

## Replies to Reviewer 2

We would like to thank Reviewer 2 for his valuable comments. It is very useful for us to improve our paper. According to the comments, we have made corresponding changes in our manuscript.

Replies to specific comments of the reviewer are as follows:

### Comment 1:

*“Snow fall changes are of great importance for Xinjiang in terms of water resources management. The currently well-evidenced global warming may have critical impacts on snow cover changes, in this case, this study is of great importance. I recommend acceptance of this study in your journal for exchange and I have the confidence that many international readers will be interested in this research. However, my concern is that the author may be expected to do autocorrelation analysis of the time series due to the fact that the significant autocorrelation, if any, will have influence on MK trend test results. Besides, persistence effects of time series on MK trend test results have been widely discussed, the authors should discuss it.”*

### Authors' answer:

We'd like to thank the reviewer for regarding the article as important. The reviewer says that it is very important to check the autocorrelation in the time series before doing MK trend analysis due to the persistence effects of time series. It is a precious advice for us. Based on the advice, to eliminate the persistence effects of time series, we have done pre-whitening process to eliminate the autocorrelation in time series, of each extreme snowfall index in recent 49 years, before MK trend analysis. Consequently, the contents of Table 4 and Table 5 are modified (the modified Table 5 and Table 5 are shown as follows), and the main text is correspondingly changed as well.

**Table 4.** Numbers and percentages of stations with upward, downward and zero trend.

ID	Upward		Downward		Zero trend	
	Number of stations	Percentage	Number of stations	Percentage	Number of stations	Percentage
SX1day	13	72.22	4	22.22	1	5.56
SX1process	13	72.22	5	27.78	0	0
DSb	9	50	9	50	0	0
DSc	13	72.22	5	27.78	0	0
PSb	15	83.33	3	16.67	0	0

**Table 5.** Results of MK significance test at the 0.05 significance level.

ID	Upward		Downward		No trend	
	Number of stations	Percentage	Number of stations	Percentage	Number of stations	Percentage
SX1day	5	27.78	0	0	13	72.22
SX1process	5	27.78	0	0	13	72.22
DSb	7	38.89	1	5.56	10	55.56
DSc	5	27.78	1	5.56	12	66.67
PSb	1	5.56	0	0	17	94.44

Besides, the persistence effects of time series on MK trend test results have also been discussed in this paper. We will insert, on Page 9, Line 11, a paragraph to discuss this problem: However, due to the persistence effect of time series, there may be significant autocorrelation in the series. Positive autocorrelation will result in overestimating the significance of MK trend, when actually no trends exist; negative autocorrelation in the data, on the other hand, produces an opposite effect (Hamed and Rao, 1998). Considering the existence of significant autocorrelation in time series may influence on MK trend test results, we did pre-whitening process for the time series, of each ESE index, before MK trend analysis, to eliminate the influence of significant autocorrelation on MK trend results.

Consequently, this corresponding reference will be added in the list of references:

Hamed, K. H. and Rao, A. R.: A modified Mann-Kendall trend test for autocorrelated data, J. Hydrol., 204, 182–196, 1998.

## Comment 2:

*“Besides, the following references should be cited and discussed in this study:*

*Qiang Zhang, Jianfeng Li, Vijay P. Singh, Yungang Bai, 2012. SPI-based evaluation of drought events in Xinjiang, China. Natural Hazards, 64(1), 481–492.*

*Qiang Zhang, Vijay P. Singh, Jianfeng Li, Fengqing Jiang, Yungang Bai, 2012. Spatio-temporal variations of precipitation extremes in Xinjiang, China. Journal of Hydrology, 434-435, 7-18.*

*Qiang Zhang, Jianfeng Li, Vijay P. Singh, Chong-Yu Xu, Yungang Bai, 2012. Changing structure of the precipitation process during 1960-2005 in the Xinjiang, China. Theoretical and Applied Climatology, 110(1-2), 229-244.”*

### Authors' answer:

Thanks for the advice of Reviewer 2. The articles suggested are useful to supplement most related references of northern Xinjiang about extreme precipitation in winter. We have read the suggested references and discussed them in the introduction. We insert in Page 5, Line 13 the sentence: Zhang et al. (2012a; 2012b; 2012c) implied the same conclusions as well, especially after 1980.

Consequently, these corresponding references will be added in the list of references:

Zhang, Q., Li, J. F., Singh, V. P., Xu, C. Y., and Bai, Y. G.: Changing structure of the precipitation process during 1960-2005 in the Xinjiang, China, *Theor Appl Climatol.*, 110, 229-244, 2012a.

Zhang, Q., Li, J. F., Singh, V. P., and Bai, Y. G.: SPI-based evaluation of drought events in Xinjiang, China, *Nat. Hazards*, 64, 481–492, 2012b.

Zhang, Q., Singh, V. P., Li, J. F., Jiang, F. Q., and Bai, Y. G.: Spatio-temporal variations of precipitation extremes in Xinjiang, China, *J. Hydrol.*, 434-435, 7-18, 2012c.