1P6-2

Horizontal directionality of ambient noise at the Socheongcho ocean research station

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1. Introduction

Acoustic signals emitted in the water include various information. A variety of noises due to marine vessels, biological, offshore plant construction, and breaking waves are included in underwater noise. Research on this area is also underway. Underwater noise is distributed in different bands in the frequency domain. Noise level of the frequency band is calculated to determine the noise source that affects the surrounding area. The ambient noise in the ocean is characterized by analyzing the isotropy noise level using one omnidirectional hydrophone. In this method, there is a limit to the characterizing of noise sources. However, if more than one hydrophone is used, the directional characteristics of the ambient noise can be identified. In this paper, horizontal directional underwater noise of ship traffic noise was analyzed in 200,400, 500, 800 Hz band using 20 hydrophone array.

2. Geometry of array

The acoustic signal analyzed in this paper was a line array hydrophone data installed at Socheongcho ocean research station located in the Yellow Sea, Republic of Korea. The geometry of the array is shown in Figures 1, 2 and Table 1.

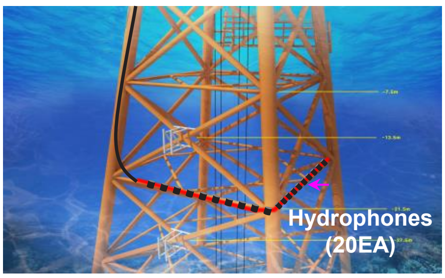

Fig. 1 Concept diagram of hydrophone installation

Table I. Specification of array.

Number of hydrophones	20 EA
Hydrophone spacing	1.5 m
Depth of array	21.5 m

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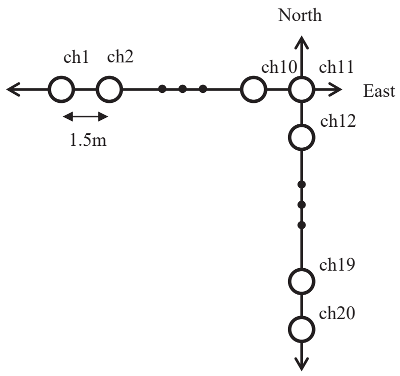
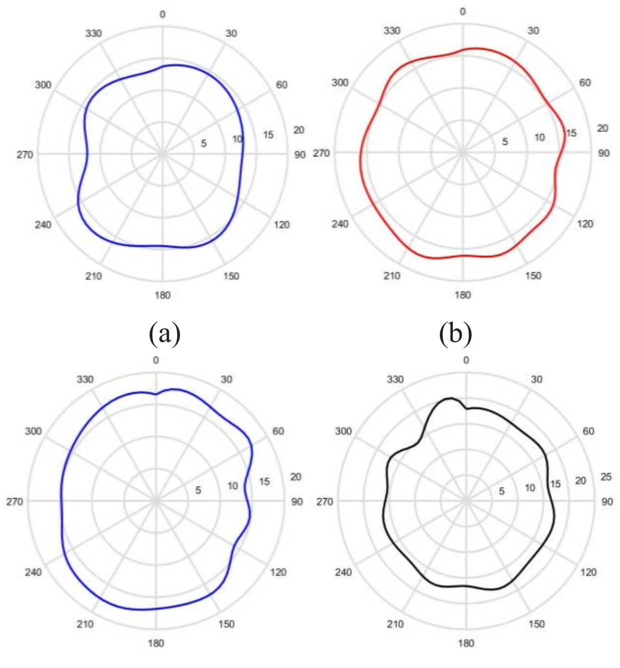


Fig. 2 Geometry of array.

3. Horizontal directionality of ambient noise

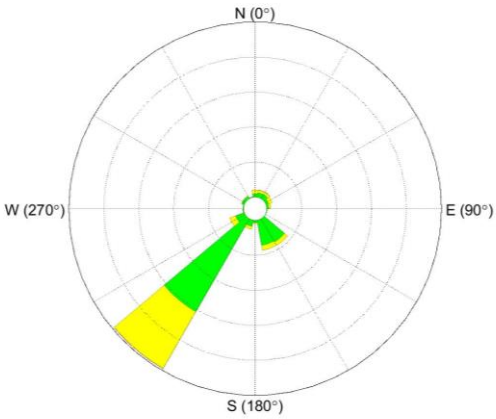
In order to analyze the horizontal directionality of ambient noise, we analyzed the acoustic signals acquired during the day. In addition, a specific frequency 200, 400, 500, 800 Hz was selected for analysis of ship noise in the surrounding station area.



