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Earth System Dynamics
Discussions

Interactive comment on "Contributions of climate change and groundwater extraction to soil moisture trends" *by* Longhuan Wang et al.

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Thank you very much for your careful review and constructive suggestions with regard to our manuscript "Contributions of climate change and groundwater extraction to soil moisture trends". Those comments are all valuable and very helpful for revising and improving our paper, as well as the importance guiding significance to our researches. The main corrections in the paper will be marked in the revised paper later and the responds to the comments are as following:

Comment 1: As is indicated in the abstract of the manuscript, this paper provides the contributions of climate change and groundwater extraction to the trends in surface and deep soil moisture. For example, GW extraction accounted for −1.2% and 9.3%

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to global drying and wetting trends of surface soil moisture, respectively. I suggest that the definition of surface soil should be explained at the beginning of the manuscript to avoid misunderstanding.

Response: We will explain the definition of surface soil at the beginning of the revised manuscript as suggested.

Comment 2: The monthly groundwater abstraction datasets, which is based on the Food and Agriculture Organization of the United Nations (FAO) global water information system and the Global Map of Irrigation Areas, version 5.0 and it is explained in the Section 2. However, it is not clear to this reviewer whether groundwater extraction only includes irrigation? and explain briefly the relationship between the different uses of GW extraction and soil moisture change.

Response: Groundwater extraction includes irrigation, industrial and domestic water use. Among them, irrigation acts as an effective precipitation on the surface soil, part of the industrial and domestic water enters the surface runoff, and the other part evaporates.

Comment 3: In this manuscript, only the GW abstraction was considered, not involved other human activities. I suggest that the title of section 3.3 should be changed.

Response: The title of section 3.3 will be replaced by “Contribution of climate change and groundwater extraction to soil moisture trends”. And we will make correction as suggested.

Comment 4: GW extraction should be improved was mentioned in section 4. It should be given an explanation, like the limitations of this scheme and how to improve.

Response: The GW extraction scheme used in this study is a simple bottom-up representation and further study will focus on a more realistic definitions of irrigation water demand. We will revise this part according to the suggestion.

Comment 5: When analyzing Figure 1, NEW or CTL simulation were compared with

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observations? I suggested that it should be explained clearly.

Response: When analyzing Figure 1, NEW simulation were compared with observations. And we will explain this point clearly.

Comment 6: In section 2.1 line 265, the correlation was higher when considering the GW extraction, which was not obvious in the other two areas. How to get the difference between the NEW and CTL? Figures or data should be provided to illustrate it.

Response: We will add some data according to the comment.

Once again, thank you very much for your comments and suggestions.

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