Deciphering the history of the oceanic phosphorus budget from the sediment record

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Understanding phosphorus (P) global budgets is an important element for understanding global change because phosphorus limits biological productivity over geologic time scales. However, the history of oceanic P budgets is not well known. Our research focuses on assessing changes in P fluxes to the sediments over long time scales (millions to tens of millions of years) to provide a critical link in the understanding of long-term oceanic productivity. We used analytical techniques to distinguish sedimentary phosphorus components that were originally derived from P reactive in the oceanic water column from detrital P, which is unreactive. The sites include eastern and western equatorial Pacific (ODP Leg 130 and ODP Leg 138, respectively) and western equatorial Atlantic (ODP Leg 154) [*Delaney and Anderson,* 1997; *Filippelli and Delaney,* 1994,1996; *Delaney and Filippelli,* 1994], and encompass ranges of biological productivity, site water depths, and sedimentation rates to establish that P retained in sediments is not a function of a specific site but rather a global sedimentary process. We find reactive P is delivered to the sediments primarily as organic material or adsorbed to oxides, and is transformed to authigenic P (Figure 1) with no apparent loss of total P. P accumulation rate evidence from the Pacific [*Filippelli and Delaney,* 1994; *Delaney and Filippelli,* 1994] and Atlantic [*Delaney and Anderson,* unpublished data] indicates that there are globally significant shifts of a factor of three to six in the P mass balance through time. The only source of P is from continental weathering so the increase in P outputs suggests increased inputs. We are now looking at other sedimentary productivity proxies to better understand the significance of these shifts.

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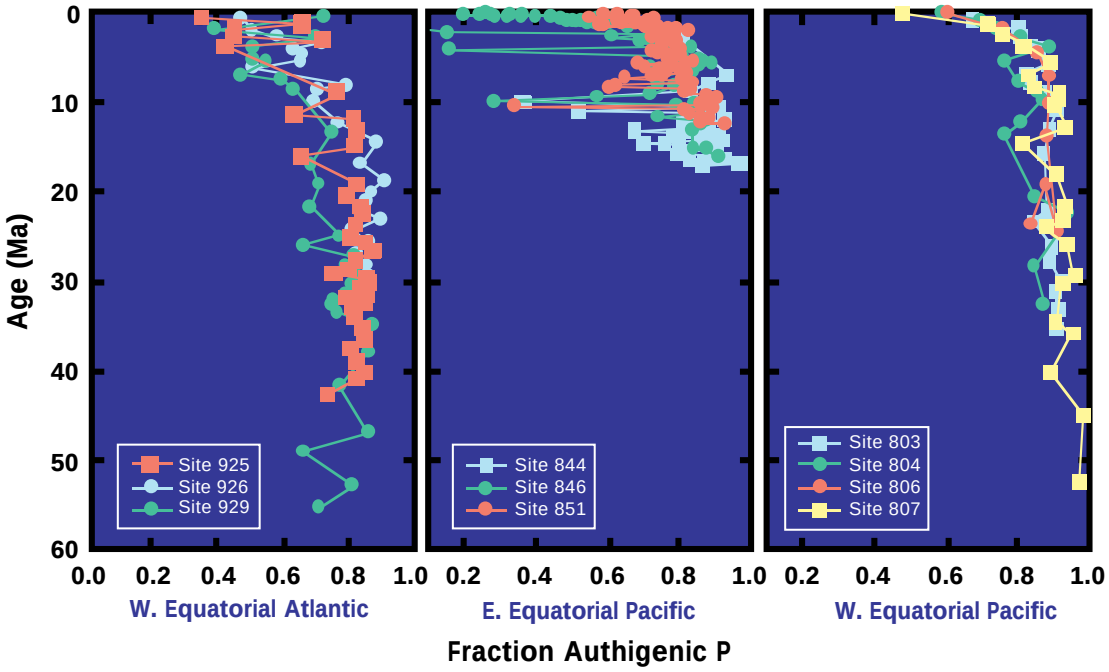

Fraction of authigenic P relative to sediment age for eastern and western equatorial Pacific sites and western equatorial Atlantic sites.