



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 effort. 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 CO₂ 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) CO₂ partial pressure than would occur in a world without “biological pump”.

W. Koeve and H.W. Ducklow -- JGOFS synthesis and modeling: The North Atlantic Ocean -- 2141-2154

Ferial Louanchi and Raymond G. Najjar -- Annual cycles of nutrients and oxygen in the upper layers of the North Atlantic Ocean -- 2155-2171

Andreas Oschlies -- Model-derived estimates of new production: New results point towards lower values -- 2173-2197

Véronique C. Garçon, Andreas Oschlies, Scott C. Doney, Dennis McGillicuddy and Joanna Waniek -- The role of mesoscale variability on plankton dynamics in the North Atlantic -- 2199-2226

Aida F. Ríos, Fiz F. Pérez and F. Fraga -- Long-term (1977-1997) measurements of carbon dioxide in the Eastern North Atlantic: evaluation of anthropogenic input -- 2227-2239

W.G. Harrison et al. -- Basin-scale variability in plankton biomass and community metabolism in the sub-tropical North Atlantic Ocean -- 2241-2269

W.K.W. Li and W.G. Harrison -- Chlorophyll, bacteria and picophytoplankton in ecological provinces of the North Atlantic -- 2271-2293

Susana Agusti et al. -- Food-web structure and elemental (C, N and P) fluxes in the eastern tropical North Atlantic -- 2295-2321

Stephanie Dutkiewicz, Mick Follows, John Marshall and Watson W. Gregg -- Interannual variability of phytoplankton abundances in the North Atlantic -- 2323-2344

I. Dadou et al. -- An integrated biological pump model from the euphotic zone to the sediment: a 1-D application in the Northeast tropical Atlantic -- 2345-2381

J.C. Scholten et al. -- Trapping efficiencies of sediment traps from the deep Eastern North Atlantic: - the ²³⁰Th calibration -- 2383-2408

Bernd Christiansen, Werner Beckmann and Horst Weikert -- The structure and carbon demand of the bathyal benthic boundary layer community: a comparison of two oceanic locations in the NE-Atlantic -- 2409-2424