Response letter

The manuscript present a new 366-year series of Jun-Jul scPDSI modeled with the help of tree rings. The topic is relevant to the scope of CD.

I find that the manuscript is not strong enough for publication. It holds many unclear issues related to the reconstruction model, data analysis, and interpretations.The paper title suggests a discussion of changing drought signals in juniper tree rings of western Central Asia, although much of the Discussion emphasizes the linkages between the Tajikistan-site PDSI reconstruction, regional PDSI pattern and atmospheric circulation.

Response: First of all, we thank you for your valuable advice, which will help us to further improve this article. Yes, this article has some shortcomings, but it is a standardized method for reconstruction models and data analysis, and it does not have fatal defects. At the same time, the purpose of our reconstruction is not only to reveal the facts of regional climate change, but more importantly to reveal the mechanism of climate change and serve to improve climate simulation and strategies to deal with climate change.

The paper has a number of short-comings. The most obvious that the authors try to explain the variability of reconstructed moisture with ENSO, solar activity (Fig 9 cross wavelets) and volcanic eruptions (L216-217). The Discussion is lacking conclusive assertions explaining how these factors drive the moisture variability across the region.

Response: Indeed, we only objectively demonstrated the relationship between them and did not conduct a mechanism analysis. In fact, a large number of studies have been conducted in the past to analyze the effects of ENSO, volcanic activity and solar activity on tree rings and climate. But as you know, there is very little research on tree-ring climate in this area, and this study only shows preliminary results. If we can get a chance to modify it, we will explain the mechanism further in the discussion, and added some important references.

The conceptual scheme linking the drought reconstruction solely to the Asian monsoon (“tropical domains”) sounds speculative. How is the impact of Arctic and Atlantic air masses compatible with the Asian monsoon variability?

Response: This area is affected by a variety of climate circulation, forming a climate characteristic similar to that of the Iranian plateau, and is very different from the Tianshan Mountains. Under the influence of the meridional circulation, the Southwest monsoon (moisture) crossed Southwest Asia into Central Asia. We will explain this mechanism further in the discussion.

The tree rings collected in cold semi-arid climate is mostly influenced by the westerlies. The side map shows the position of the study area along the west-northern margin of Central Asian mountain system, where the Alay-Pamir Mountains (Tajikistan/Afghanistan) is merging with the Tian Shan Mountains (Kazakhstan/Kirgizstan). More generally, it is unclear why the moisture fluctuations between eastern and western sub-regions of Central Asia appear so similar and coherent. It is just hard to believe that the Asian Monsoon controls the moisture regime of this entire region. The PCA analysis of the PDSI-derived moisture records must be shown and explained prior to the Discussion.

Response: No, over the past eight years, we has found that some areas are relatively wet and can grow spruce (see figure), which is affected by Marine climate, and. But in Tajikistan and southern Kyrgyzstan, eastern Uzbekistan is drier, summer rains are rare and forests grow only on the windward slopes of high mountains. As you can see, our research area is located in the south slope. Only will there be enough water vapor to meet the growth needs of trees when the southern monsoon and the westerly wind system work together. The two regions are connected, so their climate is of course consistent. The monsoon is only likely to affect the southern slope of the area, and in the north it is affected by the western wind. I will discuss the impact of the interaction between the West wind and the monsoon on the climate in Central Asia in the mechanism exploration section. At the same time, I will cite the papers published in recent years on the precipitation mechanism in Central Asia. The results of these papers can support our conclusions.

Technical flaws:
The physiological mechanism underlying the response of tree rings to moisture is not well explained and cited. There is a dozen different species of juniper trees in the studied region and their climatic response to temperature and moisture vary significantly (see Seim et al. 2016, Mukhamedshin 1980). For example, J. seravschanica is highly sensitive to cold but well adapted to low moisture. In opposite, J. turkistanica favors wet and cold habitats. J. seravschanica studied in the paper is strongly limited by the Apr-Sept moisture conditions (Seim et al. 2016). Why do the authors select the Jun-Jul window for their reconstruction model? How do they explain the physiological mechanism underlying the tree-ring response to soil moisture of the mid-summer months?
Response: Indeed. In different growing environments, trees have different responses to climate. In order to reconstruct drought changes, we only chose dry sampling sites. In Dr Seim's study, they collected data from a large number of sampling sites and analyzed the climate response characteristics of Juniper at different altitudes and environments. Because the months are the most important growing season for plants and crops, we chose June-July PDSI as target. The mechanism is well understood, because this is the peak season for forest growth in high mountains, and there is very little rainfall in this area. This has been explained in this paper, and the variance of the reconstruction equation in this period is highest. I will improved the response of tree rings, and discuss about the link of tree rings with to soil moisture.

The reconstruction model is not clearly explained, e.g. the regression equation is not given, the residuals and quality of the model are not analyzed. Fig. 5 shows R2 adj. =0.637, which is actually the correlation (Table 2).
Response: Yes, you are right. The model will be added in the paper. We use the standard reconstruction method and process, and show the results of equation test. I don't know why you would say we didn't show the test of the equation. But we decided to modify the content about the quality test of the equation.

The wavelet plots are unreadable due to 1) invisible arrows displaying the difference in phases (time lag) and signal coherence, and 2) missing the cone of influence (area of uncertainties). How was the periodicity of 24.3 and 11.4 yrs assessed?
Response: the periodicity of 24.3 and 11.4 was determined by calculating his highest peak. I have

shown the meaning and scope of the arrows in the diagram. I don't know why the wavelet plots are unreadable. Could you provide an example diagram? Or I will use multi-taper methods to analysis cycles based on the advice of reviewer 2.

The Principal component analysis applied to the Tajikistan reconstructed series and Central Asian regional record (Cheng et al. 2015) is not shown in the Results.
Response: Yes, I will show the results of the principal component analysis applied to the Tajikistan reconstructed series and Central Asian regional records in the result section.

Fig. 10 is missing scale bar and location of the study.
Response: Yes, I will redraw the fig. 10 and added scale bar and location of the study.

Abstract and Results have no indication for the span of reconstructed series. Notice that the sampling was done in the Kuramin Range. Calling this range “Kuramenian Mountains” is nor correct.
Response: Yes, I will improve. The name of the mountains is very confusing. According to the local map of tajikistan and some tourist information, we adopted this name. But according to the information you provided, we will modify the name in the fig 1.
https://www.advantour.com/tajikistan/nature/mountains.htm