



Trace metal geochemistry in deep hypersaline anoxic basin in the Mediterranean Sea

Elvira Oliveri, Mario Sprovieri, Daniela Salvagio Manta, Anna Traina, and Salvo Mazzola

National Research Council-CNR, IAMC-Istituto per l'Ambiente Marino Costiero, Italy (elvira.oliveri@iamc.cnr.it)

Trace metals accumulation in marine sediments is primarily regulated by redox conditions; specifically, in the geological record, ancient anoxic sediments appear characterized by significant enrichments in redox sensitive elements. In the modern sedimentary record, examples of extreme limitations in dynamic circulation at the sea bottom are represented by the fascinating hypersaline anoxic basins, recently explored in the eastern Mediterranean Sea. These basins present a peculiar layer of "brine" (a mass water with salinity $>300\text{‰}$) above the bottom sediments. The seawater-brine is generally located at a depth of about 3000 m below sea level with a thickness up to hundred meters. This transition zone characterized by steep pycno- and chemoclines passes with evident gradients of salinity and Eh to an extremely salty, anoxic a sulfuric seawater (brine). Here, we present geochemical results from two deep hypersaline anoxic basins discovered during two R/V Urania cruises (September 2008,2009), the Thetis and Kryos Basin ($22^{\circ}08'E$ $34^{\circ}41'N$, $22^{\circ}01'E$ $34^{\circ}56'N$). Sediments appear depleted in organic matter (TOC 0.17-1.28%) and some redox-sensitive trace metals (As, Fe, Co, Cu, Zn) do not show the classical enrichments reported for anoxic sediments (e.g., sapropel). The only trace metal favored in the sedimentary accumulation seems to be the Mo. In particular, the documented low Mo/TOC ratios suggest strongly restricted conditions and limited deepwater renewal, and evidence the role played by the hydrographic control on redox conditions and trace metals accumulation in the studied sediments. A comparison among trace metal distribution patterns in hypersaline basins with sediments of other recent anoxic basins shows that the Cr, Ni, V and Zn concentrations are generally comparable thus suggesting similar mechanisms for metal enrichments. On the other hand, a comparison with the geochemistry of ancient anoxic sediments suggests that these anoxic hypersaline basins do not offer perfect analogues of the past anoxic marine systems although give the chance to investigate the biogeochemical cycles of the redox sensitive elements.