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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Enhanced cold-season warming in semi-arid regions" *by* J. Huang et al.

Anonymous Referee #1

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This study analyzed global temperature trends over global land regions according to climate regimes and precipitation amount over a 100-year period. Significant differences in the long-term trend were identified between arid, semi-arid and humid regions, and also between warm and cold seasons. Overall, they found that the temperature increasing trend is widespread with the most drastic increase occurring over semi-arid regions and in cold seasons. Temperature trends in semi-arid regions account for nearly half of the global trend. They further study the dependence of the trend on rainfall amount and found that the trend generally increases with decreasing rainfall.

These findings are of great significance to climate change, which may convey key information regarding the causes of global warming, as elaborated in the paper. They provide several plausible hypotheses to attempt to qualitatively explain the observed temperature and their dependence on precipitation. I find such dependence very intriguing for it attests to an inherent connection between changes in temperature which

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is an index of energy cycle and precipitation that is an index of water cycle. Apparently, in the arena of climate change, both are key and of most concern to the public. The paper is very well written and the results are thoroughly elaborated. I would recommend it for publication after the following issues are addressed.

1. The study employed the CRU long-term gridded temperature dataset, but does not provide much insights of the dataset. They may explain how the dataset was developed, input data, the quality and accuracy of the data from any data assessment studies. 2. Elaborate more the formulae used to compute the temperature trend and regional contribution and the determination of contribution of regional trends to global trends. 3. P 4633, L12, change "to comparing" to "to compare". 4. Separate "summary" and "discussion" as two separate sections. The discussion is concerned with explanations of the observed trends. It is a very important part of the study. The authors offer several plausible causes that may be summarized in a table, or use a schematic diagram. The present discussion is somewhat scattered. 5. Just for authors' consideration, I'd think that the dependence of temperature trend on precipitation may be explained as follows qualitative, or use a simple 0-dimension energy balance model. Over humid region, water cycle is accelerated by the availability of more plentiful of water. This can make use of more energy that would otherwise be used to warm up the atmosphere to cause more heating. The contrary would be true for arid regions. 6. P4637, L21-24, combine the two sentences to avoid mis-understand for quoting findings from two studies, like ". . . water content, which was confirmed by simulations . . ."

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 4627, 2012.

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12, C1554–C1555, 2012