Biogeochemically cycling of C, S, H across the P/Tr boundary in Spitsbergen

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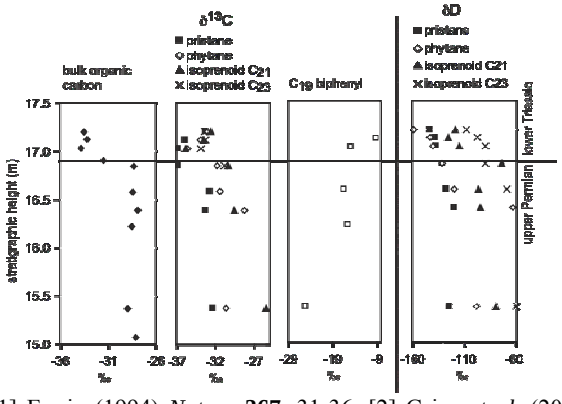
The extinction near the P/Tr boundary, some 252 Ma ago is universally portrayed as the most catastrophic of all the Phanerozoic mass extinctions [1].

In the present study we focus on a new P/Tr sample set from a locality in Lusitaniadalen, Spitsbergen. A multidisciplinary approach includes biomarker abundances and a compound specific carbon and hydrogen isotopic approach along with bulk carbon and hydrogen isotopes of total organic matter and sulphur isotope studies of pyrite across the boundary. Both, bulk carbon and hydrogen isotopes of organic matter shift by 5‰ across the boundary, in part reflecting source change from terrestrial organic matter in the Upper Permian to predominantly algal-derived organic matter in the Lower Triassic. A similar $\delta^{13}C$ trend is for $\delta^{13}C$ of individual biomarkers suggesting a perturbation of the global carbon cycle. However, sulphur isotopes of pyrite show a shift occurring earlier in the Upper Permian, along with the first occurrence of biomarkers derived from abundant green sulfur bacteria (GSB), demonstrating that photic zone euxinia developed before the global carbon cycle was affected [2].



[1] Erwin (1994) *Nature* **367**, 31-36. [2] Grice *et al*. (2005) *Science* **307**, 706-709.

Early Bronze Age Manika on Euboea (Greece): A 'colony' or not? Evidence from strontium isotope ratio ($^{87}Sr/^{86}Sr$) analysis

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Introduction

This study investigates the biological constitution (indigenous settlement vs. 'colony') of the Early Bronze Age (EBA) II-III (2650 - 2000 BC) site of Manika on Euboea (Greece) through the application of strontium isotope ratio ($^{87}Sr/^{86}Sr$) analysis of human skeletal remains from the respective cemetery to distinguish between locals and non-locals at this site. In a wider scope it challenges traditional interpretations of inter-regional cultural affinities in the EBA Central Aegean as evidence for the establishment of 'colonies' by the Cycladic islanders in this region.

Materials and Methods

$^{87}Sr/^{86}Sr$ in the human skeleton largely reflects local geology, passing there from the food and water consumed. Because the enamel of the first molar –preferably sampled- is formed by the 5th year of life of an individual and does not remodel thereafter, its $^{87}Sr/^{86}Sr$ should be similar to the 'local' biologically available $^{87}Sr/^{86}Sr$ where he/she was buried, unless he/she was born and raised at a site geologically and isotopically different [1]. Based on the dating, the presence/absence of 'exotic' material culture and the spatial distribution of burials in the Manika cemetery, sixty-five individuals were sampled for $^{87}Sr/^{86}Sr$. The 'local' $^{87}Sr/^{86}Sr$ signatures at the region investigated were determined from archaeological and modern animal samples.

Results and Discussion

Based on the results of $^{87}Sr/^{86}Sr$ analysis, 16% of the individuals analysed from (early) Manika tombs may be identified as non-locals at this site. Allowing for the paucity of published data on the 'local' $^{87}Sr/^{86}Sr$ signatures in the Aegean [2], it may tentatively be suggested that these originated from Naxos in the Cyclades, or other sites geologically and isotopically similar to the latter. The proportional representation of non-locals, however, is not high enough to confirm the hypothesis that Manika was a 'colony'. In addition, the results suggest spatial organization of the Manika cemetery based on the geographical origin(s) of the dead, and that non-local pottery was not exclusively associated with burials of non-locals.

[1] Price, Burton & Bentley (2002) *Archaeometry* **44**, 117-135. [2] Nafplioti (2008) *JAS* **35**, 2307-2317.