Master 2 Research internship offer
Academic year 2018 – 2019

Internship supervisor: Prénom NOM

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Address/Workplace [1]: CRAL - site Charles André : 9 avenue C. André, St Genis Laval

Hosting research team [1]: Galpac

Internship title: SPHINX galaxy morphologies

Summary of proposed work:

During the first billion years or so 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 main upcoming telescopes such as the James Webb Space Telescope and the 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 understanding is to use cosmological simulations.

The Galpac team at CRAL has developed the SPHINX suite of radiation-hydrodynamical 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 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.

The idea for this master's project is to analyse the morphologies of SPHINX galaxies, for example their half-light radii, compactness, and ellipticity. The morphologies will be compared to existing models in the literature (e.g. arxiv.org/abs/1710.00008) as well as observations of lower-redshift galaxies that are know to 'leak' ionising radiation (e.g. arxiv.org/abs/1805.09865). Last but not least, the student will establish whether there are relations, as claimed, between these morphological quantities of galaxies and their instantaneous escape fraction of ionising radiation. During the project, the student will acquire extensive knowledge of front-line topics in extreme-redshift astronomy (theoretical and observational) 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: Galpac team

Potential for a follow-up as a PhD thesis [1]: Yes, financed by the école doctorale

[1] Inscrire votre choix