**Earth System
Dynamics**
Discussions

Interactive comment on "Impacts of future climate change on potential yields of major crops in China" *by* Y. Yin et al.

Anonymous Referee #2

Received and published: 7 November 2014

This paper makes use of the large climate and impact model database created by ISI-MIP, the Inter-Sectoral Impact Model Intercomparison Project, by evaluating its results in the field of agriculutral yields for the area of China. The paper is a valuable, relevant and interesting contribution to the literature, however it presently merely reports the regional findings rather than discussing them in the context of existing knowledge or investigating the underlying causes of changes observed. Therefore to me it fails to clearly identify whether anything new was learned. I do think the paper is suitable for the ESD special issue on ISI-MIP and could be published there if a number of improvements in this respect are made.

My main suggestions for a revision of the manuscript are the following:

(1) The paper would benefit from discussing the main climatic causes of the changes

observed by comparing patterns in the changes in temperature, precipitation and CO2 to the patterns observed in crop yields. I realize that it would go beyond the scope of this paper to do an in-depth analysis here, but it is not satisfying to not receive any information about how climate changes in the different GCM projections. Do the crops that increase growth mainly benefit from CO2 fertilisation? Do the crops that show a decline of yields mainly suffer from increased water stress?

(2) I think it would be valuable to receive information from your analysis about the leading reason for the grey areas of inter-model uncertainty behind the temporal plots of median crops yields. Are they mainly due to differences between the crop models, mainly due to differences between the GCMs, or a mix of both, and if so, in what relation?

(3) You announce at the end of the introduction that you intend to compare your results to those obtained from AR4-based studies but as far as I can detectt, do not do so subsequently. More generally: the strength of your study is that it is multi-model, multi-GCM using AR5 scenarios. The important question left open by your paper is: what do we learn from such a multi-GCM, multi-GGCM AR5 analysis? Do the results simply confirm previous knowledge (if so, in what way is that significant? Were there doubts about earlier studies?) or add to it? I suggest that you more systematically discuss your results (a) with respect to the present state of knowledge about climate impacts on crops in China, identifying the advances made (even if it is an important confirmation of existing knowledge), (b) with respect to AR4 in particular (if that is important – you mention it in the introduction), (c) with respect to single-model studies. In summary: what is the advance in knowledge you provide?

(4) You discuss the median behavior a lot, and the disagreement between model pairs. However, would not the "worst case" be of particular importance, too? If the best case happens, no problem. The median case is of interest. But the worst case could potentially really be a problem. It could be the real case. Maybe those models are right. So it is not just uncertainty, it is also a case where "the worst case cannot be excluded

scientifically and is therefor a non-zero likelihood, i.e. a risk". So I suggest you also discuss the worst cases as such.

Some other, more minor points are:

(5) I suggest to not use the abbrviation GGCM (global gridded crop model) because it is so similar to GCM. It can cause mistakes and confusion.

(6) The crop models used are established models described elsewhere, but the paper should very briefly describe what they do and what not.

(7) Figures 6 and 7 are never mentioned in the text. You discuss Figs. 4 and 5, but not 6 and 7.

(8) How do results compare to discussions in the IPCC's AR5 WG2 report?

Finally, on language. The paper is quite well written, a good read. The english is ok; however, there are quite a number of small but important language mistakes that are typical for non-native speakers. Often it is about the word "the", so let me explain once more, since it occurs many times: you use "the" before a noun when you mean a specific thing or group of things, one that you identify: you are talking about those things (for example: the coast of China, the GGCMs used). You do not use "the" if you are talking about a type of thing generally without a specific thing referred to (for example: "GCMs simulate climate"). There are too many small language problems for me to list, so let me just do it for the abstract so you get an idea: (i) "a couple of" ... usually means: two. You mean: "a number of" (since there are 4). By the way: why not just say "four GGCMs" (ii) "may benefit food production IN (not over)" (iii) "where are outside"; you mean "which (or that) are outside" (iv) "such as North China Plain" should be "such as the North China Plain" (v) "new agronomic strategy"; better "new agronomic strategies" or "a new agronomic strategy"