Climatic signals in stable carbon isotope ratios of Juniper and Oak tree rings from northern Iran

Zeynab Foroozan, Kambiz Pourtahmasi, Achim Bräuning

PII: S0921-8181(17)30292-8
DOI: doi:10.1016/j.gloplacha.2018.03.010
Reference: GLOBAL 2755

To appear in: *Global and Planetary Change*

Received date: 8 June 2017
Revised date: 22 February 2018
Accepted date: 19 March 2018

Please cite this article as: Zeynab Foroozan, Kambiz Pourtahmasi, Achim Bräuning , Climatic signals in stable carbon isotope ratios of Juniper and Oak tree rings from northern Iran. The address for the corresponding author was captured as affiliation for all authors. Please check if appropriate. Global(2018), doi:10.1016/j.gloplacha.2018.03.010

Climatic signals in stable carbon isotope ratios of Juniper and Oak tree rings from northern Iran

Zeynab Foroozan[a,*] zeynab.foroozan@fau.de, Kambiz Pourtahmasi[b], Achim Bräuning[a]

[a]Institute of Geography, Friedrich-Alexander-University Erlangen-Nürnberg, Erlangen, Germany

[b]Department of Wood and Paper Science & Technology, Faculty of Natural Resources, University of Tehran, Karaj, Iran

[*]Corresponding author at: Institute of Geography, University of Erlangen-Nuremberg, Wetterkreuz 15, 91058 Erlangen, Germany.

Abstract

Stable isotope ratios in tree rings are increasingly used as palaeoclimatic archive and ecophysiological indicator. We used cross-dated tree-ring series from different tree functional types, i.e. the evergreen conifer *Juniperus polycarpus* and the deciduous broadleaved *Quercus macranthera*. The samples were collected from Chaharbagh Gorgon forest in northern Iran, where oaks and junipers grow on north-facing and south-facing slopes, respectively. We extracted α-cellulose from the whole wood of annually separated tree rings and evaluated their potential for palaeoclimate reconstructions by examining the relationships between variations of $\delta^{13}C$ in tree-ring cellulose and climate parameters. Based on tree-ring $\delta^{13}C$, we calculated intrinsic water use efficiency (iWUE) and evaluated changes in water availability at the study site over the past 50 years. We found significant negative relationships between tree-ring $\delta^{13}C$ values in oak and juniper and precipitation in April and spring (only in junipers), while no significant correlations of tree-ring $\delta^{13}C$ with temperature occurred. A strong negative relationship between tree-ring $\delta^{13}C$ and summer Palmer Drought Severity Index (PDSI) was found at the drier site, indicating that juniper growing on south-facing slopes is a better indicator of drought stress in semiarid environments. A continuous increase in iWUE in both species was observed. $\delta^{13}C$ variations in both species reflect the combined influence of climate and local site conditions. The interplay between climatic conditions and species behavior determines the inter-annual $\delta^{13}C$