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ORIGINAL ARTICLE

A technique for estimation of starburst masses and ages in luminous compact galaxies

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Abstract We propose a technique for estimation of the mass m of the young stellar population and the starburst age T in luminous compact galaxies (LCGs). For this purpose we use LCG Hα emission line luminosities from the Sloan Digital Sky Survey (SDSS) spectra and *Galaxy Evolution Explorer* (*GALEX*) FUV and NUV continuum luminosities. The method is intended for quick estimation of m and T in large galaxy samples and does not require spectral energy distribution (SED) fitting. Estimated m and T for the sample of about 550 LCGs are compared with the same values derived from the SED fitting in the wavelength range $\lambda\lambda$ 3800–9200 Å. We obtain the average differences in $\log m$ and T of 0.27 and 0.87 Myr, respectively. This technique could be used for selection of galaxies with desired ranges of m and T or for reducing a range of parameter variations in SED fitting.

Keywords Galaxies: starburst · Galaxies: star formation · Galaxies

1 Introduction

The goal of this article is to describe a method for estimating some starburst parameters of luminous compact galaxies (LCGs). LCGs are characterized by a strong burst of star formation (Izotov et al. 2011) and have the properties similar to those in so called "green pea" (GP) galaxies discussed by Cardamone et al. (2009).

GPs were selected from the Sloan Digital Sky Survey (SDSS) images (Abazajian et al. 2009) in the framework of the Galaxy Zoo project as compact objects with a green color. This color indicates the presence of strong [O III] λ5007 emission line redshifted to the SDSS r band in galaxies with redshifts $z \sim 0.1$–0.3.

On the other hand, LCGs were selected from the SDSS spectra as the objects with strong emission lines and they are characterized by a wider range of redshifts $z \sim 0.02$–0.6 (Izotov et al. 2011). Therefore, depending on the redshift, LCGs on composite SDSS images can be blue, pink, white, green, brown while other characteristics are the same as those in GPs. Selection criteria and derived global characteristics of LCGs are described in Izotov et al. (2011). Briefly, these criteria were as follows: high equivalent width and large luminosity of the Hβ emission line (EW(Hβ) $\geq$ 50 Å, L(Hβ) $\geq 3 \times 10^{40}$ erg s^{-1}, respectively); well-detected [O III] λ4363 Å emission line in galaxy spectra, with a flux error less than 50 %. Only star-forming galaxies with typical angular diameters $\leq 10''$ were selected. All these criteria only select objects with strong emission lines in their spectra and thus with young starburst ages 3–5 Myr for which the accurate abundance determination using the direct method is possible. Izotov et al. (2011) concluded that GPs sample is a subset of a larger sample of $\sim$ 800 LCGs in a relatively narrow range of redshifts.

General properties of GPs and LCGs seem to be uncommon in the nearby universe suggesting a short and extreme phase of their evolution (Amorín et al. 2010) and may represent the star formation mode prevailing in the early Universe (Cardamone et al. 2009). LCGs and GPs are characterized by low oxygen abundance (of $\sim$ 20 % solar) (Amorín et al. 2010; Izotov et al. 2011; Pilyugin et al. 2012; Haw-

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