

Continuous Underwater Noise Reporting Format

March 2020



1. Introduction

An agreement was made between HELCOM and ICES for the latter to host ambient underwater noise data. The continuous underwater noise submission format has been agreed by the ICES Data Centre, JOMOPANS and EN-NOISE.

2. Reporting format

The Continuous Underwater Noise format has to be submitted to ICES in HDF5 file format, and consists of three groups, each containing several datasets. A description of each group can be found in the subsections below. In the tables below, the “Field” column defines the datasets in each group, the “Status” column describes whether the dataset is mandatory, conditionally mandatory, or optional, the “Data type” column defines the data format in each dataset, the “Field definition” column describes the dataset, and the “Reference” column links to the controlled vocabulary for the corresponding dataset, when existent. A dataset is considered to be conditionally mandatory when a specified value is present in a related dataset.

2.1. File information group

| Field | Status | Data type | Field definition | Reference |
|--------------|-----------|--------------|---|---|
| Email | Mandatory | String(50) | Creator of the HDF5 file/ who holds responsibility for data QA and creation of the submitted hdf5 file. | |
| CreationDate | Mandatory | DateTime(21) | Date of file creation. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss] . Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z | https://en.wikipedia.org/wiki/ISO_8601 |
| StartDate | Mandatory | DateTime(21) | Measurement collection start date. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z | https://en.wikipedia.org/wiki/ISO_8601 |
| EndDate | Mandatory | DateTime(21) | Measurement collection end date. UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z | https://en.wikipedia.org/wiki/ISO_8601 |
| Institution | Mandatory | String(6) | Institution which acquired the data. | https://vocab.ices.dk/?ref=1398 |
| Contact | Mandatory | String(255) | Contact of all future external queries/who submits/holds responsibility for submission | |
| CountryCode | Mandatory | String(4) | | https://vocab.ices.dk/?ref=337 |
| StationCode | Mandatory | String(10) | The station code and its associated coordinates can be found in the ICES station dictionary | https://vocab.ices.dk/?ref=1399 |

2.2. Metadata group

| Field | Status | Data type | Field description | Reference |
|------------------------|-----------------------|--------------|---|---|
| HydrophoneType | Mandatory | String(255) | This field describes the manufacturer and the used hydrophone type/model e.g. 'Brüell&Kjaer 8106'. This field needs to be an array if there are multiple channels (one per channel). | https://vocab.ices.dk/?ref=1584 |
| HydrophoneSerialNumber | Mandatory | String(50) | e.g. "SN#1234". This field needs to be an array if there are multiple channels (one per channel). | |
| RecorderType | Mandatory | String(50) | Recorder/data logger type e.g. "Soundtrap" | https://vocab.ices.dk/?ref=1585 |
| RecorderSerialNumber | Mandatory | String(50) | Recorder serial number e.g. "SN#2345" | |
| MeasurementHeight | Mandatory | Float | Height above the seafloor, in meters | |
| MeasurementPurpose | Mandatory | String(10) | Description of why the continuous underwater noise measurements reported were monitored | https://vocab.ices.dk/?ref=1586 |
| MeasurementSetup | Conditional Mandatory | String(10) | Description of deployment. Mandatory in case the purpose is "HELCOM monitoring" | https://vocab.ices.dk/?ref=1587 |
| RigDesign | Conditional Mandatory | String(10) | Description of deployment construction. Mandatory in case the purpose is "HELCOM monitoring" | https://vocab.ices.dk/?ref=1588 |
| FrequencyCount | Mandatory | Integer | Number of frequency bands | |
| FrequencyIndex | Mandatory | Float | Third octave band nominal center frequencies. This field is an array of frequencies, with as many columns as the number of frequency bands reported under FrequencyCount. | |
| FrequencyUnit | Mandatory | String(10) | | https://vocab.ices.dk/?ref=1592 |
| ChannelCount | Mandatory | Integer | Number of channels used | |
| MeasurementTotalNo | Mandatory | Integer | Number of measurements | |
| MeasurementUnit | Mandatory | String(10) | Unit in which the values are in e.g. dB re 1µPa | https://vocab.ices.dk/?ref=1589 |
| AveragingTime | Mandatory | Integer | Averaging time in seconds | |
| ProcessingAlgorithm | Optional | String(225) | Algorithm used to process the data e.g. computation method for third octave band (fft, filter bank ...)-analysis | https://vocab.ices.dk/?ref=1590 |
| DataUUID | Mandatory | String(255) | Unique identification number, linking the data submission to the corresponding raw data. It should be used for resubmissions of the same data; matlab function available: uuid = char(java.util.UUID.randomUUID()); | |
| DatasetVersion | Mandatory | String(255) | Indicates version of the submitted dataset. It should be changed upon resubmission | |
| CalibrationProcedure | Conditional Mandatory | String(255) | Method used to check the measuring chain. e.g. point calibration with pistonphone, functionality test with microphone and loudspeaker (frequency dependent), or other method used to check the measuring chain. e.g. point calibration with pistonphone, functionality test with microphone and loudspeaker (frequency dependent), or other. Mandatory in case the purpose is "HELCOM monitoring" | https://vocab.ices.dk/?ref=1591 |
| CalibrationDateTime | Conditional Mandatory | DateTime(21) | Date of when the system was last calibrated. Mandatory in case "CalibrationProcedure" is specified UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z | https://en.wikipedia.org/wiki/ISO_8601 |
| Comments | Optional | String(255) | | |

