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Quantitative evaluation of Lanthanide release to seawater during sinking of atmospheric Fe-rich particles

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We report the results of model describing the fate of trace elements during the weathering of atmospheric particulate in the seawater column. This material consisting on silicate grains with Fe-rich coatings (desert varish) can be a potential source of trace elements to seawater. The model describes the effects of sinking of atmospheric particulate under the Stockes law conditions along the water column using a kinetic geothite-like dissolution expression. Equation defining Fe (and other elements) release to dissolved pool during the process is:

$$\frac{dn}{dh} = \frac{54\eta_{sw}K_c}{g(\rho_{(PM)} - \rho_{(SW)})}t^2$$

where: Fe release versus depth (dn/dh) is related to seawater viscosity ($\eta_{(SW)}$), time (t), particulate and seawater density ($\rho_{(PM)}$ and $\rho_{(SW)}$, respectively), gravity constant (g) and kinetic rate constant K_c.

We found that natural YREE distributions observed in several shallow conditions (Pacific ocean, Eastern and Central Mediterranean waters) can be described by our equation when ocean or epicontinental basins are surrounded by semiarid regions. Under

these conditions the delivery of trace elements to seawater is ruled by fallout of atmospheric particulate.