Special Issue

Low-Frequency Underwater Acoustic Signal Processing and Applications

Message from the Guest Editors

Low-frequency underwater acoustic signal processing plays a pivotal role in marine exploration, environmental monitoring, and underwater communication systems. Due to the unique propagation characteristics of low-frequency signals (typically below 1 kHz) in water—such as reduced attenuation and long-range transmission—they are indispensable for applications like underwater target detection, seismic activity monitoring, marine biodiversity studies, and underwater vehicle navigation. However, the complex underwater environment, characterized by ambient noise, multipath interference, and dynamic channel variations, poses significant challenges to signal acquisition, analysis, and interpretation. Key research areas focus on enhancing signal-to-noise ratio (SNR) in the low-frequency range through adaptive filtering and beamforming techniques, developing robust algorithms for feature extraction and recognition in noisy environments, and improving localization accuracy via time/frequency/space processing. Additionally, artificial intelligence-based methods are increasingly demonstrating critical importance in the low-frequency range of underwater acoustic signal processing.

Guest Editors

Prof. Dr. Yong Wang

Prof. Dr. Peng Xiao

Prof. Dr. Long Yang

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Electronics
Editorial Office
MDPI, Grosspeteranlage 5
4052 Basel, Switzerland
Tel: +41 61 683 77 34
electronics@mdpi.com

mdpi.com/journal/electronics

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Editor-in-Chief

Prof. Dr. Flavio Canavero
Department of Electronics and Telecommunications, Politecnico di Torino, 10129 Torino, Italy

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