

Interactive comment on “Central Himalayan tree-ring isotopes reveal increasing regional heterogeneity and enhancement in ice-mass loss since the 1960s” by Nilendu Singh et al.

Anonymous Referee #1

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General comments: This paper of Singh et al. reconstructed and analyzed the glacier mass balance since 1743 in central Himalaya, using tree ring carbon isotope, it is meaningful for the understanding the glacier variation in Himalaya area. However, the present version has many problems in the results and structure. One of the most important is the glacier mass balance reconstruction. Firstly, is it available to use tree ring carbon to reconstruct glacier mass? The tree ring carbon is influenced by climate, environment and plant physiological factors, the authors should give reasonable explanation about the mechanisms. Secondly, the record of glacier mass balance in only 23 years, also with a few years gap, it is too short and lead to a very low degree of freedom, and then the correlation coefficients between tree ring carbon and glacier mass

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balance are not so high. Therefore, I deeply doubt the statistics of the reconstruction. I think the authors should firstly determine the dominant factor of glacier mass, temperature or precipitation in which season? After that, clarify the influence factor of tree ring carbon. Only make these explicit can discuss if tree ring carbon is available to reconstruct glacier mass. Besides, the studied glacier type is not obvious, the authors should give the monthly ice mass, as well as the percentage of summer rainfall and winter snowfall.

Special comments:

Introduction: in the fifth paragraph of this section, you present that tree ring width, you should give some investigation that why tree ring oxygen and carbon could record the information of glacier mass balance. To my knowledge, the climate signal recorded in tree ring carbon isotope is more complicated. Line 174: Do you mean the two conifer trees contain winter-time climate record? what is the growth period of the two conifer trees and the deciduous trees? Line 181: the amount of cellulose is too much, why? Line 165-173: this paragraph should be removed, it should be given in Results section. Section 3: this section should present the carbon series firstly, and then the correlation analysis, finally the reconstruction. The authors should give the raw and corrected ^{13}C values of the studied five trees, as well as the EPS, R_{bar} and the number of trees at different period.

Line 236-239: the correlation coefficients between ^{13}C of two PFTs and annual mass balance are not very high, especially in consideration of the low value of degree of freedom ($n = 23$), so I deeply doubt the reliability of the reconstruction. Line 250-253: this sentence is obscure, you mentioned that the uncertainty still exists in the reconstruction, how does the ^{13}C and the combination of two conifer species can help to minimize several factors.....? Why? Line 262: please give the period of the last glacial advance. Tree ring ^{13}C is affected not only by climate variation, but also the plant physiology and ecological factors, such as the photosynthesis, respiration, soil etc. in term of this, may be tree ring oxygen isotope is better for the reconstruction.

You should give sufficient discussion on the impact factors of tree ring carbon isotope, the physical mechanisms between tree ring ^{13}C and glacier mass balance must be discussed, the basis of the statistical correlation between them is not persuasive, Line 370: please give the reference. Line 376-377: please give the reference. Table S1: The first order autocorrelation is very high, why? Section 3.3: this section is too complicated and have no focus. Line 236-240: what is the relationship between ^{13}C of both evergreen conifer species, from Figure S6, the difference between two series is obvious, I don't think it is available to combine the two series.

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