

Underwater Acoustic Simulator (UAS)

Predicting the **impact of underwater noise** on marine life

The Underwater Acoustic Simulator (UAS) offers **modelling of underwater noise** from a variety of **man-made activities at sea**. It is the ideal tool for **investigating and managing underwater acoustic challenges** covering a wide frequency range.

APPLICATIONS

As human activities in the marine environment intensify, underwater noise impact assessments become increasingly important. Sound in the ocean travels over large distances, causing man-made noise associated with offshore activities to have potentially far-reaching consequences on marine life. It may cause temporary or permanent hearing loss, masking of important sounds, damage tissue or behavioural changes in marine mammals.

This makes accurate and reliable numerical modelling of underwater sound from a variety of sources a prerequisite for biological impact and risk assessments on the marine environment.

UAS is an intuitive, user-friendly tool designed for conducting environmental impact assessments of noise created by offshore operations and activities at sea. The model focuses on the noise propagation in the far-field and it is developed from years of acoustic, biological and environmental expertise.

TYPICAL APPLICATIONS

- Conducting environmental impact assessments (EIA) for offshore wind farms, seismic surveys, shipping, drilling, dredging and other human activities at sea
- Supporting research projects concerned with effects of noise on aquatic life such as whales, dolphins, turtles, fish and the like

FEATURES

STATE-OF-THE-ART ACOUSTIC MODEL

UAS is a 2D range dependent acoustic model featuring a state-of-the-art acoustic engine. The model accounts for variation in speed of sound in the water column in addition to vertical change in volume attenuation - properties that are both of high importance when modelling propagation of sound. In relation to volume attenuation in the water column, UAS provides the option to apply an empirical model based on spatial variation of salinity, temperature and pH in the water - information easily extracted from a MIKE 3 Hydrodynamic (HD) model.

ABSORPTION IN THE SEABED

For a realistic treatment of seabed effect on sound wave propagation in the ocean, it is necessary to include absorption in the bottom material. In UAS, you can define multiple sediment layers of individual thickness, density, compressional wave speed and compressional wave attenuation. You can define as many layers as needed.

FEATURES

OCEAN FLOOR AND WATER DEPTH

Sound transmission is highly affected by the local bathymetry, especially at shallow waters, and with UAS you are able to include this range dependency property. The model is automated and provides options for specifying deep water with limited bottom interaction settings.

SOUND PROPAGATION OF MULTIPLE FREQUENCIES

Man-made noise sources are often broadband by nature with varying energy levels in each frequency band. UAS is capable of solving the sound propagation of multiple frequencies. Frequencies range from 16 Hz to 40 kHz.



Marine mammals are particularly sensitive to noise and they rely heavily on sound to communicate, navigate, find prey and steer them away from danger. Consequently, loud man-made noises can distort messages and have far-reaching and damaging impact on aquatic life.



FEATURES

SOUND SOURCE LEVEL

The sound source is defined by its sound level and the location in the water column.

The sound level can be defined as a constant value (one sound level), spectrum (the sound energy varies per frequency band), or a scaled spectrum (the sound level varies per frequency but the overall sound level is defined as a constant).

OUTPUT

UAS includes the option to define a number of specific outputs in terms of sound exposure level (SEL) or transmission loss (TL).

The output files are standard DHI formats: 1D (dfs1) and 2D (dfs2), which make your result files easily compatible with other MIKE software products.

FEATURES

PRESENTING YOUR RESULTS

Presentation of your results is crucial in order to facilitate clear communication of your work.

UAS provides clear visualisation of bathymetry data, noise sources and prediction results. For this purpose, you can use the MIKE Zero plot composer to create plots of the 2D transect (grid plot) and the 1D profiles (profile plot).

ENVIRONMENTAL AND BEHAVIOURAL MODELLING

UAS can advantageously be used together with our ABM Lab for agent based modelling or ECO Lab for ecological modelling.

Combining the strengths of UAS with ABM Lab, you have a dynamic risk assessment model that enables you to simulate the acoustic disturbance behavioural of the marine species of your attention.

BENEFITS

With UAS, gaining detailed insight into the mechanisms governing underwater sound propagation becomes easier and less time-consuming.

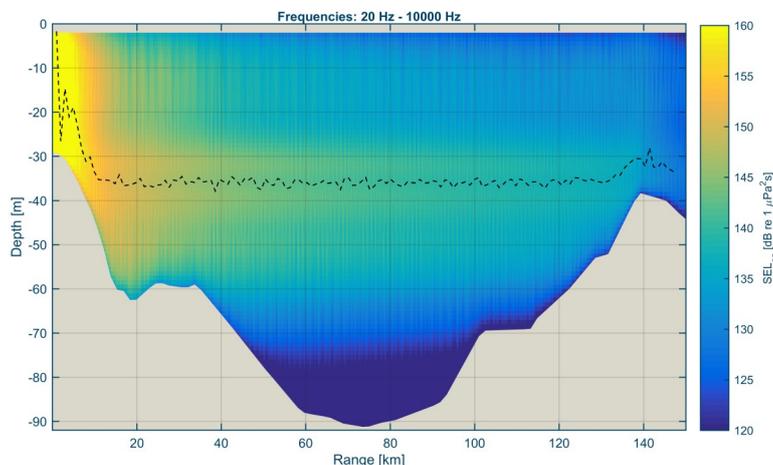
UAS allows you to seamlessly derive environmental properties from a MIKE 3 HD model using standard MIKE Zero data extraction tools.

Meshing and numerical settings are automated, leaving you only to focus on building a model with project site input properties.

UAS also provides the option to easily scale the sound source signature to comply with a specific user-defined source level.

You may define a number of specific outputs in terms of sound exposure level or transmission loss, depending on the objective of the biological risk assessment.

This model supports significant and accurate predictions of underwater noise impacts as well as production of accurate sound profiles to help develop reliable and cost-effective monitoring and mitigation plans that reduce the environmental footprint.



Sound propagation in a two-dimensional vertical cut through the water column and seabed. Levels are depicted in terms of sound exposure level. © DHI

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For more information, visit:
www.mikepoweredbydhi.com