Recent cessation of Nile discharge affecting the geochemistry of SE Mediterranean inner shelf sediments

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Climatic-control variations of Nile River discharge to the SE Mediterranean were suggested to play a major role in changing the geochemical characteristics of deep water sediments [1]. During the last century a series of dams were built on the Nile and since the operation of the Aswan High Dam (AHD), in the mid 60th of the last century, late summer floods carrying fine sediments and nutrients stopped entering the Mediterranean. This affected directly the 30 to 50 m silt belt off the Israeli coast, an integral part of the Nile littoral cell. Grain-size, major and trace elements and Sr isotopes were used for assessing the effect of the shut down of Nile discharge on a series of short cores taken along a S-N transect at ~40 m water depth. Chronology was based on ^{210}Pb dating. Grain size sharply increased since the operation of the AHD together with a two fold increase in $CaCO_3$ content accompanied by a distinct increase in Ba/Al ratio. TOC content decreased from ~1.0 wt.% to less than 0.3 wt.% at core tops and δ^{13}Corg decreased by ~3.5‰ (from -19.5 to -23‰) reflecting apparently a distinct drop in nutrient input and major reduction in primary productivity. ^{87}Sr/^{86}Sr value, around 0.7065, determined in the <63μm size fraction of the insoluble material, indicate mainly a basaltic lithological source originating apparently from the Ethiopian highlands and transported by the Blue Nile and Atbara via the Nile River towards the Mediterranean.

The sediments of the Israeli inner shelf, located distally within the Nile littoral cell, responded directly and rapidly to Nile River discharge cessation. This may indicate that distal inner shelf parts of large deltaic systems document faithfully extreme aridity episodes that might occur at the headwaters of large river systems, including that of the Nile River.

[1] Box *et al* (2011), *Quat. Sci. Rev.* **30**, 431–442.

The FeS/H_2S system - A model for a primitive DMSO reductase

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Within the Iron-Sulfur-World hypothesis, the development of an autotrophic surface metabolism based on the reduction of CO_2 and catalytic action at iron sulphide surfaces is proposed. The required redox energy for the metabolic reaction pathways is provided by the thermodynamically favoured but kinetically inhibited reaction

$FeS + H_2S \rightarrow FeS_2 + H_2$ ($\Delta_R G°$= -38 kJ/mol, pH 6.5) [1].

The reducing power accompanied by catalytic activity of the FeS/H_2S system could be demonstrated in several studies, e.g. dinitrogen N_2 could be reduced to NH_3 [2]. Another intriguing model compound for the investigation of the reducing power of the FeS/H_2S system is DMSO. In nature, the reduction of DMSO by the enzyme *DMSO reductase* in marine phytoplankton is relevant to the global climate due to the release of major amounts of DMS into the oceanic atmosphere. There, DMS acts as an important source of cloud condensation nuclei.

Our study aimed at investigating the capability of the FeS/H_2S system to reduce dimethyl sulfoxide (DMSO) to dimethyl sulphide (DMS) under geologically mild conditions (1 bar, 90°C). Experiments were carried out under strictly anaerobic conditions in glass vessels and the amount of produced DMS was quantified *via* gas chromatography. The FeS/H_2S system indeed reduces equimolar amounts of DMSO selectively to DMS with yields of up to 60% within seven days. Hence, the FeS/H_2S system can be regarded as a model of a primordial *DMSO reductase* supporting the idea of its relevance for the origin of a first metabolism.

[1] Wächtershäuser (1992) *Prog. Biophys. molec. Biol.* **58**, 85-201. [2] Dörr *et al.* (2003) *Angew. Chem. Int. Ed.* **42**, 1540-1543.