

Spectral analysis for contact classification

Provide an UNCLASSIFIED case study using data from DRDC's Gascoyne Inlet Camp:

2x48 hydrophone arrays

2015: 25 Aug – 3 Sep

2019: 29 Jul – 30 Aug

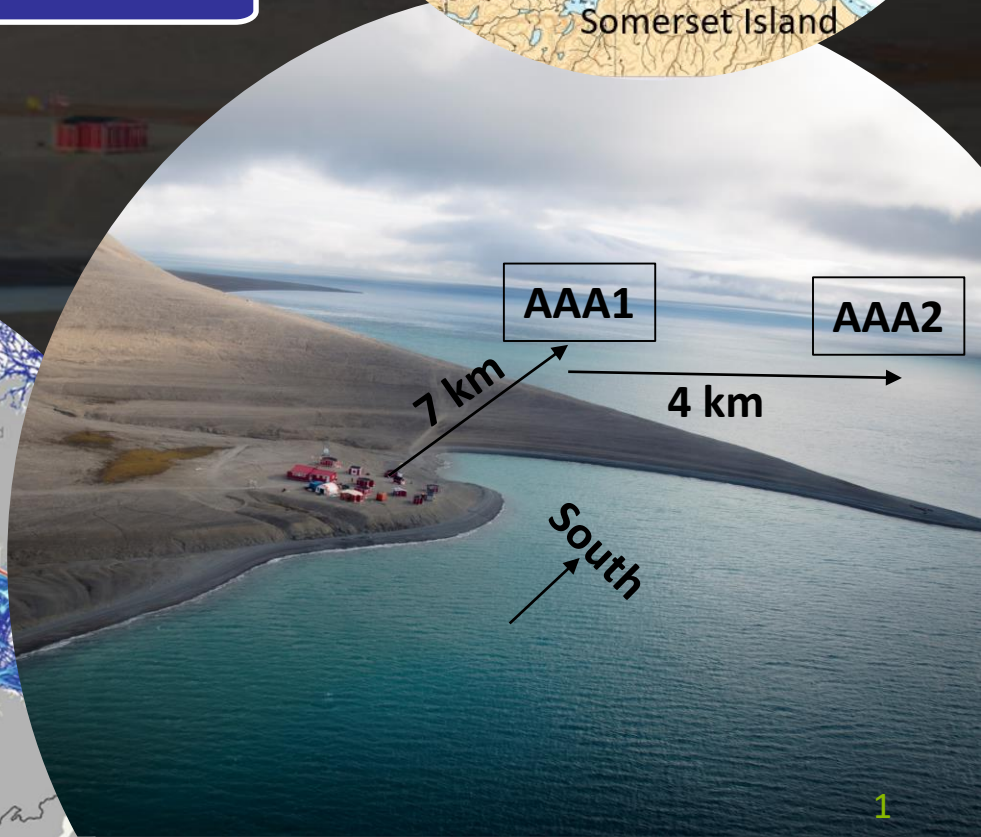
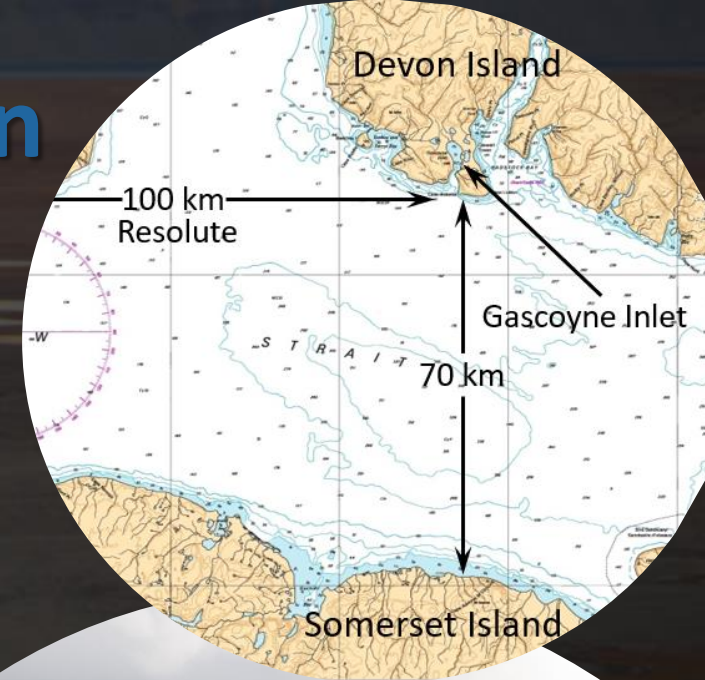
Environmental

