

(Research Article)

The impact of wind-generated bubble layer on matched field sound source localization in shallow water

V. Zarepour¹, M. Ezam^{*1}, S. Allahyari Beik¹, A. Aliakbari Bidokhti²

1. Department of physical oceanography, Environment faculty, Science and Research Branch, Islamic Azad University, Tehran

2. Department of Space Physics, Institute of Geophysics, University of Tehran

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Abstract

This paper investigates the effect of the wind-generated bubble layer on the underwater sound source localization in the Persian Gulf shallow-water environment through computer simulation and the matched field processing technique. An underwater sound source of 2-10 kHz located at depths of 10, 45, and 75 m was considered at a distance of 4 km from a linear vertical receiver array. The estimation of the source range and depth was performed in the match condition using the maximum-likelihood matched field processor. Next, the errors due to the effect of the sound-speed mismatch of the bubble layer (affected by different wind speeds) were extracted. The results showed that, although errors increased by increasing the degree of the mismatch and by increasing the source frequency, the error values are significant (above 1%) only at frequencies greater than or equal to 8 kHz for wind speeds greater than 8 m/s. Also, the maximum error in estimating the range and depth of the source is 2.5% and 4.5%, respectively. Besides, the values of these errors were dependent on the source depth, so the errors for the sound source located at depth 10 m (closer to the bubble layer) were more than the errors in the other two source depths.

Keywords: Wind-generated bubble layer, Source localization, Mismatch, Range-depth ambiguity surface, Matched field processing.

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* Corresponding author E-mail: ezam@srbiau.ac.