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Interactive comment on “Impacts of climate change on growth period and planting boundaries of winter wheat in China under RCP4.5 scenario” by Z. Sun et al.

Anonymous Referee #1

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Using climate projections in CMIP5, authors of this manuscript tried to study the impact of climate change on sowing date, harvest date, planting boundaries of winter wheat in China. While the topic is interesting, the methodology is flawed, and the results presented are neither reasonable nor convincing. Therefore, I have to recommend rejecting the manuscript for possible publication in ESD.

Firstly, the regression models against sowing and harvest date built by the authors reflects solely statistical coincidence instead of meaningful relationship. For example, sowing date depends much on climate conditions before sowing, such as monthly temperature before sowing and soil moisture, but not on the annual average or winter

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Interactive Discussion

Discussion Paper



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climate. The average minimum temperature of the coldest month (X3) is the month during winter-time when sowing has already occurred, how should it cause variations in sowing dates? Similarly, it is well-known that harvest date should depend on the thermal accumulations from sowing or anthesis, instead of the winter temperature indexes in the author's regression model.

In addition, the authors claim that MME perform best to simulate the historical climate. However, how well does the MME perform against the observations remain a mystery. In addition to that, I am wondering why the authors do not use observed historical climate to build the regression model against sowing and harvest date.

On the other front, the authors tried to project the changing planting boundary of winter wheat. The sole base to deduce the planting boundary change is a research by China Crop Climatic Division Cooperation Group (1987). The research is non-peer-reviewed, 30-years-old and not accessible. Putting aside those, the CCCDCG research described the minimum temperature of the existing wheat growing area, according to the authors. However, this does not suggest that any area within such climate limit is suitable for wheat growing. This is a fundamental logical error. For example, a vast area of Xinjiang today may also fit into the climate boundary, but they are not cultivated with any crop, because the soil is infertile and the wind-induced soil erosion made it hard to keep a fertile soil layer, which is vital for practical agriculture. Surprisingly, the main conclusion of the paper is that the wheat agriculture should extend to such area in Xinjiang and Inner Mongolia.

The presentation of the manuscript is not in a good shape. For example, after reading section 2.2.2, I could not obtain any useful information on how they perform stepwise regression: is it forward, backward or recursive? what are the candidate variables? why are they instead of others? Similar problems widely occurs in the manuscript, making the methodology non-transparent and non-reproducible by readers.

The references cited do not reflect state-of-art understanding on the climate change

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impacts on wheat. It is also full of literature written in Chinese and non-peer-reviewed materials, the quality of which cannot be assessed.

In the Figure 1, 2 and 3, the distribution of fitted sowing/harvest date covers all land area in China, even including Tibet and deserts in northwestern China, where wheat cannot grow. This is misleading.

Interactive comment on Earth Syst. Dynam. Discuss., 6, 2181, 2015.

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