Climate
of the Past

Open Access

Discussions

CPD

Interactive
comment

Interactive comment on "Juniper tree-ring data from the Kuramenian Mountains (Republic of Tajikistan), reveals changing summer drought signals in western Central Asia" *by* Feng Chen et al.

Anonymous Referee #2

Received and published: 31 May 2018

General comment

The paper "Juniper tree-ring data from the Kuramenian Mountains (Republic of Tajikistan), reveals changing summer drought signals in western Central Asia" by F. Chen et al. is devoted to reconstruct past summer drought variability (PDSI based) in western Central Asia (actually, the authors analyzed a very local area in the Kuramenian Mountains which contains just two sample plots).

Overall impression of the work is very mixed. The authors use traditional techniques to

analyze their dendroclimatical datasets and to obtain a local PDSI reconstruction and its analysis. As an example based on well-known "classical' procedure they obtained tree-ring measurements from 81 juniper trees located at the elevations from 1600 to 2035 m. But what is a reason to mix them together? Early it was shown a tree-ring response on climate can be different for mountain regions and significantly depended on site elevations (e.g. Touchan et al., 2016 for vast part of Eastern Mediterranean). That response can be changed each 500 m of additional elevation. It means that the moisture on 2000 meters can be different from the values on 1000 meters. At the same time Chen F. and co-authors try to extend their results for the very diverse (in context of elevation) and vast region such as western Central Asia. Could the authors prove that the western Central Asia is a more homogeneous in comparison with the semi-arid Eastern Mediterranean in the context of the tree-ring response on climate depended on altitude (or elevation)?

Other serious issue of the manuscript is a way to use different approaches which are not appropriate to obtain the certain results (see specific comments).

Speculation concerning the global climate patterns and their connections with the obtained reconstruction should be clarified or proven taking into account wavelet features (see specific comments). For example, why the correlation between reconstructed scPDSI and sunspot number becomes much stronger in XX centuries in the high-frequency domain (Fig. 9b)? How that phenomena can be explained in terms of climatology?

I recommend to re-submit the paper after major revision.

Specific comments

Lines 70-72 Authors wrote: "To achieve this additional moisture-sensitive tree-ring chronologies are needed." What does "moisture-sensitive tree-ring chronologies" mean? Is the local tree-ring signal sensitive to soil moisture or to mixed signal "precipitation-temperature", i.e. PDSI associated? Could the authors clarify it?

Lines 103-104 Authors wrote: "Each raw ring-width series was first detrended to re-move non-climatic trends using the negative exponential curve." It was shown early (i.e. Melvin, 2004) that the selected standardization can be a reason of "divergence problem"? What was a criteria to select "the negative exponential curve" as a stan-dardization method?

Lines 109-110 Authors wrote: "The regional chronology was correlated with a set of monthly climate variables (including monthly total rainfall and average temperature) from July..." What was a criteria to mix (average) tree-ring indexes from two different plots located on different elevation levels? The elevation difference is more than 500 m. Early it was shown tree-ring response is significantly different for different eleva-tions and depended on site elevation for the extensive area of Eastern Mediterranean (Touchan et al., 2016). Can the authors prove the tree-ring signal are the same for the both sites? If they are able to show it then they can go further.

Line 126 Authors wrote: "...principal component analyses (Jolliffe, 2002)..." Could the authors include PCA statistics in the MS to understand why and how new PCA components can be associated with "common drought signals"?

Line 128 Authors wrote: "In this study, wet and dry periods were determined if the 31-year low-pass values..." Why the "31-years low-pass filter" is selected? I am sure in case of other window for filter we can obtain other wet and dry periods.

Lines 132-133 Authors wrote: "Wavelet analysis was employed to reveal any period-icities in the scPDSI reconstruction..." What was a kind of wavelet analysis used to "reveal any periodicities" taking into account that in most cases the wavelet technique allows to obtain a frequency strongly affected by the time window?

Line 135 Authors wrote: "...smoothed with a 20-year low-pass filter." Why was 20-years filter used? What will be a difference in case of 15-, 21-, 25-years filters used?

Line 144 Authors wrote: "...signal-to-noise ratio (32.22) and EPS (0.97)." What was

a value of Rbar between individual trees for both sites? It seems to me the Rbar was pretty low (about 0.3 or less).

Lines 144-145 Authors wrote: "The Variance in first the eigenvector of all series accounted for 51.6% of the total variance, . . ." What does "all series" mean? Are the time series indexed or raw? How the first PC is corresponding to regional chronology?

Lines 153-158 It seems to me the lines 153-158 is not a result and they should be removed to discussion section.

Line 164 Authors wrote: "These test results indicated that our statistical equation was reliable". Where is the statistical equation or equations? The authors used cross-validation approach to testify the model. They calibrated the model on the 1957-2012 and verified it on the 1901-1956 as a first step. Then they used an inverse approach (to change the calibration and verification periods). It means they obtained 2 equations as minimum (see table 2). How are the equations statistically different or the same? Which equation is used for reconstruction? And what does it mean "common calibration period 1901-2012"? Does it mean the third equation?

Lines 177-178 Authors wrote: "The three tree-ring width chronologies of juniper trees (this study; Seim et al., 2015; Chen et al., 2016) were correlated significantly (p < 0.001) among each other." What are the correlation values between chronologies? What is the common time period?

Lines 189-192 Authors wrote: "Wavelet analysis indicated that some centennial (100-150 years), decadal (50-60, 24.3 and 11.4 year) and interannual (8.0, 2.0-3.5 years) periodicities were found in the reconstructed scPDSI data for the Kuramenian Mountains (Fig. 8)." It seems to me the wavelet analysis is not a best choice to analyze the periodicity in time series taking into account the wavelet features in time and frequency domains. For example, multi-taper method could be more appropriate in that case.