OVERVIEW OF RAW NOISE DATA PROCESSING TOOLS

AARHUS
UNIVERSITY
DEPARTMENT OF ECOSCIENCE

WORKSHOP ON UNDERWATER NOISE DATA UPLOAD
4 OCTOBER 2023

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ACADEMIC EMPLOYEE

THIRD-OCTAVE LEVELS – BASE 2 AND 10

Nominal Band Center (Hz)
100
125
160
200
250
315
400
500
630
800
1000

Octave
$f_2/f_1 = 2$

Decade
$f_2/f_1 = 10$

Ratio between center frequencies:

1/3 Octave: $2^{(\frac{1}{3})}$ (base 2)

Decidecade: $10^{(\frac{3}{10})}$ (base 10)

THIRD-OCTAVE LEVELS – BASE 2 AND 10

Nominal Band Center (Hz)	Base 2 Center Frequency (Hz)	Base 10 Center Frequency (Hz)
100	99.21	100.00
125	125.00	125.89
160	157.49	158.49
200	198.43	199.53
250	250.00	251.19
315	314.98	316.23
400	396.85	398.11
500	500.00	501.19
630	629.96	630.96
800	793.70	794.43
1000	1000.00	1000.00

Octave
$f_2/f_1 = 2$

Decade
$f_2/f_1 = 10$

Ratio between center frequencies:

1/3 Octave: $2^{(\frac{1}{3})}$ (base 2)

Decidecade: $10^{(\frac{3}{10})}$ (base 10)

Base 10 is mandated by ANSI and IEC standards, while base 2 are depreciated. Therefore, you should be careful to select base 10 to produce your decidecade bands

AVAILABLE PROGRAMS

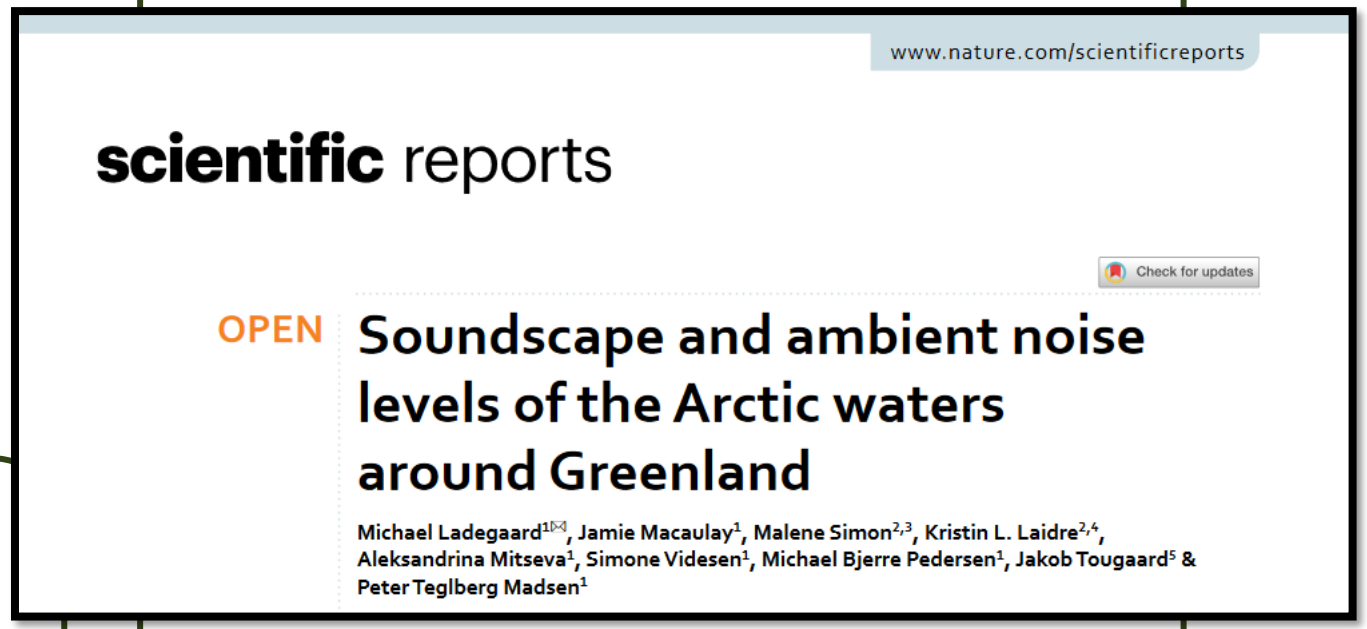
MATLAB

Stand-Alone GUI

Base 2 TOL only!

