



Tidal currents in the Qiongzhou Strait estimated from shipboard ADCP data during spring 2013

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In spring 2013, thirty-three repeat shipboard Acoustic Doppler Current Profile (ADCP) surveys were conducted to measure the tidal current in the Qiongzhou Strait (QS). The major tidal currents and residual current along a section across the QS were estimated for the first time using a modified tidal harmonic analysis method based on the inverse technique. A simple simulation and comparisons with previous observations demonstrated that the tidal currents estimated using the modified tidal harmonic analysis method are reasonable, and the modified tidal harmonic analysis method was able to control the magnitude and deviation of the estimation error. The direction of the major axis of tidal current ellipses is generally along the strait. The diurnal tidal constituents are dominant among the five tidal current constituents (K1, O1, M2, S2 and Mf). The ratio of the amplitudes of O1, K1, M2, S2 and Mf averaged along the section across the QS is 1:0.74:0.34:0.51:0.52. The residual current along the entire section is all westward, and the averaged velocity over the section and the associated volume transport through the section is 19.3 ± 2.4 cm/s and -0.182 ± 0.0220 Sv, respectively, in which the second value denotes the uncertainty of first value. The dynamic analysis indicates that the tidal rectification and sea level difference between two entrances of the QS are important mechanisms to maintain the residual current through the strait.