HAL
open science

High resolution record of millet cultivation during the Bronze Age around Lake le Bourget (French Alps). Is there any climatic control?

Jérémy Jacob, Jean-Robert Disnar, Fabien Arnaud, Yves Billaud, Emmanuel Chapron, Marie-Alexandrine Sicre, Rachel Boscardin

To cite this version:

Jérémy Jacob, Jean-Robert Disnar, Fabien Arnaud, Yves Billaud, Emmanuel Chapron, et al.. High resolution record of millet cultivation during the Bronze Age around Lake le Bourget (French Alps). Is there any climatic control?. 24th International Meeting of Organic Geochemistry (IMOG 2009), Sep 2009, Brême, Germany. hal-03427315

HAL Id: hal-03427315

https://hal.science/hal-03427315

Submitted on 13 Nov 2021

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

Author manuscript, published in "International Meeting of Organic Geochemistry - IMOG, Brême : Germany (2009)"

insu-00442921, version 1 - 23 Dec 2009

High resolution record of millet cultivation during the Bronze Age around Lake le Bourget (French Alps). Is there any climatic control?

Jérémy Jacob [a,*], Jean-Robert Disnar [a], Fabien Arnaud[b], Yves Billaud[C], Emmanuel Chapron[a], Marie-Alexandrine Sicre[D], Rachel Boscardin[a]

[a] *Institut des Sciences de la Terre d'Orléans. Université d'Orléans/Université François Rabelais de Tours, UMR 6113 du CNRS/INSU. 1A rue de la Férollerie, 45071 Orléans, France. (* corresponding author: jeremy.jacob@univ-orleans.fr)*

[b] *EDYTEM, UMR 5204 CNRS/Université de Savoie, Campus Savoie Technolac, F-73376, le Bourget du Lac, France.*

[c] *Ministère de la Culture, DRASSM 58 bis rue des Marquisats 74000 Annecy, France.*

[d] *Laboratoire des sciences du climat et de l'environnement (LSCE), UMR 1572 CNRS/CEA/Université de Versailles-Saint-Quentin, Orme des Merisiers bât 701, Saclay 91191, Gif-sur-Yvette, France.*

Our understanding of past interactions between the development of human societies, the evolution of climate and associated changes in ecosystems and landscape dynamics is conditioned by the acquisition of high resolution records within which specific tracers allow us estimating variability. The recent development of a molecular biomarker (miliacin) specific of *Panicum miliaceum* (common millet) associated with the determination of a biomarker allowing to track soil erosion in the sediments of Lake le Bourget (French Alps; [1], [2]) expands the possibilities afforded by organic geochemistry applied to sedimentary archives to unravel these interactions.

Within the frame of the Pygmalion project (ANR Blanc, France) we improved the previous miliacin record from Lake le Bourget sediments [1] to reach an infra-decadal resolution for the 2000-600 BC time period that covers the Bronze Age. Miliacin is detected for the first time in sediment samples dated back to ca. 1700 BC, in agreement with the supposed date of introduction of *P. miliaceum* in the region. Miliacin concentration is low (ca. 20 $ng.g^{-1}$) during the 1700-1400 BC interval and then rises to values up to 300 $ng.g^{-1}$ at 850 BC before the strong decrease to 20 $ng.g^{-1}$ at 750 BC imputable to the abandonment of palaffitic habitats due to a climatic deterioration at the Bronze Age/Iron Age transition. In addition to this general trend, miliacin concentration shows century-scale variations in the 1700-800 BC interval that share similarities with other records. Two periods of miliacin high concentrations at 950 and 850 BC coincide with high densities of dendrochronological dates acquired on wooden piles and with two periods of lake level lowering.

The comparison of miliacin evolution in Lake le Bourget with the high resolution alkenone-derived sea surface temperature (SST) record obtained in the North Atlantic off Iceland [3] shows striking coincidences. Previous studies showed that periods of elevated SSTs in this area coincide with favourable climatic conditions in Europe (Mediaeval Warm Period for example) [4]. Our data indicates that the beginning of millet cultivation coincides with a period of elevated SSTs that is followed by lower temperatures, when miliacin concentration is low. Then, century-scale periods of miliacin high concentrations follows century-scale oscillations of elevated SSTs from 1400 to 800 BC.

A relationship between population density around Lake le Bourget and climate variations cannot be disregarded at this stage. We are currently improving the miliacin record from another core drilled in Lake le Bourget in which miliacin shows the same global trends [2] to support these findings.

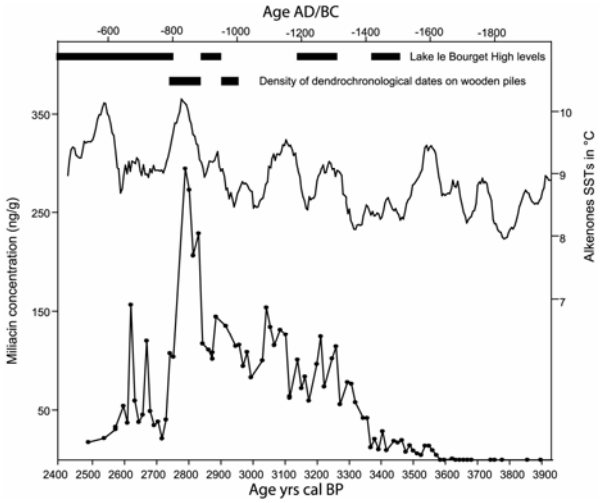

Fig. 1. Evolution of miliacin concentration, density of dendrochronological dates measured on wooden piles and periods of high lake levels for Lake le Bourget and alkenones-based SSTs reconstruction off Iceland for the 2000-600 BC time period.

References

[1] Jacob, J. et al. 2008. Millet cultivation history in the French Alps as evidenced by a sedimentary molecule. Journal of Archaeological Science 35, 814-820.

[2] Jacob, J. et al. Impacts of new agricultural practices on soil erosion during the Bronze Age in French Prealps. The Holocene, in press.

[3] Sicre, M.A., et al., 2008. A 4500-year reconstruction of sea surface temperature variability at decadal time-scales off North Iceland Quaternary Science Reviews, 27, 2041-2047.

[4] Sicre, M.A., et al., 2008. Decadal variability of sea surface temperatures off North Iceland over the last 2000 yrs. EPSL 268, 137-142.