The role of dust in supplying nitrogen and phosphorus to the Southeast Mediterranean

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ABSTRACT: This study assesses the role of the atmospheric dry fallout as a source of new nitrogen and phosphorus to the surface Levantine seawater. Leaching experiments of inorganic nitrogen ($LINO_3^-$, $LINH_4^+$) and phosphorus ($LIPO_4$), using SE Mediterranean surface seawater, were performed on 41 aerosol (hereafter dust) samples collected on Whatman 41 filters between April 1996 and January 1999 at Tel Shikmona, Israel and on four desert-event dust powder samples. A geometric mean of 2.8 and 3.2 mmol NO_3^- and NH_4^+ per gram of dust was leached by seawater from normal (background) dry deposition captured by the filters. Significantly lower amounts of IN with lower NH_4^+:NO_3^- ratios were leached from both the 1 2 filters and the dust powder sampled during dust events (mean of 0.18 and 0.02 mmol NO_3^- and NH_4^+ per gram of dust). Similarly, relatively lower values of $LIPO_4$ were measured in desert type events, attributed to systematic decrease in IP solubility with increased rock/soil component. The calculated $LINO_3^-$ and $LINH_4^+$ fluxes were 34 and 20 mmol m^{-2} yr^{-1} from normal dry deposition, 2.5 higher than the wet IN deposition, and twice the riverine input (23 mmol m^{-2} yr^{-1}, Guerzoni et al.). This high ratio is due to the semiarid climate in this basin. The estimated flux of total dry IP was 1 mmol P m^{-2} yr^{-1}, approximately 3 times higher than the input of wet IP and somewhat lower than the estimated riverine input (1.4 mmol m^{-2} yr^{-1}, Guerzoni et al. 1999). The similarity of atmospheric and burial fluxes of P in the Levantine basin reinforces the hypothesis that the atmosphere is the dominant source of P to the sediments in the deeper parts of the basin. It was estimated that the leachable fluxes of IP and IN (dry 1 wet) can support between ~15 or ~70% (1-4 g C m^{-2} yr^{-1}) of the new production in the SE Mediterranean, effective mainly during dust events and stratification. This input may contribute significantly to the relatively high N: P ratios in Levantine deep water (~27).