Bathymetry

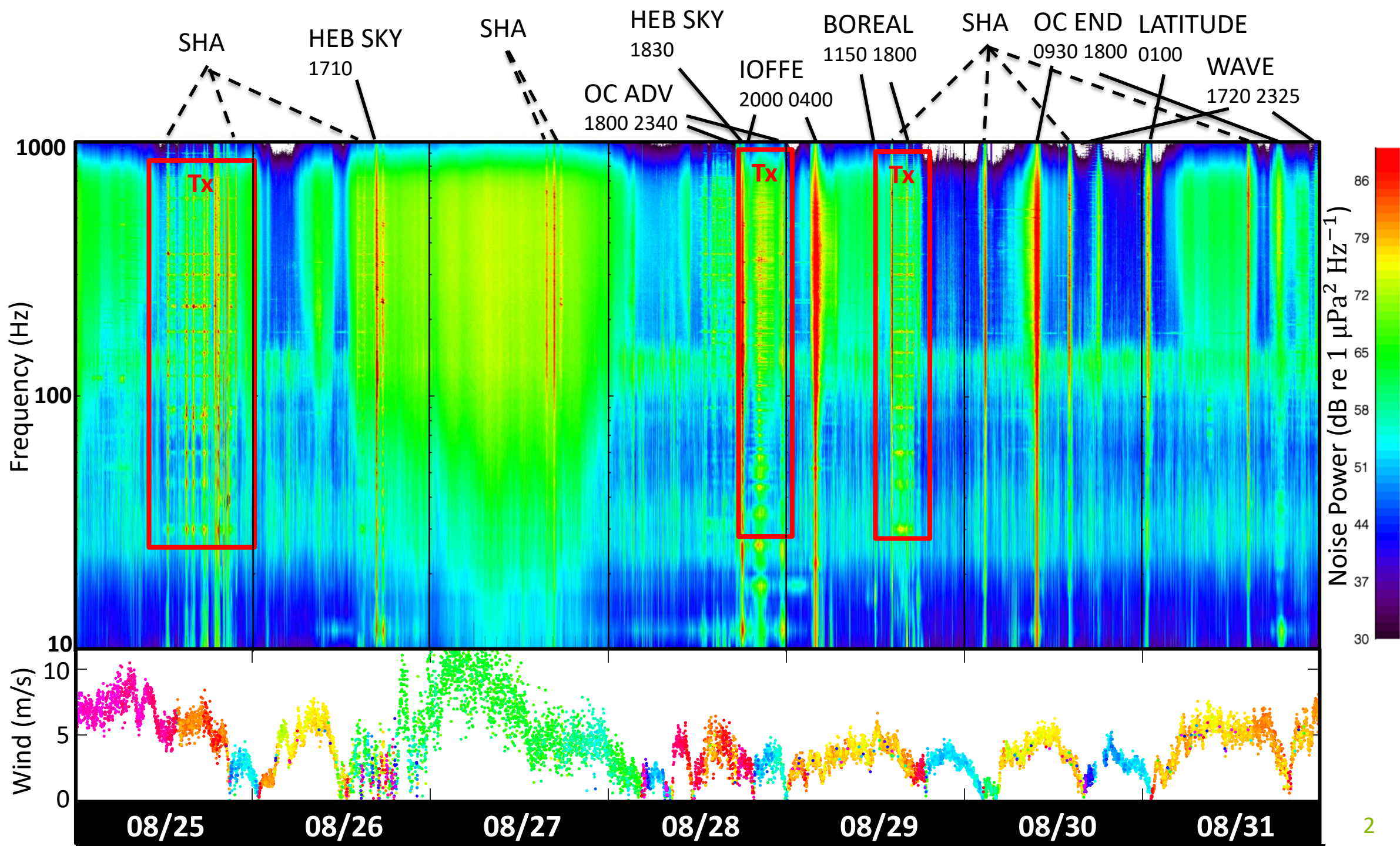
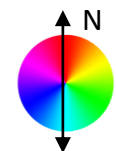
SSPs + Winds

