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To cite this version:

Joel Guiot, Michelle Leydet, Armand Rotereau. Climatic variations across the Mediterranean Basin reconstructed from pollen and vegetation model. American Geophysical Union, Fall Meeting, Dec 2012, San Francisco, United States. hal-03100975

HAL Id: hal-03100975

https://amu.hal.science/hal-03100975

Submitted on 6 Jan 2021

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AGU Fall Meeting Abstracts, December 2012

Climatic variations across the Mediterranean Basin reconstructed from pollen and vegetation model

- Guiot, J. (*CEREGE, CNRS, Aix-En-Provence, France;*);
- Leydet, M. (*IMBE, CNRS, Aix-en-Provence, France;*);
- Rotereau, A. (*ECCOREV, CNRS, Aix-en-Provence, France;*)

Abstract

The Mediterranean Basin is a complex region with a complex topography at the interface of two climatic systems. Water availability is the main limiting factor of vegetation at low elevation and both temperature and precipitation are equally important at higher elevation. We propose here a gridded reconstruction of the Holocene climate at the scale of the Mediterranean region from pollen by using a vegetation model in inverse mode (Guiot et al, 2009) and so relating vegetation changes to climatic changes in a more mechanistic way than standard statistical approaches. The proxy data used are the pollen series stored in the European Pollen Database (EPD) for the Mediterranean Basin. The period covered is the last 10 ky at a multi-decadal time-step and the climatic variables are winter, summer temperature and precipitation, as well as soil water. BIOME4 model (Kaplan et al, 2003) uses as inputs monthly temperature, precipitation variables and provides outputs comparable to pollen data (assuming that there is a relationship between plant productivity and pollen counts). The idea behind paleoclimatological reconstructions is then to obtain inputs, given outputs. This procedure, called model inversion, is achieved with appropriate algorithms in the frame of the Bayesian statistical theory. As CO2 atmospheric concentration is also an input of the model, it is possible to take into account the true variations of the concentration across Holocene to reconstruct the climate. We will present gridded maps of climatic change for typical periods where Mediterranean Basin has known important water stresses. Guiot, J. Et al, 2009. Climate of the Past, 5, 571-583. Kaplan, J., et al, 2003. JGR-Atmos., 108, 8171, doi:10.1029/2002JD002559

Publication: American Geophysical Union, Fall Meeting 2012, abstract id. B13F-05
Pub Date: December 2012
Bibcode: https://ui.adsabs.harvard.edu/abs/2012AGUFM.B13F..05G/abstract
Keywords :

0315 ATMOSPHERIC COMPOSITION AND STRUCTURE / Biosphere/atmosphere interactions;
0473 BIOGEOSCIENCES / Paleoclimatology and paleoceanography