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BIOMINERALIZATION AND DISSOLVED ORGANIC MATTER IN THE SEA : IMPLICATIONS FOR MARINE BIOEGEOCHEMICAL MODELS

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There are still large uncertainties in the size and turnover times of dissolved organic matter (DOM) in the sea, which represents one of the largest pools of organic carbon on the earth (DEGENS & ITTEKKOT, 1983). The uncertainties in the size of the DOM-pool are mostly related to problems associated with the methods involved in its determination. Two of the most widely employed techniques are wet oxydation and high temperature combustion (HTC) techniques. Concentration of dissolved organic carbon (DOC) measured with HTC techniques are higher than those measured by the wet oxydation techniques. More recently, the introduction of high temperature catalytic oxydation (HTCO) appeared to confirm the higher concentrations, although subsequent work has failed to provide any conclusive evidence for such high concentrations (KIRCHMAN *et al.*, 1993). Interesting, however, was the possibility that the marine DOM had a large component which had high molecular weight and which was chemically stable, but biologically labile.

Because of the size of the DOM and of the possible variabiliy in the production and turnover times of its various fractions (BILLEN *et al.*, 1980; ITTEKOT, 1982), a better understanding of the processes controlling its nature, production and fate is a prerequiste for modelling the role of the DOM in marine carbon cycle.

The DOM-problem is examined here from the geochemist's viewpoint. Attention will be focussed on the role of biominerals in the formation of marine DOM. Biominerals consist of an organic and an inorganic phase whose nature and interaction with each other determine the type of biomineral formed (DEGENS, 1976). Biogenic opal is an example of such a biomineral forming the frustules of diatoms, which are the major group of CO_2-fixing organisms in the sea. The aim of the presentation is to show the importance of diatom mediated biogeochemistry of silicon in the sea as the major controlling factor in the production and recycling of marine DOM and, consequently, in the marine carbon cycle.

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MODELLING DYNAMICS OF PHYTOPLANKTON IN THE MEDITERRANEAN

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Phosphorus, nitrogen and silica have been recognized as elements most often participating in nutrient limitation of phytoplankton growth in the Mediterranean. According to in situ enrichment studies, phosphorus tends to limit phytoplankton growth more intensively than nitrogen (JACQUES *et al.*, 1973; FIALA *et al.*, 1976; POJED and KVEDER, 1977). OWENS *et al.* (1989) concluded that in the western part N limitation is more probable than P limitation. Finally, there are parts of the Mediterranean where silica has been demonstrated to limit phytoplankton growth more often and more intensively than either phosphorus or nitrogen (MORKOC *et al.*, 1994).

Models of processes that describe phytoplankton growth limited by a single nutrient have been perfected over 20 years and a lot is known about their ability to reproduce phytoplankton dynamics. Here we report on development of models that combine the above three nutrients to describe and predict phytoplankton growth in the Mediterranean Sea. Specifically we are trying to answer the following questions: What is the extent of each nutrient in limiting phytoplankton growth? What other processes we need to consider at the minimum to correctly describe observed recurrent phytoplankton peaks? Finally, how much are the bacteria and zooplankton affecting phytoplankton dynamics?

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