Satellite & Ground AIS

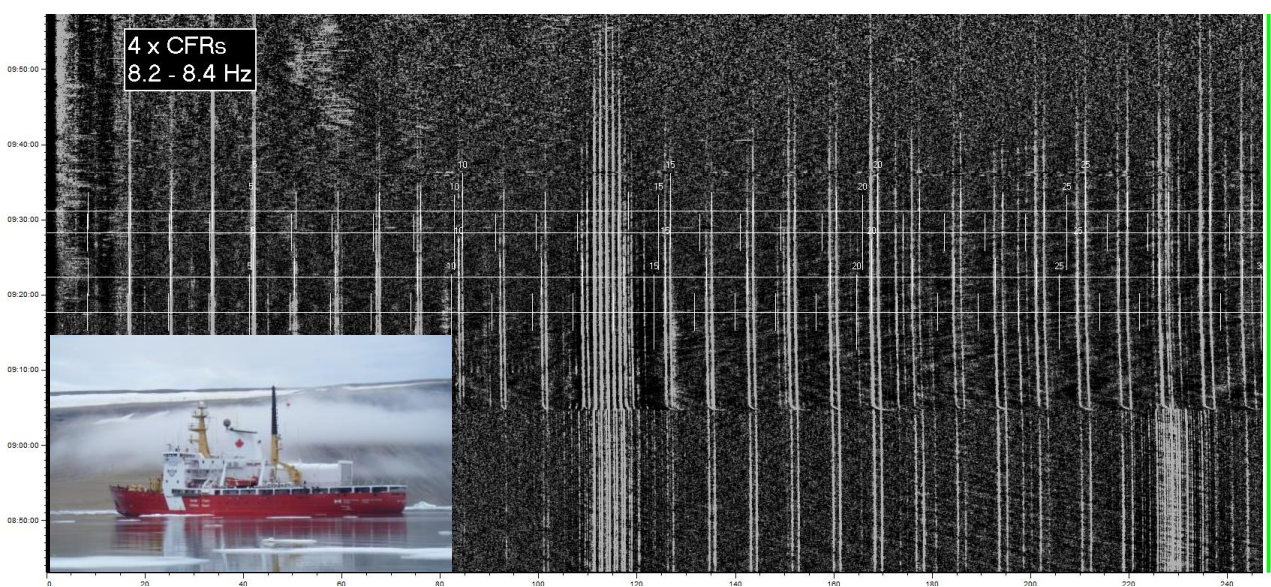
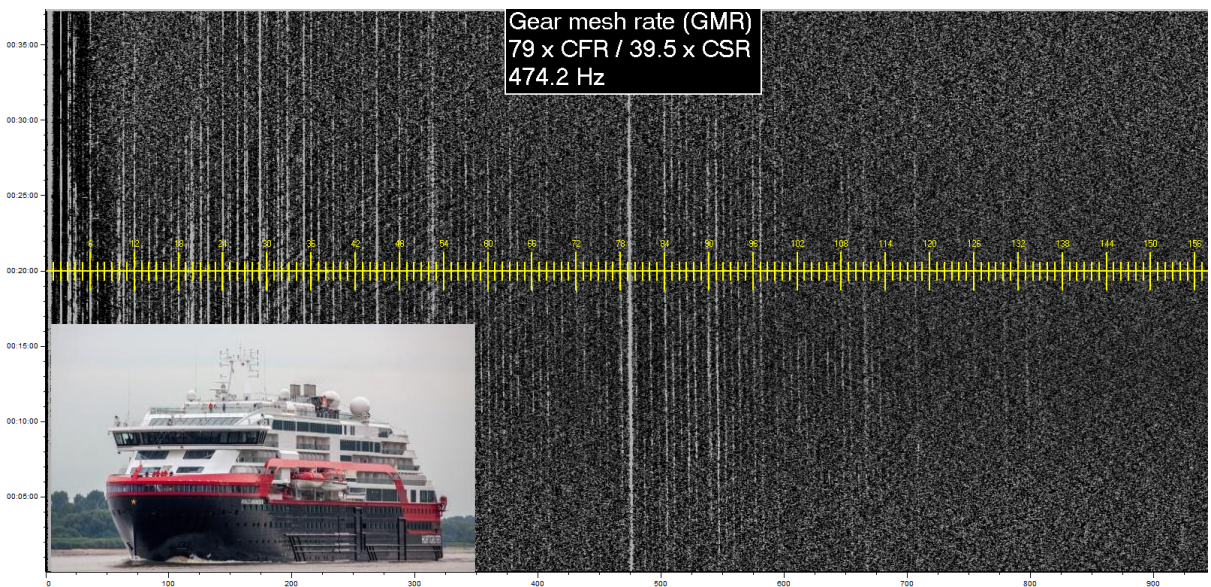
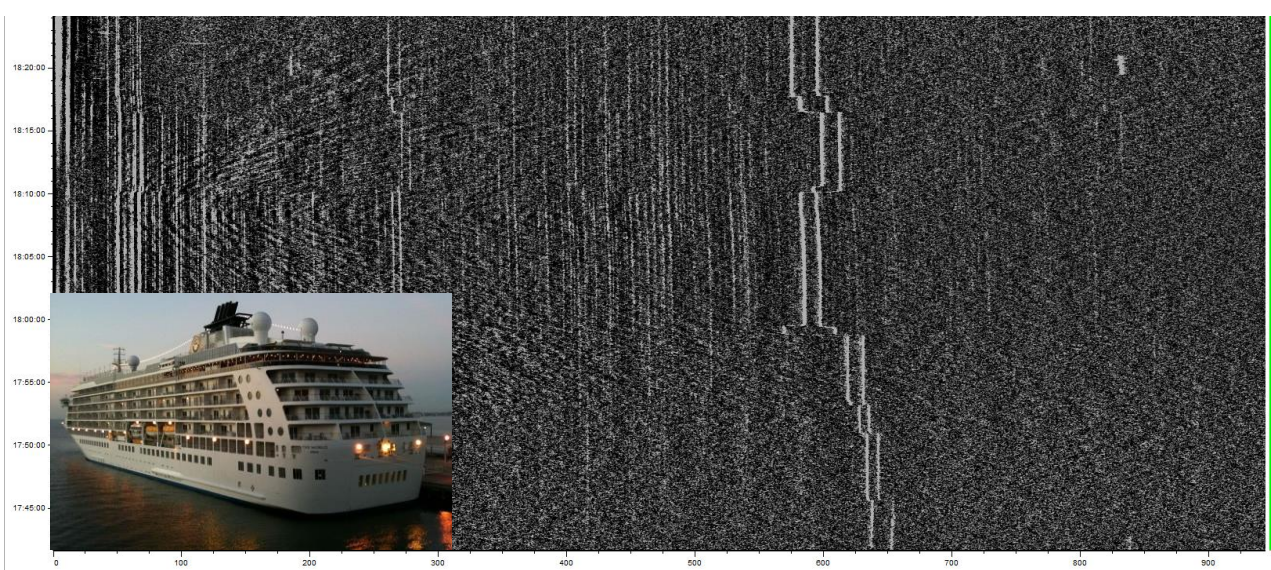
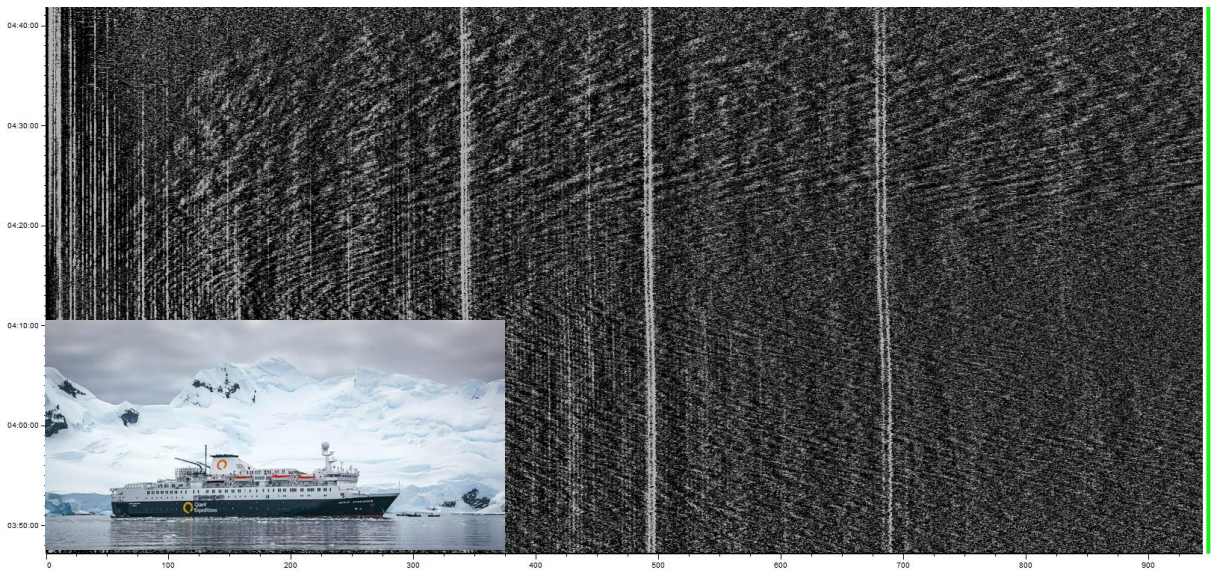
Open-source intelligence



