

Point Source Distribution Model of Ship Noise in Shipping Channel

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Abstract: Ship noise plays an important role in low-frequency ocean ambient noise. With the increasingly busy sea traffic, the randomness of the spatiotemporal distribution characteristics of ship noise is also increasing. However, most ships sail in a relatively fixed range in different sea areas. Most of the previous studies assumed that the ship noise sources in shipping channel satisfy a uniformly distribution, actually all kinds of large ships are not uniformly distributed in the shipping channel, and there are also many small boats distributed on the channel that contribute significantly to low-frequency ocean ambient noise. The channel within a certain sea area will be divided into different regions, and ship information (AIS) in different regions will be analyzed statistically in this paper. It is assumed that the ship noise sources in different channel regions are point noise sources that obey a certain spatiotemporal statistical distribution. The spatiotemporal distribution model of point noise sources is combined with the noise source level models of different types of ships to form a point source model of ship noise in shipping channel. Based on the point source model, and the ray propagation theory considering the horizontal refraction of sound energy, the vertical distribution of the ship noise level in this sea area is calculated, and compared with the measured data, the variation range of the calculated noise level (such as maximum and minimum values) is consistent with the measured data. The point source distribution model of ship noise established in this paper may provide a technical support for predicting low-frequency ambient noise characteristics near the channel.

Keywords: ocean ambient noise; shipping channel; spatiotemporal statistical distribution