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Interactive comment on "Temporal and spatial variability in precipitation trends in the Southeast Tibetan Plateau during 1961–2012" *by* X.-L. Zhang et al.

X.-L. Zhang et al.

wsjbnu@163.com

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We thank the anonymous referee very much for the constructive comments and suggestions. We hope to have addressed all raised issues in our response and in the revised manuscript.

Anonymous Referee #2 (Received and published: 17 May 2015)

General comments: This study presents the trends in annual and seasonal precipitation over the southeastern Tibetan Plateau. Based on the references made in the introduction chapter and the reviewer's own literature review, the novelty of this manuscript is questionable. As referee #1 already pointed out, numerous studies exist dealing with

the same parameters (precipitation plus max and min precipitation), with similar time scales, and mainly covering the same region (e.g. Li et al. (2010), Lu et al. (2008), Tan et al. (2010), Li et al. (2007), Duan et al. (2008), Wu et al. (2005), Li (2011), etc.). The authors' response does not really solve this controversy because even if they focus on the Southeastern TP, not much "new" information can be given compared to what has been presented already by all the other literature!

Answer : Li et al. (2010) has found that the Southeast Tibetan Plateau (STP) as a whole was the most significant in precipitation-increasing in the whole Tibetan Plateau (TP). According to the summer day-by-day precipitation data of 97 meteorological sites on the TP from 1961 to 2004, Lu et al. (2008) found summer precipitation in the TP could be roughly divided into three precipitation pattern fields: the southeast plateau pattern field, the northeast plateau pattern field and the three rivers' headstream regions pattern field. However, it is only division research based on the summer precipitation using empirical orthogonal function. There is no further study on the trend change in the STP. Based on the monthly precipitation data of 24 meteorological stations from 1971 to 2007 in the southern TP (namely the Tibet Autonomous Region but not the STP in our manuscript), Tan et al. (2010) found there was an unobvious increasing trend in annual precipitation with a significant regional difference (decrease in the western section whereas increase in the eastern section). And it seems that precipitation decreased from the east to the west with the increase of altitude and topography in the southern TP. Li et al. (2007) have statistically analyzed the daily precipitation data from 1971 to 2004 of 82 meteorological stations on the TP, based on which the climatic sub-regions have been got by using the REOF method. Seen from sub-regions, the precipitation increased most remarkably in the south parts of TP and Sichuan. A detailed analysis of the spatial and temporal changes in annual precipitation over the period of 1961-2004 in the TP is presented based on a developed daily precipitation dataset of 45 weather stations with altitudes over 2000m above sea level. Duan et al. (2008) found that precipitation also varies differently in the southern and northern TP. Wu et al. (2005) found Trends calculated by linear regression were tested through Mann-Kendall test. Results of 77 meteorological stations on the TP during the period 1971-2000 showed that the main trends of climate change are temperature rise and precipitation increase. Based on the precipitation data of the 135 stations on TP from 1982 to 2001ïijŇthe use of EOF expansion method to analyze the TP in the spatial distribution of precipitation and the time evolution of the characteristics and trendsïijŇLi (2011) has foun that the annual precipitation of the northern (the Qinghai region) and Southern (Tibet) is mainly concern with the change of north-south RP (Reversed-Phase). In conclusion, most studies have determined the changes in precipitation in the TP as a whole (or in the STP as a whole) as described in our manuscript, and general conclusions have been drawn, but no research on spatio-temporal variations in precipitation trends in the STP on a regional scale have been conducted. In this study, the temporal and spatial variability in precipitation trends over the STP are researched for the first time using observational data from 1961 to 2012 on the seasonal and annual time scales. And our results reveal that for the precipitation variation with elevation was not obvious but the variation with complex topography was obvious in the STP. It is also proved that the complexity of precipitation variation because of the special topography features over the TP. So it is very important to carry out the regional (or small scale) climate researches over the TP, and our manuscript is one of them.

By only using one method (the commonly used MK test) on few datasets, the results and conclusions do not present novel concepts, ideas, tools, or data, and are not compelling enough to approve publication in Climate of the Past

Answer: In our research, trends calculated by Mann-Kendall test were tested through linear trend analysis. As it was restricted only by the length, the results of linear trend analysis did not show.

