Goldschmidt 2022 Abstract
https://doi.org/10.46427/gold2022.11936

# Dissolved trace metals and Pb and Th isotope dynamics between the continental shelf and the deep and warm ultraoligotrophic eastern Mediterranean

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The land to ocean gradient in the chemical composition of seawater is controlled by boundary exchange processes, a term that reflects the combined effect of lithogenic and dissolved terrigenous fluxes, particle-dissolved exchange, oceanic biogeochemical processes, and the interplay with open ocean water masses.

Here, we report for the first time dissolved trace metals, rare earth elements, nutrients, $^{232}$Th and $^{230}$Th concentrations, and the Pb isotopic composition of seawater profiles sampled during two cruises carried out in April 2018 and June 2021 between the northern offshore of Israel and the deep and warm oligotrophic eastern Mediterranean Sea.

The results display elevated concentrations of Zn, Mn, Co, Cu, Pb and $^{232}$Th at the coastal stations along the continental shelf, corresponding with Pb isotopic signals associated with terrestrial inputs. An enrichment in Zn, Cd, Ni, $^{230}$Th and $NO_3$ and a depletion in $^{232}$Th and Pb concentrations was observed along intermediate depths, in tandem with terrestrial Pb isotopic compositions and a negative Ce anomaly. These imply that a shelf-break sourced intermediate nepheloid layer acts as both a source and a sink for trace metals through partial dissolution of, and scavenging onto, suspended particles. Open sea trace metal profiles suggest that the effects of the nepheloid layer may resonate further away to the remote Mediterranean Sea. The $^{230}$Th and $^{232}$Th are used to evaluate first order residence times and dust fluxes, though these values require consideration in the context of significant south to north transport of seawater and lateral transport of particulates and dissolved constituents from the shelf to the deep sea.

The different trends in dissolved elemental concentrations, as well as Pb and Th isotope distributions, observed between the two cruises emphasize the dynamic nature of continental margin environment as varying atmospheric, terrestrial and anthropogenic inputs may transiently alter elemental water column distributions and potentially impact open water biogeochemical cycles.