Anonymous Referee #1

Received and published: 14 August 2020

Line 34/35: Related to which events? Not really clear how minimums are related to 8,15, an 18 months. What causes interval cooling? A mechanism must have been discussed.

Reply: *Thank you for the comment. The eruption events indicated some large volcanic eruptions with dust veil indices >1000 m^3. The citation here is an old article that focuses on the relationship between temperature and volcanic eruptions but does not provide any information regarding mechanisms. We modified this sentences and added a new citation in the revision . Please see lines 33-41, page 2:*

"As early as 1985, studies of the relationship between large volcanic eruptions (dust veil index > 1000m3) and temperature variations from 1951 to 1980 in China (Zhang and Zhang 1985) demonstrated that temperature on the northeastern TP decreased 8, 15, and 18 months after eruptions. However, temperatures in the 6 months immediately following an eruption were found to be relatively high. Jia and Shi (2001) studied climate signals following volcanic eruptions from 1950 to 1997 and found that temperature on the TP dropped within 2 years after eruptions during this period. However, new research focusing on regional differences over China of winter temperature response to large volcanic eruptions with different latitudes and seasons from 1956 to 2005 found that winter volcanic eruptions led to extensive warming of winter temperature over Tibet Plateau (Sun et al., 2019)."

Line 55: Are these new samples or samples from the studies referenced in the sentence before? Were they published for another study? This must be clarified.

Reply: *Thank you for the reminder. These are new samples taken from a different site in the Animaqin Mountains. Both the chronology data and the reconstruction series are used for the first time in this study. We have modified the sentence to clarify this; please see lines 59-60,Page 2:*

"Using tree-ring samples of Qilian juniper (Sabina przewalskii Kom.) collected from a new sample site in southeast part of the Animaqin Mountains, a 667-year tree-ring width chronology is developed, and then is used to reconstruct annual mean minimum temperatures (Tmin) across the east-central TP."

Line 55: Explain what a "strong" volcanic event is.

Reply: *We have provided further clarification; please see lines62-63, Page 3:*

"Finally, this study explores the response of Tmin to strong volcanic eruptions (Volcanic Explosivity Index (VEI) ≥ 5) over the past six centuries."

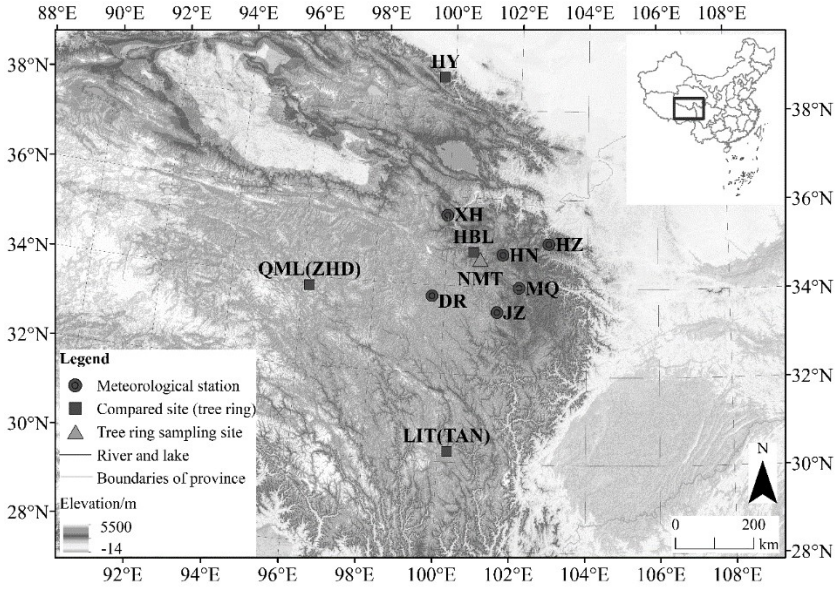
Line 61: The site name has "farm" in it which suggests that the area has had human activity and disturbance. Please elaborate.

Line 61: Give coordinates for the site.

Reply: *Thank you for pointing this out. There is no farm or history of human disturbance at this site. We have modified the site name to avoid further confusion and added the site coordinates and elevation.please see line 66-67, Page3.*

"Qilian juniper samples were taken from a natural woodland 35km west of Ningmute town, Henan County, Qinghai Province, China (E100.96, N34.62, 3806 m a.s.l)."

