Deep Sea Research Part II: Topical Studies in Oceanography

Volume 48, Issues 8â€“9, 2001, Pages 1405-1447

Overview of the US JGOFS Bermuda Atlantic Time-series Study (BATS): a decade-scale look at ocean biology and biogeochemistry

Deborah K Steinberg [a] ... Anthony H Knap [a]

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https://doi.org/10.1016/S0967-0645(00)00148-X

Abstract

The Bermuda Atlantic Time-series Study (BATS) commenced monthly sampling in October 1988 as part of the US Joint Global Ocean Flux Study (JGOFS) program. The goals of the US JGOFS time-series research are to better understand the basic processes that control ocean biogeochemistry on seasonal to decadal time-scales, determine the role of the oceans in the global carbon budget, and ultimately improve our ability to predict the effects of climate change on ecosystems. The BATS program samples the ocean on a biweekly to monthly basis, a strategy that resolves major seasonal patterns and interannual variability. The core cruises last 4â€“5Â d during which hydrography, nutrients, particle flux, pigments and primary production, bacterioplankton abundance and production, and often complementary ancillary measurements are made. This overview focuses on patterns in ocean biology and biogeochemistry over a decade

This overview focuses on patterns in ocean biology and biogeochemistry over a decade at the BATS site, concentrating on seasonal and interannual changes in community structure, and the physical forcing and other factors controlling the temporal dynamics. Significant seasonal and interannual variability in phytoplankton and bacterioplankton production, biomass, and community structure exists at BATS. No strong relationship exists between primary production and particle flux during the 10Â yr record, with the relationship slightly improved by applying an artificial lag of 1 week between production and flux. The prokaryotic picoplankton regularly dominate the phytoplankton community; diatom blooms are rare but occur periodically in the BATS time series. The increase in Chl a concentrations during bloom periods is due to increases by most of the taxa present, rather than by any single group, and there is seasonal succession of phytoplankton. The bacterioplankton often dominate the living biomass, indicating the potential to consume large amounts of carbon and play a major ecological role within the microbial food web. Bacterial biomass, production, and specific growth rates are highest during summer. Size structure and composition of the plankton community may be an important factor controlling the quality of dissolved organic matter produced and could affect production of bacterioplankton biomass. Larger heterotrophic plankton play an integral role in the flux of material out of the euphotic zone at BATS. Protozoans are abundant and can constitute a sizable component of sinking flux. Zooplankton contribute significantly to flux via production of rapidly sinking fecal pellets, and vertically migrating zooplankton can actively transport a significant amount of dissolved organic and inorganic carbon and nitrogen to deep water. An important question that remains to be further addressed at BATS is how larger climatological events drive some of the interannual variability in the biogeochemistry.

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