with a deep-water platform for testing new instrumentation; (2) interdisciplinary BTM data are used for scientific studies, particularly in conjunction with other nearly co-located research programs including the Ocean Flux Program (OFP; e.g., Conte et al., 2001) and the US JGOFS BATS (e.g., Michaels and Knap, 1996; Steinberg et al., 2001); and (3) nearly continuous bio-optical time-series data are obtained for calibration, validation, and algorithm development for ocean color satellites (Dickey et al., 1998a, 2001). The BTM site is located at the northern edge of a transition region between relatively eutrophic waters to the north and more oligotrophic subtropical waters to the south. A weak surface front and energetic sub-mesoscale and mesoscale features are often present and can affect local biology (e.g., McNeil et al., 1999). Here the term "mesoscale" refers to features with horizontal scales on the order of 100–200 km that pass the mooring on a time scale of roughly a month and "sub-mesoscale" as features on the order of 10–100 km that pass the mooring on a time scale of less than a month (Dickey et al., 2001). The periodic variability of the region of the BTM site is dominated by the seasonal cycle (e.g., Michaels and Knap, 1996; Dickey et al., 1998a, 2001; Steinberg et al., 2001) and secondarily the diel cycle. The mixed layer depth and phytoplankton concentrations vary seasonally (and to a lesser degree diurnally), but their respective timing and intensities vary interannually. Synoptic scale weather patterns typically pass every few days. Several accounts of physical, bio-optical, and biogeochemical variability measured at the BTM site are presented in Dickey et al. (1998a, b, 2001), McGillicuddy et al. (1998), McNeil et al. (1999), Zedler et al. (2002), and Conte et al. (2003).

### 2.2. Data collection

Measurements made from the BTM include: surface meteorology and optics along with subsurface currents, temperature, salinity, and bio-optical and chemical variables. An RDI 153-kHz ADCP has been deployed from the BTM to obtain current and acoustic backscatter intensity (for estimating zooplankton biomass) data since late August of 1996. These measurements provide important high frequency information required for studying periodic and episodic processes. The BTM enables collection of nearly continuous data during periods of inclement weather and large sea states (even hurricane passages) when traditional ship-based sampling is not possible and provides otherwise inaccessible data in the important temporal spectral range of minutes to several years. Previous studies based on BTM measurements in the past decade have concerned physical and biogeochemical variability (e.g., Dickey et al., 1998a, b, 2001; McNeil et al., 1999; Zedler et al., 2002; Conte et al., 2003). Observations of zooplankton biomass as estimated from an ADCP deployed on the BTM are now providing concurrent and long-term biological information about zooplankton with high vertical spatial and temporal resolution, and facilitate studies of physical and biological interactions.

The mooring configuration for the present study (see www.opl.ucsb.edubtm/methods.html) included temperature sensors at several depths from 2 to 750 m (3.75-min sampling interval), conductivity sensors (for salinity determinations) at one or two depths (3.75-min sampling interval), and fluorometers for estimating chlorophyll-*a* (chl-*a*) at several depths (3.75-min sampling interval). An upward-looking 153-kHz Blue Water broadband ADCP manufactured by RD Instruments, Inc. of San Diego, CA (RDI, 1995) was moored at depth (in range of 200–212 m) and provided horizontal and vertical currents and acoustic backscatter intensity (for estimating zooplankton biomass) from roughly 20–200 m (Table 1). The ADCP was configured to collect data in 68 vertical bins, each with a bin size of 3 m, and at a sampling time interval of 7.5 or 15 min. The ADCP beam angle is 20° from the system's vertical axis for each of the instrument's four transducers and the acoustic transmission beam spreads at an angle of approximately 4°. This results in a 7.5-m-diameter bin for each beam at 72-m depth, with a horizontal surface area of 44.2 $m^2$,

Table 1
Bermuda Testbed Mooring ADCP measurement periods

| Deployment | Time period | Depth range (m) |
|---|---|---|
| 6 | August 21, 1996–January 10, 1997 | 20.5–200.5 |
| 7 | May 3, 1997–July 30, 1997 | 20.5–203.5 |
| 8 | August 8, 1997–November 20, 1997 | 20.5–203.5 |
| 9 | November 26, 1997–March 31, 1998 | 21.5–201.5 |
| 10 | November 11, 1998–March 19, 1999 | 18.5–195.5 |
| 11 | April 1, 1999–July 21, 1999 | 19.5–196.5 |
| 12 | July 29, 1999–November 6, 1999 | 20.5–197.5 |
| 13 | December 5, 1999–May 27, 2000 | 19.5–196.5 |
| 14 | June 1, 2000–November 29, 2000 | 20.5–197.5 |
| 18 | May 10–November 13, 2003 | 20.5–191.5 |