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Comment

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

**J. Huang et al.**

hjp@lzu.edu.cn

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We are very appreciative for the reviewer's thorough review of the paper. His/her suggestions and comments have been most helpful in improving the readability of the paper as a whole. The revised version of the paper has addressed all of the reviewer's concerns. We hope this revision is now acceptable for publication. The following are our point-by-point responses to the reviewer's comments:

Question 1. The criterion of arid and semi-arid regions division is the key issue, which influenced the result of this paper. Traditionally, arid and semi-arid region such district, which has more potential evaporation than precipitation. I want to know if the definition of arid and semi-arid region in this paper consistent with the international criterion. The criterion of arid and semi-arid region division influences the ratio of contribution of global warming directly.

Response: The classification of different region is cited from the paper below:

Rotenberg, E. and Yakir, D.: Contribution of semi-arid forests to the climate system, Science, 327, 451-454, 2010.

Question 2. In figure 1, the semi-arid region is defined by the 109 years mean annual precipitation from 1901-2009. While it should be defined by 30 years mean annual precipitation, such as from 1961-2009, according to the international convention. This will avoid the influence to global climatic regions division of the long-term precipitation trend, so as to obtain a more exact global climatic regions division.

Response: Both the annual precipitation of 1901 to 2009 and 1961 to 2009 have been used to classify the climatic regions, the results related with the period of 1961 to 2009 have not been showed in the manuscript because the results are similar.

Question 3. In Figure 2, the linear trend of temperature change should be significant tested to make sure if the temperature trend is reliable or not.

Response: Yes. The significant test of temperature trend has been checked for all region and most of the area especially the semi-arid region pass the 95% significant test (blue color in the Figure below, the value in the figure is the temperature trend).

Question 4. in line 113, the word “expect” should be “except”

Response: the word of “expect” have been changed to “except”

Question 5. As we all know, the increasing trend of land surface air surface temperature over southern hemisphere is smaller than northern hemisphere's. We can see that the increasing trend of surface air temperature over the arid regions of northern hemisphere is smaller than the increasing trend of the semi-arid regions. On the contrary, the southern hemisphere has an opposite result. This phenomenon is very interesting. Can the author discuss a little bit here why does this happen?

Response: The phenomenon of warming in southern hemisphere is reasonable, i.e.:

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the temperature trend over arid region should be faster than it over semi-arid region by following thermal theory. The enhanced warming over semi-arid region of north hemisphere may be mainly caused by human activity.

Question 6. Does the figure 4 show the trend of mean annual land surface air temperature variability?

Response: Yes, it shows kind of variability for comparing the trend difference between for arid region, semi-arid region and all land.

Question 7. According to authors results, we can find out that of north America and Europe. Why the increasing trend is the most significant? Including the reasons which the author mentioned, the author ignored the fact that, in the past few decades, also as we know warming period, most of the arid and semi-arid regions of Asia under a remarkable aridification period. This may be a possible important reason for this area has a more distinct increasing trend.

Response: Yes. We agree with reviewer's suggestion and we try to add some discussion in this revision.

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

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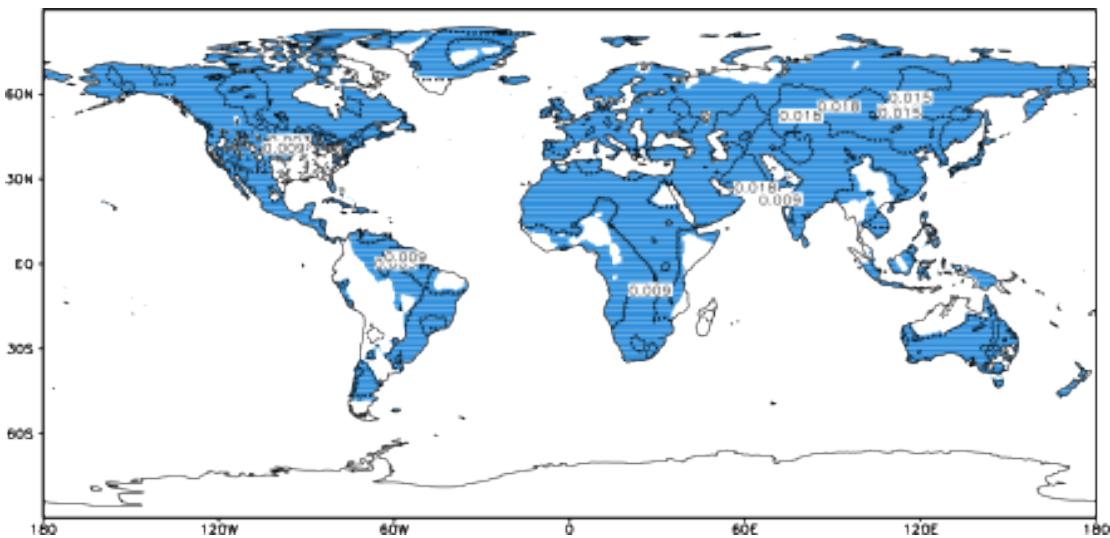
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**Fig. 1.**

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