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Interactive comment on "Improving the monitoring of deciduous broadleaf phenology using the Geostationary Operational Environmental Satellite (GOES) 16 and 17" *by* Kathryn I. Wheeler and Michael C. Dietze

Anonymous Referee #1

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General comments: This article presents a novel application of Wheeler's algorithm for estimating midday NDVI from GOES data to estimate the dates of phenological transitions. Using phenocam data as a validation dataset, the authors test the correspondence of key phenological transitions as derived from GOES vs MODIS NDVI or EVI data, with the hypotheses relating to the higher frequency of GOES vs MODIS data, as well as sensitivities of the different indices to leaf presence vs color. Encouragingly - estimates of two spring transition dates do seem to align better for the GOES data than MODIS. and in some cases the GOES algorithm produces estimates with smaller

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CIs. However, this was not the case for all phenophases and it is difficult to discern why. There are many differences between the datasets used including the algorithms used for preprocessing as well as the temporal frequencies and bands which make interpretation difficult. Overall, I found the paper interesting but perhaps better suited to a more remote-sensing oriented journal as it is difficult to distill a strong biological story in the comparisons presented.

Specific comments: Equation 3: I think that the top case should be for t>=k and the bottom for t<k

Did you investigate the 0.6040 artefact in the raw bands rather than just the indices? I wonder if it is also creating less obvious errors in other parts of the data - e.g. in S2 there are some outliers just after the series of values that were removed. Are both the red and NIR bands fixed at some value for these and are those invalid NIR/red values whereever the occur or only when they contribute to a ratio of 0.6040?

Would there be a way to automate the removal of the 68 days to further automate the algorithm?

Better legends on the supplemental material would improve readability.

The authors assert the GOES data can provide real-time estimates of phenological transitions whereas MODIS cannot due to the temporal frequency. However as I understand it the algorithm was fit on the entire time series at once, not subsetting down particular portions of the year. It is possible that the higher temporal frequency of the GOES data would allow for real-time estimation, but I think to demonstrate this one would need to iteratively refit using data only up to Jan, Feb, March (for example) and compare the estimated transition dates between the two datasets/algorithms. It is possible none would fit, though adding an informed prior on c and d based on the year(s) prior data might(?) provide enough information for them to converge without the full season of data.

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What would implications be of NOT using the 16 composited NDVI/EVI from modis and instead using the native temporal resolution data and preprocessing as per the GOES? Would using the same snowcover mask on both datasets align the results? Is there any way to make the raw data more comparable to disentangle the cause of the differences (bands vs temporal resolution vs pre-processing)?

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