Climatic and oceanographic changes during the deposition of circum-Alpine Miocene marine sediments

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Geochemical compositions of Miocene marine fossils and their embedding sediments were investigated from a number of circum-Alpine localities in order to determine the changes in climate and oceanography during an active phase of Alpine upliftment. $^{87}Sr/^{86}Sr$ of most fossilized shark teeth indicate that the marginal seas adjacent to the emerging Alps had good connections to the open oceans. However, some deviations from the Sr-evolution curve of the open ocean exist but can be related to a local influence by the hinterland lithologies. $\delta^{18}O$ values of teeth from the north Alpine Molasse basin, the Vienna and Pannonian basins, parallel the relative changes in $\delta^{18}O$ values observed for the global record [1]. Exceptions to this are given by $\delta^{18}O$ values of two shark teeth that are compatible with a formation while the sharks frequented a freshwater habitat, but that experienced diagenesis under conditions identical to those of the other teeth. These "freshwater" teeth can be used to estimate a Miocene paleoelevation that was similar to that of the Alps today. ε_{Nd} values of marine fossils vary considerably (–3.9 to –12), but these values as well as their REE patterns differ from those of the embedding sediments, supporting fixation of the REE in the fossils during early diagenesis in the presence of a marine-dominated pore fluid. Differences in the ε_{Nd} values may thus be used to trace the influence of the Atlantic ocean (ε_{Nd} at 25 to 16 Ma of –9 to –7) and/or the Mediterranean (ε_{Nd} of –4.5 to –8.5) in the region [2]. However, as for the Sr, local influences may be important, particularly if local volcanic activity was abundant and/or if old continental rocks have been exposed in the hinterland. Besides the large variation, a general increase by about 1.5 to 2 ε_{Nd} units is observed for the Lower and Middle Miocene in the north Alpine area and the Paratethys, reflecting increasing Atlantic influence on the marginal Alpine basins. ε_{Nd} units of the southern Alpine region have a range of between –8 to –9 with a minimum at 16 Ma [3]. To further constrain the variation of these Tethys-Mediterranean ε_{Nd} values and the connection between these basins and the Paratethys, additional sections from Italy and Slovenia are being investigated.

References

[1] Zachos, J., Pagani, M., Sloan, L., Thomas, E. and Billubs, K. (2001) *Science* **292**, 686-693.
[2] Stille, P., Steinmann, M. and Riggs, S. R. (1996) *EPSL* **144,** 9-19.
[3] Mühlstrasser, T. (2001) *Tüb. Mikropal. Mitteil.* **24**, 1-119.