Wave Parameters from Sound Records

Since a long time, many authors, as for example Bernard [1941], Miche [1944], and more recently Ardhuin et al [2011], and Ardhuin et al [2012], among others, showed that it is possible to extract wave parameters from seismic noise. Very preliminary results indicate that, at least qualitatively, the same approach can be used to correlate sound registers to the waves. In the figure 1, it can be seen a wavelet transformation of 5 sound records, and it is clear the concentration of the energy around the 8-s period, which is the peak period in the region where the data was collected. It is important to note that y axis exibits the double of the period actually found, or in other words, $f_w = 2f_s$.

Unfortunatelly, there were no wave measurements associated with the sound records, and the period and height of the waves were obtained by visual estimation.

To improve the quality of the results and to verify the validity of the extension of the theory, an experiment was planned, including sound recording with 3 hydrophones, and measurement of the wave field by bottom mounted adcp's and oceanographic buoys, as showed in the figure 2. The place where the experiment will be conducted is exposed only to the waves generated by the South Atlantic anticyclone, most of the time wind sea with broad band spectrum. However, the passage of cold fronts change the wind direction and the waves turn pratically pure swell. So, both sea states can be measured.

The objective of this work is to present the methodology proposed for the experiment and open it for suggestions that could improve its results.
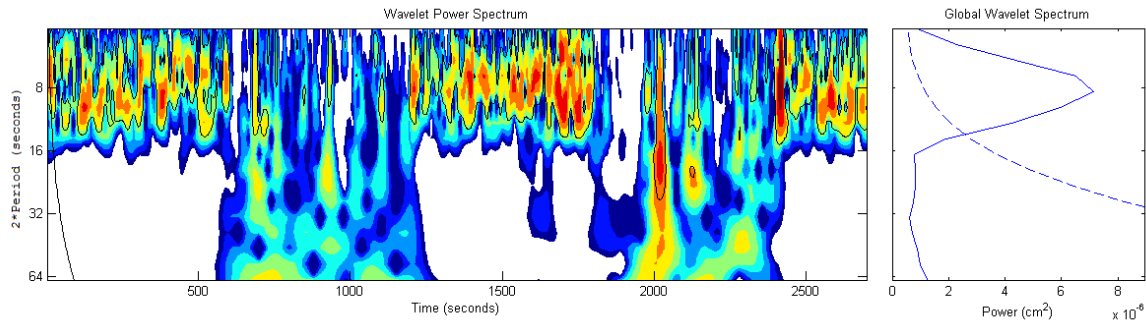

Figure 1 - Wavelet of 5 sound records showing the concentration of energy around 8-s period.

Figure 2 - Image of the place where the experiment will be conducted. H's mark the position of the hydrophones, and W's indicate the wavemeters.