Referee#1

Global warming speeds up the solid-liquid water cycle and change snowfall phenology. It was found that postponed snowfall occurrence and advanced snowfall ending took place in the Eurasian continent. Potential snowfall phenology can identify the possible onset, end, and duration of snowfall. To describe the characteristics of the potential snowfall phenology, this manuscript proposed three indicators, the start of potential snowfall season (SPSS), the end of potential snowfall season (EPSS), and the length of potential snowfall season (LPSS). Spatial-temporal variations of those three PSP indicators past, present, and future across the Chinese Tianshan mountainous region (CTMR) were explored. The research is sound and thorough. It provides a new direction to understand the potential snowfall phenology in the alpine region. Therefore, I recommend minor revision of this manuscript.

Reply: Thanks for your recognition of our work. Your specific comments could help us to improve our manuscript greatly. We will revise our manuscript seriously according to your specific comments.

Some specific comments and replies are as follows:

1 Lines 35-37: please check the number of days cut down for the length, 63 or 64?

Description on the modification: Thank you very much for your advice. We have checked the number as suggested.

2 Lines 41-43: It suggested that "The results indicate that with constant snowfall intensity, annual total snowfall will decrease, including amount and frequency, ..."

Description on the modification: Thank you very much for your advice. We have revised the sentence as suggested.

3 Lines 50-105: The status, shortcomings and need of potential snowfall phenology studies is poorly described in the introduction.

Description on the modification: we will show more details about status, shortcomings, need, or significance of potential snowfall phenology in the revised manuscript.

4 Lines 95-100: The research from Jennings et al. (2018) only illustrated that RST was spatially heterogeneous and does not show that different methods of precipitation pattern separation yield different RST. Please check it.

Description on the modification: we will check it and revise the related sentences.

5 Lines 128: The sentence "The frequency of rainfall increases while that of snowfall decreases. Besides, precipitation shifting from solid to liquid is obvious" is not clear enough, please check it.

Description on the modification: Thank you very much for your advice. We have revised the sentence as suggested.

6 In Figure 1: It is recommended that a general overview map could be added to Figure 1 to help the reader quickly identify the location of the study area.

Description on the modification: Thank you very much for your good suggestion. We will revise Figure 1 as suggested.

7 In Table 1: It is suggested that a column could be added to Table 1 to indicate the duration of the data.

Description on the modification: Thank you very much for your advice. We have added the duration of the data in Table 1 as suggested.

8 Line 230-232: It is recommended to use “advance / delay” instead of using “smaller or larger” to describe the change of LPSS and EPSS as much as possible.

Description on the modification: Thank you very much for your advice. We have revised the sentence as suggested.

9 Line 241-242: please check the slope of LPSS.

Description on the modification: Thank you very much for your advice. We checked the slope of LPSS. It should be -2.7 days/10a. We changed the text and replace the corresponding figure.

10 Line 371: More should be added here on the comparison of potential snowfall phenology with observed snowfall phenology.

Description on the modification: Thank you very much for your good suggestion. We will collect more observed data to validate the performance of potential snowfall phenology.

11 line 377: “4.2 Spatial and temporal heterogeneity” should be changed to “4.2 Temporal heterogeneity”.

Description on the modification: Thank you very much for your advice. We have revised the sentence as suggested.