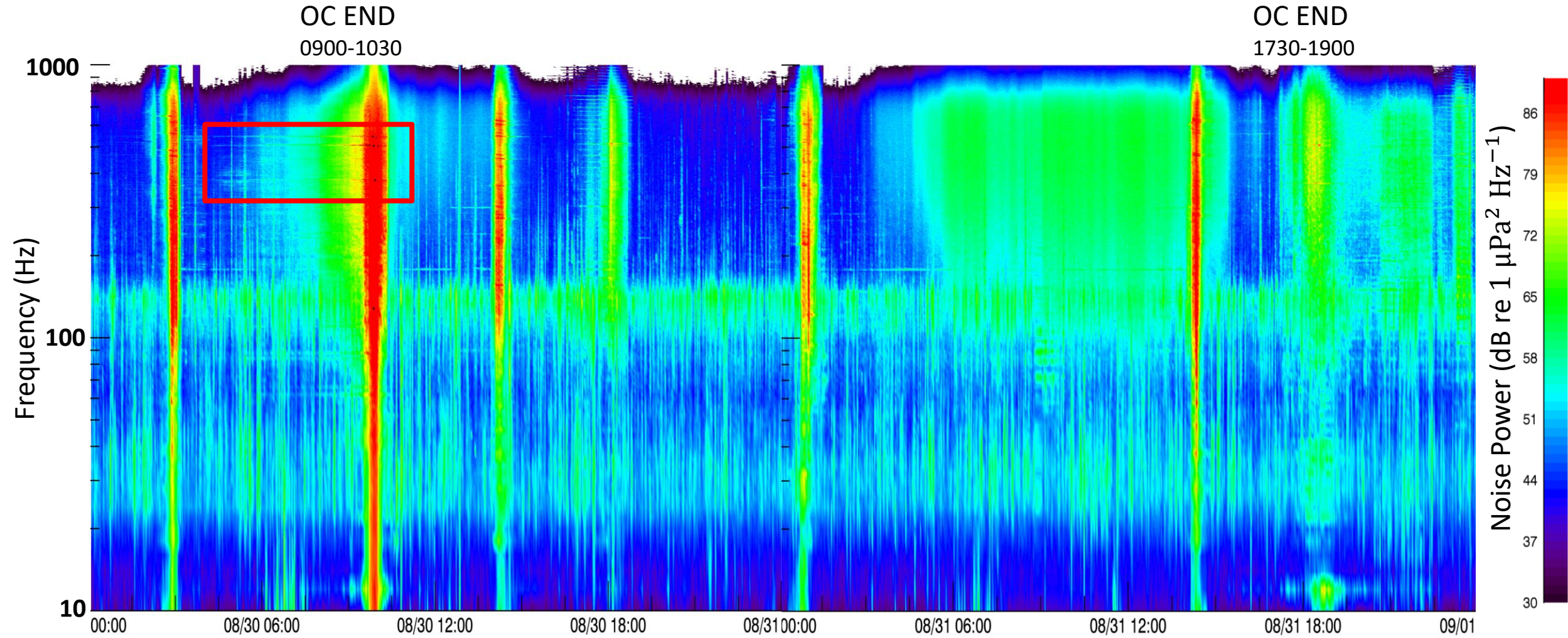
Weekly spectrogram



Acoustic signature fingerprinting – ID with unique spectral characteristics



48-hour acoustic spectra



MV Ocean Endeavour

TECHNICAL INFORMATION¹

