

PHOSPHOGENESIS, THE PHOSPHORUS CYCLE, AND ENVIRONMENTAL CHANGE

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Phosphorus is an essential nutrient and one of the major forces driving photosynthetic processes and the transformation of atmospheric CO₂ into organic matter. The phosphorus cycle is linked to the carbon cycle at this critical interface. Considering the phosphorus cycle, it appears that continental weathering is the prime source of phosphorus. Also here a link is given to the carbon cycle, since atmospheric CO₂ is instrumental to biogeochemical weathering under natural conditions.

A globally averaged marine phosphorus burial record should approximate phosphorus flux rates into the marine system and, correspondingly, continental weathering rates. A phosphorus burial record was extracted from the DSDP and ODP proceedings (up to leg ODP-129) by using the geometrical mean of all calculated phosphorus accumulation rates in 1-m.y. intervals for the last 160 m.y. Prior to 32 Ma, the phosphorus burial curve is positively correlated with the long-term sea-level record, whereas it is inversely correlated with sea level from 32 Ma onward. Whereas prior to 32 Ma phosphorus may have implemented a negative feedback on climate in accelerating carbon burial and the fixation of atmospheric CO₂ during periods of enhanced greenhouse conditions, from 32 Ma onward it may have exerted a positive feedback on climate change in maximizing CO₂ uptake rates during periods in which the long-term trend was already directed toward cooling.