

NON-POLLEN BIO-PROXIES USED IN RECONSTRUCTING QUATERNARY CONTINENTAL SYSTEMS: NEW ORIENTATIONS IN PALAEOCLIMATIC AND ANTHROPOGENIC ENVIRONMENTS

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ABSTRACT

The purpose of this presentation is not to present new results on a genuine research in Turkey. Based on gathering new data on new researches, it aims at drawing an overview of present research orientations toward the reconstruction of local to regional environments responding to global changes and local environmental conditions, also in the context of human actions when these intermingle with the course of natural environmental systems. As a result, the presentation will dissociate first the proxies reconstructing climate (e.g. isotopes recording temperature and precipitation; elementary chemistry of sediments recording humidity) and those related to sediment records of environmental dynamics (e.g. facies, grain distribution, structural architecture of deposits, weathering etc.), from the biologic data allowing to reconstruct environmental complex living systems. These latter systems respond to changes in external factors, among which climate is only one of several, while human impact adds to other factors during the Holocene.

During the last decade, increasing publications in Turkey have reconstructed Quaternary climate and continental environmental at various locations and in various regions of the country. These studies are increasingly high resolution and exhaustive. They are generally based on sedimentology (deposition dynamics), elementary chemistry of lake sediments, isotopes in carbonates (including speleothems), paleontology (in continental records), palynology (of marine and continental records), etc. A few other bio-indicators are being used, such as diatoms and ostracods in lake sediments. Other bio-indicators also exist, the study of which is not yet much introduced in the study of Quaternary sites in Turkey, including in the researches concerning Holocene reconstructions associated with archaeological contexts.

As a matter of fact, researches about bio-indicators require a first step for the production of data bases referencing today's specific diversity with regard to living species responses to environmental and climatic conditions and changes. Such databases exist in Turkey, or have started to develop, for several bio-proxies: pollen (vegetation spectra), diatom (lake systems), tree-rings (chronology and climate), ostracods (ecology). Apart from bio-proxies studied in archaeological contexts (e.g. seeds, charcoals, plant remains, dung a.s.o.), other bio-proxies have been however yet too rarely subject to researches devoted to Quaternary environments in Turkey. The oral paper will present some of them: non-pollen palynomorphs, remains of insects, molluscs, phytoliths, etc. with the addition of new analytical directions that are very promising on the reconstruction of climate ($\delta^{18}\text{O}$ of earthworm calcite granules), environment/vegetation (texture analyzes of teeth micro-traces allowing to reconstruct diets of mammals), human impact on landscapes (organic geochemistry, with the example of miliacin molecule vs millet cultivation).

It will conclude with the state-of-the-art of the European Quaternary Aminostratigraphic Timescale. Amino acid geochronology, which uses the time-dependent breakdown of proteins in biominerals, has indeed the potential to date the whole of the Quaternary, and recent work on isolating the intra-crystalline fraction of calcitic biominerals (Bithynia opercula) has enabled the development of an aminostratigraphic framework for Britain for the Pleistocene (Penkman et al., 2016). This latter subject is a very important challenge for the researches on the Quaternary geology, environmental history and chronology in Turkey.

Keywords : *Turkey, global changes, Holocene, amino acid geochronology*