



The dynamics of phosphorus in turbid estuarine systems: Example of the Gironde estuary (France)

Deborde, Jonathan, Pierre Anschutz, Gwénaëlle Chaillou, Henri Etcheber, Marc-Vincent Commarieu, Pascal Lecroart, Gwenaël Abril

Limnol. Oceanogr., 52(2), 2007, 862-872 | DOI: 10.4319/lo.2007.52.2.0862

ABSTRACT: Suspended particles and surface waters were collected in the Gironde estuary (southwestern France) along the salinity gradient. Dissolved inorganic phosphorus (DIP) was analyzed in the filtered surface waters. The suspended particles were sequentially leached to determine five fractions of phosphorus: exchangeable or loosely sorbed P, reactive Fe-bound P, refractory Fe oxide-bound P, P associated with apatite and carbonates, and organic P. Experiments were conducted to determine the effects of temperature, salinity, and DIP concentration on phosphorus sorption/desorption processes. The concentration and distribution of particulate phosphorus was homogeneous along the salinity gradient of the estuary, whereas it was variable in time and space in the freshwater part. DIP showed a rapid desorption of loosely sorbed P at low salinities. Desorption depended on suspended particle concentration, but not on DIP concentration. At high suspended particle concentrations, some exchangeable P remained linked to particles, until suspended particle concentration decreased downstream of the estuary. This delayed desorption of bioavailable P occurs in waters in which the penetration of light is sufficient to support photosynthesis and probably plays a major role in primary production at high salinities. Mineralization of organic phosphorus also releases available phosphorus, but this process is slow relative to the water residence time in the estuary. The budget of DIP, the loss of particulate P from the organic fraction, and the water residence time suggest that the dynamics of P in the Gironde estuary is well explained by the two processes of P release from particles to waters without P uptake.

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.