

## ***Interactive comment on “Land surface phenological response to decadal climate variability across Australia using satellite remote sensing” by M. Broich et al.***

### **Anonymous Referee #1**

Received and published: 30 June 2014

This study examined the spatial and temporal patterns of vegetation phenology in Australia. The authors also assessed the relationship between climate variability especially rainfall and vegetation phenology and productivity. The authors also developed an algorithm to extract key phenological parameters from satellite greenness index time-series.

Phenological change is one of the most direct indicators of the impact of climate change to terrestrial ecosystems. Although it has been widely studied in many ecosystems, it is surprisingly rare to see landscape scale analysis of vegetation phenology in Australia, and more importantly, how climate variability contributed to the changes. This study is thus novel and important, and will contribute to our understandings of how climate

C3042

variability controls vegetation phenology.

The manuscript in current form is concise and well written. It can be a better paper if the following issues are addressed:

1. I agree with Anonymous Referee #2 that more clarification on the fitting algorithms is needed for the readers to reproduce the method. Specifically, the moving window to identify minimum and maximum needs more clarification: are those points identified local min/max points? If so, how did the authors determine the window size? Did the size of the window affect the result? In addition, the authors need to explain the choice of  $EVI > 0.01$  (Page 7692) and 20% amplitude threshold for the start and end of the season.
2. Some of the statements in the Discussion section need to be explicitly supported by the results from the current study. For example, the authors mentioned in P 7700 Line 17 that “however we see a fast response to rainfall pulses . . .”. However, according to Fig.6B, some areas in interior Australia lag behind SOI for  $\sim 12$  months, which thus did not support the above claim. Another example is that in P 7700, Line 27, the authors mentioned Lake Eyre, but Lake Eyre was not annotated in the figures.
3. Please add the spatial resolution of TRMM. As I understand the resolution is 0.25 degree by 0.25 degree, which is much larger than the spatial resolution of MODIS. Then the authors need to explain in detail how to compare the data from these two products.
4. It would be useful to compare the inter-annual variability of the start of season, and the end of season, and their relationship with the timing of rainfall (and SOI). As one previous study suggested that for deciduous forest in Australian tropical savannah, leaf-out (or leaf flushing) only occurs after the first rainfall event: Williams, R. J., et al. "Leaf phenology of woody species in a north Australian tropical savanna." *Ecology* 78.8 (1997): 2542-2558.

C3043

Specific comments (P for Page, L for Line): P7686 L11: what does “internally” mean here? It would be better to avoid vague terms like this one.

P7686 L15: how to define the effectiveness of the method? If the algorithm used in this study was not compared with other methods (which is the case), it will be better to refrain from using this statement.

P7690 L06: As Referee #2 suggested that more specifics are needed here. How was the calibration done? What are the land cover types of those sites (a table will be better)?

P7690 L13: Comparing with the 16-day EVI data used in this study, MOD09 products have higher temporal resolution (daily and 8-day), which is important for the study of phenology. The authors need to explain/discuss why the coarser temporal resolution product was selected.

P7695 L13: Please explain what is “persistent greenness”. Is it “high mean EVI, and low magnitude”?

Figures:

Fig.1: It will be better if the legend shows the land cover types different colors correspond to, instead of use words in the caption.

Fig.7: This figure would be better if the location of the Cooper Creek floodplain is shown in the figure. In addition, north arrow would be good.

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Interactive comment on Biogeosciences Discuss., 11, 7685, 2014.