Northern Ireland - Piling

Time series and peak pressures

First open the latest version of dBSea, as downloaded and installed from http://www.dbsea.co.uk/download/ (either full version or BASIC).

1 THE SCENARIO

After using "Open file"  to browse for "Northern Ireland piling.UWA", you will see a 3D-view of the area between the island of Ireland and the Hebrides in Scotland.

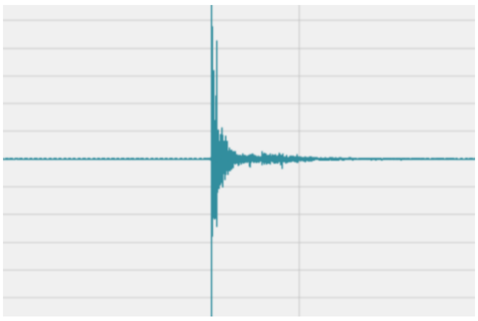
Press "reset 3D view"  to switch to a birds-eye view.

For this scenario most of the work is already done (as it's rather resource intensive). We've included a timeseries and already calculated the transmission loss. Thus, we will mainly walk through this scenario to enable you to model similar scenarios later on.

For impulsive sources it's often necessary to evaluate both the peak acoustic pressure level (dB$_{z-p}$) and the exposure level (dB$_{SEL}$) of the activity to fully assess the impact of the noise.

We thus need the actual signal imported into dBSea:

Figure 1. Example of a single impact on a steel pile.



To calculate peak pressures the arrival times of the noise at each location from each path has to be considered. The solver dBSeaRay calculates individual ray-paths for the noise to all positions in the scenario. This gives us the arrival times of the timeseries waveform and allows for calculation of the received time-pressure-series at any location.

Because of the strong dependency on arrival time of the peak pressure this more resource-costly method must be used.

Two scenarios are included in this UWA file:

1. Peak pressure
   This has been solved with respect to the peak pressure.
2. Exposure
   This scenario has been solved for single strike noise exposure.

You can swap between these two by using the dropdown menu next to the "Help" labelled "Active Scenario" or using the "Scenarios manager" .

Clicking "Reset 3D view" will give you a birds-eye perspective.

Now click "Sound sources" to open the sources panel. Press "timeseries" to see the waveform used as impulse for this source.

If you have a (short) wavfile you can import it here, see the waveform and use it as a sound source. You will in this case need to run the solve again, which depending on your machine can take a while (hours on a laptop).

Switch to scenario "Peak Pressure" and open the "Probe" menu. Notice that all frequencies have the same level. This is because, in the peak pressure mode we are only interested in the highest pressure, and we cannot assign a specific frequency to that pressure. To see what frequency carries the most energy, switch to the scenario "Exposure". You can "grab" the probe (brown spot in the 3D view) with your mouse, to move it around the scenario (you have to be in birds-eye view for this).

2 Data Sources

Bathymetry data from http://www.gebco.net/
30 arc-seconds resolution.

The timeseries used as source is an inhouse recording of a steel pile being struck, scaled to 210 dB_{z-p} / 182 $dB_{SEL\ single\text{-}strike}$.

3 Further Information

This scenario was prepared as a showcase of features and is therefore massively simplified both in terms of input and output. Here I will try to outline what these simplifications mean and what to do if you wish to achieve an accurate representation of real world levels.

In "Setup project" the number of "z depth points", "Radial slices" and "Range points" have been set low. This speeds up solving time and lowers the memory needs, useful for examples, but reduces accuracy, especially in a detailed environment.

The detailed settings of the individual solvers can be changed in “Preferences” → “Advanced”. For a more accurate solve increase “Frequency oversampling”, decrease “Radial smoothing” and untick “levels must decrease with distance from source” and also “Stop marching solution upon reaching land”.

For “dBSeaPE” the the accuracy can be increased by increasing all variables. Increases in accuracy are decent compared to solving speed up to around 3-5 Padé terms and a couple of times oversampling of range and depth.

dBSeaRay should be configured to “Calculate volume attenuation at each step”, “Max number of reflections from seafloor” should be high, >1000 and “Initial angles range” should be set to the desired range. “Number of rays” set to “0” will use 1000 rays, but can often be limited to reduce calculation time.

When “Max number of modes” in dBSeaModes is set to “0”, the solver will use all the modes it can find, if this is too slow, try to set your own value.

The input data from GEBCO is very coarse and our results will be affected by this.

The source used here is a point source – consider setting a piling scenario up as a line source.

Lastly we have not provided any details on sediment, water properties or sound speed in the scenario – all details important for and accurate representation of the real world.

If you wish to know more about how the solvers function, please download the dBSea help file and the dBSea FAQ for a fuller explanation.

Always remember that modelling software will only give you answers as good as the data provided.
This scenario was created using data from GEBCO’s 30” grid. While this data is great for overviews and accessibility it can lack the necessary resolution for accurate modelling. Likewise, with sediment properties, sound speed profile and sound source characteristics.
We advise that you always ground-truth your models.

If you have any questions, contact your local distributor or me at rasmus.pedersen@irwincarr.com (Please check Help and FAQ)

We hope you enjoy working with dBSea!

dBSea