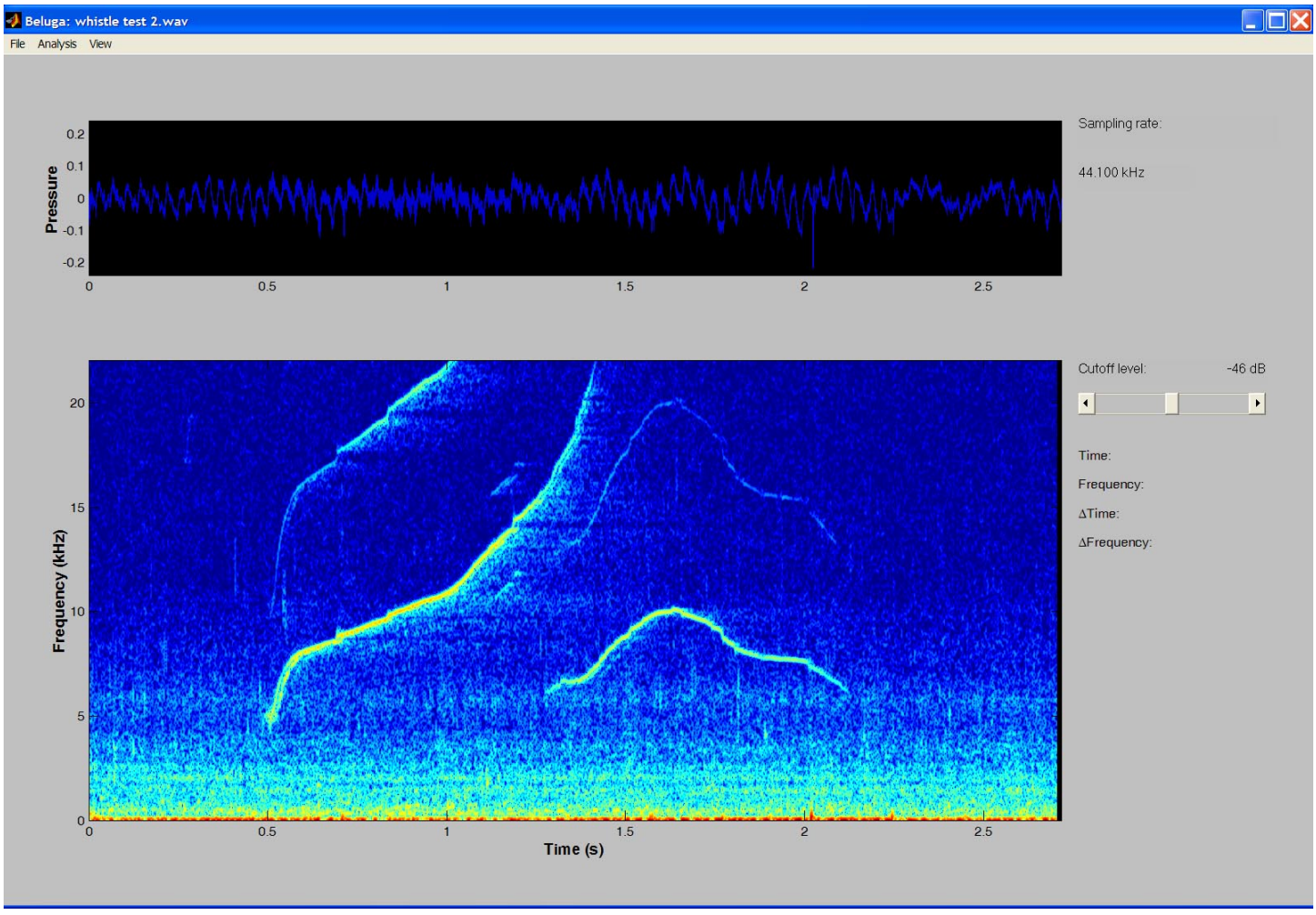
INSTALLATION INSTRUCTIONS

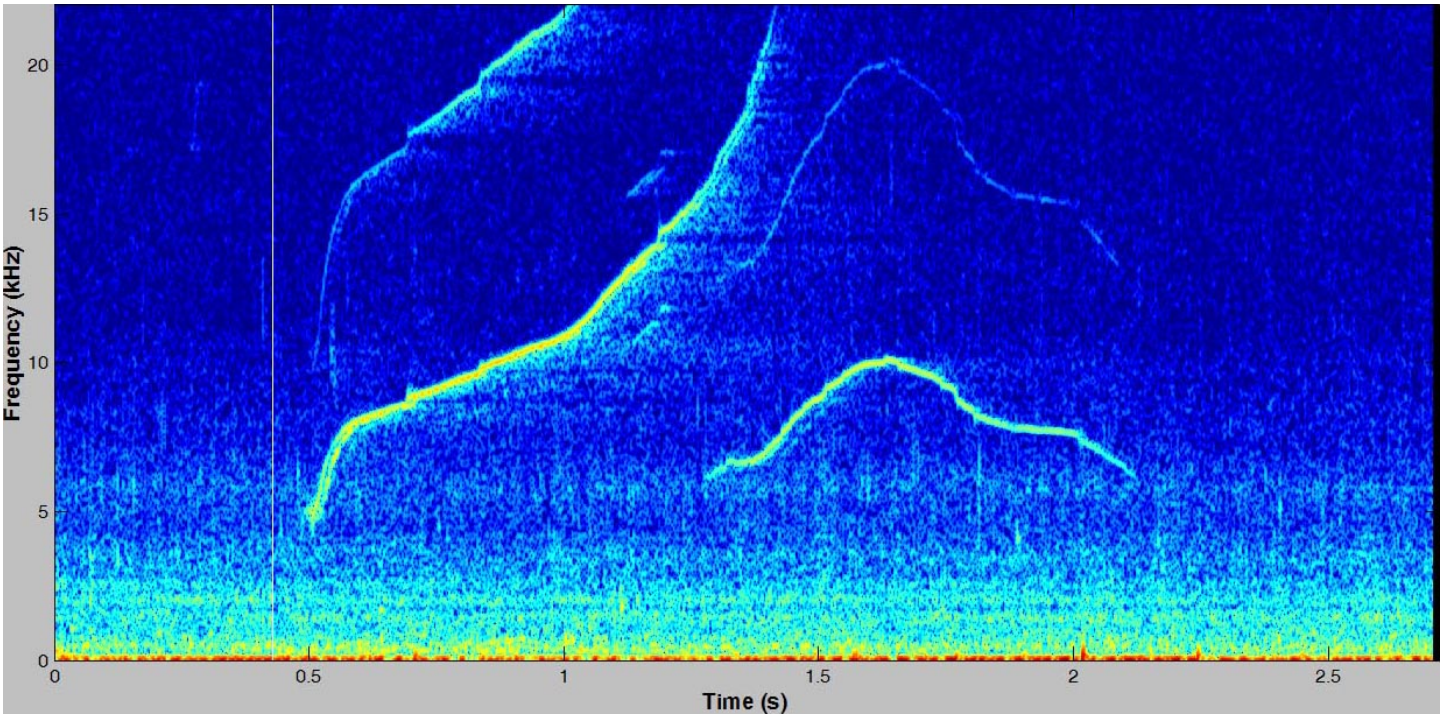
1. Make a folder named `beluga` inside your MATLAB directory (e.g. `c:/matlab/toolbox/beluga`)
2. Inside this make a subfolder named `utilities` (e.g. `c:/matlab/toolbox/beluga/utilities`)
3. Move the first four files in the zip folder (`harmonics.m`, `outliers.m`, `silence.m`, `smooth1.m`, `smooth2.m`, `SPGex.m`, and `xcorr3.m`) into the `utilities` subfolder
4. Move the remaining files into the `beluga` folder
5. Start MATLAB, go to `File -> Set Path` and add the folders `c:/matlab/toolbox/beluga` and `c:/matlab/toolbox/beluga/utilities` to the MATLAB search path
