Research associate position in the field of asteroseismology

Context

Massive stars are affected by various physical phenomena such as a strong mass-loss throughout their lifetime due to radiative winds, fast rotation, and a high binarity rate, thus complexifying their internal physics. In order to understand and characterise these stars, sophisticated observational methods are needed such as long-baseline interferometry and seismology. These go hand-in-hand with elaborate multi-dimensional numerical tools and methods needed to model these stars. The goal of the MASSIF[1] project funded by the ANR[2] is to progress in our understanding of the internal physics of these stars, particularly mass-loss and rotation, using available interferometric and seismic data as well as the most sophisticated numerical tools currently available.

The team behind the MASSIF project is composed of three partners:

- the Nice node (A. Meilland, A. Domiciano de Souza, F. Millour): focusses on the interferometric aspects. This is also the lead node.
- the Toulouse node (M. Rieutord): focusses on developing models of massive, rapidly rotating stars.
- the Paris-Meudon node (D. R. Reese): focusses on the seismic aspects.

Description

We are seeking an early career scientist to perform research on the seismology of massive rotating stars under the supervision of D. R. Reese at the Paris-Meudon Observatory. Target stars range from 4 to 20 $M_\odot$ and include β Cep stars, B, Be, B[e] type stars, and other fast rotators. The successful candidate will seek to characterise these stars seismically with the help of the ESTER[3] stellar structure code and the TOP[4] pulsation code, both of which can handle the effects of rapid rotation. They will also work on the development of seismic observables, namely line profile variations and multi-colour amplitude ratios/phase differences, which can be used to identify observed pulsations. Other tasks may include calculating the pulsation spectra for grid of rapidly

1 MAssive Stars Study in InterFerometry (see https://www.anr-massif.fr/)
2 Agence Nationale de la Recherche (see https://anr.fr/)
3 Evolution STEllaire en Rotation (see http://ester-project.github.io/ester/)
4 Two-dimensional Oscillation Code (see Reese et al. 2021, A&A 645, A46)

rotating models, adapting the AIMS[5] code to handle rotation, and inverting rotation profiles in such stars, provided a sufficient number of pulsation modes have been identified.

Qualifications

Successful candidates should have the following qualifications:

- Doctoral degree/PhD in the domain of stellar physics, preferably asteroseismology
- A solid background in computer programming, numerical simulations, and mathematics. Numerical simulations will typically be carried out using fortran and python.

Salary and duration

The net salary will range from 2320 € to 3295 € depending on experience. The duration will depend on available funds and salary but should be roughly two years.

Laboratory

The successful candidate will work at the LESIA[6] within the Paris-Meudon observatory:

LESIA
Observatoire de Paris, Section de Meudon
5, place Jules Janssen
92195 MEUDON Cedex

Application document

Please send a single PDF document name “LastName_FirstName.pdf” to daniel.reese@obspm.fr. This document should contain:

- a cover letter explaining your motivations
- a CV which includes a publication list

Deadline

The application deadline is September 30th. Ideally, the candidate should start before the end of the year, but the start date is negotiable.

5 Asteroseismic Inference on a Massive Scale (see https://sasp.gitlab.io/aims/)
6 Laboratoire d’Études Spatiales et d’Instrumentation en Astrophysique (see https://lesia.obspm.fr/)