Bachelorarbeit Sommersemester 2024

Gravity-mode period spacings in pre-main sequence stars

Supervision: Konstanze Zwintz (konstanze.zwintz@uibk.ac.at)

Aims: *Analysis of space data for pre-main sequence stars pulsating with gravity modes, search for regular period spacings, and comparison to results from more evolved stars on the main sequence. Your study will contribute to the work on young pulsators conducted in the "Stellar Evolution and Asteroseismology" research group.*
Keywords*: asteroseismology, early stellar evolution, space photometry*

Short description

In the research group "Stellar evolution and asteroseismology" we particularly focus on the pulsations in stars that do not burn hydrogen in their cores yet, so-called pre-main sequence stars. Different types of pulsations exist in stars of all evolutionary stages, and many of those can also be present in pre-main sequence stars. Among those is the group of so-called gravity (g-) mode pulsators for which the oscillations are either excited by the heat engine mechanism or by convective blocking. Stars with g-mode pulsations can be members of two groups: the Slowly Pulsating B (SPB) stars (2 – 7 solar masses) and the γ Doradus stars (1.4 to 1.7 solar masses). Both groups possess pulsation periods between about 0.5 and 3 days. One of their special characteristics is the presence of nearly equally spaced pulsation periods that can be used to describe the rotational properties close to the stellar cores.
Only few g-mode pulsators in the pre-main sequence evolutionary stages are presently known. Data for these objects have been obtained by different space telescopes. 15 of those stars are the subject of the bachelor thesis described here. In your thesis you will analyze the photometric time series of these young stars, extract the periods and search for regularities in period space. You will then compare your results to already published results for more evolved stars on the main sequence and put your findings into an evolutionary context.

Helpful Skills

- Basic knowledge of python or programming in general
- Interest in stellar oscillations and / or early stellar evolution

Figures: left – periodogram (top) and period spacing pattern for a young SPB star; right – the theoretical instability regions for pre-main sequence stars (Steindl et al. 2022)