

and Oceanography





Home

Members

Libraries

Publications

Meetings

Employment

Activities

Search

On the nonlinear relationship between dissolved cadmium and phosphate in the modern global ocean: Could chronic iron limitation of phytoplankton growth cause the kink?

Cullen, Jay T.

Limnol. Oceanogr., 51(3), 2006, 1369-1380 | DOI: 10.4319/lo.2006.51.3.1369

ABSTRACT: I report two vertical profiles of dissolved cadmium (Cd) and phosphate (PO₄) from the Bering Sea: one from a high-nutrient, low-chlorophyll (HNLC) area, in which phytoplankton growth is limited by iron (Fe) availability, and one in highly productive waters near the continental shelf, where Fe is sufficient. At both stations, dissolved Cd and PO₄ display nutrient-like profiles and are strongly correlated with depth. The surface-water dissolved Cd: PO₄ ratio in the Fe-limited HNLC (0.21 ± 0.03 nmol µmol¹¹) is significantly lower than the ratio in the productive Fe-replete station (0.31 ± 0.02 nmol µmol¹¹). A simple model based on the results of previously published laboratory culture studies by others and field incubation experiments with natural phytoplankton assemblages is proposed relating the availability of Fe to the Cd: phosphorus content of phytoplankton, the dissolved Cd: PO₄ of ocean surface waters, and the slope of Cd: PO₄ in the nutricline. The model is consistent with available data and suggests that the nonlinearity or kink in the global dissolved Cd versus PO₄ relationship exists because of chronic Fe-limiting conditions in high-latitude HNLC areas in the modern ocean.

Article Links

Download Full-text PDF

Return to Table of Contents

Please Note

Articles in L&O appear in PDF format. Open access articles may be freely downloaded by anyone. Other articles are available for download to subscribers only, or may be purchased for \$10 per article. All L&O articles are moved into Open Access after three years.