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Comparation between different tracers of SFR in the CALIFA sample

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Abstract

The Calar Alto Legacy Integral Field Area survey (CALIFA survey) has been designed to be the first survey to provide Integral Field Spectroscopy (IFS) data for a statistical sample of all galaxy types ($\sim$ 600 galaxies) in the Local Universe (0.005<z<0.03) covering the optical wavelength range. We compare these data with the ones in the UV range obtained by GALEX (GALaxy Evolution eXplorer) satellite at both far-UV (FUV) and near-UV (NUV) wavelengths and imaging data in the near-infrared (22 μm) from WISE. The main objective of our work will be to provide a robust determination of the star formation rate (SFR) in galaxies as a crucial element to understand galaxy evolution. We will focus on the analysis of this property using different tracers/calibrators: dust-extinction-corrected Hα-line emission (from CALIFA), FUV continuum (from GALEX), and infrared luminosities (from WISE). Besides a global comparison of the total SFR in the sample we will also identify those galaxies where these estimates clearly depart suggesting the presence of significant amounts of hidden star formation or variations in the IMF. Once these objects are identified we will study the spatial distribution of the different SFR tracers to know whether the discrepancies are ubiquitous in each galaxy or they are associated to specific, individual regions. The SFR are derived using both simple and hybrid recipes (see Calzetti 2012 for a recent compilation). In the case of the recipes based on a single photometric band (simple) we have used the extinction-corrected UV and Hα and the observed mid- or far-infrared luminosities. The hydrid ones combine luminosities measured directly (observed UV or Hα) with that of the light emitted by dust after being heated by young massive stars (in our case the WISE 22 μm luminosity). We have discovered that the results obtained depend in what calibrators we are using, in particular the SFR$_{FUV}$ correlate well with SFR_{H_α} once both have been properly corrected for dust attenuation. On the contrary, in the case of the SFR$_{22_{\mu m}}$ a significant fraction of the SF is transparent and finally when the hibrids calibrators are using we can recover part of the total amount of SF that we could not observe with only 22μm data.