

## ***Interactive comment on “Evaluating remote sensing of deciduous forest phenology at multiple spatial scales using PhenoCam imagery” by S. T. Klosterman et al.***

### **Anonymous Referee #1**

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#### General comments

Authors tested the utility of digital repeat photography for estimating the phenological stage of deciduous forest trees, and they also proposed a new curve fitting model for the image analysis. In the scale of near-surface monitoring, statistical uncertainty of the presented model (generalized sigmoid model) was smaller than other classical fitting models due to good fitting ability of small time course variation of the index value. Then, they compared the estimation accuracies between the digital camera-derived VIS band indices (GCC & RCC) and satellite-derived VIS-NIR indices (EVI & NDVI). The authors also showed the uncertainty of global phenology products such as MEASURES and MCD12Q2 by comparing with near-surface imaging data. They suggest

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the better index (EVI) and better scales (5km in MEAURES) for satellite remote sensing of phenology in the deciduous forests. These trials and information are very valuable for the readers in the field of plant ecology and environmental sciences. In addition, one of the interesting findings in this paper is that landscape metric (e.g. ratio deciduous forest cover) would affect the error of phenology estimation in the end of spring. I wish to know the detail mechanism of this effect and the idea about future strategy to correct this effect. Overall, I think that this paper is acceptable in this journal, since the paper present much valuable information about the application of near-surface imaging and satellite remote sensing for the studies on the monitoring of terrestrial ecosystem.

### Specific comments

P2307 L10 Please mention the background information about PhenoCam network.

P2309 L21 How large was the analyzed canopy cover area? How many photo images were captured during the day? Authors should add the basic information related to the data collection and data quality.

P2310 L7 I want to know how to define the “site-dependent threshold”. If the authors can propose the general method of data filtering, it will be valuable for the readers.

P2311 L1 Did authors test the satellite GCC? I can understand the reason why they analyze EVI and NDVI, since these VIs are main parameters of common satellite products. However, if the authors want to argue the effect of landscape metric on the accuracy of phenology estimation, the same VI should be compared between satellite and near-surface sensors to minimize the effects of different wavebands.

P2320 L11-L20 This explanation about the time lag between maturity date ( $\approx$  max. LMA, LAI) and GCC-derived date is very interesting. Can we solve this problem by using other wavebands related to leaf mass (NIR), water absorption and/or secondary metabolites (SWIR)?

P2320 L23-L26 Hmimina et al. (2013) have not analyzed the difference between VIS

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band indices and VIS-NIR indices. Can we ignore the difference of VI really?

P2320 L28-P2321 L9 If this relationship was found only in late spring, please let me know the reason why. I guess that the difference of fractional forest cover may cause bias also in other phenological stages.

P2321 L20-P2322 L4 This discussion is acceptable. On the other hand, the evaluation of heterogeneity of phenology is important to understand the diversity of ecological function and its response to environmental stresses, and we can monitor it by using near-surface camera having high temporal/spatial resolution.

P2330 Table 1 If possible, please add the information about dominant species and maximum LAI. The estimation accuracy would be affected by species-difference, tree density and leaf mass.

P2332 Table 3 Why is not MOS shown?

P2332-P2334 Table 3-5 How much sample did you analyze?

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Interactive comment on Biogeosciences Discuss., 11, 2305, 2014.

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