(which in my point of view is also not the right journal, as this study is rather focusing on the present conditions based on the most recent past).

Answer: This study focused on the precipitation trends analysis over the STP during

the past half century, which does not involve analysis about present and future climate. It is within the scope of CP. In the other side, our manuscript can be accepted by the editorial department for publication as a discussion paper in CP, which also show our research is within the scope of CP.

Specific comments: The authors engage in describing how the topographic conditions are responsible for the identified trends. This is rather weakly described in a simple and only qualitative way. To improve their results and conclusions some quantitative investigation into the topography seems rather necessary, especially considering the large mountainous terrain (of an area of at least 40,000 sqkm) and the small number of used weather stations (14). As this study focuses on the topography an interpolation with kriging in combination with a profound digital elevation model might be interesting. Only data from 14 stations is available, hence, I strongly recommend incorporating further sources of data such as re-analysis, modeling, or satellite sources. An addition could be also the use of rather specific indexes that prove the variations in precipitation more evidently.

Answer: Our study focused on the precipitation trends analysis over the STP based on observational data from 1961 to 2012. According to observational facts, we found that the precipitation variation with elevation was not obvious but the variation with complex topography was obvious in the STP. However, the mechanisms require further research by combining other methods and data, which will be interested field of our research in the ongoing investigation.

In climate research numerous methodologies exist to analyze (extreme) precipitation data. Hence, I strongly recommend to additionally using at least one more appropriate method. For example recurring cycles in dry and wet episodes could be investigated by applying a Fourier analysis and/or a wavelet analysis.

Answer: In our research, trends calculated by Mann-Kendall test were tested through linear trend analysis. As it was restricted only by the length, the results of linear trend analysis did not show. We can add the results of linear trend analysis, if necessary.

Another feature of scientific interest is the linkage to changes in river discharge and/or surface water/snow accumulation, which is the major concern in this area anyway.

Answer: In this manuscript, our focus is precipitation trend analysis. Certainly, regional precipitation is closely related to river discharge and/or surface water/snow accumulation, but which is beyond the research content of this manuscript. It is impossible to involve all aspects for one journal paper.

For the introduction chapter, the responses/additions to referee #1 are merely helpful as these are only common statements, of which the most have been already stated in other papers. The authors should put their focus on a more specific topic/feature (which hasn't been investigated yet) and apply more advanced methodologies and indexes.

Answer : Please refer to the first response.

Technical corrections: All maps (Figure 1, 2, 5, 7, 8) lack a good descriptive character. This means that e.g. the neighboring provinces/countries/oceans/rivers need to be shown and named, especially in Figure 1 and 2.

Answer: Our study basically is outstanding the geographic locations, but not the administrative divisions. According to the comments both referee #1 and referee #2, we show the rivers (the Yellow River and Yangtze River) in Fig. 1. The station name and terrain height are given in the Fig. 2.

As Figures 5, 7, and 8 show only one parameter; using different shadings of the circles or even exchanging them with the actual value might be much better decipherable for the reader than they are now.

Answer : Figure 7 shows the trend results, and the actual value can not show the trend test results for stations. Fig. 5 and Fig. 7 may show as value, but the graphical is more meaningful for comparisons. The revised Fig. 5 used the same legend for all the subfigures.

Additionally Figure 7 and 8 should be integrated into one figure only by applying shapes and shadings according to the trend and magnitude, respectively.

Answer: It is not important that Fig. 7 and 8 maintain independence or merger. The key is to express the research meaning. So Fig. 7 and 8 maintain the status quo.

The information in most of the tables is not much needed as most significant values have already been described in the text.

Answer: The values in the tables are systemic and intuitive, which may provide more information for readers. So it is necessary to retain the existing tables.

Please note: a non-significant trend is not significant and, hence, might only show a positive or negative tendency (and not a positive or negative trend)! Please revise accordingly.

Answer : We revised accordingly.

Please also note the supplement to this comment:
http://www.clim-past-discuss.net/11/C468/2015/cpd-11-C468-2015-supplement.zip

Interactive comment on Clim. Past Discuss., 11, 447, 2015.