Título/Title:
Determining helium abundances in evolved stars

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Descrição/Description:
Knowledge of helium abundance in distant red-giant stars is of major importance to the study of stellar populations, hence, also to the study of our galaxy. However, the determination of the stellar helium abundance is a most challenging task, as no surface signatures of helium can be seen in the great majority of stars.

A possible way around this problem is to look directly at stellar interiors and search for signatures of the helium, associated to the helium second ionization zone. This method has been applied to the sun, using data on the solar oscillations. Recently, the observations provided by satellites launched by NASA and ESA, such as Kepler and CoRoT, made it possible to apply the same method to other stars. In the case of red-giant stars, for which this determination is of great importance, the application of the method has so far been limited by the fact that one important set of data (namely, the frequencies of dipolar acoustic oscillations) is contaminated by the deepest layers of the stars.

In this project the student will develop an innovative procedure to de-contaminate the data set that has so far been excluded and use these de-contaminated data, together with those usually considered, to determine the relative abundance of helium in a sample of red-giant stars. The work will be performed first on simulated data, using a few stellar models previously computed and provided to the student, and later, on real red-giant data from the NASA Kepler satellite. The results on real data may be subject to publication in an international journal and/or presented in a workshop/conference in the field.