6. Type `beluga` at the MATLAB prompt. This launches the spectral analysis programme.

INSTRUCTIONS FOR CONTOUR EXTRACTION

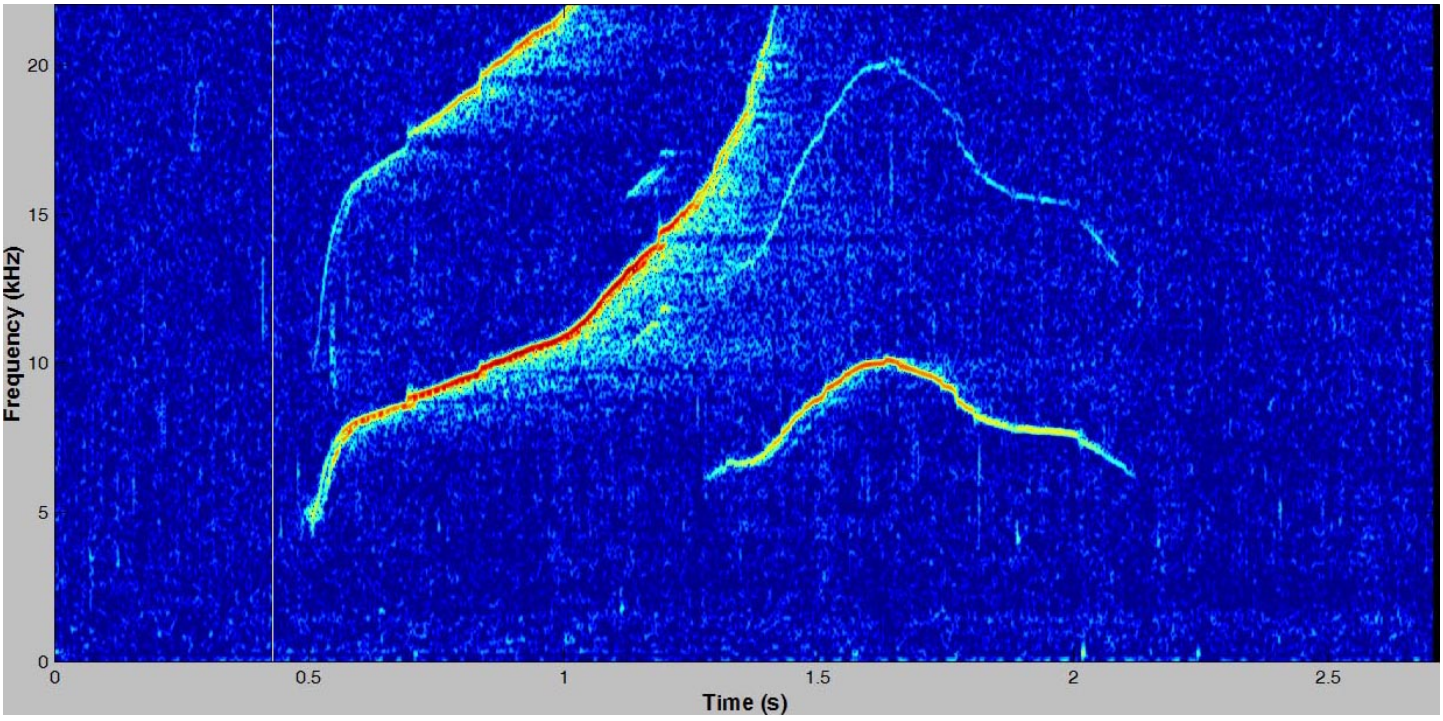
1. Open the sound file (`File-> load Sound` or `ctrl&O`).
2. Generate a spectrogram (`Analysis -> Calculate Spectrogram` or `ctrl&G`). If the sound file is very long, you can first select a section of the waveform (by dragging your pointer over it). This will only generate the spectrogram for the selected section. I usually use an FFT length of 2048, frame length of 512 and 87% overlap between frames, but you may find that other parameter combinations work better.



