Asteroseismology is a subfield of astrophysics which uses stellar pulsations to derive information on the stellar structure. We investigated the power of such seismic techniques in the case of massive B-type stars which are the progenitors of supernovae by which the interstellar medium is chemically enriched during the evolution of our universe.

First, we devised a methodical iteration scheme to determine accurate radial velocity values for both components of the double-lined spectroscopic binary β Cen. In this way, we determined very precise orbital parameter values, the distance to the system and the most accurate mass estimates of any β Cephei star known to date. We also showed that it is in fact the more rapidly rotating component which exhibits pulsations with high spherical degree.

Subsequently, we calculated an extensive grid with state-of-the-art stellar models and developed a software architecture around this grid which automates the seismic modelling to a very large extent and allows us to deal with the large amount of data which we expect from future space missions, in particular COROT. Using this methodology and the pulsation modes derived from the recent multi-site campaigns for ν Eri and 12 Lac, we revealed shortcomings in our current stellar models of massive B-type stars and we made suggestions on how to improve these models.

Given these results, that were obtained on the basis of only a relatively limited number of frequencies, and the prospect of space missions which will gather a large amount of data with unprecedented accuracy, we are very hopeful for the future of asteroseismology of massive B-type stars.