Frequency analysis & spectroscopic mode identification of the delta Scuti star 4 CVn

Nathalie Themessl*[1]

[1]University of Vienna – Vienna, Austria

Abstract

For a long time, theoretical studies represented the one and only possibility to probe the internal structure of stars due to the fact that the deep stellar interior remains hidden from direct observations. With the advent of ground-based campaigns and recent space missions such as CoRoT and Kepler, the field of asteroseismology took a major step forward and assumed the role of a highly-sophisticated tool to concisely probe the interior of stars by studying resonant oscillations.

The variable delta Scuti star 4 CVn has been subject to extensive photometric analyses for more than four decades allowing the detection of over 70 frequencies. These studies report consolidated findings regarding its stellar properties and complex pulsational structure. In addition, a spectroscopic campaign over several years has provided a large number of high-resolution spectra, which enable the study of line-profile variations. After all, the complementary study of photometry and spectroscopy allows to investigate the stellar structure in great detail and provides essential improvements of common state-of-the art models.

In this work, we present the analysis of the variations in the profiles of absorption lines. We use the Fourier parameter fit method to extract the individual pulsation frequencies and carry out a mode identification by comparing the observations to synthetic line-profile variations. The analysis reveals that the star is a single-lined binary. In total, we extract 11 frequencies in the light variations and derive the spherical wave numbers l and m of each mode. Moreover, we obtain reliable estimates of the line-profile and pulsation mode parameters of the observed p modes.

*Speaker