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Inter-Division D-G-H-J / Commission WG-2
Reference Library of Galaxy Spectral Energy Distributions (RELIGAS)

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1. Introduction

The working group "Reference Library of Galaxy Spectral Energy Distributions (RELIGAS)" was formed in 2017. In 2019 it was merged with the working group "From Databases to Galaxy SED Fitting" (DB2SED).

The main goals of the working group were:

- to analyse the availability and fidelity of observed SEDs of galaxies, and to compare them with what would be necessary to represent the SEDs of actual populations of galaxies (as a function of the environment, mass, redshift, morphology, etc);
- to analyse the availability and fidelity of modeled SEDs and modelling algorithms to represent the SEDs of galaxy populations;
- to survey existing databases, models and SED fitting tools and provide recommendations for their use.

Although many of the joint activities were affected by the disruptions due to the COVID-19 pandemic, various group members were engaged in different aspects of this work. In particular, the main activities related to the goals of this WG are listed as follows.

2. Observational studies

Baes and collaborators derived the observed SED of Local Group galaxy M33 using radiative transfer models. They found that increased silicate fraction compared to the MW is needed to reproduce the dust emission well (Williams, Baes, et al. 2019). The same galaxy was the focus of the radiative transfer study by Popescu, Tuffs and collaborators, who, in contrast, find that the sub-mm SED can be explained using geometry, without modifying dust properties (Thirlwall, Popescu, Tuffs et al. 2020).

Brown and collaborators are working on detailed empirical SEDs of 110 AGN to serve as photo-z templates (Brown et al. 2019)

Burgarella and collaborators produced empirical stacked SEDs of $z \sim 3$ LBGs (Alvarez-Marquez et al. 2019). Burgarella and collaborators (incl. Inoue) have also constructed dust emission SED templates for the galaxies in the early universe ($5 < z < 10$, Burgarella et al. 2020)

Dale and collaborators studied the spatially resolved star formation histories in normal star-forming galaxies drawn from the Spitzer Extended Disk Galaxy Exploration Science survey (Dale et al. 2020).

Gruppioni and collaborators analysed the observed SEDs of high-z ALMA selected dusty galaxies drawn from the ALPINE survey, finding shapes similar to those of nearby galaxies (Gruppioni et al. 2020).

3. Theoretical studies

Baes and collaborators studied the radial distribution of dust emission of galaxies in DustPedia sample. The radial distribution is important because it needs to be assumed in the radiative transfer models that produce model SEDs (Mosenkov, Baes, et al. 2019).

Boquien and Gruppioni edited the proceedings of IAU Symposium 341 (PanModel2018: Challenges in Panchromatic Galaxy Modelling with Next Generation Facilities).

Stanway and collaborators highlighted the need to include binary stars in stellar population synthesis models (Stanway et al. 2020).

4. Codes, tools and databases

Baes has reviewed panchromatic SED fitting tools, their methodology and recent developments in this area as an invited review for IAU Symposium 341 (PanModel2018: Challenges in Panchromatic Galaxy Modelling with Next Generation Facilities). The review, quite relevant for the goals of the woring group, is available at https://arxiv.org/abs/1910.04065.

Boquien and collaborators (including Burgarella and Inoue) presented a comprehensive overview of the CIGALE SED fitting code (Boquien et al. 2019) as well as of X-CIGALE, code optimized for SED fitting of AGN (Yang et al. 2020).

da Cunha and collaborators presented a new version of SED fitting code MAGPHYS +photo-z, which can obtain the photometric redshift in addition to physical parameters.

Hunt and collaborators evaluated and compared three SED fitting codes (MAGPHYS, GRASIL and CIGALE) by fitting them to a local sample (KINGFISH) with rich multi-wavelength data (Hunt et al. 2019)

Mazzarella and NED team have demonstrated how NED can be used to visualize SEDs obtained from diverse sources, focusing on LIRG sample.

5. Conclusion

Members of the working group have made various important contributions both to our observational and theoretical understanding of galaxy SEDs. Furthermore, they continue to provide state of the art tools for facilitating work in this area.

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