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Preliminary constraints on Paleogene temperatures and climate during the growth of the Pyrenees

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Global climate has been changing dramatically during the Cenozoic from greenhouse to icehouse. Several authors showed a relation between the alpine orogeny, the closure of the equatorial Tethys and the global cooling observed throughout the Cenozoic. The combination of those events addresses the question of the interaction between climate change and mountain growth during the Paleogene.

The present study provides preliminary paleoclimatic constraints associated with mountain bulding of the Pyrenees during the Paleogene. In this aim we have performed stable isotopic geochemistry (δ^{18}O and Δ47) on different kind of carbonates (charophytes oogonas for the continental domain, oysters for littoral and bulk carbonate for the oceanic domain) sampled in the Southern Pyrenean foreland basin (SPFB).

This basin has been chosen because it has recorded 1) the regional building of the Pyrenean belt in various environments from continental to oceanic domains and 2) the major climatic ruptures in the Tertiary, between the Early Eocene climatic optimum and the first Cenozoic glaciation at the Eocene – Oligocene boundary.

Our samples have been collected in strata of Thanetian ($\sim$ 50Ma, Late Paleocene) to Bartonian ($\sim$ 38Ma, Late Middle Eocene) ages and come from various localities in the basin. The charophytes are coming mostly from the eastern part of the Ebro basin, in the Igualada area. The paleoenvironments vary from paleosoil to alluvial plain. Oysters are coming from various localities in the Tremp-Graus basin and the Jaca

basin and were sampled mainly in deltaic environment, except for the Lutetian which corresponds to carbonaceous sediments. Bulk carbonates are characteristic of various environments alternating from upper offshore carbonates to pelagic carbonates.

This study brings new constraints on the local climatic context of the northern hemisphere in continental environments as well as littoral domains. Indeed, paleoclimatic data are generally obtained from stable isotopic (δ^{18}O) analysis of benthic foraminifers and thus give only bottom ocean temperatures. Moreover, those results are coming from the high latitudes of the southern hemisphere and do not reflect local climatic conditions.

Our preliminary results suggest that the Paleogene strata of the SPFB recorded a climatic evolution that is comparable with that observed in the oceanic domain. Hence although the sedimentary environments and palaeography were controlled by the dynamics of Pyrenean orogeny we suggest that the first order paleoclimatic evolution evolved independently. For instance, we found low δ^{18}O isotopic values in the Early Eocene ($\sim$ -3 per mill) indicating relatively hot temperatures whereas higher δ^{18}O values are recorded in the Lutetian and the Bartonian (-1,5 per mill to -2 per mill).