

**Contribution of MCS to the quantification  
of seasonality in ancient times ;  
application between 3,5 Ma and 1,2 Ma in the Omo  
(Shungura Formation, Ethiopia)**

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Seasonality is one of the climatic variables that has the greatest impact on the landscapes and distribution of faunas and their diversity at different time scales: annual, historical and geological.

At long (archaeological and even more paleontological) time scales, research that seeks to quantify the impact of change in seasonal amplitudes on biodiversity stumbles on the lack of independent methods to characterize and quantify seasonal amplitudes or to evaluate their evolution over time. In the (frequent) absence of varve, these methods are based on fossil remains and interpret the ecological behaviors of the organisms and in particular their diet (mainly the micro-wear and stable isotopes of oxygen and carbon in the mammals) or they reflect multifactorial variations in the environment (such as stable isotope ratio in mollusc shells that depends on both precipitation temperature and fractionation in water).

Given the current challenges in assessing the impact of climate change on biodiversity, it is essential to improve our knowledge of the response of biodiversity to variations in seasonality in the past, with the development of new independent methods. The objective of the thesis project is (1) to develop the study of growth marks in the skeletal formations of aquatic ectotherms (actinopterygians and chelonians) to quantify the amplitude of seasonality and its evolution over time and (2) to apply it in the in key localities to understand the context of the evolution of the human lineage. Indeed, ectothermic organisms display subcontinuous growth and are highly sensitive to seasonal change that significantly regulates their growth. Growth marks in their skeletal formations archive this information during their lifetime. This information is already used in archeology and fisheries, respectively to determine the fishing seasons of our ancestors, or follow the dynamics of growth in modern aquatic populations. But they have never been used as a climatic proxy whereas this information would then be very widely accessible (fossils of aquatic ectothermic vertebrates are relatively abundant in the sedimentary archives).

The PhD student will benefit from the data of a yet completed experiment (*approval MENESR 86050, collaboration G. Garcia & O. Otero, with D. Bouchon - UP-EBI, X. Bonnet - ULaRochelle-CEBC / LIENS, E. Réveillac - Agrocampus Rennes*) and current data obtained from wild specimens to calibrate the method. Depending on the skills of the PhD student, aspects of geochemistry of stable isotopes will be developed as part of the thesis or in collaboration. The method will then be applied in Shungura Formation Units (Ethiopia, Omo) dated between 3.5 Ma and 1.2 Ma in the East African Rift. This period covers the supposed emergence of *Homo* and robust *Australopithecus*, dispersions out of Africa, the appearance of the first tools. In addition, drastic changes in Omo terrestrial environments and faunas are recorded as well as several phases of paleo-lakes (3.5 to 3 Ma, 1.9 to 1.5 Ma, 2.5 Ma and about 1 million), which at least for some of them correspond to important climatic change. The results will be compared to those obtained by other methods in this particularly well-studied series (*collaboration with A. Souron, PACEA, Bordeaux, and J.-R Boisserie, PalEvoPrim, Poitiers and OGRE*). On this basis, the existing climate models and the high-resolution paleo-climate simulations currently being developed for this region (*ANR HADoC, PI G. Ramstein, LSCE, O Otero coPI*) will be discussed. Further information on ANR HADoC and on the team's projects, especially in the Omo, are available on the laboratory website: <http://paleovprim.labo.univ-poitiers.fr/>

## Application and recruitment procedure

### 1 - Deadline for receipt of applications: April 30th

#### Composition of the file :

- 1 CV (including results along University studies)
- 1 cover letter (maximum 2 pages)
- 1 summary of master memoir including perspectives (maximum 2 pages)
- supporting letters (3 maximum)

**To be sent in one file to : [olga.otero@univ-poitiers.fr](mailto:olga.otero@univ-poitiers.fr) AND [geraldine.garcia@univ-poitiers.fr](mailto:geraldine.garcia@univ-poitiers.fr)**

**An acknowledgment will be sent at reception**

### 2 - Eligibility of applications on file

### 3 - Admission on interview of the eligible candidates (first half of May)

**By teleconference:** 30 minutes of presentation (10 min max) and discussion with the recruitment panel.

**Presentation:** since all the panel knows the application details, the presentation must concentrate (1) on the former / master research project in its scientific context, (2) on the understanding of the project in its scientific context, and (3) on a criticism of the adequacy candidate profile/project

#### Selection criteria :

- academic quality
- scientific relevance with scientific interest and skills
- motivation

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