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Acoustic Calibration of Echo Soundings: Applications in Shelf Region off Northern Taiwan

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ABSTRACT

With a preset echo sounding velocity, each bathymetric measurement can be corrected off-line numerically. This article presents an iteration algorithm of acoustic calibration for a representative acoustic profile versus depth of water column obtained in the survey area. In addition, different kinds of acoustic profile, represented by polynomial regression equations, were addressed offshore north Taiwan. Results gave a large variety of patterns in acoustic profile within a small limit of territories in the shelf region, indicating that bathymetric measurements collected off northern Taiwan should be calibrated with much care. However, using an expected mean velocity at 1525 m/s, sounding accuracy with deviation less than 0.2% was obtained on the shelf in the summer.

(Key words: Bathymetry, Acoustic correction, Acoustic profiles, Offshore northern Taiwan)

1. INTRODUCTION

Echo sounders measure water depth by generating a pulse of sound, and receiving its echo from the bottom. The time that it takes the sound to travel between the water surface and bottom allows us to calculate the range to the bottom or the thickness of the water column, by knowing this time and the speed of the sound in water (called echo time and acoustic velocity, hereinafter).

Acoustic velocity depends on the water temperature, pressure and salinity, and these must be known at a sufficient number of points in the water column before an echo sounding can be derived. However, whilst bathymetry is obtained as under-way geophysical data, it has been very seldom that the temperature and salinity could be measured at time of echo sounding. Under this circumstance, either an estimated mean velocity was presumed (conventionally at 1,500 m/sec) to compute so-called the observed water depths, or the observed depths would be calibrated by a certain defining empirical formula; like the Matthews Tables (Matthews 1939),

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