

Thesis subject

Name of the laboratory: Laboratoire d'Astrophysique de Marseille

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Subject's title: AGN contribution to high-redshift galaxies emission lines in preparation for PFS and MOONS.

Subject description:

Black holes activity has a strong influence on the star-formation activity of galaxies over cosmic times and the coevolution of galaxies and black holes is important, especially in the Early Universe. Black holes accretion disk in Active Galactic Nuclei (AGN) radiate from gamma-rays to radio and induces a response from the surrounding interstellar medium (ISM). The resulting emission, both in its continuum and in its emission spectrum, (*i.*) gives us important information on black holes physics, such as the black hole mass and the accretion rate, (*ii.*) it contaminates the star-forming galaxies emission and needs to be removed to evaluate the fraction of AGN and to retrieve the galaxy evolution parameters, such as the star formation rate and the stellar mass.

The aim of this PhD are:

- to model the panchromatic emission of galaxies hosting AGNs to implement them in the CIGALE (Code Investigating GALaxy Emission) (<https://cigale.lam.fr/>) (Boquien et al. 2019) in a dedicated module. The student will use the CLOUDY photoionization code (<https://www.nublado.org>) to model AGNs atomic and molecular emission lines (from X ray to radio), both in the narrow line regions and in the broad line regions (Groves 2004, Spinoglio 2021) to generate a library of synthetic spectra templates that will be implemented in CIGALE. This work will be benchmarked on existing samples from previous work (Mountrichas et al. 2023).
- to perform SED fitting with both the galaxy emission and the AGN emission on the first (summer-fall 2024) observations from PFS and MOONS, to perform a statistical study on the AGN fraction, the evolution parameters of the host high-redshift galaxies to understand their co-evolution.

Bibliography:

- CIGALE: a python Code Investigating GALaxy Emission, M. Boquien, D. Burgarella, Y. Roehlly, V. Buat, L. Ciesla, D. Corre, A. K. Inoue (井上昭雄) and H. Salas, 2019, A&A, 622

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• Groves et al. (2004), Dusty, Radiation Pressure-Dominated Photoionization. I. Model Description, Structure, and Grids, *The Astrophysical Journal Supplement Series*, Volume 153, Issue 1, pp. 9-73.

- Mountrichas, G. et al. (2023) The relation of cosmic environment and morphology with the star formation and stellar populations of AGN and non-AGN galaxies, *Astronomy & Astrophysics*, Volume 675, id.A137

• Spinoglio et al. (2021) Mid-IR cosmological spectrophotometric surveys from space: Measuring AGN and star formation at the cosmic noon with a SPICA-like mission , *Publications of the Astronomical Society of Australia*, Volume 38, article id. e021