

## **Proposition de stage de Master 2 Recherche** **Année académique 2025 – 2026**

**Responsable de stage :** Jérémy BLAIZOT

@ : jeremy.blaizot@univ-lyon1.fr

☎ : 04 78 86 83 84

**Adresse/Lieu du Stage :** CRAL - site Charles André : 9 avenue C. André, St Genis Laval

**Équipe de recherche d'accueil :** GALPAC

**Intitulé du stage :** Diffuse gas emission in the circumgalactic medium of galaxies.

### **Résumé du travail demandé :**

The circumgalactic medium (CGM) is a multiphase gas reservoir where inflows of pristine gas co-exist with outflows of reprocessed baryonic material, ejected from the galaxy by supernova explosions. These flows of gas represent the two major drivers of galaxy evolution: the accretion brings in mass to fuel star formation, and the ejection of gas is the dominant self-regulation mechanism of galaxy growth. Because the CGM is very diffuse, it is unfortunately very difficult to detect, and our theoretical and observational knowledge of this medium is extremely limited.

Over the last decade, the advent of high-sensitivity integral-field spectroscopy (IFS) has revolutionised this topic by enabling the direct detection of diffuse line emission from the low-density gas in the CGM. Deep surveys carried out with VLT/MUSE have notably revealed that most star-forming galaxies exhibit extended UV line emission (e.g. the MgII doublet), revealing the ubiquitous presence of cool gas throughout their dark-matter haloes. IFS observations not only provide a spatial mapping of the CGM, but also spatially-resolved spectra, which inform us on the gas dynamics. The observation of extended MgII emission will be a key target of future surveys with forthcoming instruments (VLT/BlueMUSE, WST), for which theoretical predictions are badly needed.

The overall goal of the project is to provide a theoretical framework to interpret existing and future IFS observations of extended gas emission from the cool phase of the CGM. For this, the successful applicant will construct mock observations of galaxies from the SPHINX simulations, and analyse them to predict the variation of the occurrence rate, morphology, and surface brightness of MgII haloes. These mock observations will be generated with the RASCAS radiative transfer code developed by our team, and will be compared against existing observational data from VLT/MUSE. If time allows, the intern may also investigate how these properties are connected to the duty cycle of star formation, the presence of cool gas outflows, the escape of ionizing radiation, and metal enrichment of the CGM.

The successful applicant will join the GALPAC team at CRAL, which is a world leader in IFS instrumentation and in cosmological radiation-hydrodynamics simulations. The GALPAC team is a stimulating and friendly environment, with 9 PhD students, 4 postdocs, and 12 staff, sharing a strong expertise in observational and theoretical extragalactic astronomy.

**Type de financement envisagé pour le stage :** Financement réglementaire par le CRAL.

**Indication éventuelle d'ouverture vers un sujet de thèse :** Oui