LENGTH 137 m DRAFT 5.6 m

MAIN ENGINES 4 x Sulzer 6 ZL 3.2 MW @ 420 rpm

GENERATORS 4 x 1,080 kW @ 750 rpm

PROPELLERS 2 x 3.7 m CP @ 180 rpm / 4-bladed

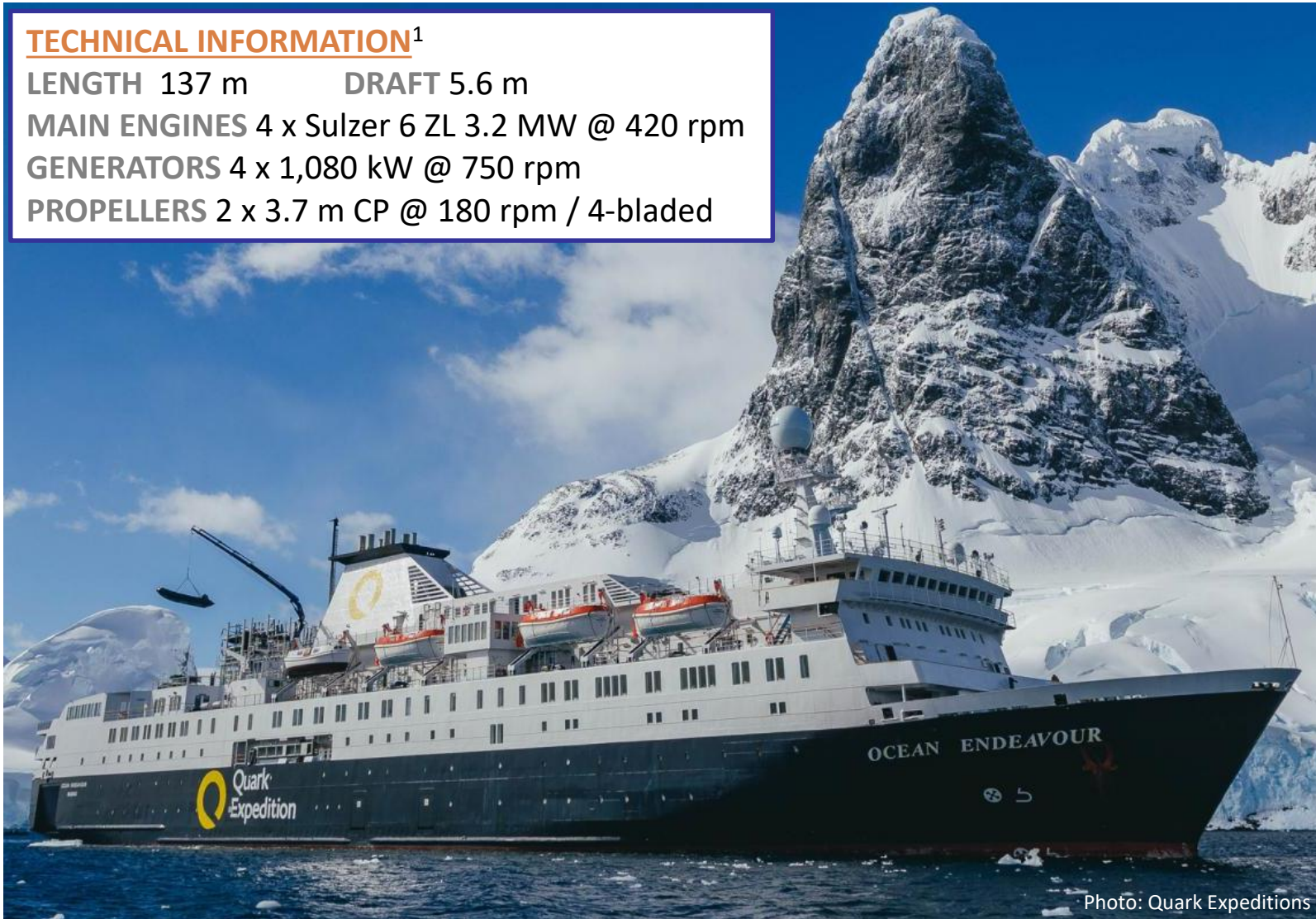
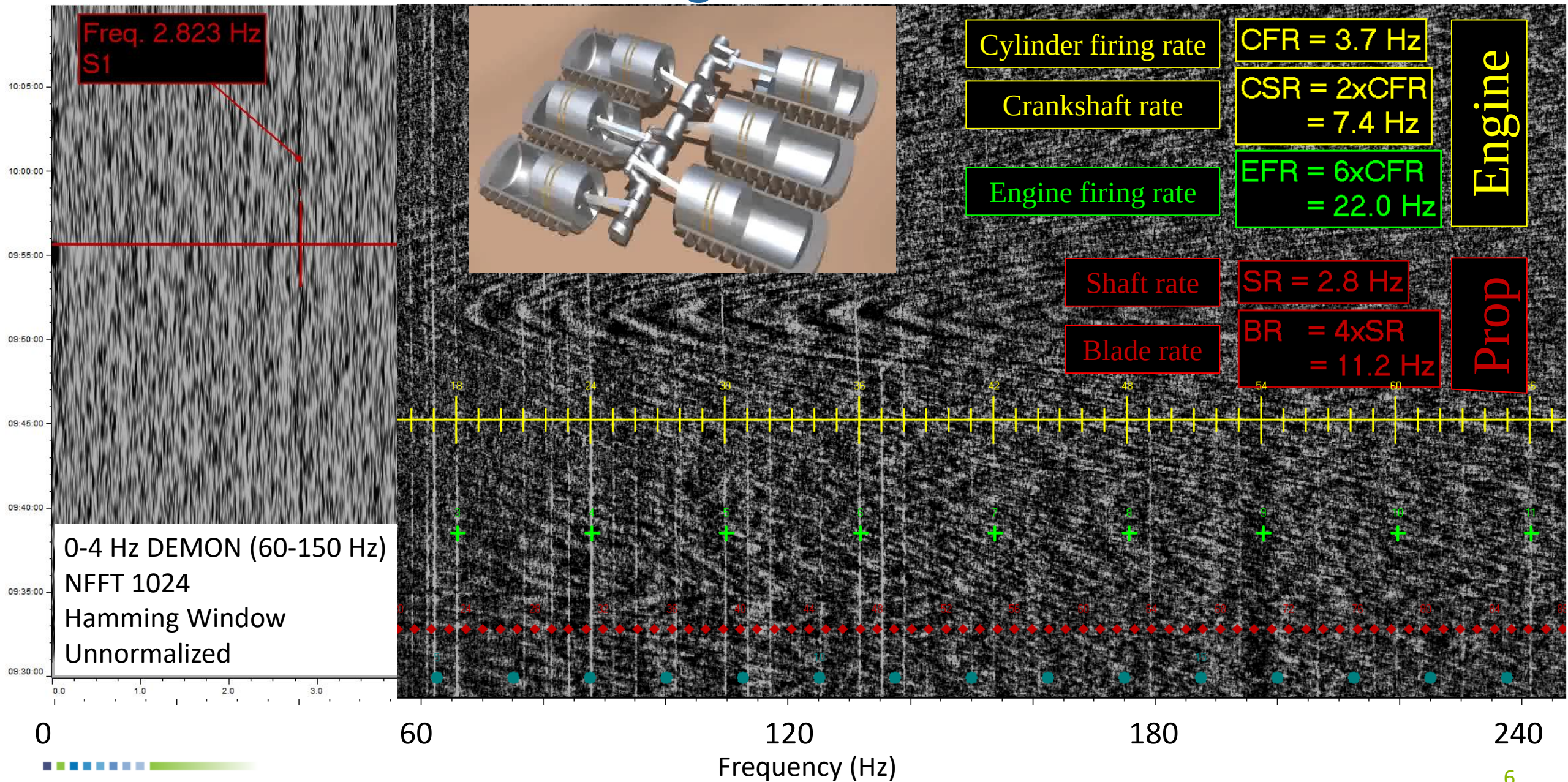


