

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2022-244

Anonymous Referee #1

Referee comment on "Change in the potential snowfall phenology: past, present, and future in the Chinese Tianshan mountainous region, Central Asia" by Xuemei Li et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2022-244-RC1>, 2022

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. Some specific comments are as follows:

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

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

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

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.

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.

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.

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

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.

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

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

line 377: "4.2 Spatial and temporal heterogeneity" should be changed to "4.2 Temporal heterogeneity" □□

line 408: Is there also an uncertainty error in the definition of PSP?