ECOLE LEMANIQUE DES SCIENCES DE LA TERRE
DES UNIVERSITES DE GENEVE ET DE LAUSANNE

Master ès Sciences in Earth sciences

Reconstruction of salinity based on the composition of fish teeth and scales: Examples from the Cretaceous

Contact persons

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Context

Constraining salinity in the geological record is a major challenge because alike temperature, salinity is a fundamental property of water masses that is used to reconstruct paleoenvironments and past habitats. However, direct proxies to paleo-salinity reconstruction are scarce and salinity is most often inferred from fossil assemblages, with major caveats. During the Cretaceous, large scale oceanographic changes occurred due to successive sea level high and low stand that modulate the influence of marine realm on coastal environments. Fish live in nearly all aquatic environments from fresh, brackish to saline waters and they mineralise bio-apatite (in particular teeth, ganoid scales) in equilibrium with the ambient water. Therefore, their geochemical composition serves as excellent proxy for reconstructing the properties of ancient aquatic habitats. Using geochemical proxies, this project will explore if some of Cretaceous fishes may have occupied environments different from that of their living descendants.

Aims and Methods

This project aims to combine paleontological (taxonomy) and geochemical approach to reconstruct the paleo- salinity of various Cretaceous environments under low and high sea level using fish remains. The palaeontological content will be identified with Lionel Cavin from the Museum of natural history of Geneva and depending on the sanitary conditions further samples might be collected in the field. The geochemical approach will combine Sr and O isotope analyses that were shown to be a powerful tool to infer past salinity (e.g., Reinhardt et al., 1998; Vennemann et al., 2001; Tütken et al., 2020). This project will be conducted at UNIGE.

References

Reinhardt et al., (1998). Strontium isotopic-paleontological method as a high-resolution paleosalinity tool for lagoonal environments. Geology, vol 26(11). Doi: 10.1130/0091-7613(1998)026<1003:SIPMAA>2.3.CO;2.
Tütken et al., (2020). Strontium and Oxygen Isotope Analyses Reveal Late Cretaceous Shark Teeth in Iron Age Strata in the Southern Levant. Frontiers in Ecology and Evolution, vol 8. Doi: 10.3389/fevo.2020.570032.
Vennemann et al., (2001). Isotopic composition of recent shark teeth as a proxy for environmental conditions. Geochimica et Cosmochimica Acta, vol 65 (10). Doi: 10.1016/S0016-7037(00)00629-3

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