

PARTICLE FLUX IN THE OCEAN

The vertical flux of particles in the ocean determines the distribution of biogeochemical elements in sea water, fuels benthic life and is the source of sediments accumulating on the ocean floor. The decomposition and dissolution of particles during sinking together with ocean circulation control the behavior of oxygen, nutrients and other trace constituents. Understanding the processes controlling particle formation in the upper ocean and their transport and transformation within the water column is crucial in determining the role of the oceans in global cycles of carbon and other associated elements.

Particle flux in the ocean is coupled to biogeochemical processes in the upper ocean which are driven by the prevailing meteorological and oceanographic regimes. Planktonic organisms and their metabolic waste products are the key link. They effectively package particles introduced at the sea surface from rivers and atmospheric fallout into large high density aggregates. These aggregates because of their higher sinking speeds are rapidly transported to the seabottom. This process effects the transfer of carbon dioxide fixed at the sea surface during photosynthesis to the deep sea and facilitates its storage there. Also, dust from the deserts and from erupting volcanoes and pollutants from human activities are carried to the sea floor by this process. Signals of biogeochemical processes are carried to the sediments by settling particles and their distribution in sediments can be used to reconstruct paleoenvironmental conditions.

This volume contains a series of review articles and case studies on these and other aspects of particle flux in the ocean contributed by scientists actively involved in research in the field. They describe the tools that are available today for the simultaneous and continuous monitoring of atmospheric and surface ocean processes and ocean particle fluxes, the major sources and pathways of particles to the ocean general trends in ocean particle dynamics and variability as well as the environmental and climate signals embedded in settling particles in the ocean

and their paleoceanographic utility. Case studies are all from recent long-term time-series particle flux experiments from all major oceanic regions: the Nordic Seas, the Northern and Equatorial Atlantic, the Southern Ocean, the Mediterranean, the Black Sea, the Arabian Sea, the Bay of Bengal, the South China Sea and the Pacific Ocean and from the largest freshwater lake in the world, the Lake Baikal. They describe how wind speeds and dust fallout over the ocean, volcanic eruptions, and freshwater and suspended matter inputs from rivers influence particle flux to the ocean's interior and its variability. In this context the book explores the potential use of deep ocean particle flux studies to record and monitor global climatic and environmental changes.