



Data Description for underwater noise signatures of ships in Australian waters

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This provides details of file formats for digital ship source spectra described in Erbe et. al. 2021. That reference should be consulted for details of the methods used to obtain the spectra and should be cited in any papers or reports describing work that utilizes the data.

Data are provided in comma separated variable (csv) files, with each ship pass by a hydrophone having two associated csv files, one containing the source spectrum computed from the pass, and the other containing associated meta data. These are a form of text file and can be opened in any text editor and also in most spreadsheet programs.

File naming convention:

Spectrum files are named as follows:

ShipSourceSpec_<Deployment ID>_<Pass number>_<Vessel ID>_<Vessel Class>.csv

Where:

<Deployment ID> is a 4 digit number that identifies the sound recorder deployment,

<Pass number> is a unique (within that deployment) identifier of the ship pass,

<Vessel ID> is the vessel's AIS identifier (usually its call-sign), and

<Vessel Class> the vessel's AIS class identifier and will be one of: CT_CARGO, CT_TANK, CT_PASSENGER, CT_REC, CT_SAIL, CT_HBR, CT_OTHER or CT_FISH.

Not all ships transmit name and/or class information on their AIS signals, in which case <Vessel ID> and or <Vessel Class> will be empty (the surrounding underscore characters will still be included in the file name).

Meta data files have the same name as the associated spectrum file, but with the string _Meta appended after <Vessel Class>.

For example:

ShipSourceSpec_3073_10_9HZA9_CT_CARGO.csv

and

ShipSourceSpec_3073_10_9HZA9_CT_CARGO_Meta.csv

are respectively the source spectrum and meta data files from recorder deployment 3073, pass 10, and are of a vessel with ID 9HZA9 which is of class CT_CARGO.

Similarly,

ShipSourceSpec_3274_49__CT_CARGO.csv

and

ShipSourceSpec_3274_49__CT_CARGO_Meta.csv

are respectively the source spectrum and meta data files from recorder deployment 3274, pass 49, and are of an unidentified vessel of class CT_CARGO.

Spectrum file description:

An example of a spectrum file is given below. This is a three-column, comma delimited text file. The first line describes each column and the second line indicates the corresponding units. The data in subsequent lines are: 1/3 octave band centre frequency (Hz), 1/3 octave band source level (dB re 1 μ Pa.m), and 1/3 octave band average source spectral level (dB re 1 $(\mu$ Pa.m)²/Hz).

“No data” entries are indicated by NaN (not a number) and occur where the measured spectrum was less than 6 dB above the ambient noise spectrum.

```
Frequency, Band Source Level, Spectral Density Level
Hz, dB re 1 uPa.m, dB re 1 (uPa.m)^2/Hz
 2.0,      NaN,      NaN
 2.5,      NaN,      NaN
 3.1,      NaN,      NaN
 4.0,      NaN,      NaN
 5.0,    179.0,    178.4
 6.3,    179.1,    177.3
 8.0,    175.9,    173.2
10.0,    189.5,    186.0
12.5,    182.7,    178.0
16.0,    180.4,    174.7
20.0,      NaN,      NaN
25.0,    176.2,    168.6
31.5,    175.0,    166.3
40.0,    171.2,    161.5
50.0,    176.3,    165.7
63.0,    179.4,    167.7
80.0,    174.8,    162.2
100.0,   165.6,    152.1
125.0,   161.0,    146.3
160.0,   158.2,    142.4
200.0,   154.0,    137.5
250.0,   150.5,    133.0
315.0,   148.3,    129.6
400.0,   148.1,    128.4
500.0,   148.8,    128.2
630.0,      NaN,      NaN
800.0,      NaN,      NaN
1000.0,     NaN,      NaN
1250.0,     NaN,      NaN
1600.0,     NaN,      NaN
2000.0,     NaN,      NaN
2500.0,     NaN,      NaN
```

Meta data file format

Meta data files are a two-column csv files with the first column being a tag that identifies the data in the second column. An example is shown below and should be self-explanatory, apart from noting that SetName is the same as the <Deployment ID> in the file name.

```
SetName, 3129
PassID, 86
VesselName, VREU4
CraftClass, CT_TANK
DateTimeUTC, 23-Feb-2013 02:40:23
VesselLengthMetres, 182.0
AverageSpeedKnots, 11.8
MinRangeLimitKm, 1.000
MaxRangeLimitKm, 8.000
MinRangeKm, 1.353
MaxRangeKm, 7.824
AssumedSourceDepthMetres, 3.0
SNRThresholdDB, 6.00
RecorderLatDeg, -32.3093
RecorderLonDeg, 152.9249
RecorderDepthMetres, 146.62
RecorderWaterDepthMetres, 146.72
```

Reference:

Erbe, C., Duncan, A., Peel, D. Smith, J.N. (2021). *Underwater noise signatures of ships in Australian waters*. Report to the National Environmental Science Program, Marine Biodiversity Hub. CMST Curtin University