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Calibration of foraminiferal Ba/Ca for reconstructing Mediterranean sapropel formation

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Because mechanisms of sapropel formation in the Eastern Mediterranean Sea such as high riverine input through increased precipitation, a stratified water column and lateral input of oxygen poor intermediate water leading to anoxic bottom waters are relatively well understood, the sediment record in this area constitutes a robust framework to test and validate relatively unexplored paleo-productivity and –redox proxies (Mojtahid et al., 2019). Specifically, in the Northern Aegean Sea at present day, surface and intermediate waters are connected to the larger circulation pattern while the deep water formation is rather local. Nevertheless, the sapropel layers are also observed in the Northern Aegean Sea despite proxy indicators of benthic foraminifera pointing towards less intense bottom water anoxia than in the rest of the Eastern Mediterranean Sea (Schmiedl et al., 2010). Therefore, we consider the Northern Aegean Sea as a natural laboratory for studying the local to regional sapropel formation processes, and first of all, we want to investigate the present day situation in order to assess the proxy record.

Barium concentrations in the benthic marine environment either reflect directly riverine input or export productivity via barite as part of the organic matter sinking to the seafloor. As both factors lead to the onset of sapropel formation, benthic Ba is a promising proxy element in this respect. Benthic foraminifera as proxy carriers are investigated here, to reconstruct the Ba bottom and pore water concentration. We use core-top material of dead and live (Rose Bengal) benthic foraminiferal shells from intermediate water depth throughout the Northern Aegean Sea, to quantify variability of Ba/Ca across different species and sediment sampling depth. Using Laser Ablation ICP-MS we can further assess the intratest variability of Ba/Ca. Despite the multitude of factors to consider for such core-top calibrations, first results show an unaltered preservation of the Ba/Ca signal from live to dead tests. We intend to show further insights in the application of high-resolution sampling techniques in the benthic environment to assess the complex present day situation.

Mojtahid et al., 2019, Marine Micropaleontology 153, 101783

Schmiedl et al., 2010, Quaternary Science reviews 29, 3006-3020