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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 detailed comments. P1S30, P2S5-10, P3S10: Thank you for the suggestions of these papers. I'll incorporate these papers and your suggestions in the revised version. P3S10: Importance of the objectives will be added. P3S15-20: Map of USA indicating the location of Maine will be added. I agree there are duplicated information in figure 2 and 3. I can move figure 2 to supplementary material. The air temperature provided here is from the McFarland Hill weather station (elevation of 158 m) to show the yearly variation. Base on

the elevation, this station is in the low elevational zone. Caitlin McDonough MacKenzie, one of the coauthors, also measured temperature in each elevational using HOBO temperature loggers, and the results can be found in the supporting information of McDonough MacKenzie et al., 2019 (Table S1). From the results we can see that the maximum difference between the temperature of different elevational zone could even reach 2.4 degree (Cadillac ridge, 2016). Therefore, the temperature distribution in such topography complex region are quite heterogeneous. P4S15: maturity, senescence and dormancy will be removed from the paragraph P5S5-10: Details of the common species observed on the trail and their distribution in each elevational zone can be found in the supplement material of this paper (Table S3 and Table S4). Function type will be added in these tables in the revised version. The field study is led by my co-author Caitlin McDonough MacKenzie, and the results have been published in McDonough MacKenzie et al., 2019, which are also cited in the paper. As for the observation frequency, the trails were monitored twice a week from April 1 through June 30 as mentioned in P5S10-15. The tree monitored in the field are deciduous trees. In the field, only trees at eye height are observed. I'll change to "small deciduous trees" in L3. P5S30: Thank you for pointing out to italicize scientific names here. I'll make the changes in the revised version accordingly. Also double checked the scientific name, it is corrected. P6S5-15: I'll group Landsat monitored greenup dates and field observed leaf out dates base on their function types, then perform the comparison, and illustrate the variation of the dates for each group in figure 9. The comparison greenup and first leaf dates with the temperature of each elevational zone will be added in the revised version. P6S30: More detailed description and discussion regarding these two figures will be added in the revised version. P7S5-10: The statement here is drawn based on visual comparison. McDonough MacKenzie et al., 2019 found a significant linear relationship between mean spring temperatures and leaf out dates. Her finding will be cited in the revised version. A few reasons could lead to the difference between satellite monitored and field observed phenology, including variation in leaf out times between species, and the overall contribution of uncommon species (excluded from

our analysis) to green up as satellites capture the overall information of the pixel and field survey reflect individual plants. Based on the three years data, it's difficult to draw conclusion why satellite derived greenup was later than field observations in 2016 and not in the other two years. Maybe more years of analysis will help, which we'll perform in future study. P7S25-30: The conclusion of 2013 is based on the median value (the red line in the figure). More detailed statistical analysis, such as ANOVA, will be added in the revised version. The greenup in 2015 is actually later than other years in Figure 8 with more red and yellow. P7S30-P8S5: One possible reason for the greenup of forest earlier at higher elevation could be the differences in species composition of each landcover for each elevational zone. It's quite difficult to conduct detailed survey in this area due to the extreme topography variation. We'll conduct more years of analysis in the future to confirm this. P8-9: More discussion will be added in the revised version based on your above comments. There is PhenoCam installed in Acadia (https://phenocam.sr.unh.edu/webcam/sites/acadia/). It can be used to access the phenology yearly variation. However, it's difficulty to reflect the phenology variation along the elevation at this moment. Technical corrections: These errors will be corrected in the revised version.

Reference: McDonough MacKenzie, C., Primack, R. B. and Miller-Rushing, A. J.: Trails-as-transects: phenology monitoring across heterogeneous microclimates in Acadia National Park, Maine, Ecosphere, 10(3), e02626, doi:10.1002/ecs2.2626, 2019.

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