Map: Need to zoom closer to the sites, currently some of the names are unreadable.
Reply: *Thank you for pointing this out. We have increased the font size in figure 1, as shown below:*



Line 63: Briefly describe rainfall amount and temperature. From the closest met station in fine. I see this information is in Table 1- this should be mentioned when you first discuss met data and seasonalityâ˘A ˇ Tline 63.
Reply: *We have added a brief description in line 68-70, page3:*
"According to climate data of the Henan meteorological station (1960–2015; Table 1), mean annual temperature is 0.31 ℃ and mean annual precipitation is 582 mm. Precipitation is mainly concentrated between May and September"

Line 81: Reference your map when talking about station locations.
Reply: *We reference the map (figure 1) in the subsequent paragraph.*

Line 116: Some description of what SEA is would be helpful for readers.
Reply: *A brief discussion of SEA has been added in lines 124-132, page 5:*
"The Superposed Epoch Analysis (SEA) method (Haurwitz and Brier, 1981) was also used to analyze the influence of volcanic activity on regional temperature. SEA is a statistical method used to resolve significant signal-to-noise problems and is often used to study the link between climate and discrete events such as solar activity, fire events, volcanic activity etc. (Brad et al., 2003; Singh and Badruddin, 2006; Swetnam 1993; Esper et al., 2013;). In this study, the year of a volcanic eruption is regarded as year 0. The years before the volcanic eruption are denoted as -1, -2, -3 and so forth, whereas the years after the eruption regarded as 1, 2, 3, etc.. The impact of volcanic eruption on temperature in the east-central TP was analyzed by comparing differences in temperature in the years leading up to and following an eruption."

Are there any longer met records to test? Even if they are further away? These met records are very short, with a lot of overlap between calibration/verification periods. Some of the met records here do not also show up in the US, NOAAs, Global Historical Climatology Network- why is that?
I would like to see a variant of the reconstruction using longer station records, even if they are father away, using just current JJ.

Reply: *We will address the two comments above together:*

Most instrumental records for the Tibetan Plateau start after 1956 because many weather stations were built later in this remote and cold place. The longest instrumental records available are from Yushu station (starting in October 1951 with many missing data until 1954), which is located more than 500 kilometers to the southwest of this site. The correlation coefficient of our chronology index with T_{min} in current June-July at Yushu station is 0.62; the first-order differenced correlation coefficient is 0.39. These values indicate that the regression model has poor skill and does not explain much of the variation. More importantly, tree growth is directly affected by local environmental factors; at a distance of more than 500 km from the study site, data from Yushu station cannot be considered representative of the site conditions. In addition, this study focuses on temperature variations in the Animaqin Mountains and their response to volcanic eruptions. Thus, data from more distant stations are not suitable.

There are three types of weather stations in China: national standard climate stations, national basic weather stations, and national general weather stations. Each type of station provides data of varying consistency and length. National standard climate stations are set up to obtain long-term and continuous climate data with sufficient representativeness. Records from these stations may be found in NOAA, Global Historical Climatology Network, such as Dari station, Guinan station and Yushu station. The observation data obtained from the other two types of stations are mainly used by local and provincial meteorological services. These data are not reflected in the global climate observation system.

Line 131: Explain the obvious differences. It's better to explain it then to just say it is obvious.

Reply: *We have modified this paragraph as follows:*

"The first-differenced correlations between the tree-ring width index and climate data are weak; in some months, the first-order correlations are even negative (Figure 3b). The first-differenced chronology correlates significantly and positively with precipitation of the previous September and the current May, but negatively with precipitation of the previous December."

Line 132: Refer to this as the 1st differenced chronology otherwise it is confusing.

Reply: *Thank you, we have changed this as suggested.*

Line 135: More information is needed in the introductory section about the growing season to understand if these correlations make sense.

Reply: *We have added some additional information to the discussion section. Please see lines 213-224, Page 8.*

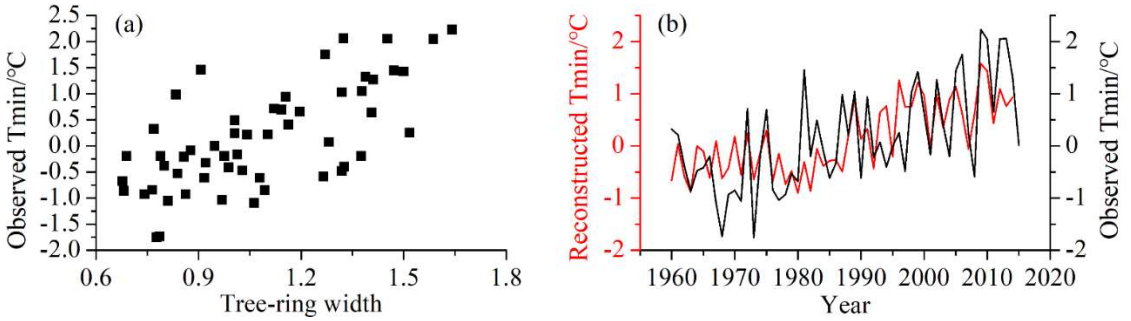
"With the thick topsoil and humid climate in spring and summer, the study area meets the needs of trees for radial growth. However, according to instrumental data from the GL weather station (Table 1), the elevation of which is close to that of the sampling site, the annual Tmean and Tmin are 2.25 ℃ and -6.76 ℃, respectively. These temperatures are quite low for tree growth, and the statistically significant positive correlation between growth and temperature shows that tree radial growth in this area is restricted by temperature, especially Tmin. Tmin before and during the growing season may affect tree growth in several ways. In winter and early spring, warmer Tmin protects roots from cold damage and triggers earlier snowmelt. Warmer Tmin may therefore result in a longer growing season, and trees may experience increased growth in the subsequent growing season (Pederson et al., 2004; Fu et al. 2012; Hollesen et al. 2015; Williams et al. 2015). In the other hand, Tmin is known to affect conifer tracheid division and enlargement by controlling the onset and conclusion of xylogenesis during the growing season (Deslauriers et al., 2003; Rossi et al., 2008; Li et al., 2017b; Hosoo et al. 2002; Steppe et al., 2015)."

