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Optical properties of CSS/GPS sources

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Abstract. In this work, we study the optical properties of 58 CSS/GPS radio sources selected from the literature in order to determine the impact of the radio-jet in the circumnuclear environment of these objects. We obtained optical spectra for all sources from SDSS-DR12 and performed a stellar population synthesis using the Starlight code. Our results indicate that the sample is dominated by intermediate to old stellar populations and there is no strong correlation between optical and radio properties of these sources.

Keywords. galaxies:active, galaxies:ISM, galaxies:jet

1. Introduction

Compact Steep Spectrum (CSS) and GHz Peaked Spectrum (GPS) objects are powerful extragalactic radio sources with projected linear sizes of the order of ∼20 kpc. They are considered young active galactic nuclei (AGN) with ages varying between 10^2 and 10^3 years. Also, in these sources, the jet is still crossing the Interstellar Medium (ISM) and the interaction with the ISM is stronger than in large radio sources. Such features make CSS/GPS objects very important to our understanding of the jet evolution and the interactions between the radio source and the ISM. In this work we investigate the stellar population properties of a sample of 58 CSS/GPS obtained from catalogues publicly available in the literature (Spencer *et al.* 1989; Fanti *et al.* 1990, 2001; Kunert *et al.* 2002; Hancock *et al.* 2010; Snellen *et al.* 1998, 2004; Kunert-Bajraszewska & Labiano 2010; Stanghellini *et al.* 1998; Tengstrand *et al.* 2009; Son *et al.* 2012; Jeyakumar 2016; and Peck & Taylor 2000). The main goal is to determine the impact of the radio-jet on the circumnuclear environment of these objects.

2. Sample selection and Stellar population synthesis

Initially we found 204 CSS/GPS sources with spectroscopic redshift $z < 1$. We then searched for optical counterparts of these objects in the Sloan Digital Sky Survey (SDSS) Data Release 12 and found 75 objects with signal-to-noise ratio (SNR) greater than 3 of which 58 are clearly dominated by a strong stellar-like continuum. For these, we performed a stellar population synthesis using the STARLIGHT spectral synthesis code (Cid Fernandes *et al.* 2005a,b; Asari *et al.* 2007) following the procedure described in Riffel *et al.* (2009) and Dametto *et al.* (2014). The figure 1 show the comparison between the stellar properties derived with STARLIGHT, redshift, radio luminosity and optical morphology for the sample of 58 CSS/GPS sources with good quality spectra. The red, blue, purple and green symbols represent, respectively, the values for elliptical, spiral, irregular/merger and point sources. For each graph, we show in black the linear regression model, assuming the x axis as the independent variable. Our results indicate that our

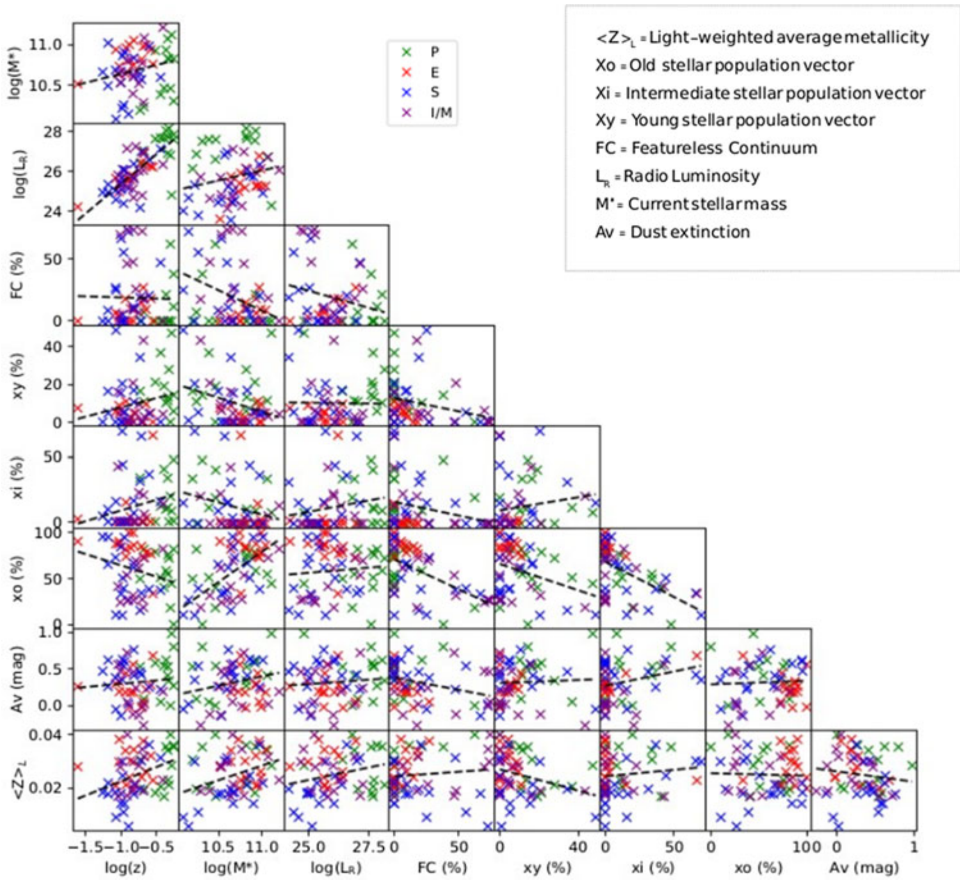

Figure 1. Comparison between redshift, radio luminosity and stellar properties. Elliptical galaxies are denoted red, spirals are blue, irregular/merger purple and point sources green. For each graph, we show in black the linear regression model, assuming the x axis variable as the independent one.

sample is dominated by intermediate to old stellar populations and there is no strong correlation between optical and radio properties of these sources.

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