Mesozoic sea surface temperatures of the western Tethys inferred from $\delta^{18}O$ of fish teeth

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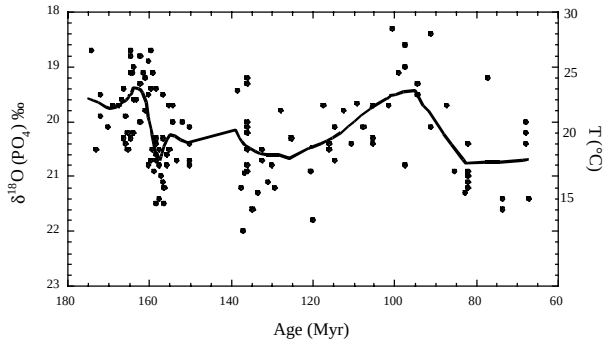
Oxygen isotope compositions of one hundred thirty five samples of vertebrate tooth enamelloid were measured to determine the evolution of tropical sea surface temperatures in the western Tethys from Jurassic to Cretaceous. Based on a well-constrained stratigraphic framework, vertebrate teeth were sampled through the Anglo-Paris Basin with a 1 Myr resolution. *Asteracanthus* sharks and pycnodontidae teleosteans, identified as sea surface dwellers, have $\delta^{18}O$ values that range from 18.5‰ to 21.5‰. Thermal oscillations of tropical surface waters, with amplitudes of a few degrees at the million year scale, suggest that Late Jurassic and Cretaceous climates were quite variable. Warming stages are identified during the Callovian, Kimmeridgian, Hauterivian/Barremian and Cenomanian/Turonian, whereas Oxfordian, Valanginian and Campanian/Maastrichtian were characterized by rather cool temperatures (Figure).



Assuming a $\delta^{18}O$ of seawater of -1‰ in the case of a hypothetical ice-free world, calculated isotopic temperatures range from 15°C to 28°C for sub-tropical to tropical paleolatitudes. The meaning of such marine paleotemperatures estimates at low latitudes is debated on the basis of contemporaneous faunal and floral associations. Possible glacial interludes during the Late Jurassic and Early Cretaceous are discussed as well as the impacts of climatic variations on marine fauna migrations. Finally, a compilation of published $\delta^{18}O$ values combined with our dataset lead to reconstitute latitudinal thermal gradients for the Albian-Cenomanian, Turonian and Maastrichtian. They were weaker than today with 0.2-0.3°C against 0.4°C per latitude degree. Mesozoic climates were variable but the average surface temperature was at least 5°C higher than now during the Cenomanian-Turonian interval.

Molecular analyses of mixed-species biofilms on carbon steel

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Bacteria in nature live in complex communities called biofilms, a population of microbes attached to a solid surface. Natural biofilms can be difficult to study for several reasons: the majority of bacteria are neither identified nor cultured; even if the bacteria can be grown, they are often difficult to manipulate genetically; and natural physical and chemical variables cannot be controlled. As an entry towards understanding how biofilm communities function, we have created a model dual-species biofilm using two genetically tractable bacterial species. Our reductionist system comprises *Desulfovibrio desulfuricans* and *Shewanella oneidensis* in a controlled environment where we can alter individual parameters, and measure the impact of these changes on the biofilm with respect to both the chemistry of the biofilm environment and the interactions between the different species. We chose these organisms because they represent guilds (e.g. sulfate reducers and iron reducers, respectively) that are associated in a variety of habitats, including carbon steel surfaces. Here, we describe experiments to validate this model system, as well as results of a genetic screen to identify S. *oneidensis* genes that respond to the presence of *D. desulfuricans*.