

Interactive comment on “Trend and climatic sensitivity of vegetation phenology in semiarid and arid ecosystems in the US Great Basin during 1982–2011” by G. Tang et al.

Anonymous Referee #2

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General Notes:

As noted by the authors, the phenology of drylands is relatively understudied compared to deciduous forests, despite the substantial role these ecosystems play in the global carbon cycle. Here, Tang and colleagues utilize station meteorology and GIMMS NDVI imagery to assess long-term trends in phenological indices (SOS, EOS, and GSL) and vegetation greenness (mean NDVI) in the US Great Basin region, as well as the relative importance of temperature and precipitation in explaining their interannual variability. The central findings are that GSL has extended at the rate of 3 days per decade due to delayed autumn senescence, driven largely by increases in mean seasonal temperature, but variability in vegetation greenness is better explained by precipitation variabil-

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ity, in particular preseason precipitation (DJF). The analysis is well devised, and the paper is very well written. The paper would be improved, in my opinion, if the authors attempted to connect their results with the carbon cycle and/or future climate changes, even if it were only informed speculation. I also wonder about the extensive spatial averaging and the lack of analysis of local weather/phenology relationships (do the relationships hold at the station-level?). Despite these shortcomings, I think this is a nice contribution to the literature and would support its publication.

Specific Notes:

- Why would you consider both SOS~SSA and SOS~Spring models (e.g. Table 2)? Since SSA is calculated over spring, summer, and autumn Temperatures, the difference between Spring T and SSA are FUTURE temperatures, right?
- The rates of mean NDVI increase are quite small (e.g. 5e-4), and so would only contribute to an increase of 0.015 over the 30 year period. This seems very slight, is it ecologically significant? Of course, it is consistent with the magnitudes noted by other authors like Fensholt.
- How well do the splines fit? Sometimes they can go "off the rails" and interpolate much higher/lower NDVI values, especially in the presence of missing data.

Technical Notes

- P11388, L25: Since vegetation would presumably respond to climate change regardless of its cause, I'd suggest "climate change" instead of "anthropogenic climate change"
- P11389, L8-9: Unclear what "consequent information" means here, perhaps: "Consequently, phenological information has important applications..."
- P11389, L22: "and ARE particularly sensitive"
- P11392, L1-5: Which version of the GIMMS dataset?

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- P11393, L24: The acronym "SSA" was defined in the abstract, but not in the main text before its use here, it wouldn't hurt to do so.
- P11397, L21: Change "points were exhibited" to "points that exhibited" or similar
- P11399, L1: Probably not "surprising" since it was the implicit hypothesis
- P11401, L4-7: Wouldn't these spatial differences argues for a more spatially explicit analysis (i.e. less extensive spatial averaging)? If altering the study area slightly would change the sign of a regression coefficient, and the inference based on that relationship, what does that say about the robustness of the findings?
- P11401, L15: What is meant by "ameliorate soil moisture conditions"?
- P11402, L23-27: But you have the station-data to test whether or not the local trends are consistent with their local climatic variation, right?
- P11403, L1: Suggest changing "agreed well" to "were consistent" Saying that the observations "agreed" with the ground observations implies that their interannual variations are consistent. The datasets could share a lack of long-term trend without "agreeing" at all.
- P11403, L15-17: Stronger warming at higher latitudes may be only one of multiple factors leading to contrasting Northern Hemisphere SOS results, vegetation assemblages are also different, for instance.
- P11405, L17: Suggest changing "we are lack of" to "we lack"
- Table 1: There are two AIC columns with the heading: "STP/PSP", should one be "SMT/PSP"?
- Table 1: footnote: "minimum" would be better than "smaller" in this case since smaller could be interpreted as "closer to zero" rather than "most negative" Also on P11404 L25

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- Table 3: It's clear from Table 3's footnote, but not the text, that PSP refers to DJF precipitation. This should be in the text, in my opinion.

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