PAMGUARD

python



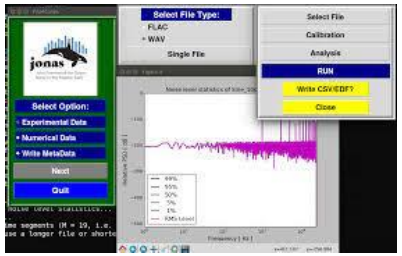
Ladegaard, M., Macaulay, J., Simon, M., Laidre, K.L., Mitseva, A., Videsen, S., Pedersen, M.B., Tougaard, J. and Madsen, P.T., 2021. Soundscape and ambient noise levels of the Arctic waters around Greenland. *Scientific Reports*, *11*(1), p.23360.

AVAILABLE PROGRAMS

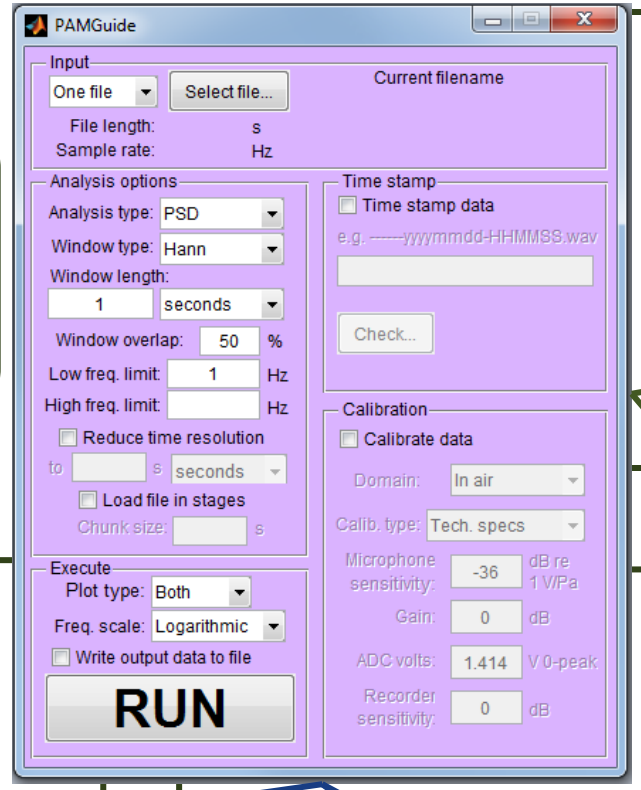
Stand-Alone GUI

PAMGUARD

python



PAM2PY (GUI)



MATLAB

Custom Code (AU)
Custom Code (FOI)

TRITON

PAMGuide in Matlab (GUI)

R

PAMGuide in R

R package YAWN (Kaitlin Palmer)
R script (Mirko Mustonen)