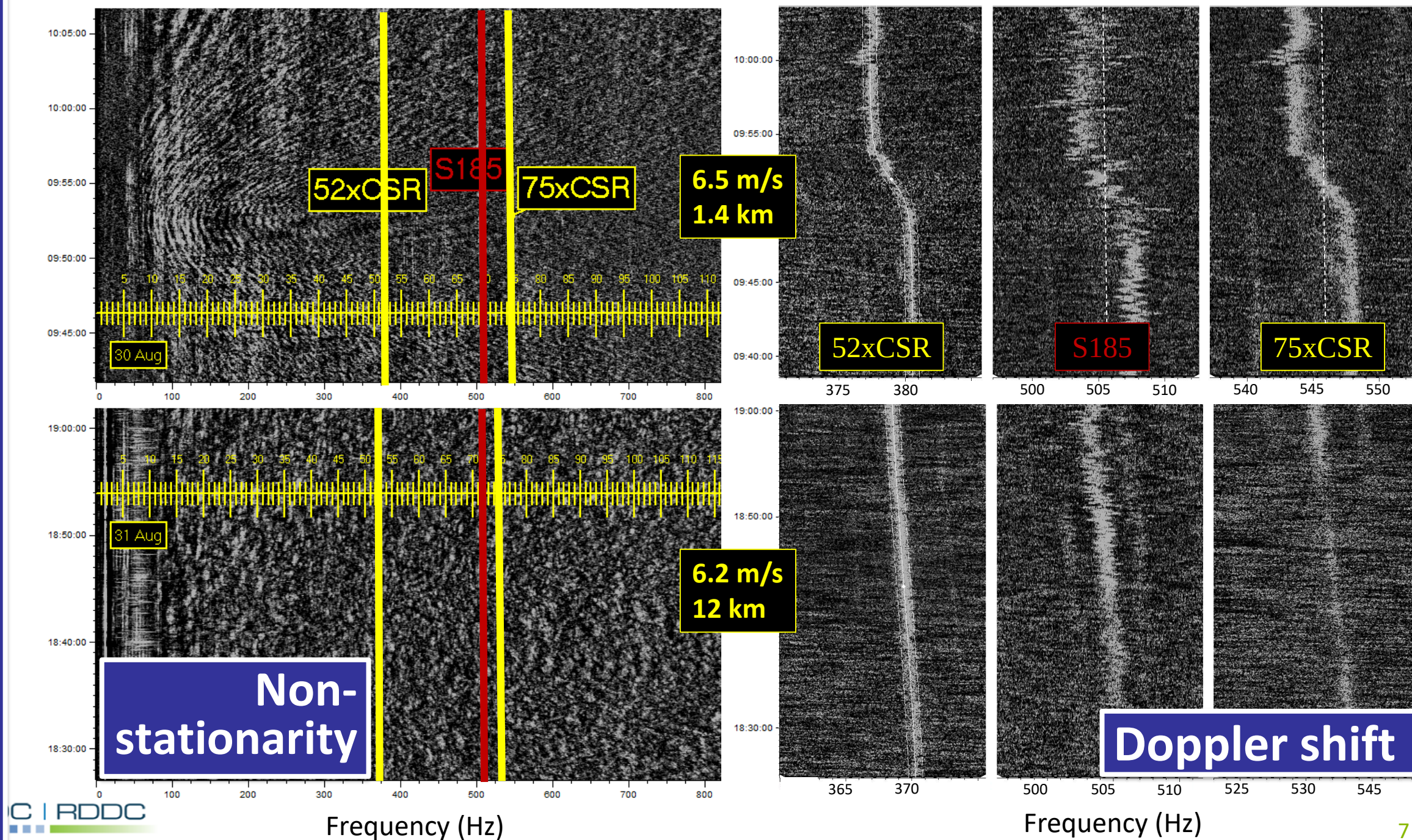
Photo: Quark Expeditions



Ocean Endeavour Acoustic Signature



Challenges to tonal tracking



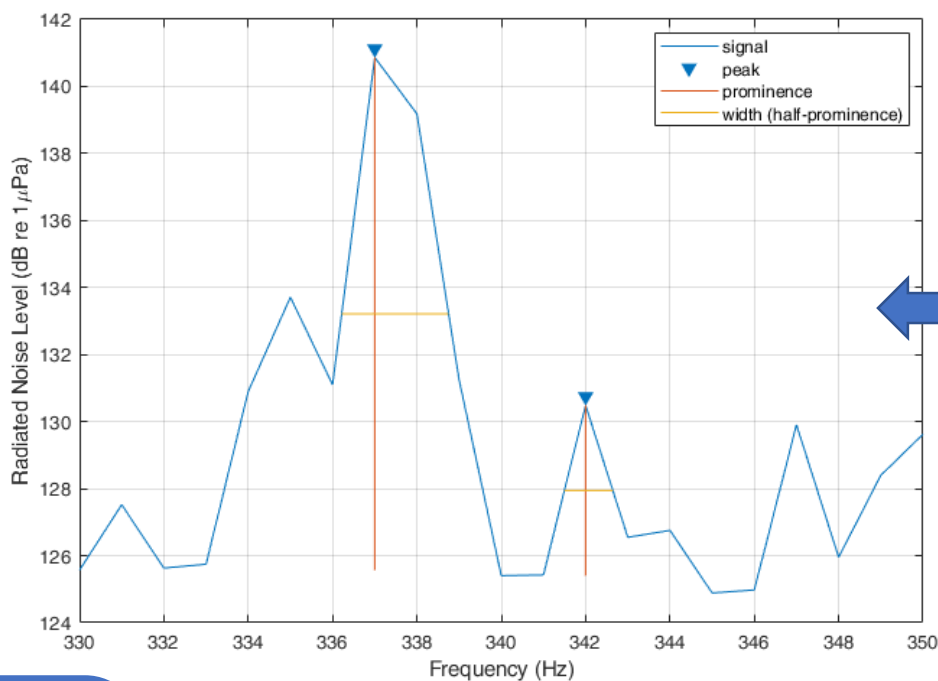
dsp.ZoomFFT

- MATLAB system object that implements zoom FFT
