CENTRE DE RECHERCHE ASTROPHYSIQUE DE LYON

Centre de Recherche Astrophysique de Lyon
UMR 5574

Master 2 Research internship offer
Academic year 2024 – 2025

Internship supervisor: Karl Joakim ROSDAHL
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Address/Workplace: CRAL **-** site Charles André : 9 avenue C. André, St Genis-Laval
Hosting research team: GALPAC team

Internship title: The influence of galaxy mergers on star formation and ionising photon escape

Summary of proposed work:
During the first billion years after the Big Bang, the dark, cold, and neutral Universe was flooded with radiation and underwent a transition to a warm ionised state, in a process known as reionisation. This last major transition of our Universe is at the frontier of observational astrophysics and is the focus of the James Webb Space Telescope and the forthcoming Square Kilometre Array. A theoretical understanding of galaxy evolution during the Epoch of Reionisation is vital for preparing observational campaigns and interpreting eventual observations, and the best way to gain a theoretical understanding is to use simulations.

The GALPAC team at CRAL has developed the SPHINX suite of radiation-hydrodynamical cosmological simulations (https://sphinx.univ-lyon1.fr), designed to predict the formation of galaxies during the first billion years and understand the process of reionisation and its sources, which likely are predominantly young stars formed in the earliest galaxies. These simulations are the first to simultaneously capture the process of reionisation while resolving the escape of radiation trough the inter-stellar medium of tens of thousands of galaxies, and they reveal a scenario of rare and brief flashes of ionising radiation escaping into the inter-galactic medium, following bursts of star formation.

In this M2 project, we propose to analyse galaxies in the SPHINX simulations and determine whether bursts in star formation and escape of radiation are correlated to galaxy mergers, as is often suggested by both observations and theory. The student will make a statistical analysis of the plethora of simulated galaxies to determine of such a correlation exists for them. During the project, the student will acquire extensive knowledge of front-line topics in extreme-redshift astronomy and gain experience with analysing large state-of-the-art cosmological simulations, using and refining (Python/Fortran) analysis tools developed by the GALPAC team.

Nature of the financial support for the internship: Basic salary, funded by the team

Potential for a follow-up as a PhD thesis: Yes, but dependent on the approval for funding from the University doctoral school.