ORIGINAL ARTICLE

Optical observations of bright elliptical galaxies in the Virgo cluster: stellar population and distance analysis

Michele Cantiello

Abstract The analysis of deep imaging data of bright elliptical galaxies is capable of providing fundamental information on the stellar content and the distance of the target, via the Surface Brightness Fluctuation method (SBF hereafter). Here, I present the study of the properties of two ellipticals in the Virgo cluster, NGC 4621 and NGC 4374, based on deep *BVR* imaging data obtained with the FORS2 camera at the VLT.

The *V* and *R* SBF measures are used to get accurate distances of the targets. In addition, since both galaxies hosted type Ia Supernova events, I also compare the new SBF distances with the ones based on SNe Ia lightcurve analysis. In all cases SBF distances agree well with distances obtained by other distance indicators.

For what concerns stellar population analysis, I present a detailed comparison between SBF data and models to constrain the properties of the dominant stellar components. Among the other results, the measures presented here seem to suggest that the *B*-band SBF can be reconciled to model predictions only through the presence of a percentage of hot-HB stars "polluting" the old and metal rich dominant stellar population.

M. Cantiello (✉)
INAF-Osservatorio Astronomico di Teramo, via M. Maggini snc, 64100, Teramo, Italy
e-mail: cantiello@oa-teramo.inaf.it

1 Introduction

In the past two decades, the SBF method (Tonry and Schneider 1988) has proved to be an accurate and precise distance indicator and a powerful tracer of stellar population properties (e.g. Jensen et al. 2003; Raimondo et al. 2005). The SBF magnitude is defined as the ratio of the second to the first moment of the stellar luminosity function in the galaxy, implying that (i) SBF magnitudes are linked to the properties of the stars in the galaxy; (ii) the SBF signal is dominated by the brightest stellar component in the galaxy because of the dependence on the second moment of the luminosity function; (iii) since the brightest phase in a stellar population is wavelength dependent, SBF magnitudes in different passbands are sensitive to the properties of stars in different evolutionary stages (Worthey 1993).

Here I present the results of a multi-band SBF study based on archival *BVR* observations taken with the FORS2 camera of the VLT for two bright ellipticals in the Virgo cluster: NGC 4621 and NGC 4374. With this sample of measurements, I investigate the properties of the two galaxies using the SBF technique under its twofold aspects of distance indicator (Sect. 3) and tracer of stellar population properties (Sect. 5). Moreover, since the target galaxies have hosted three SNe Ia events—SN 1939B in NGC 4621, SN 1957B and SN 1991bg in NGC 4374—I also present a detailed comparison between these two fundamental distance indicators (Sect. 4).

2 The data

The FORS2 *BVR* science images of NGC 4621 and NGC 4374, were retrieved from the ESO archive together with the calibration files (bias, flat, field of standard stars).