Effects of Current Meter Tilting on Current Observation


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Abstract
We measured tidal currents by using an electromagnetic current meter mooring in the Ariake Bay to clarify how heavy the sinker needs to be and how current meters should be moored for accurate current measuring. From the results, it is believed that there possibly occur 1 m/s over speeds of tidal currents in situ, and that the tilt of the current meter caused a decline of the observed speed. In addition, in cases where one observes tidal current by ACM-8M, a 10 kg sinker seemed to be insufficient to keep the current meter tilt to less than 20°, which is the limit of theclinometers installed, and furthermore mooring current meters in series encourages tilting. We recommend that the mooring of current meters in series should be avoid, the sinker should be connected close to the current meter, and that sinkers much heavier than 10 kg should be used.

Keywords: electromagnetic current meter, vector averaging, Ariake Bay, mooring

1. Introduction
A variety of types of vector measuring current meters are used for tidal current measurements. Recently, the electromagnetic current meter has been extensively used by oceanographers in mooring measurements due to its ruggedness, user-friendliness, and lightweight, and this instrument has proven to be a reliable instrument for obtaining quality data of tidal current from moorings in scientific studies (Halpern et al. 1981; Beardsley 1987; Dickey et al., 1991; Irish et al., 1995). However, very little in situ performance data, with which the reliability of mooring methods could be evaluated, previously existed except for a few reports. In particular in inner bays where high-speed tidal currents occur, little attention has been given to the point of how one should prevent tilting of current meters and correct the effect of tilting. Among such inner bays the Ariake Bay shown in Fig. 1 is a topical bay where a high speed current of 1.0 m/s or more often occurs during the spring tide. Tidal current surveys in the Ariake Bay have been conducted in many studies, and a great deal of effort has been made to understand the features of tidal currents and to estimate their change by natural and artificial impacts e.g. the construction

Fig. 1 Location of the experiments in the Ariake Bay.