Asteroseismology Group of IAA

Overview

Research in the stellar variability group has been related with the fractal character of time in the time series describing the light curves of some pulsating stars. This can be the origin of many peaks in the power spectra of several objects which are not yet understood.

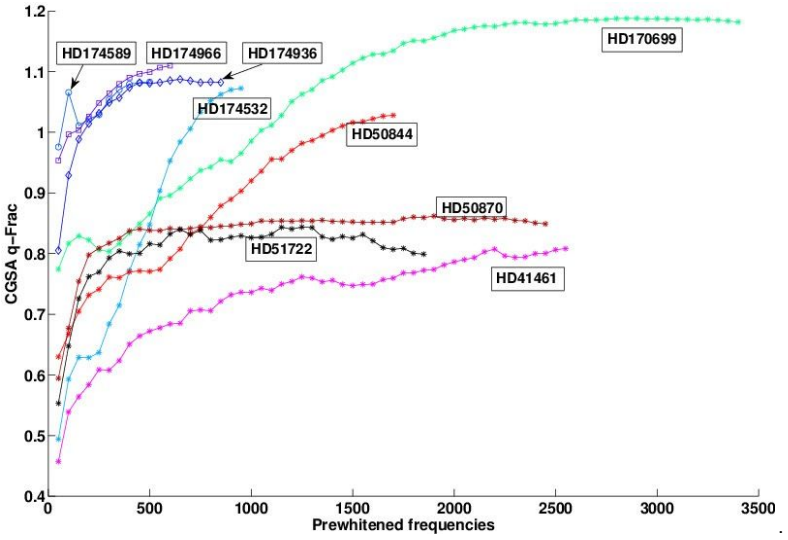
Recently, we have included the effects of rotation on the pulsations of stars and one paper concerning the interplay between Astropartcles and Asteroseismology has been published and within the PLATO2.0 project. Besides, activity related with open science within the project SKA-Link have led the group to participate in the ESCAPE European project.

Highlights in 2019

- We have participated in the asteroseismic analysis of 200 light curves from sector 1 and 2 of the TESS mission. In this worldwide collaboration, classification of the pulsation content (in δ Scuti, γ Doradus or roAp variable stars), and contrasts with the theoretical models where made. Results allowed to announce the discovery of the roAp with the shortest period known to date (4,7 min) [Cunha, 2019] and to confirm that the mixing processes in the outer envelope of intermediate-mass variable stars are relevant regarding the excitation mechanisms theory [Antocci, 2019].

- The Asteroseismology use case is based on the analysis of light curves of pulsating stars in order to derive their internal structure parameters and how they evolve. Development of specific numerical codes for the treatment and analysis of data generated by the space photometric mission PLATO2.0 is a task assumed by our team. This study includes standard harmonic analyses and non-standard fractal time series analyses. Using these techniques we have found in De Franciscis et al. 2019 that there is a fractal background component determining the frequency content extracted using classical techniques. In addition to this, the innovative application of fractal techniques resulted especially relevant to extract true oscillation modes in iterative harmonic fitting procedures, pointing to a new stop criterion based on the percentage of fractal component that is present in the residuals of the fitting

- Implementation and development of the TOUCAN virtual observatory tool. This tool in a reference of management, comparison and analysis of astrosismatic models. Creation of workflows for the processing of observation data following the precepts of reproducibility of the "Open Science" within our participation in the ESCAPE project funded by the European Community.



Fractal analysis technique CGSA as a new stop criterrion for the frequency extraction from the light curves of pulsating stars.

Members

A. Ayala Gómez, R. Garrido Haba, M. Lares Martiz, S. Martín Ruiz, J. Pascual Granado, A. Ramón Ballesta, J. R. Rodón Ortiz

Lines of research

Stellar Structure and Evolution
Time Series Analysis
Open Science