the objectives are important. P3S15-20 Consider adding an insert of the USA in Figure 1 to indicate the location of Maine. Also consider if all the data in Figure 2 are necessary when the paper is focused on spring and consider combining Figures 2 and 3 as the information appears to be duplicated. Justify the use of March, April and May for use as representing spring temperature. How representative are the temperature data of the higher elevation areas? P4S15 Since this paper is focused on the spring season consider removing reference to maturity, senescence and dormancy. P5S5-10 It would be useful to have more detail on the 'thirty plant species'. Consider adding a table of the plant species, including number of individuals in each species, elevation range, functional type, frequency of observation, etc. If the direct observation data were collected by citizen scientists this could be stated. It would be useful to include how the elevational ranges used were derived. L3 indicates 'small trees' were monitored but later 'overstory deciduous trees' are referred to – please clarify which type of trees were monitored. Figure 4 is not very clear – the different elevation zones are not clearly depicted. P5S30 The species composition of the four 30m pixels include bunchberry but I am not entirely sure the scientific name matches the common name please check this. Also, all scientific names should be italicised. P6S5-15 A statistical analysis section could be included in 'Analysis of greenup dates' to include details of how the comparisons between different methods were made e.g. correlation? It would also be useful to see how the greenup and first leaf dates were compared to the temperature data. If the first leaf out dates of all the vegetation types are averaged this means that the later leafing species such as trees compared

to early leafing shrubs or ground vegetation will bias the 'true' green up date that is detected by the satellite data? It might be worth separating the field observations into different functional groups as it might turn out that early spring greenup is more closely related to ground-level than canopy level leaves. The method of averaging use would have introduced large variation. P6S30 Figures 6 and 7 are very interesting and clearly show different spatial scales. However, it would be useful to mention why the trends appear to be quite different. For example, in Figure 7 greenup appears to be earlier (more blue) in 2013 and later in 2014, 2015 and 2016 (more green, yellow and red) compared to Figure 6 (lower resolution). P7S5-10 Has the average May temperature been correlated with greenup or leaf out or is this just visual comparison? Average May temperature would be influenced strongly by daily temperature after leaf out – it is generally the temperature before the event that influences the timing. Are the temperature differences between years statistically significantly different? Have other temperature influences been examined? Is there any explanation why satellite derived greenup was later than field observations in 2016 and not in the other two years? P7S25-30 The boxplots for 2013 do not portray a convincing difference between low and high elevation, the range is very large and without any statistical analysis it is not accurate to state that earliest greenup dates were at lower elevation. The earlier greenup in 2015 (in Figure 8) is not so evident in Figure 10. P7S30-P8S5 Figures 11-14 (not referred to in the text) show interesting results – in general it appears that greenup was earlier at higher elevation for both deciduous and mixed forest which is contrary to that stated in the text. It is also interesting that deciduous forest greenup appears to be later than shrubs, wetland and herbaceous habitats which is what might be expected. P8-9 The discussion is a bit light and could include more references such as Liu et al. 2016 IJB. Perhaps discuss influence of temperature at different elevations and over different time periods, influence of moisture (especially at higher elevation), need for more field observations both species and years, and perhaps PhenoCams data, etc. It would be worth exploring the fact that since it appears that the variation for both direct observation and satellite-derived greenup are very large and so may explain some



of the correlation between the methods. Technical corrections Overall the manuscript could be improved by thorough editing for correct use of English. There were numerous minor, but important, errors, for example, use of 'medium' instead of 'median', use of 'doesn't' rather than 'does not' etc. Tenses should also be consistent either all in the past or present but not a combination of both. Use of symbols rather than words e.g. '°C' instead of 'Celsius degrees'. Also all figure captions require revision to include more detail.

---

Interactive comment on Biogeosciences Discuss., https://doi.org/10.5194/bg-2019-126, 2019.