Nat. Hazards Earth Syst. Sci. Discuss.,
https://doi.org/10.5194/nhess-2017-144-RC2, 2017

Natural Hazards and Earth System Sciences
Discussions

Interactive comment on "The Effect of Soil Moisture Anomalies on Maize Yield in Germany" *by* Michael Peichl et al.

Anonymous Referee #2

Received and published: 6 November 2017

The manuscript "The effect of soil moisture anomalies on maize yield in Germany" by Peichl et al. describes the intra-seasonal impact of meteorological drivers and soil moisture on silage maize yields in Germany. Reduced form fixed effect models are employed to perform the analysis. The results are revealing the important meteorological factors driving inter-annual maize yield variability, and therefore provide important step towards development of seasonal forecasting framework (which can be used to advise farmers/policy makers). The results are interesting and scientifically sound. Nevertheless, I would suggest to revise the clarity of the methods used as well as several discussion aspects before the manuscript is accepted for publication.

Specific comments:

Page 1, line 21: instead of yield, I would mention maize yield variation.

Printer-friendly version

Discussion paper

Page 2, line 18: temperature above which threshold? Do you mean the Heat degree days (i.e. above ∼30 deg. C) or base temperature? Moreover, is temperature accumulation above that threshold considered or number of days with temperature above that threshold?

Page 2, line 20: I propose better reasoning before nonlinearity is mentioned; only stating the threshold is not sufficient. A reference to non-linear response of processes would be better.

Page 3, lines 1-5: Authors state that the temperature sensitivity is the highest during the flowering period. Nevertheless, high temperatures during the reproductive period affect maize as well, causing increased senescence rates, shortened duration of grain filling period and therefore reduced yields.

Page 5, line 15: rephrase (i.e. E is calculated based on empirical estimate, it is not measured)

Page 5, lines 28-30: Are crop yield data normalized as well? Moreover, you mention the normalization of meteorological data, followed by mentioning that their mean and standard deviation are 0 and 1, respectively. Does this mean that you have standardized rather than normalized the data? With this respect, the SMI ranges between 0 and 1, and is not standardized. How does this affect the regression coefficients? Better explanation would be welcomed.

Page 7, line 1: absence instead of absent

Page 7, Eq. 3: Index j in the first term indicates drought class, in the second term it indicates exponent and is therefore misleading. Moreover, three numberings are provided for the same equation.

Page 7, line 20: Why are coefficients constrained to be the same? Should they not reflect also the impact of non-climatic factors (such as agro-management, which can differ among different regions under consideration) on yield variability?

Page 7, lines 28-30: Better explanation is needed: - are fixed effect terms included in Ci? - how is Ci calculated? - this substantially increases the number of variables for regression model trained on the relatively small sample sizes. It is worthwhile mentioning that standardization of predictors avoids problems with multi-colinearity arising from structure of regression models.

Page 8, line 1: what is natural experiment?

Page 9, line 1: what is demeaning? Short description might help.

Page 10, line 14: Is BIC related to explanatory power? Or is it referred to table 2?

Page 10, lines 15-20: What do non-linear terms represent? What could be the biophysical reasoning behind?

Page 10, lines 20-25: In this analysis you have applied separately for each month the regression models an evaluated their capability to predict yields. You argue that soil moisture during the grain filling is a variable with "memory" from previous months and is therefore explaining more variability. Wouldn't that be the case also if you would take seasonal cumulates of precipitation and/or evapotranspiration, or climatic water balance (as their difference)? In that sense I agree that soil moisture is more relevant variable, however the comparison is not fair towards the monthly meteorological cumulates.

Page 11, lines 5-10: see previous comment – could seasonally cumulated precipitation and evaporation give similar results? Can you comment on this?

Page 11, lines 9-20: The study doesn't really show what is the role of soil information (i.e. soil water holding properties). Are there regions where SMI plays more/less (spatially variable) role with respect to meteorological counterpart? In the case where soils are able to retain water, the climatic water balance, integrated from the beginning of the season or for specific period during the season (i.e. flowering-maturity), could perform equally well. I think this might be important message of this study, which is not

adequately shown in results.

Page 12, line 8: 409 % with respect to what?

Page 13, line 15: Predictive power or explanatory power? This study does not assess the out-of-sample prediction performance; therefore, I would characterize adj. R2 as explanatory power.

Can these models be used for silage maize yield seasonal forecasting? Out-of-sample validation would be necessary to determine the predictive power, especially due to the fact that relatively short time series are used to construct the regression model. Can you comment on that?

Page 16, lines 5-11: What could be the biophysical meaning behind the second and third terms being significant?

Interactive comment on Nat. Hazards Earth Syst. Sci. Discuss., https://doi.org/10.5194/nhess-2017-144, 2017.