Geophysical Research Abstracts, Vol. 8, 01358, 2006
SRef-ID: 1607-7962/gra/EGU06-A-01358

C/P organic ratios in phosphorites and related facies

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The organic C (C_{org}) to organic P (P_{org}) ratios (C/P_{org}) measured directly in sediments from a Cretaceous-Eocene sequence in an upwelling continental margin in Israel were studied in order to estimate the relative importance of the different P sinks. The C/P_{org} varied by more than two orders of magnitude, from values lower than the Redfield ratio (21) in sediments formed in oxic conditions, up to very high C/P_{org} values, some two orders of magnitude higher than the Redfield ratio (11592), in the suboxic/anoxic parts of the sequence.

These results confirm recent conclusions that P_{org} regeneration is much higher than previously estimated. This does not mean that all or even most of this regenerated P is returned to the surface waters; a part is used for the formation of authigenic P (francolite) during diagenesis. This sink-switching process, which is quantitatively more important in upwelling systems, significantly alters the estimates of the P sinks, lowering the organic P sink and increasing the authigenic P sink. Our results indicate that the present estimates given for the P_{org} burial in sediments are too high. Based on a burial rate of 1.25 x 10^{12} mole C_{org} year^{-1} (Jahnke, 1996) and a global average of 347 for C/P_{org}, we obtain a global estimate of 0.4 x 10^{10} mole P year^{-1} buried as organic P. This estimate is significantly lower than all the previous estimates and implies a lower percentage for the P organic sink (8 – 10 %), a higher estimate for the P authigenic sink and a lower oceanic P residence time.

Previous results as well as ours show that estimating P accumulation rates in a formation from economic phosphate reserve data may lead to an underestimation by almost two orders of magnitude. They also indicate that phosphate deposition is not even over

time and space. Even rough calculations show that there is episodicity in phosphate deposition, which together with the lower P residence time implies the probability that P concentrations in the oceans varied through geological times.