Extracting sequentially Ra, Nd, Pa, Th and U from a unique natural sample, on the same column

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Multi-proxy approach is very promising for modern and past marine process investigation. However, extracting simultaneously several tracers from the same sample using the same column remains a challenge. Measuring any natural tracer requires sample collection, pre-concentration or mineralization, chemical extraction and spectrometric analysis. Natural concentrations being very low, when each tracer requires its own collection, huge volumes of water have to be taken from the rosette and/or filtered with *in-situ* pumps, which is time and money consuming. Since the GEOTRACES program objective is to analyse numerous tracers and isotopes along oceanographic sections, there is an urgent need to find ways to analyse as many elements as possible on the same sample. In addition, collecting more samples on the same marine cast will enhance the homogeneity of the final data, and improve the sampling resolution, therefore improving the data set quality.

A new procedure is presented, allowing the simultaneous extraction of 5 tracers (Ra, Nd, Th, Pa and U) from the same natural sample. In addition to isotopic ratios ($^{143}Nd/^{144}Nd$, $^{230}Th/^{232}Th$ and $^{234}U/^{238}U$) concentrations of ^{226}Ra, ^{230}Th and ^{231}Pa are investigated requiring spike addition, i.e. ^{228}Ra, ^{229}Th and ^{233}Pa / ^{236}U respectively. Accuracy and precision of the analytical methods were evaluated using artificial standards and natural samples (marine suspended particles and rocks). Satisfactory purifications of Th, Pa and U were obtained from this unique column, whereas Nd and Ra extraction require light additional steps.

New productivity in the Eastern Arabian Sea during winter Monsoon

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The biogeochemistry of the Arabian Sea is driven by seasonally reversing southwest and northeast monsoons. Although both the monsoons trigger high primary production, the underlying mechanisms are different. Recent observations on the basis of ocean color studies have shown contradicting trends in ocean productivity for the western and eastern Arabian Sea; it has increased in the western Arabian Sea over last 6 years whereas no such trend is seen in the eastern Arabian Sea [1]. In this context, it would be interesting to know about the export production taking place in this part of the world's ocean. Measurement of new production using ^{15}N tracer technique [2] provides an avenue to estimate the export production; integrated over an annual time scale new productivity is equal to the export of carbon out of the surface ocean *i.e.*, the export production. We have carried out new productivity measurements in the eastern Arabian Sea during early and late winter monsoon. Our results suggest that during the early winter, though the column N-uptake is low (~8.91mmolN/m^2/d) over a large area of the eastern Arabian Sea the f-ratio (new production/total production) is relatively high (~0.66). Results from the late winter, in conjunction with the earlier reported results [3], reveal consistent high column N-uptake rate (~20.1mmol N m^{-2} d^{-1}), particularly when the bloom (dominated by heterotrophic *Noctiluca Scintillans*) develops in the northeastern part. During this period the f-ratio is also very high (~0.86) suggesting enhanced downward transport of newly formed organic matter implying increased sequestration of carbon to the deeper ocean.

References

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