Line 137: What do you mean by annual? P8-C7? That needs to be stated.

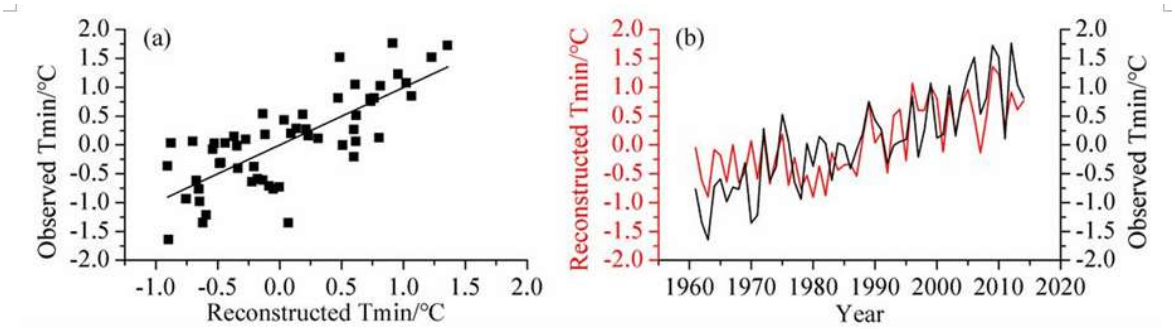
Reply: *You are correct, annual Tmin means minimum temperature from previous August to current July. We have clarified this in the revision.*

Figure 3. So much of the relationship between the trees and meteorological data is based on trend, as apparent by Figure 3b. Why not just reconstruct CJJ- the relationship(Fig 4b) must improve or look more convincing?

Reply: *We attempted to develop the regression model using the T_{min} of current June and current July, but the calibration/verification results were not good enough to warrant further use in reconstruction. We compared the instrumental and reconstructed T_{min} in current June and July as shown below:*



The comparison between the instrumental and reconstructed T_{min} from current June to current July



The comparison between the instrumental and reconstructed T_{min} from previous August to current July

Section 3.5: This very large area of correlation is based on the warming trend across most of Asia, this needs to be stated more clearly. It is fine to show both, but Fig. C and D are more representative of your results and reconstructed area, so I would suggest leading with that.
Reply: *Thank you for the suggestion. We have modified this part and added a few sentences in the discussion section to clarifying the influence of warming trend on correlation results. Please see lines230-234, page 8:*
"The results of correlations of the reconstructed series with CRU Tmin reflect the regional significance of the reconstruction in general, however, the consistent warming trend of Tmin over most of Asia (Dong et al., 2017) may result in the large area of significant positive correlations, the results of first-order correlation analysis are therefore more referential, i.e. our reconstruction can reflect the temperature variations in the Animaqin Mountains and the area to the west."

Line 185, Figure 6. The region that each Tmin timeseries is from needs to be labeled and mentioned in the text.
Reply: *We apologize for the lack of clarity. Each T_{min} time series belongs to one series. In the figure, we zoom in on different periods to more clearly present the relationship between volcanic eruptions and temperature variations in the series. We have modified the figure caption to make this clear.*

Line 188: The ratio description is unclear.
Reply: *We have modified the description for clarity.*
"A comparison of large volcanic eruption events and the reconstructed Tmin87 is shown in Figure 6. For most years, large volcanic eruptions (VEIs> 4) coincide with a drop in Tmin across the study area. Of the 46 strong volcanic eruption years, there are 35 event year in which temperature decreases in the year of the eruption or 1, 2, or even 3 years after the event. "

Figure captions could be more detailed.
Reply: *We have added more details to the figure captions.*

Watch your tense- sometimes the text is written in past tense and sometimes in present tense.
Reply: *Thank you; the tenses should now be consistent. When we refer to actions we took (e.g., we collected samples…), we use past tense. When we refer to the results (e.g., growth is positively correlated with…), we use present tense.*