

Temporal variability of zooplankton biomass from ADCP backscatter time series data at the Bermuda Testbed Mooring site

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Abstract

Temporal variability of acoustically estimated zooplankton biomass at the Bermuda Testbed Mooring (BTM) site in the Sargasso Sea (at 31°43'N, 64°10'W) is described for time scales from less than an hour to the seasonal cycle primarily using data obtained between August 1996 and November 2000, and from May 10 to November 13, 2003. Concurrent high frequency BTM observations of meteorological, physical, and bio-optical variables are used to interpret processes contributing to the zooplankton variability. Zooplankton biomass estimates are derived from regressions of backscatter intensity data measured with an upward looking 153-kHz acoustic Doppler current profiler (ADCP) and zooplankton net tow data collected near the BTM site as part of the Bermuda Atlantic Time-series Study (BATS). Our data show clear event-scale variations. Peaks are associated with annual spring blooms involving mixed layer shoaling and in some cases passages of mesoscale eddy features. Biomass peaks are often coincident with maxima seen in BTM chlorophyll fluorescence measurements (inferred phytoplankton biomass). Some storm events do not appear to manifest in significant perturbations of zooplankton distributions; however, Hurricane Fabian (2003) greatly impacted these distributions. Estimates of zooplankton biomass and relative vertical velocity show the vertical structure of daily migration patterns. Seasonal variations in migration patterns are also evident, with diel changes in zooplankton biomass most pronounced in spring and least pronounced in winter. In summary, our high temporal resolution time series of estimated zooplankton biomass in the open ocean provide information on scales inaccessible through conventional monthly ship-based sampling. These data have implications for upper ocean ecology and the vertical transport of carbon and nitrogen through the diel migration of zooplankton.

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1. Introduction

Knowledge of variability in zooplankton biomass is important for understanding the effects of climate change on ecosystems. In addition, zooplankton

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