CRAL

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: Jérémy BLAIZOT
@ : jeremy.blaizot@univ-lyon1.fr ☎ : 04 78 86 83 84

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

Internship title: Observational signatures of stochastic star formation in high-redshift galaxies.

Summary of proposed work:

The JWST has opened a new window on the very distant Universe, and provides us with exquisite rest-frame optical and ultraviolet images and spectra of the first generations of galaxies. These observations show us that distant galaxies are already well developed systems, with complex morphologies and an important amount of dust in their interstellar medium. Their stellar masses are low, as expected in the early Universe, and their star formation is likely to be stochastic because of strong feedback from massive stars. Inferring the physical properties (star formation histories, stellar mass, …) of high redshift galaxies is difficult, as it is unclear how far our empirical knowledge from low redshifts may be extrapolated to the high-redshift Universe.

Cosmological simulations are the tool of choice to develop an interpretative framework for JWST's deepest observations, and the SPHINX simulations (https://sphinx.univ-lyon1.fr) led by the GALPAC team at CRAL are uniquely positioned for this. They describe a large population of galaxies while resolving star formation and feedback from massive stars at the molecular cloud scale. They implement radiation-hydrodynamics, so that they are predictive for the most important observables (e.g. H-alpha), and their results are largely compatible with JSWT observations.

In this M2 project, we will construct and analyse mock JWST observations of a large sample of SPHINX galaxies, with the radiative transfer code RASCAS (https://rascas.univ-lyon1.fr). We will use this dataset together with the simulation outputs, to investigate how measurements of the UV continuum and the H-alpha emission line may inform us on the stochasticity of star formation in high-z systems with complex morphologies and dusty interstellar media.

With this project, the student will work at the interface between observations and simulations, and will gain a solid experience in using state-of-the-art numerical tools to investigate galaxy formation.

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

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