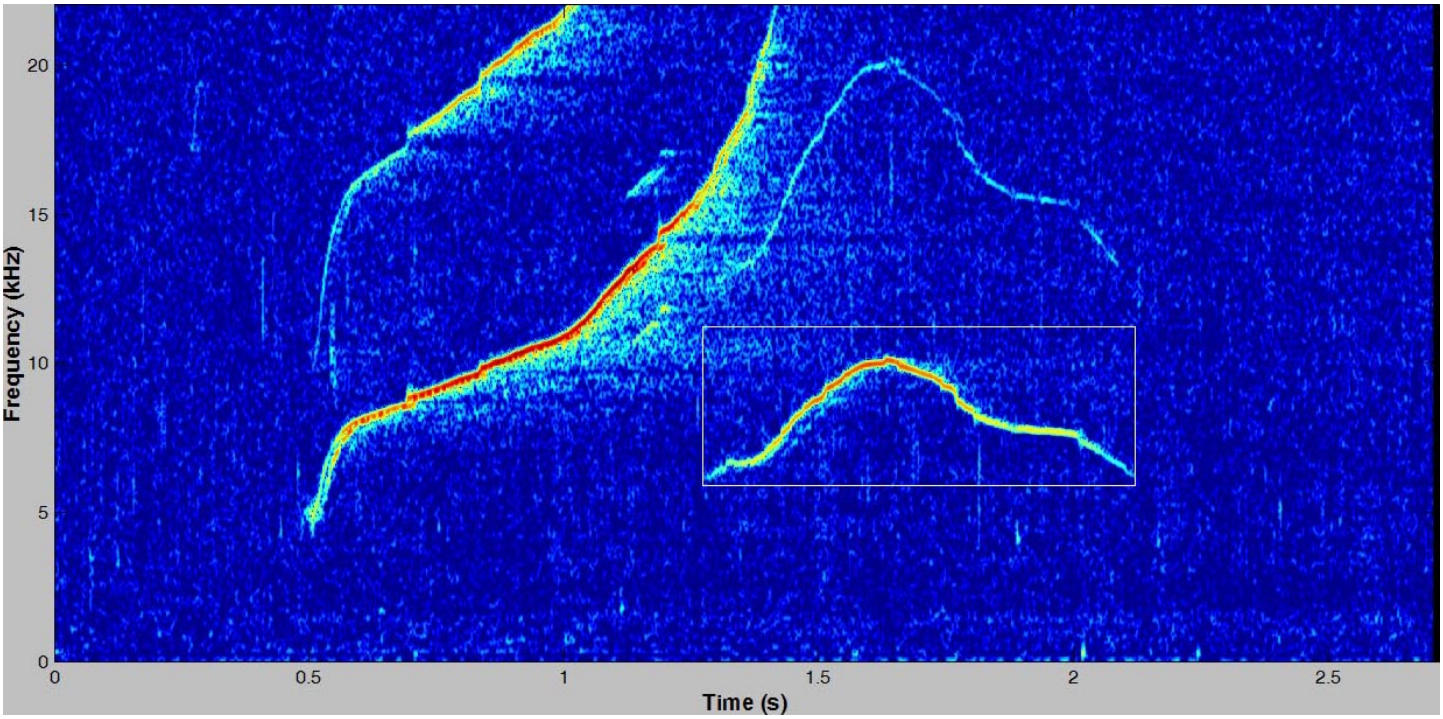
3. If your recordings are noisy, you can filter the selection. To do this, select all of the spectrogram containing whistles. Leave a section of the spectrogram containing only background noise at the beginning of the spectrogram unselected.



