Dissolved ^{230}Th and ^{232}Th as tracers of particle fluxes in the Gulf of Aqaba, Red Sea

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The impact of short-term (daily-weekly) dust storms on the oceanic water column is poorly known due to the typical low sampling resolution in open ocean environments. The Gulf of Aqaba (GoA), is a deep oligotrophic water body, with negligible terrigenous inputs except for frequent dust storms originating primarily from the Sahara Desert. Importantly, the GoA is highly accessible, allowing for high-resolution sampling, hence, providing a unique opportunity to study the impact of short-term dust storms on the water column.

Thorium isotopes can be applied as proxies for modern and past particle fluxes, including dust deposition to surface waters, which plays an important role in modulating the supply of nutrients to the surface waters of oligotrophic oceans.

Here, we report a time-series of dissolved ^{230}Th and ^{232}Th vertical profiles in the GoA waters, on a seasonal to daily time scale between 2017-2018, recording both an annual time series in the GoA, and examining the dynamics of the impact of three dust storms on the marine water column at a daily-weekly resolution.

The observed concentrations of ^{232}Th are 20-1730 pg/kg, reflecting inputs from dust deposition, marginal diffusion, and water inflow from the Straits of Tiran. The concentrations of ^{230}Th are in the range of 4.5-8.5 fg/kg.

The results suggest ^{232}Th concentrations reach a peak perturbation in the upper water column approximately 5-7 days after the occurrence of dust storms, reflecting the combined response time of the oceanic water column to leaching of the freshly deposited mineral dust particles, and the scavenging of dissolved Th by settling marine particles. In addition, a local maximum in dissolved ^{232}Th concentrations occurs at intermediate depths of ~200-300 m, reflecting changes in Th adsorption-desorption kinetics during the settling process.