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# Long- and short- term interplay between dissolved and particulate trace elements: insights from the Red Sea dust, marine particles and seawater timeseries (REDMAST)

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Real time documentation of coeval dissolved and particulate trace element (TE) concentrations in open ocean waters are scarce, and more so in the context of continuous, highly resolved timeseries. Consequently, the impact of short-term environmental perturbations such as dust storms and sediment resuspension events on the oceanic water column is poorly constrained.

Here, we present results from the Red Sea dust, marine particles and seawater timeseries (REDMAST) campaign in the Gulf of Aqaba (GOA), northern Red Sea, a highly accessible open ocean proxy site, which is surrounded by hyper-arid deserts with no major tributaries, limiting terrigenous influxes to surface waters, except for sporadic dust storms.

A time series of dissolved TE concentrations, Pb and Th isotopes, macronutrients, chlorophyll-a and CTD profiles are presented together with hourly-resolved dust loads and sediment trap -based daily timescale particulate TE fluxes, across multiple years with a particular focus on abrupt dust storms and deep sediment resuspension events.

Together with sequential leaching experiments of dust samples, the combined results are used to quantify the interplay between dust, marine productivity, seawater compositions and export production fluxes and compositions. The inventory of dissolved TEs in the mixed layer is compared to corresponding dust loads and vertical particle fluxes, and used to retrieve the response time of the oceanic water column to dust deposition events, as well as calculate the scavenging and dissolution rates of the sinking particles. During winter, organic carbon and crustal TE fluxes (e.g., Al, Ti, Fe, REEs) increase together in deep water, highlighting the critical role of inorganic particulates as ballasts that enhance export production. By contrast, the vertical decrease patterns in the flux of several TEs (e.g., Cd, Zn, Ba) indicate that despite relatively higher particulate fluxes in the winter, remineralization is more efficient during the summer, when the water column is stratified and oligotrophic.

Collectively, the results provide improved understanding of the source-to-sink oceanic signal transfer and the interpretation of the downcore records.