



Upwelling in the Ocean: Modern Processes and Ancient Records

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Upwelling is one of the major physical processes driving the biogeochemistry of the ocean system. It dominates primary productivity in the world's oceans, accounting for 80-90% of new production. However, because of the physical conditions that have to be met to generate upwelling, this production is concentrated in just a few places, e.g., in the coastal waters of major eastern boundary currents off California, Peru, Mauritania, and Namibia, where productivity leads to major fishing grounds. These areas account for about 50% of the world's fish catch, underlining the importance of upwelling to humankind. Source rocks for oil formed in ancient coastal upwelling environments, making their study useful for improving oil exploration models. Upwelling also occurs in the open ocean, especially along the equator and beneath the westerly winds in the subarctic Pacific and the Southern Ocean, where the ocean's silica budget is transformed by the deposition of the remains of siliceous phytoplankton. Because phytoplankton, the grass of the sea, can extract CO₂ from the atmosphere, changes in the intensity of upwelling and associated biological productivity through time may have influenced climate. This volume uses an interdisciplinary approach to establish how upwelling systems work, how they vary through time, and whether or not they have a significant influence on the global carbon cycle. An understanding of how these largely wind-driven biogeochemical systems work today, and how they responded to past fluctuations in climate, is essential in predicting how they and their associated living resources may change in the future. One conclusion is that these systems exert a major influence on the global cycle of nutrients, a factor that contributes to making the coastal regions major sinks for organic carbon. This book recommends new strategies for observation, sampling, monitoring, experimentation, and modeling as the basis for improving forecasts of the behavior of upwelling systems. It will be of interest to physical oceanographers, marine biologists, fisheries scientists, marine organic and inorganic chemists, marine geologists, petroleum explorers, paleoceanographers, and paleoclimatologists.

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From the Publisher

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