

Breaching the North African watershed: Driver for Mediterranean anoxia?

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Quaternary climate change in North Africa appears to drive periodic changes in the redox chemistry of the Eastern Mediterranean, and such interactions may also be of importance for the interpretation of wider ocean anoxia. Deep Mediterranean anoxia is associated with negative oxygen isotope anomalies and the timing has been linked with northward shifts of the Inter Tropical Convergence Zone (ITCZ) and intensification of the African monsoon during Northern Hemisphere insolation maxima [e.g. 1]. These observations have led to the hypothesis that an increased flux of freshwater to the Eastern Mediterranean was a major contributing factor to the changes in deep ocean chemistry. Nd isotopes have previously been used to support a distinct increase in Nile discharge during the central periods of sapropel S1 (~9-6ka BP) and S5 [2]. However, a Nile source alone cannot account for the entire duration of S1 and S5 (~125 ka BP) deposition. We present new evidence of a wider North African margin source of freshwater at the time of S5 from Nd isotopes in the Western Levantine and from Quaternary lake deposits in Libya.

A large oxygen anomaly of ~ -4‰ is observed across S5 in ODP core 971A from the western Ionian Sea [3]. This anomaly is much greater than that recorded in cores from close to the Nile outflow (~ -2‰) [3]. Our data from 971A show a distinct change in the ϵ_{Nd} of planktonic foraminifera (*G. ruber*) towards more radiogenic values across S5. Analyses of gastropod fossils from Quaternary lake deposits in Libya also give a radiogenic Nd signal (ϵ_{Nd} ~ -2), as expected of waters rising in the range of basaltic mountains comprising the North African watershed at ~ 21°N.

These data support the hypothesis that a northward movement of the ITCZ breached the North African watershed during Northern Hemisphere insolation maxima and contributed freshwater to the Mediterranean basin. Further investigation is needed to determine the importance of this contribution in the development of anoxia, relative to Nile inputs.

References

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Oligomerization of amino acid on mineral surface under the pH controlled conditions

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The role of mineral surfaces as a catalyst on the oligomerization of the amino acid, glycine, during wetting and drying cycles was investigated. Several types of montmorillonite with different interlayer cations (H, Ca, Na) and silica (quartz type) powder (10mg) were suspended with 10mM amino acid solution (1ml) under pH controlled conditions. The suspensions were dried at 95°C to simulate the drying step, while addition of distilled water represents the wetting step. These wetting and drying steps were performed in several repetitions.

Amino acid oligomerization proceeded more favourably in silica as a catalyst at its point of zero charge (PZC) near pH2.6 (Figure 1). The peptide yield was subsequently reduced under more acidic condition (i.e. pH 2) due to excess positive charges of both silica surface and amino acid ions – exerting an inhibiting effect on amino acid adsorption. At the PZC of montmorillonite and glycine (pH 6.0), the catalytic efficiency of minerals was reduced due to zwitterions forming which has a low reactivity for glycine (Zamaraev *et al.*, 1997). The catalytic influence of minerals on amino acid oligomerization is largely influenced by the surface charge of the minerals.

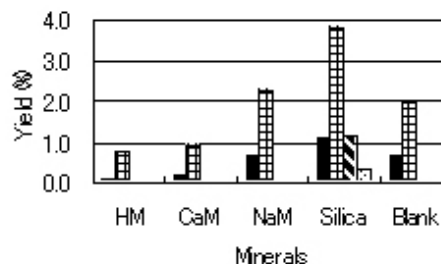


Figure 1: Peptide yield from glycine in different mineral systems at pH 2.6. Glycine anhydride (■), Gly-Gly (▤), Gly-Gly-Gly (▥), Gly-Gly-Gly-Gly (▧)

Reference

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