2.3. Data group

| Field | Status | Data type | Field definition | Reference |
|-----------------------------|-----------|--------------|---|---|
| DateTime | Mandatory | DateTime(21) | UTC DateTime in ISO 8601 format: YYYY-MM-DDThh:mm[:ss] or YYYY-MM-DD hh:mm[:ss]. Seconds are optional. For example: 2020-04-01 11:36Z, or 2020-04-01 11:36:23Z | https://en.wikipedia.org/wiki/ISO_8601 |
| LeqMeasurementsOfChannel1 | Mandatory | Float | Equivalent continuous sound pressure level measurements over time for all covered frequency bands. One frequency per column. In case there are multiple channels, there should be an array of values for each channel. If there are 3 channels, there would be three arrays called LeqOfChannel1, LeqOfChannel2, LeqOfChannel3. In case of channel failure, please report NAN values. | |
| LeqMeasurementsOfChannel... | | | | |
| LeqMeasurementsOfChannelN | | | | |

3. Calculating the measurement values

To learn about how to calculate the values reported in the “LeqMeasurementsOfChannel1”, “LeqMeasurementsOfChannel...” and “LeqMeasurementsOfChannelN” datasets in the “Data” group, please refer to the table and figures below.

| Quantity | Unit | Reference value |
|------------------------------------|-----------------|---|
| Sound pressure level (SPL) | dB | $p_0^2 = 1 \mu\text{Pa}^2$ |
| (mean-square sound pressure level) | | $p_0 = 1 \mu\text{Pa}$ |
| NOTES: | | |
| based on ISO 18405, entry 3.2.1.1 | | |
| Mean-square sound pressure | Pa ² | Integral over a specified time interval (from $t=t_1$ to $t=t_2$) of squared sound pressure, divided by the duration of the time interval, for a specified frequency range |
| | | NOTES: |
| | | Source: ISO 18405, entry 3.1.3.1 |
| | | Note that the time interval must be specified. |

$$L_{p,rms} = 10 \log_{10} \left[\frac{\overline{p^2}}{p_0^2} \right] \text{ dB} = 20 \log_{10} \left[\frac{p_{rms}}{p_0} \right]$$

$$\overline{p^2} = \frac{1}{t_2 - t_1} \int_{t_1}^{t_2} p(t)^2 dt$$

4. Change log

| Date | Change | Prepared by |
|---------------|--|---------------------|
| 3 March 2020 | Initial version created | Joana Ribeiro, ICES |
| 18 March 2020 | Field "Comment" in Metadata record updated to "Comments" | Joana Ribeiro, ICES |
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