PAMGUIDE

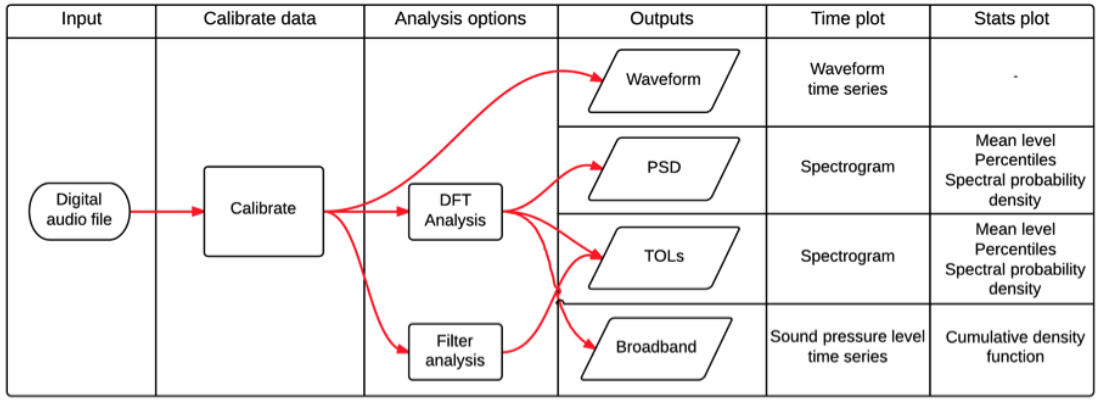


Figure 1 from PAMGuide manual: Flow diagram for PAMGuide illustrating processing steps and plot types corresponding to each output metric. DFT = discrete Fourier transform; PSD = power spectral density; TOL = 1/3-octave band level.

Download:
https://besjournals.onlinelibrary.wiley.com/doi/10.1111/2041-210X.12330

BRITISH ECOLOGICAL SOCIETY

Methods in Ecology and Evolution / Volume 6, Issue 3 / p. 257-265

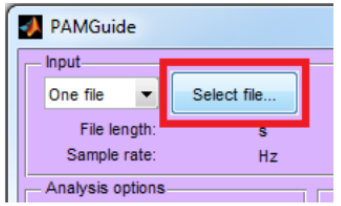
Review | Open Access

Measuring acoustic habitats

Nathan D. Merchant, Kurt M. Fristrup, Mark P. Johnson, Peter L. Tyack, Matthew J. Witt, Philippe Blondel, Susan E. Parks

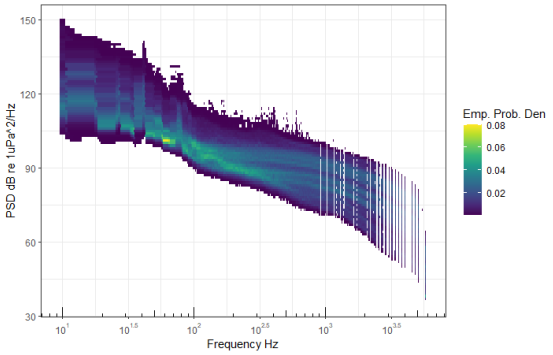
2.2 Running *PAMGuide*

MATLAB	R
Click **Select file...**. A dialogue box will appear. Select the WAV file for analysis. AIFF files can also be analysed if using MATLAB R2014 or later.	Call *PAMGuide*: `> PAMGuide()` A dialogue box will appear. Select WAV file for analysis. *PAMGuide* will then display settings and analysis progress in the command line.

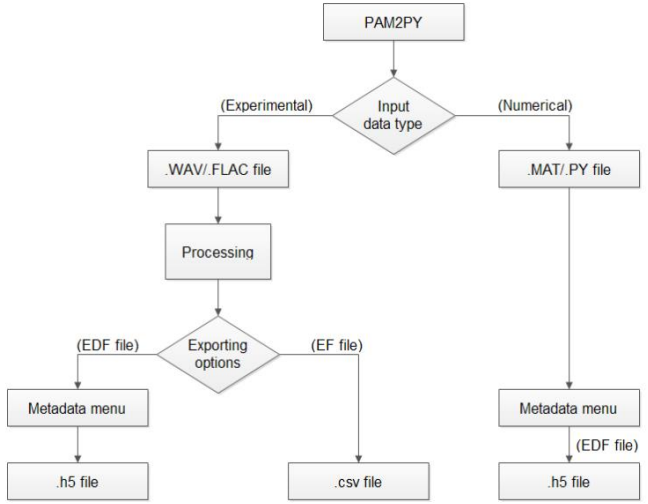


PAMGUIDE DERIVATIVES

- R script (Mirko Mustonen) (On Github)
  - A cleaner version of PAMGuide to improve memory allocation.
  - Better method to read .wav files.
- YAWN: Yet Another Way to implement Noise analysis (Kaitlin Palmer).
  - Storing metrics in HDF5 files.
  - Modularize so users determine output metrics.
  - Output integration with ICES and Tethys.
  - Still in development.
  - https://github.com/JPalmerK/YAWN_functions (includes tutorial).



- PAM2Py
  - Designed for data sharing at an institutional levels.
  - Can process .WAV or .FLAC files.
  - Stores measured and metadata in an EDF (Exchange Data Format), which is based on HDF5 formatting.
  - Current formatting for JONAS project.
  - Not for Python novices.



