Geophysical Research Abstracts
Vol. 21, EGU2019-6985, 2019
EGU General Assembly 2019

Alpine tree ring triple isotope records throughout the Holocene

Tito Arosio
universiy of Bern, Physics Institute, Climate and Environmental Physics, Bern, Switzerland (arosio@climate.unibe.ch)

Autors:
T. Arosio 1,2, M. Ziehmer 1,2, K.Nicolussi 3, C.Schlüchter 4, M. Leuenberger 1,2

1 Climate and Environmental Physics, Physics Institute, University of Bern, 3012 Bern, Switzerland
2 Oeschger Center for Climate Change Research, University of Bern, 3012 Bern, Switzerland
3 Institute of Geography, University of Innsbruck, 6020 Innsbruck, Austria
4 Institute of Geological Sciences, University of Bern, 3012 Bern, Switzerland

Multi-millennial tree-ring records are a well-established multi-proxy approach to examine climate variability in the Holocene, and the examination can be further improved by stable isotope analysis. We have access to a calendar-dated wood material from peat bog sites and subfossil wood collected at glacier forefields located in Switzerland, Austria and Italy. The samples are analysed for triple isotope and α-cellulose content records. They are separated into 5-year tree-ring blocks, then α-cellulose is extracted by a modified and standardized Jayme-Wise procedure. We have finished the evaluation of the cellulose content of wood samples covering the last 8000 years with a 4-fold coverage and the data will be presented and discussed as potential climate record (Ziehmer, 2018).
The δ18O series is almost complete and shows coherent values (EPS evaluation in progress) among the different trees and locations, even when merging records of single trees originating from the same or different locations. The preliminary data are in apparent agreement with other proxy records and reconstructions established for the Holocene, especially during the well-known 8.2 ka BP cold event. (Ziehmer, 2017).
Also, the δ13C series has been corrected for the atmospheric delta C13 trend from 1000 b2k. It is almost complete and shows coherent values as the Delta O series. The analysis of the data and EPS calculation are in progress.
The δD series, which is restricted to the exchangeable hydrogen atoms, shows an interesting offsets between the deciduous larch (Larix decidua Mill.) and the evergreen pine (Pinus cembra L.), the two conifer species we investigated. The interpretation of these data is in progress and present hypothesis suggests that the offsets are due to different biochemical pathways linked to the different metabolisms of the two species (Cormier et al., 2018).

• Cormier, M.A., R.A. Werner, P.E. Sauer, D.R. Gröcke, M.C. Leuenberger, T. Wieloch, J. Schleucher, and A. Kahmen (2018). 2H-fractionations during the biosynthesis of carbohydrates and lipids imprint a metabolic signal on the δ2H values of plant organic compounds, New Phytologist, 479-491
• Ziehmer,M (2017) “Alpine Holoecene Triple Rings Isotope Records”, PhD thesis at the university of Bern.
• Loader NJ, Street-Perrott FA, Daley TJ, Hughes PD, Kimak A, Levanič T, Mallon G, Mauquoy D, Robertson I, Roland TP, van Bellen S, Ziehmer MM, Leuenberger M. (2015). Simultaneous determination of stable carbon, oxygen and hydrogen isotopes in cellulose. Anal Chem. 87(1):376-380.
• Ziehmer, M.M., K. Nicolussi, C. Schlüchter, and M. Leuenberger, Preliminary evaluation of the potential of tree-ring cellulose content as a novel supplementary proxy in dendroclimatology, Biogeosciences, 15 (4), 1047, 2018.