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Shot noise modelling of high frequency valvometry data in oysters

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We consider oyster behaviour using high frequency valvometry data. These data are obtained in the field in the Arcachon bay, with light-weight electrodes of millimeters size, attached to the molluscs, and linked by flexible wires to an electronic control unit which measures valve activity. The latter are able to move freely and open their valve with an amplitude that is linked to environmental conditions, in order to filter surrounding waters. We consider here daily data recorded every 1.6 s for 5 different animals, corresponding to a total of 10ˆ4 to 2. 10ˆ4 datapoints for each series.

Valvometry data show important activity at high frequency, with frequent and sudden "microclosings" (meaning partial closures), at apparently random times and with random amplitudes. Furthermore, the overall frequency spectrum of valve opening time series show power-law behaviour with a slope b = 1.4 +/- 0.1. This suggests to consider a shot-noise modelling, with two independent stochastic processes representing respectively the times of these discrete shot noise events and their amplitudes. We experimentally estimate the pdfs of intertimes events and amplitudes, and discuss the relevance of a fractal shot noise modelling for such time series.