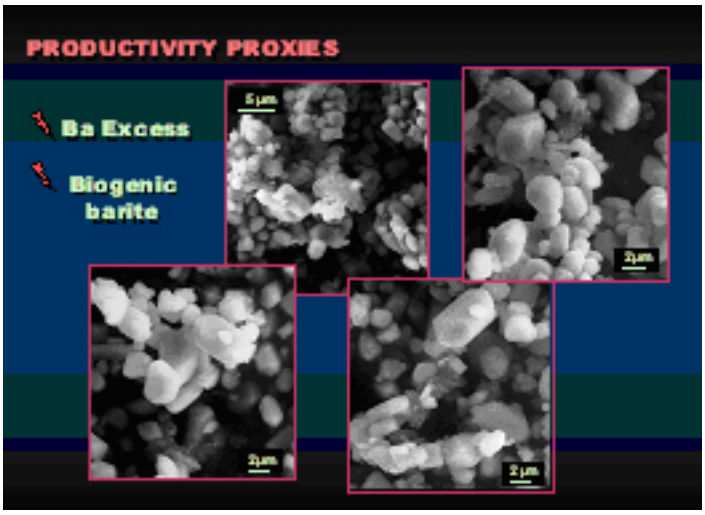
ORGANIC CARBON ACCUMULATION IN THE BLACK SEA SINCE THE LAST GLACIAL MAXIMUM: GEOCHEMICAL EVIDENCE FOR PRIMARY PRODUCTIVITY AND OXYGEN CONDITIONS

Francisca MARTÍNEZ-RUIZ, David GALLEGO-TORRES and Assemblage Partners

Instituto Andaluz de Ciencias de la Tierra (CSIC-UGR), 18002 Granada, SPAIN,
E-mail: fmruiz@ugr.es, davidgt@ugr.es

Organic carbon (C_{org}) preservation in the modern Black Sea basin is not anomalously high relative to equivalent oxic basins. However, during the Holocene significant fluctuations in C_{org} content are recognized within Black sea sediments that in turn may have related to variations in export production fluxes instead of permanent anoxia. In order to investigate the role of anoxia and productivity as well as to reconstruct paleoenvironmental conditions since the Last Glacial Maximum (LGM) in the Black Sea, productivity and oxygen proxies have been considered. Regarding productivity proxies, considerable research has been focused in the last two decades on barium (Ba) in marine sediments since it has been recognized as a reliable proxy for productivity. This is based on the strong correlation between the fluxes of excess Ba (Ba not associated with silicates) and organic matter in sinking particulate matter. This association is also supported by observations that Ba-rich sediments are usually underlying high biologically productive areas and surface sediment barite accumulation rates (BaAR) correlate with upper water column productivity. The use of Ba as a productivity proxy assumes that excess Ba is related to barite crystals originated in the water column, therefore, only in such cases excess Ba can be used as a reliable proxy.



Although the origin of barite crystals is still poorly understood, there are indications that it precipitates in microenvironments within decaying organic matter. Paleoproductivity reconstructions are being carried out using this proxy in Black Sea sediments. Results from Ba excess in the cores analyzed so far suggest that the carbon-rich sapropel of Unit 1 may have resulted from enhanced export production fluxes, probably as a consequence of changes in climatic conditions leading to higher nutrient supply. Furthermore, as the Black Sea constitutes a unique model environment to reconstruct many important biogeochemical processes, investigation of Ba AR within this basin will be one of the key pieces to understand the biogeochemical cycle of Ba and consequently the carbon cycling and productivity fluctuations in other basins. Additionally redox proxies are also being investigated in order to reconstruct paleo-oxygen conditions. Some of the classical proxies such as U/Th, V/Cr, Ni/Co, V/(V+Ni), authigenic U and V/Sc are used as well as trace metal/Al ratios as Ni/Al, V/Al, Co/Al, Zn/Al etc. These proxies also suggest that significant changes in oxygen conditions occurred since the LGM. Although the upper coccolith ooze (Unit I) shows some fluctuations in redox indices, the most considerable changes correspond to the sapropel unit (Unit II). In contrast, the deep limnic sediments of Unit III exhibit a very uniform mineral and chemical composition. Thus, redox indices present quite uniform values thought the whole analyzed interval of this unit, being the contact with Unit II marked by a significant increase in such values.