- based on the multirate multistage bandpass filter
- specify desired center frequency and decimation factor

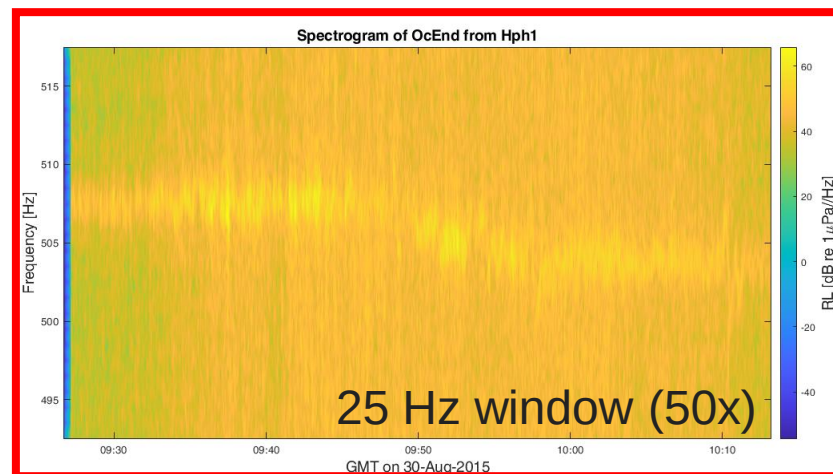
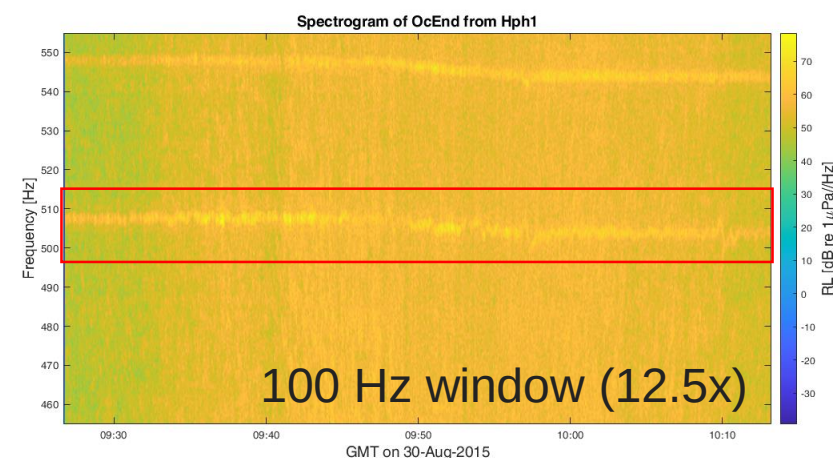
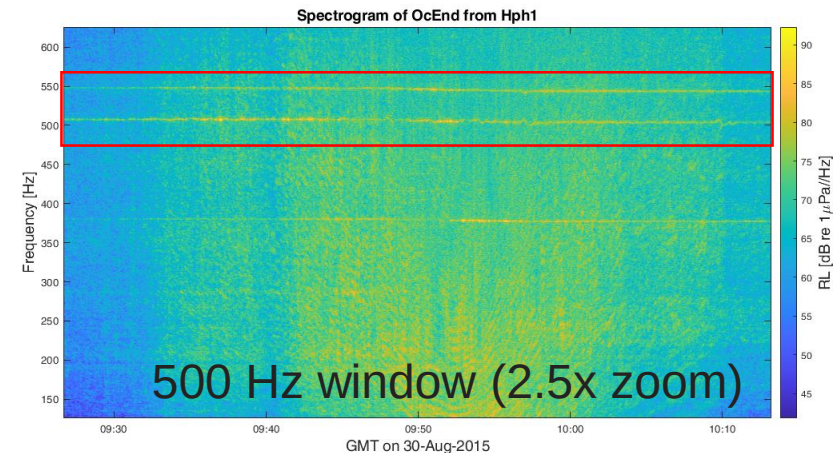
Tonal tracker