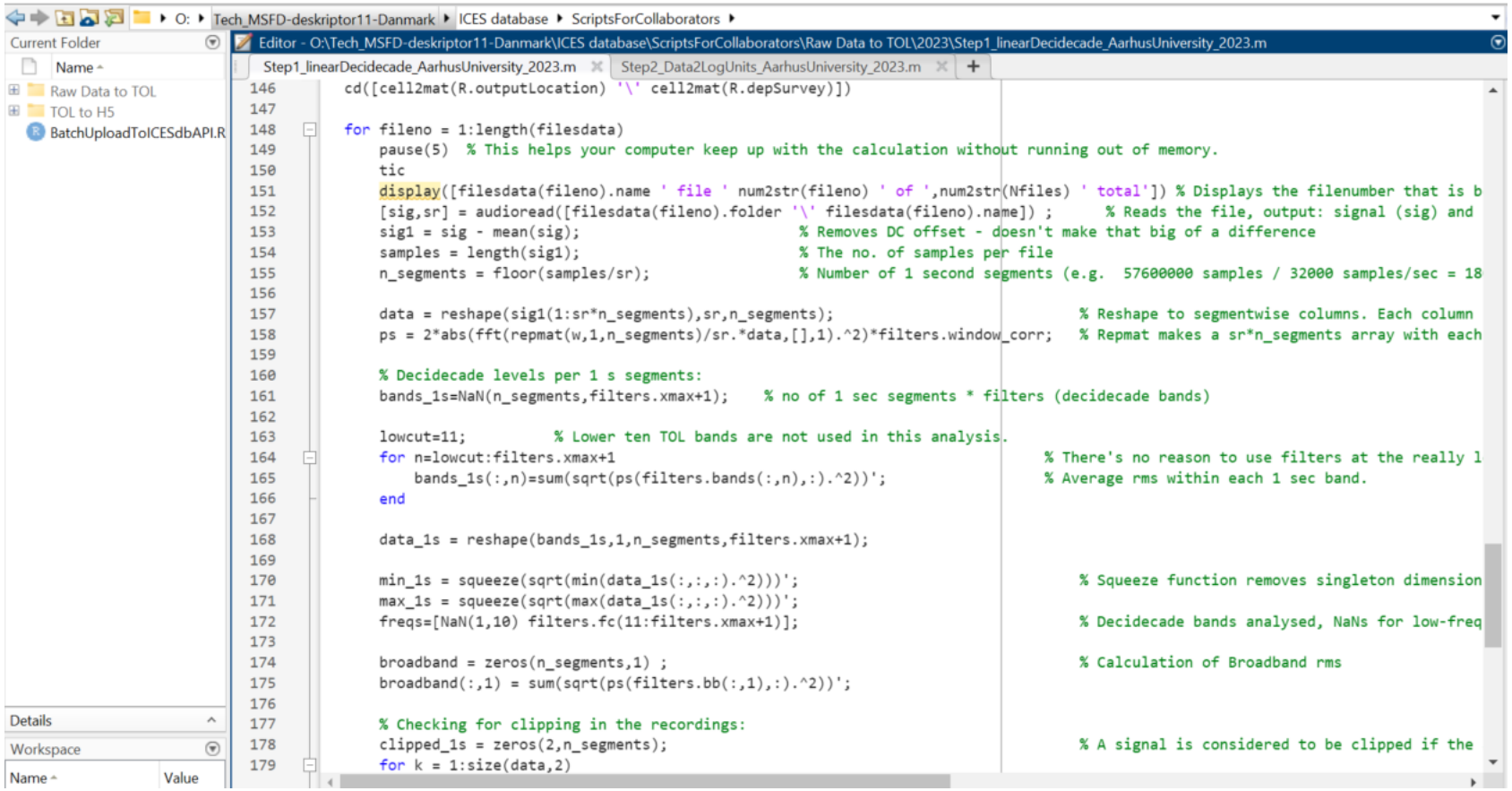
- PAM2Py package download
- PAM2Py short manual download
- PAM2Py on github
- EDF read/write standalone routines in Python download

MATLAB

Scripts from:

