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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.

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Dear Reviewer, Thank you so much for your time reading this paper and providing these valuable comments. Following are responses to your comments. 1)- a) The spatial heterogeneity evaluation of elevation will be added by showing histogram of elevation variance within 500 m pixels in research area using 30m ASTER DEM. The spatial heterogeneity of landcover will be evaluated using histograms showing the proportion of each landcover and numbers of landcovers within 500 m pixels. b) As temperature is the control climate drivers of this ecosystem, the comparison of greenup and first leaf out dates with the temperature of each elevational zone will be added in the revised

manuscript. The citizen data is collected in each elevational zone as mentioned in P5 L13-16. Therefore these data are considered as species level data in each elevational zone (plot-level data). To match with the field data, the satellite pixels were grouped in each elevational zone as mentioned in P6 L5-13. We do recognize that in this way "the species composition along the hiking trails may be quite different than the species composition of an entire Landsat pixel that covers and adjoins the trails" (P8L30-P9-L2). Therefore we tried to conduct species survey at Landsat scale along the hiking trail and a few relatively homogeneous were found (P5 L28-30). Comparison between the greenup of these pixels and the leaf out of the dormant species are performed as stated in P7 L2-14. In addition, RC1 suggested to "separating the field observations into different functional groups" for the comparison between field and satellite monitored phenology, which will also be added in the manuscript. 2) Discussion about the heterogeneity in elevation and land cover of this region, the relations between greenup and temperature of each elevational zone will be added and reflected in conclusion. Also the current discussion will be extended as well, such as need for more field observations and longer satellite monitoring. The novelty of this manuscript is to monitor phenology in mountainous region at 30 m scale to reflect the detailed variation in this heterogeneous region, and the take-home-message is 30 m is a better scale for phenology monitoring and agree well with field monitored leaf out dates. The manuscript will be revised to highlight these points. The main research questions will be stated at the beginning of the method section with an overall analyze plan followed. 3) Figure 6 and 7 will be merged into one figure with Landsat results and VIIRS results lie together for better comparison. Figure 10 to 14 will be grouped into a single figure with different year's box plot in different colors in one plot, and each plot shows the information of one landcover type. Figure 2 will be moved to supplementary material and only mean temperature will be displayed. Figure 4 will be enlarged and the trails will be colored differently base on the elevational zones. The variance of greenup of each elevational zone will be add in figure 9. And more information will be provided in the captions. 4) Corresponding corrections will be made in the manuscript. Special comments: P1L22,

the sentence will be changed to “Therefore, to take advantages of the spatial resolution of 30 m data and the temporal resolution of 500 m data, the Landsat 8 Enhanced Vegetation Index (EVI) data was augmented with Spatial and Temporal Adaptive Reflectance Fusion Model (STARFM) simulated EVI values to monitor the greenup of this mountainous region, and it does provide more spatial details than VIIRS data alone and agree well with field monitored leaf out dates. P2L1, the sentence will be changed to “such changes provide important feedbacks to the climate system, such as through albedo, nutrient cycling” P3L3, the sentence will change to “MODIS daily Nadir Bidirectional Reflectance Distribution Function Adjusted Reflectance (MCD43, V006) were used together with Landsat 8 surface reflectance to generate simulated 30 m images to improve the temporal resolution of 30 m.” P4L20, MODIS EVI was used to simulate 30 m images as mentioned in P4L26-28. P5L14, The comparison of satellite monitored greenup dates with field observed leaf out dates was performed at 30 m scale (P6L5-L13). The landcover map used in the manuscript is 30 m as well (P6L10-13), which classify evergreen forest. However, the fraction of EN to DB trees of each 30 m trees are provided. P5L29, P8L13, P9L13, P16FQ, P20F6, P21F7, corresponding changes will be made in the manuscript. P7L20: the sentence will be changed to “with a small bias (-2 days) and RMSE (10 days) as displayed in Fig.9. ” Fig 2. This figure will be moved to supplement material as suggested by RC1. Fig 3. corresponding changes will be made in the manuscript.

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