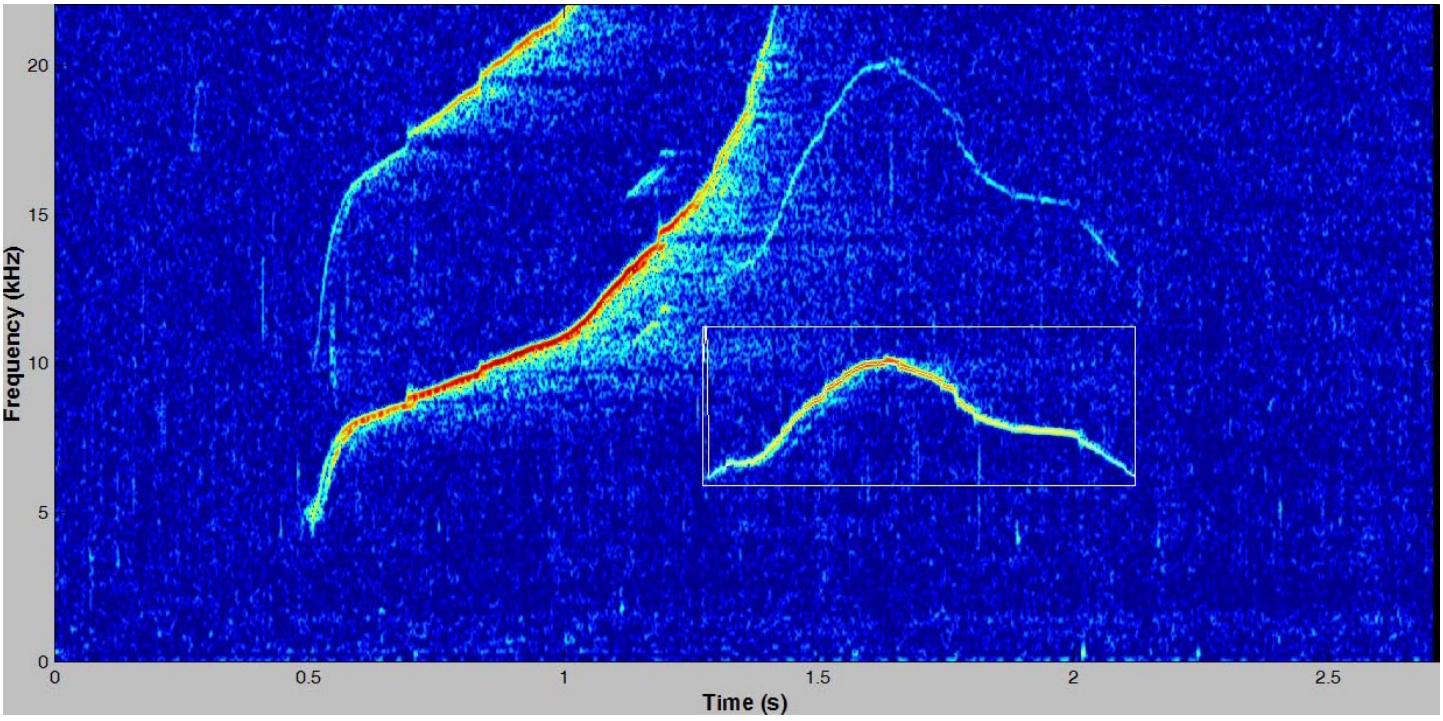
4. Then choose `Analysis -> Filter Selection` (or `ctrl&F`). This calculates an average noise spectrum from the part of the spectrogram before the selection and subtracts it from each spectrum in the spectrogram.



