Ocean Margin Processes in Global Change

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N, P, and Si Retention along the Aquatic Continuum from Land to Ocean

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Abstract. Before reaching the ocean, nutrients from land sources transit through the continuum formed by rivers, lakes, estuaries, and coastal marine areas. These systems act as successive filters, retaining a significant fraction of the nutrients transported. Retention of the aquatic continuum not only deeply affects the absolute amount of nutrients reaching the ocean, it also modifies the ratio in which N, P, and Si are transferred: P is less efficiently removed than N; Si retention is enhanced by increased N and P inputs. The removal capacity of the aquatic continuum is considerably affected by human use of land and rivers.

INTRODUCTION

Mass balance considerations show that the input of the major biogenic nutrients (N, P, Si) from terrestrial systems to the ocean plays a central role in regulating global oceanic production, hence the variations in atmospheric CO_2 (McElroy 1983). Our purpose in this paper is not to establish one more quantitative mass balance of the corresponding present, past, or future fluxes, but to present a few (sometimes speculative) generalizations based on regional observations, regarding the factors affecting these fluxes. This is of importance both for providing the basis for extrapolation when establishing global budgets of elements and for assessing the trends of variations in response to climate change or human perturbations.

Nutrients of terrestrial origin are transported to the ocean either through

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