

# Underwater Ambient Noise Modelling and Monitoring

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## Summary

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*Underwater ambient noise (AN) is caused by multiple natural and anthropogenic sources and is a random process. Statistical methods help to assess AN spatial distribution in the ocean depending on environmental conditions and physical properties of the water column. The aim of this project is to derive these properties from the AN monitoring data.*

Research field:	Building and civil engineering and architecture
Supervisor:	Prof. Dr. Aleksander Klauson
Availability:	This position is available.
Offered by:	School of Engineering Department of Civil Engineering and Architecture
Application deadline:	Applications are accepted between May 03, 2021 00:00 and May 31, 2021 23:59 (Europe/Zurich)

## Description

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Main contributors to the ocean ambient noise (AN) are wind generated surface waves. Multiple sources of underwater sound both natural or anthropogenic are contributing. Anthropogenic is caused by commercial shipping, off-shore construction etc. and is considered as an environmental pollutant causing many adverse effects on marine organisms. For this reason in EU, AN monitoring programs are launched aiming to assess the proportion of the anthropogenic footprint and to take measures to reduce it, if needed.

Natural AN generated by surface distributed sources can be calculated using well known sound propagation models. As AN is a random process, statistical methods are used to find relationships between sound pressure averaged characteristics. The spatial distribution of the noise field is formulated using statistical characteristics as cross-spectral density. Correlation of sound received by two hydrophones from multiple surface sources helps to establish sound propagation conditions between two points where hydrophones are located. Underwater sound propagation depends on water column temperature profile and sea bottom geological structure. Knowledge of AN spatial distribution can help to establish underwater communication with autonomous underwater vehicles.

The aim of this study is to extract sound propagation information from the AN monitoring data. To achieve this goal both theoretical and experimental approaches will be used. At the first stage a model of ambient sound produced by homogeneously distributed sound sources in a simplified sea model will be composed and verified with the relevant monitoring data. Finally characterization of the sound propagation conditions based on AN monitoring data will be achieved.

### **Applicants should fulfil the following requirements:**

- Master's degree either in ocean engineering, acoustics or technical physics
- programming skills (Matlab, Python, R) are expected
- knowledge of mathematical physics, statistics and basic measurement skills are beneficial



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