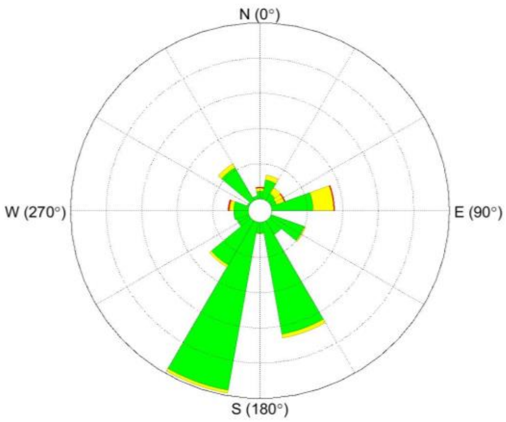
(a) (b) (c) (d)

Fig. 3. Horizontal directionality of ambient noise
(a) 200 Hz (b) 400 Hz (c) 500 Hz (d) 800 Hz

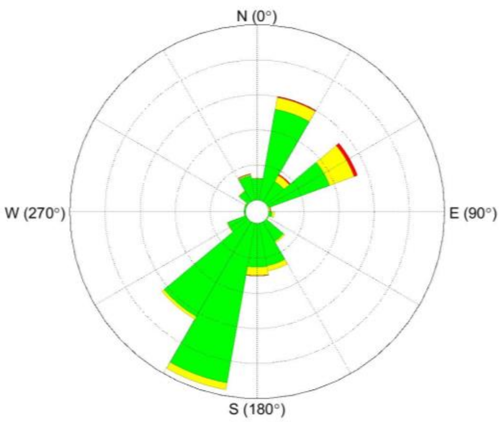
As a result of directionality underwater noise analysis, this is because even if the noise such as ship passing is generated, it does not affect the average directionality noise during the day. Therefore, the noise source distribution can be confirmed by the short period analysis for the noise source. For this, short-time signals were analyzed for directionality and the results were applied to wind rose diagram.



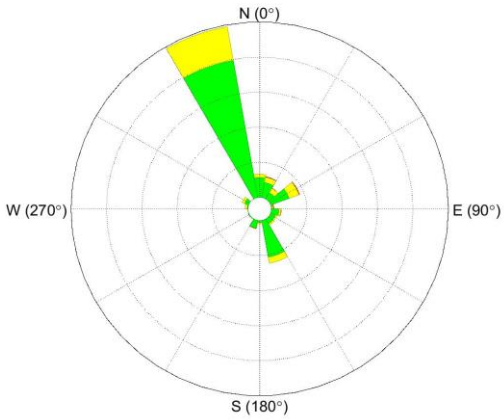
(a)



(b)



(c)



(d)

Fig. 4. Wind rose diagram for horizontal directionality of ambient noise
(a) 200 Hz (b) 400 Hz (c) 500 Hz (d) 800 Hz

Wind rose analysis shows that there is a specific underwater noise source in each direction for each frequenc. This is due to the presence of vessel traffic noise in the research station area in a specific direction. As shown in Figure 5, the distribution of vessels based on AIS information shows that the traffic density is high in the northwest and southwest directions[3].

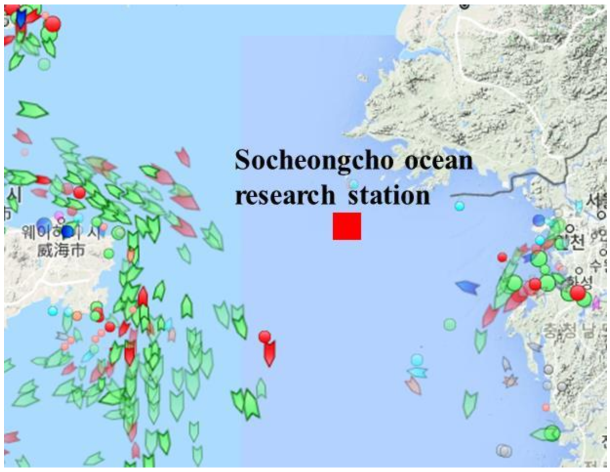


Fig. 5. Ship passing route and density.

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References
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3. https://www.marinetraffic.com/