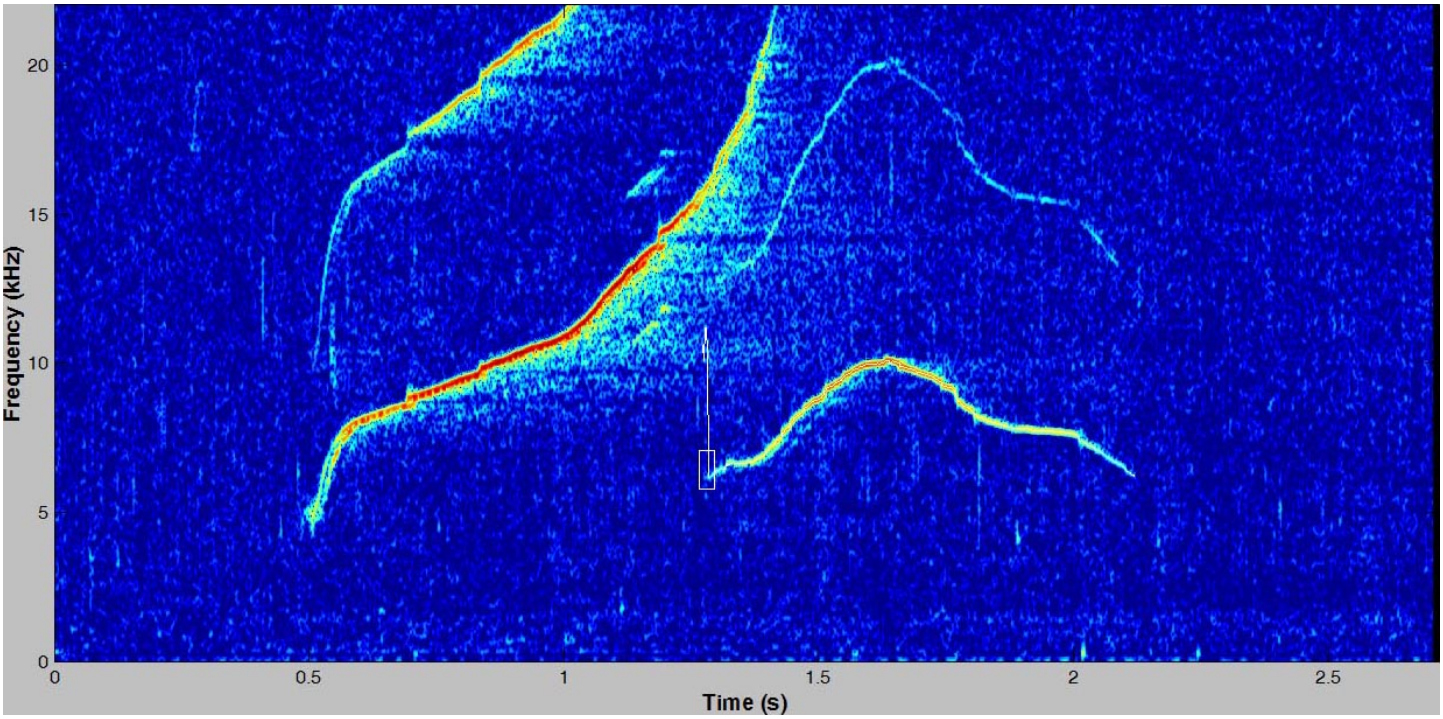
5. Select the part of the filtered spectrogram from which you'd like to extract the whistle contour



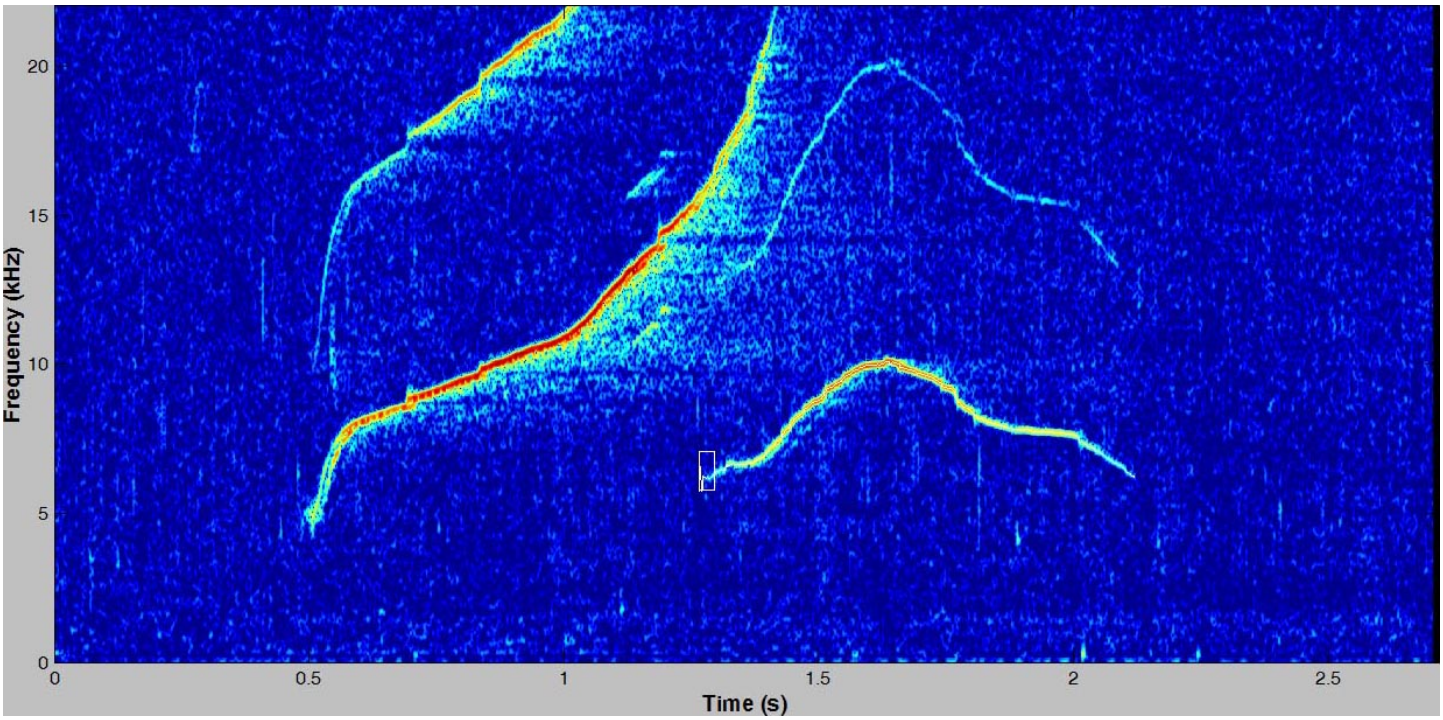
6. To extract the contour choose `Analysis -> Extract Frequency Contour` (or `ctrl&X`). This extracts a frequency contour between the time points given by your selection and using the upper and lower border of your selection as upper and lower frequencies. The extraction methods '`peaks`' and '`cepstrum`' should work for whistles, '`sidewinder`' is for sounds with strong harmonic content, such as killer whale pulsed calls. Unclick '`Include harmonics`'.



7. If you feel the algorithm goofed up in sections of your whistles, you can manually fix these by selection the trouble area (usually choosing narrower frequency boundaries)



8. Selecting `Analysis -> Edit Frequency Contour` (`ctrl&E`) recalculates the section using the narrower frequency boundaries.



9. Save the contour (`File -> Save Contour` or `ctrl&S`). This will save the contour to a MATLAB formatted file using your original name for the sound file with the extension `.ctr` instead of `.wav`. Load this file using the command `load [filename] -mat`. This file contains the frequency contour in the variable `fcontour` as well as the length of the contour in ms (`ctrlength`) and the sampling interval (`freqres`, equivalent to the frequency resolution of the spectrogram that the contour was extracted from)The last number in the frequency contour is the length of the contour (in seconds).