- AU
- FOI

- https://github.com/ices-tools-prod/underwaternoise



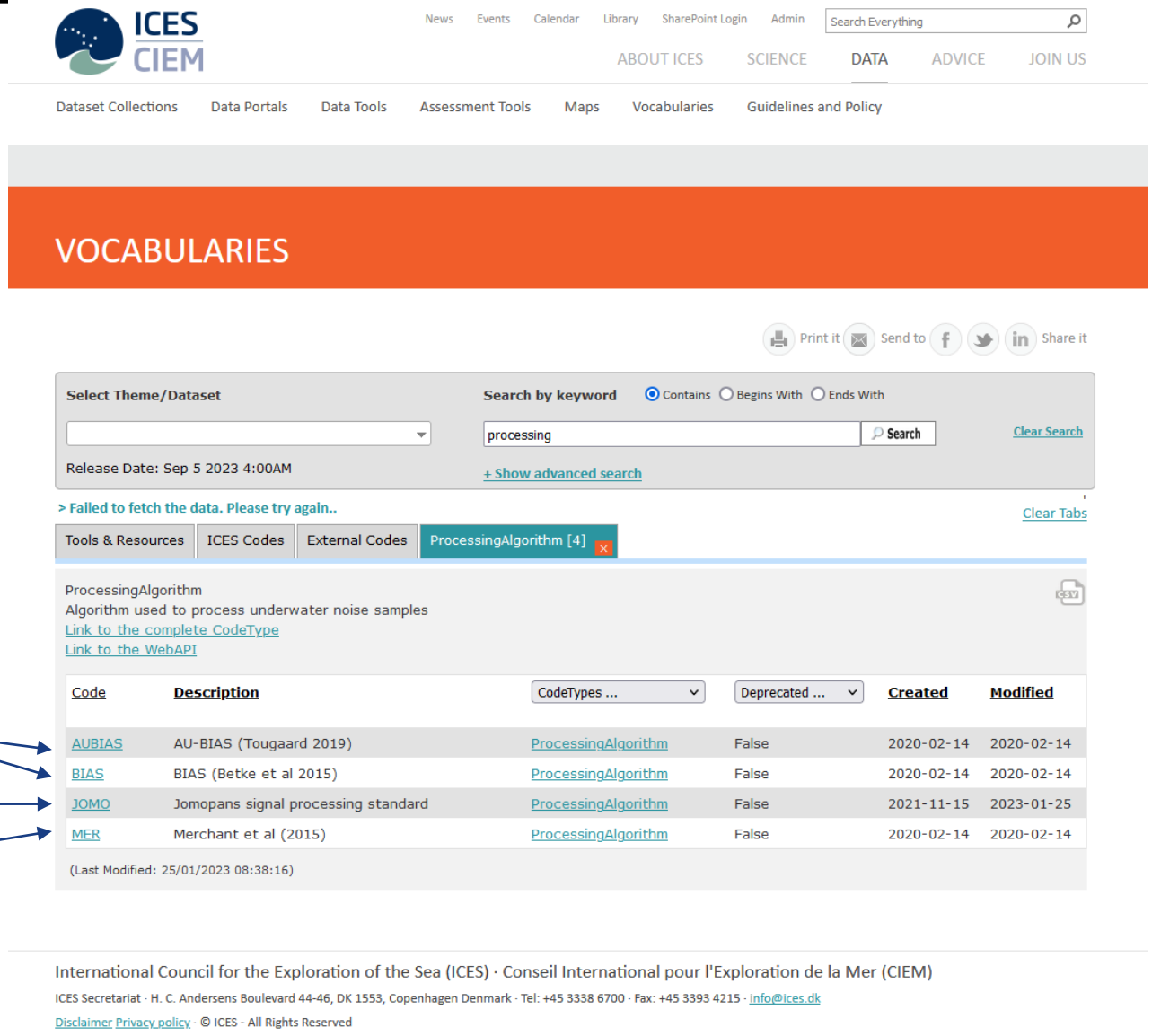
IN THE DATABASE

Ward, J., Wang, L., Robinson, S., & Harris, P. (2021). Standard for data processing of measured data. Report of the EU INTERREG Joint Monitoring Programme for Ambient Noise North Sea (Jomopans)(European Union, Brussels, Belgium).

Historical Data

Current Recommendation

PAMGuide and Derivatives



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