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

**Anonymous Referee #1**

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This study quantifies the contributions of climate change and groundwater extraction to the trends in soil moisture through two groups of simulations from 1979–2010 using the land surface model CAS-LSM with four global meteorological forcing datasets (GSWP3, PRINCETON, CRU-NCEP, and WFDEI). This work will improve our understanding of how human activities affect soil water content and will help to determine the mechanisms underlying the global water cycle. This paper should be moderate revised in accordance with the reviews before it is accepted. Some suggestions might be helpful for the authors to improve the manuscript.

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% 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. 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. 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. 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. 5. When analyzing Figure 1, NEW or CTL simulation were compared with observations? I suggested that it should be explained clearly. 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.

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