Reconstructing Over a Century of Minimum Monthly Temperature of Cold Seasons from *Quercus* Persica tree Rings in Zagros Forests
(Case Study of Dena Region)

S. Movahedi

Assistant professor of Climatology, University of Isfahan, Isfahan, Iran

Extended abstract:

1. Introduction

One of the most important challenges in climatic studies of Iran is the lack of access to long-term climatic data for all regions; among such regions, one can point to Dena region. This region is in in the central Zagros, parts of Isfahan province, ChaharMahal and Bakhtiari, Fars province and Kohkiluyeh and Boyer-Ahmad province. The longest reported climatic report of the weather stations of the region is less than 30 years. On the other hand, dendroclimatology field provides information on temperature and rainfall of past periods through addressing climatic effects existing in annual rings of trees. This attempts aims to reconstruct minimum monthly temperature of the past 131 years of Dena region based on the growth style of annual growth rings of *Quercus* Persica.

2. Methodology

This study is divided into two parts:

2.1. *Calculating the tree rings response to monthly temperature of cold seasons*: to achieve this goal, first, 3 dominant sites of *Quercus* Persica in the region were selected and 52 growth samples were extracted from trees. Applying TSAP and ARSTAN, the index of sites' chronology was prepared and the residual chronology was taken as the standard chronology and the statistical profile of this chronology was calculated. Then, applying Pearson moment correlation, the response of growth rings to minimum monthly temperature of cold seasons was specified for three stations of Yasooj, Pataveh and Dashte Room.

2.2. Reconstructing minimum monthly temperature of cold seasons from trees' growth rings: in this section, applying a simple linear and quadratic regression, we reconstructed minimum monthly temperature of cold months of the year (September-January) and the validity and reliability of this construction was checked with the control station of Shahrekord which is out of Dena region.

3. Discussion

The statistical features of the residual chronology of sites showed that the extracted samples worth dendroclimatology studying. Some of such features include: internal correlation of samples (0.529-0.574), the sensitivity of growth rings to minimum monthly temperature (0.296-0.649), signal to noise ratio (9/52-10/16), and population signal (0.905-0.910). Also, the results of Pearson correlation showed that the sensitivity of growth rings width to the minimum monthly temperature of cold months is significant with positive correlation coefficient and it is between 45 to 65 percent. In reconstruction stage, the mean coefficient of determination of linear regression of reconstructed models, with confidence level above 95%, was between 0.362 and 0.600 for the minimum monthly temperature for the stations except for February. Based on the reconstructed temperature, minimum temperature of October,

November, January and February of the last three decades has shown an increase of 1.7, 0.1, 0.3 and 0.2, respectively, in comparison to the previous century and the minimum temperature of December has decreased about a tenth of a degree (-0.1). In addition, the accuracy of reconstructed data of the region was confirmed with the control station (Shahrekord).

4. Conclusion

The following conclusions are made based on this study:

• *Quercus* Persica worth dendroclimatology study.

• *Quercus* Persica is sensitive to the minimum of cold seasons of the year and this sensitivity was significant with positive correlation coefficient.

• Comparing the minimum monthly temperature of the cold seasons to the reconstructed data of the previous century, it was found that the coldness of the cold months has been decreased to some extent.

• Studies show that the area of *Quercus* Persica forests of Dena region has been decreased significantly in the last three decades and the results of this study show that due to the direct correlation of minimum temperature with growth rings width, minimum temperature probably has no significant effect on the decrease of the area of these forests.

• It is probable that other climatic parameters and human interventions have more significant role in the decrease of Dena forests' area, which needs more investigations in this field.

• Reconstructing the minimum temperature of cold months of the year helps completion of the climate database of Dena region and the country.

Keywords: Dendroclimatology, Regression analysis, Chronology, *Quercus* Persica