Biogeosciences

Discussions

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Interactive comment on "Impact of climate extremes on wildlife plant flowering over Germany" *by* J. F. Siegmund et al.

Anonymous Referee #1

General comments:

The study by Siegmund et al tests whether extremes in temperature or precipitation coincide with extreme early or late flowering dates of four shrub species. The applied methodology is rather new, although already used in other applications. While it is potentially promising to combine the detection of climate extremes with impacts on biospheric activities, in it's current version the study provides little insights that go beyond of what is known since many years (contained in studies cited by the authors).

The authors state that their approach as an improvement to the largely used conventional correlation analysis, which only measures linear relationship. However, with respect to the research question concerning climate variables and flowering dates, it is particularly the gradual change that provides the most valuable information, namely

how many days per degree the flowering dates are shifted. In a similar fashion, it would be interesting to see how the magnitude of a climate extreme is related to the shift in flowering dates (in days). This would strengthen the message of the paper.

I see some potential in the lagged analysis which can help identifying periods which are crucial for a change in flowering dates. Yet this results in a multiple testing problem which is not adequately addressed in the paper. In other words, if many time windows and window lengths of climate variables are tested against flowering dates, the level of statistical significance changes with the number of tests. A rigorous analysis of this is missing. Furthermore, did the authors check whether there exist significant autocorrelation between the different time windows of the climate variables? This is to be expected and again inflates the significance threshold.

The paper applies a new methodology, yet the comparison with the existing established methods falls short and does not show more than that both methods are comparable. What is the major advantage of the new approach? What novel conclusions can we draw?

Why can the t-test can be used to assess the significance of correlations between binary data (Figure 7). Are the assumption to use the t-test fulfilled? These seems to be questionable.

Overall I see some potential in the topic and the methods used, yet many aspects of the analysis are not pursued with the necessary finality and stop halfway (e.g., the analysis of precipitation extremes/droughts, comparison with the classical methods, analysis of spatial patterns, relationship with other variables such as height). As an indicator for this the phrase "beyond the scope of this work" appears at least 3 times in the manuscript.

Specific comments:

The correlation analysis and statistical testing used to obtain figure 7 is not described

in the Methods section.

The introduction is rather lengthy and lacks focus. Instead of describing all general impacts that climate extremes may have on the biosphere it would be better to set the stage with the current knowledge about the topic of interest, namely how extremes in climate variables affect flowering dates. Also, instead of discussing global changes, it is maybe worth focusing on how the climate extremes have changed and are projected to change in the study region (i.e. Germany). In this way the obtained results can be related much better to ongoing change. Particularly P 18391 L 5-10, and the statement in L 22: "climate extremes can lead to a sustained perturbation or even destruction of terrestrial ecosystems, which has been observed for semi-arid regions" are not really relevant for the study

Extremes in precipitation alone are not expected to have much of an effect on flowering dates. Rather more important is soil moisture or water availability which might be computed as a proxy using precipitation as an input (e.g. by using the standardized precipitation index). I encourage the authors to do such an analysis since droughts are among the main causes for strong impacts in ecosystems functioning (Frank et al., 2015).

Other comments:

Fonts in the figures are too small

Section 4.4 and Figures 5 and 6 do not contribute any valuable information. Please either clarify the purpose of these figures or omit to clarify the structure. If they only represent a negative result (no clustering) this can be stated in words.

P 18391 L 21 "unprecedented outcomes": outcomes of what?

P18392: "ongoing debate": I wouldn't call that a debate, there is just little known about the subject.

Reference: Frank, D. A., Reichstein, M., Bahn, M., Thonicke, K., Frank, D., Mahecha,

M. D., Smith, P., Van der Velde, M., Vicca, S., Babst, F., Beer, C., Buchmann, N., Canadell, J. G., Ciais, P., Cramer, W., Ibrom, A., Miglietta, F., Poulter, B., Rammig, A., Seneviratne, S. I., Walz, A., Wattenbach, M., Zavala, M. A., and Zscheischler, J.: Effects of climate extremes on the terrestrial carbon cycle: concepts, processes and potential future impacts, Global Change Biology, 21, 2861-2880, 2015.