Foreword

The global balance of water, CO_2 and radiation regulate the climate of our planet. The involved fluxes of matter and energy are conditioned by the pressure of life on Earth. Hence, it is the existence of living organisms - unicellular in the first place - to whom the Earth's surface owe its shape and habitability. Biogeochemical element cycles are a manifestation of the permanent material exchange between the living and the non-living world. There is variability in the fluxes on a continuous spectrum of space and time scales covering several orders of magnitude.

In this context, particle flux in the ocean is a unique phenomenon in that it encompasses a wealth of mechanisms that operate on the whole range of space and time scales, that involve innumerable interactions between the living and the non-living world and that provide a link between the ocean-atmosphere boundary, the deep sea and the sediments. Its relevance on the climate system ranges from the seasonal cycle of pCO_2 to the deposition of sediment on geologic time scales.

The papers in the present SCOPE volume provide information collected over several years by scientists world-wide which will eventually provide the answer. The pattern that emerges is that particle flux in the ocean responds to many geophysical parameters: Wind speeds and aerosol deposition over the oceans, nutrient levels, CO_2 levels in the mixed layer, the availability of trace elements such as iron, and volcanic emissions, all affect particle flux in the oceans. Many of the parameters have been anthropogenically perturbed. Thus the present particle flux measurements - even in open ocean areas - must no longer give natural background values. Since fertilizer, CO_2 and trace element input to the sea have increased, one is tempted to claim a particle flux increase in the ocean as well, but this would be a premature statement. Some of the basic questions therefore are: Is particle flux in the ocean on a secular steady state or anthropogenically perturbed? Would the perturbation influence the long term CO_2 uptake of the ocean? With what sign?

Several years of experience in fruitful international cooperation was gathered during the execution of projects sponsored by SCOPE and UNEP. I urge scientists to build on this and on similar experience of other global projects such as JGOFS and TOGA, which both lead to an understanding of the seasonal and interannual features and to combine forces for a joint WCRP (World Climate Research Programme)/IGBP study of the Global Ocean Euphotic Zone. This seems to me to be the right step forward.

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