



Barium and calcium analyses in sediment cores using μ -XRF core scanners

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Barium and Ca are used as proxies for organic productivity in paleoceanographic studies. With its heavy atomic weight (137.33 u), barium is easily detectable in small concentrations (several ppm levels) in marine sediments using XRF methods, including the analysis by μ -XRF core scanners. Calcium has an intermediate atomic weight (40.078 u) but is a major element in the earth's crust and in sediments and sedimentary rocks, and hence it is easily detectable by μ -XRF techniques. Normally, μ -XRF elemental analysis of cores are carried out using split half cores or 1-2 cm thick u-channels with an original moisture. Sediment cores show variation in different water content (and porosity) along their length. This in turn results in variation in the XRF counts of the elements and causes error in the elemental concentrations.

We tried μ -XRF elemental analysis of split half cores, subsampled as 1 cm thick u-channels with original moisture and 0.3 mm-thin film slices of the core with original wet sample and after air drying with humidity protector mylar film. We found considerable increase in counts of most elements, and in particular for Ba and Ca, when we used 0.3 mm thin film, dried slice. In the case of Ba, the counts increased about three times that of the analysis made with wet and 1 cm thick u-channels. The higher Ba and Ca counts are mainly due to the possible precipitation of Ba as barite and Ca as gypsum from oxidation of Fe-sulphides and the evaporation of pore waters. The secondary barite and gypsum precipitation would be especially serious in unoxic sediment units, such as sapropels, with considerable Fe-sulphides and bio-barite. It is therefore suggested that researchers should be cautious of such secondary precipitation on core surfaces when analyzing cores that have long been exposed to the atmospheric conditions.