

Structured Session: Shallow Water Acoustics

Passive depth estimation using a single vector hydrophone in deep water: both broad-band and narrow-band sources

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In deep water, the waves from Reliable Acoustic Path (RAP) are received by the bottom-based receiver, where the direct wave (D) and the surface reflected wave (SR) both play a leading role. When the source is within a certain range, the two waves form a stable periodic fluctuation interference pattern. There is a Fourier kind relationship between the interference pattern and the source depth, which can be used to estimate the depth of the target passively. For a broadband source, the interference pattern appears in the azimuth-frequency spectrum. When aiming at the vertical azimuth of arrival, the intensity oscillates with the frequency. For a narrowband source, the interference pattern is formed in the azimuth-distance spectrum. The intensity oscillates with the range of the moving target. The vector hydrophone simultaneously receives the particle velocity in different directions. When the signal-to-noise ratio is sufficient, the single vector hydrophone can not only estimate the direction of arrival as a line array but also can observe the interference pattern. It can estimate the depth of the target independently. In this work, the passive depth estimation of both the broadband source and the narrowband source is realized using a single vector hydrophone, which is verified by the measured data in the South China Sea in 2021.

Keywords: passive depth estimation; vector hydrophone; interference pattern.

References

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