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A Matlab based HPC toolset for noise analysis of large acoustic datasets

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Introduction

Assessment of anthropogenic noise impacts on marine animals for both acute and chronic noise creates a need for an acoustic ecology toolset to manage, analyze and visualize large complex datasets.



Design

The Acoustic Toolbox was built in Matlab, to allow rapid prototyping and development. Features include:

- Hierarchical Data Structure. Data is stored at regional, deployment and sensor levels.
- Metadata is stored in a separate data file.
- Visualization panels allow time series and spatial distribution analysis.

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Process Flow



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Analysis Tools

The main acoustic toolbox serves as the hub various analysis tools can be launched from:

- (Spatial) Noise Analyzer,
- Noise Browser, and
- Communication Space and Masking Analysis Tools.



Case Study – Gulf of Maine

- 19 element array
- 2 kHz sample rate
- 4 year period from Jan-2009 to Jan-2013
- Noise Analyzer run on parallel distributed architecture across
 32 cores (see talk Dugan et al.)
- Processed the data in 39 hours



Case Study, cont'd

Diel noise plot (Fig. 1): \rightarrow L_{eq,1Hr} 71-22 Hz right whale upcall band.

Spatial noise plots (Fig. 2):

→ Anthropogenic footprint (Boston- Provincetown high speed ferry)







Case Study, cont'd

Loss of communication space:

- Modelled noise levels across a grid of receivers for minke whale calls with a population of eight vocalizing whales (magenta crosses).
- Estimated maximum communication of each individual (magenta circles). AIS vessels (black)

It's noisy out there!



For further info visit my poster

Thanks!