Objective

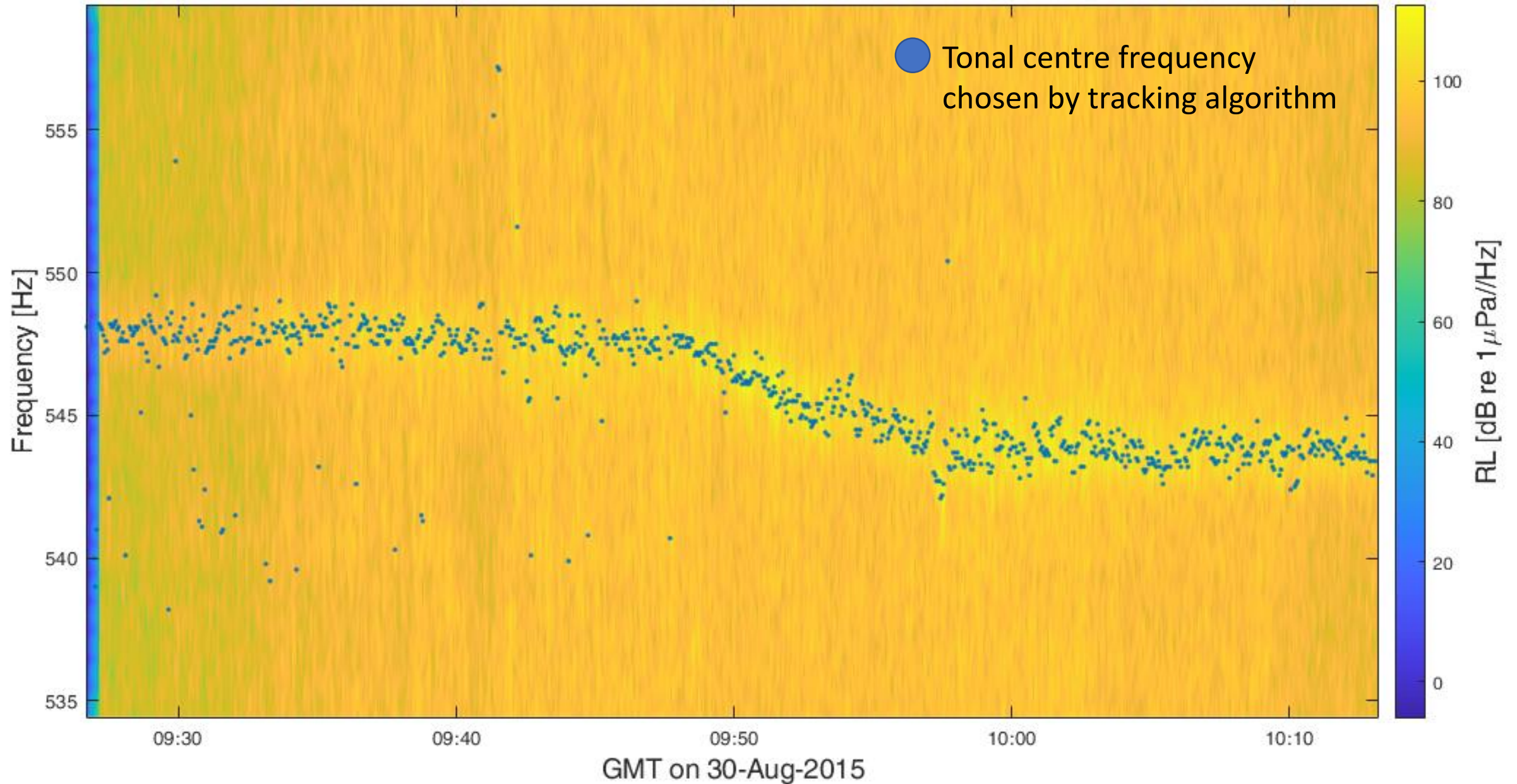
Track discrete tonals through dynamics, doppler shifts and non-stationary processes



For each time step



Tracker performance – could AI/ML perform better?



Thank you



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