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JGOFS Research in the North Atlantic Ocean: A Decade of Research, Synthesis and modelling, Guest Edited by W. Koeve and H. Ducklow

Starting with the North Atlantic Bloom Experiment in 1989, oceanographers from 2 varieties of countries and scientific disciplines have studied biogeochemical processes in the North Atlantic Ocean as a contribution to the Joint Global Ocean Flux Study (JGOFS). The papers collected in this special issue of Deep-Sea Research Part II are a contribution to the ongoing international synthesis of this decade long effect. In the introduction, we give an overview on the major results presented by the individual papers.

The North Atlantic Ocean is of great importance to the oceans' regulation of climate and to its control of the global carbon cycle. It is the site of deep-water formation in subpolar regions, driving the global deep-water “conveyor belt” circulation as well as the heating for Europe. The former is an important component of the physico-chemical “solubility-pump”, which is thought to be responsible for an uptake of about one-third of the annual anthropogenic CO_2 emissions to the atmosphere. The North Atlantic is also an ocean basin that over large regions shows intensive seasonal variation of heat exchange with the atmosphere, driving strong fluctuations in the depth of mixing, nutrient input and the mean light climate within the surface mixed layer. As a consequence of this seasonality, phytoplankton blooms develop during spring, forming one of the most dominant features in global ocean-color images. These spring phytoplankton blooms support events of “pulsed sedimentation” thought to export organic carbon more effectively to the deep ocean and the sediments underlying it than e.g. the oligotrophic gyres. The flux of particulate organic (and inorganic) carbon, the “biological tissue (and carbonate) pump”, is the process of net carbon export that builds up a gradient between the upper few hundred meters and the deep ocean, and thereby significantly lowers surface ocean (and atmospheric) CO_2 partial pressure than would occur in a world without “biological pump”.