# Detecting Baryon Acoustic Oscillations

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**Résumé**

Baryon Acoustic Oscillations are a feature imprinted in large-scale structures of the Universe by acoustic waves which traveled in the hot plasma before recombination. More precisely, they create an excess of
correlation at a particular scale (about 150 Mpc), i.e. a localized bump in the correlation function of the galaxy distribution.

Since the BAO scale is known with small uncertainty it provides a standard ruler to infer cosmological distances from redshift surveys. The detection of BAOs in large scale structures also confirm cosmological models that predict their existence at a particular scale.

In my work, I was mainly interested in different methods for detecting BAOs in the correlation function. The usual procedure consists in a statistical testing, between a no-BAO hypothesis H_0 and BAO hypothesis H_1. One designs a test statistic, and from its value on the data, one obtains a p-value which quantifies how unlikely it is under H_0.

The classical method is based on the difference of chi-squares between H_0 and H_1. The justification is that it is equivalent to a generalized likelihood ratio between H_0 and H_1, which is optimal for simple hypotheses. However it is based on some assumptions that are not verified in practice, so that it slightly overestimates the significance. The estimate can become very wrong when considering hypotheses with model-dependent covariance matrix. In this case the difference of chi-square is also not a generalized likelihood ratio anymore.

*Intervenant

We propose a new method that we call the $\Delta l$ $method. First we modify the procedure for computing the significance in order dependent covariance matrix.