Multiline Models of Galaxies: Overview of Modeling Strategies Using Nearby Galaxies as References

Vianney LEBOUTEILLER

(CEA Paris-Saclay, France)

Wednesday, July 26, 2023, 14:15–16:15

While the James Webb Space Telescope is providing us with observations of very high-redshift galaxies that redefine our view of galaxy evolution, the corresponding spectra contain a relatively small number of tracers that probe the integrated emission of a galaxy. This leads to some fundamental questions regarding our ability to model and interpret galaxy spectra in order to obtain reliable diagnostics. More generally, it is an incredibly difficult task to extract meaningful quantities from integrated observations of galaxies, which is often the case in multi-wavelength observations. Thankfully, observations of nearby galaxies allow us to distinguish the main emitting components and to observe numerous tracers, which we can use to design the best model strategies possible.

In this presentation, I will first give an overview of the various physical processes at work that produce the tracers we may observe - focusing in particular on the UV-to-IR domain - and describe typical diagnostics that can be drawn from such constraints. Focusing on nearby galaxies, I will then show evidence that many physical components in galaxies contribute to the total emission, implying potential biases due to mixing in integrated spectra or smearing in spatially-resolved observations. The last part will be dedicated to various techniques to account for the complexity of the physical processes and galaxy emitting components, finishing with some avenues to recover actual internal variations in unresolved galaxies.