Vertical Structure of Internal Tides Observed at the Eastern Part of Sagami Bay

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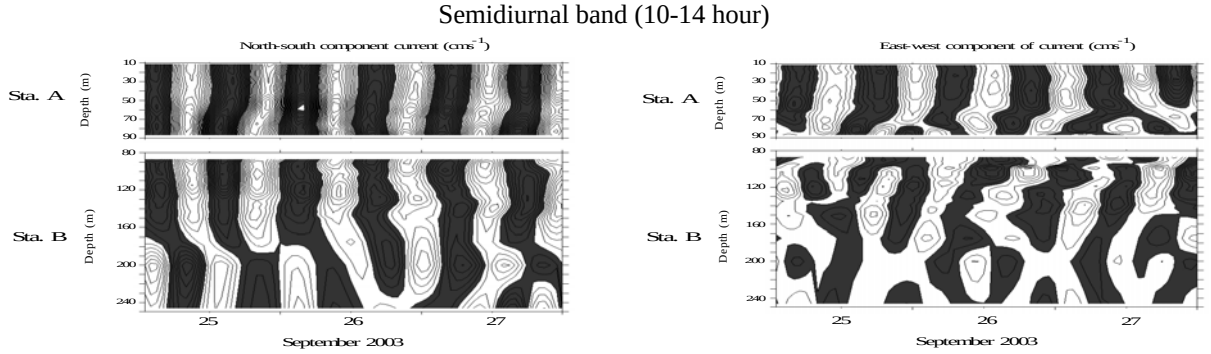
Key words: Internal tides, ADCP, Sagami Bay, Spring-neap tidal cycle

Abstract

Mooring observations using the acoustic Doppler current profiler (ADCP), current meter and thermometer were carried out on the shelf (Sta.A) and at shelf edge (Sta.B) at the eastern part of Sagami Bay from July 28 to October 6 in 2003. Current and temperature data were analyzed to investigate the vertical structure and intermittency of internal tides. Semidiurnal period fluctuations were predominant in all depths at both stations throughout the observation period, so this period ones are analyzed in this paper. The current fluctuations with the semidiurnal period were closely related to the temperature one, so these fluctuations can be considered to be mainly due to the internal tides. The stratification for internal tides changed greatly after abrupt temperature increase associated with a strong inner-ward current on September 23. The semidiurnal current was strengthened in the observational depths at both stations after this event. The current ellipses for the M2 constituent at both stations were estimated as the semidiurnal period current. The orientation of the major axis at Sta.A was directed to or along the Miura Peninsula, while at Sta.B was seen along the bottom contours. The kinetic energy of semidiurnal internal tidal current fluctuated with spring-neap tidal cycle, so that the observed semidiurnal internal tides are expected to be generated at less far from the observation stations. Structure and propagation properties of semidiurnal internal tide were estimated by using the current data after the temperature abrupt increase on September 23. The north-south component, approximately main axis, of internal tidal current at Sta.A was almost in phase throughout the water column, whereas the current direction at Sta.B changed about 170m depth such as the first internal mode. The direction of east-west component of current changed at about 70m depth at Sta.A, while at Sta.B the east-west component of current above 140m depth at was stronger than deeper layer and its phase propagated upward, implying downward energy propagation.



Time series of the semidiurnal tidal current. Shaded area shows the northward and eastward current. Each contour line interval is 1 cms^{-1}.