CIGALE hands-on project

V. Buat & P. Theulé

May 2021

Guidelines

- session 1: CIGALE installation and getting started
- session 2: case study of few galaxies
- session 3: discussion of your first results
- session 4: presentation of your results

Goals:

1. show SED fits from photometry data
2. plot your objects on the SFR-mass diagram
3. plot your objects on a BPT diagram for several radiation field intensity

1 CIGALE installation and demonstration

The last version of the CIGALE code is described in [Boquien et al., A&A, 2019].

1.1 Installation

Follow the ste-by-step instructions given in : $https://gitlab.lam.fr/ism-of-galaxies-2021/cigale-hands-on-session$. You will be explained how to set up a Python environment, install CIGALE and run. You will also find the Sings/KINGFISH sample(Sings_KINGFISH_sample.txt file).

1.2 Running CIGALE

Run CIGALE in your working directory (where your sample data file is):

1. *pcigale init* : it will initialize a configuration file called pcigale.ini, which you will complete.
2. *pcigale genconf* : it will complete pcigale.ini by reading which modules you want to use. Complete the file.

3. *pcigale check*: it will tell you how many models you will build.

4. *pcigale run*: run CIGALE and put the results in the ./out directory

5. *pcigale-plots sed*: create the figures showing the best SED plotted over the observed data (works if save_best_sed = True in the pcigale.ini file)

2 Case study of galaxies

You will find below an example pcigale.ini file for the first galaxy NGC 0337. For all the modules values by default are given for each parameter. Adding several values for a parameter generates the models fitted against the sample data file.

2.1 The Sings/KINGFISH Samples of Nearby Galaxies

We will use the Sings/KINGFISH sample of Nearby Galaxies from [Dale et al., ApJ 2017]

1. download the Sings_KINGFISH_sample.txt file. It contains the photometry data of the Sings/KINGFISH sample

2. run CIGALE

3. the results of the SED fitting are in the ./out/results.fits file. Open it using the TOPCAT software (http://www.star.bris.ac.uk/∼mbt/topcat/).

2.2 The SFR-mass diagram

Locate the different galaxies on a SFR vs mass diagram in log-log scale. From their location what can you say about the galaxies ?

2.3 Building the BPT diagram

Plot a BPT diagram [BPT, 1981], [NII]6584/Hα versus [OIII]5007/Hβ for the different galaxies a function of the ionization parameter U. To do so you will run CIGALE for several sub-samples of galaxies. Each sub-sample has the same values of metallicity Z and logU. The metallicities are taken from [Moustakas et al., ApJS 2010] and the logU is inferred from the the logU-metallicity relation found in [Pérez-Montero et al., MNRAS 2014] You can find the metallicity and logU values for each galaxy in the table_Z_U.txt file.

References

[BPT, 1981] Baldwin, J. A.; Phillips, M. M.; Terlevich, R., *Classification parameters for the emission-line spectra of extragalactic objects.* , Publications of the Astronomical Society of the Pacific, 93, p. 5-19, 1981

[Boquien et al., A&A, 2019] Boquien et al., *CIGALE: a python Code Investigating GALaxy Emission*, Astronomy & Astrophysics, 622, A103, 2019

[Dale et al., ApJ 2017] Dale et al., *Updated 34-band Photometry for the Sings/KINGFISH Samples of Nearby Galaxies*, The Astrophysical Journal, 837, 90, 2017

[Moustakas et al., ApJS 2010] Moustakas et al., *Optical spectroscopy and nebular oxygen abundances of the SPITZER/SINGS galaxies*, The Astrophysical Journal Supplement, 190, 233, 2010

[Pérez-Montero et al., MNRAS 2014] Monthly Notices of the Royal Astronomical Society, 441, 3, p.2663, 2014