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Determination of the OB stellar population of IZw18 on the basis of its H_γ and H_δ absorption lines

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Abstract.
On the basis of new spectroscopic observations of the blue compact dwarf galaxy IZw18 in the narrow spectral range between 4000Å and 4500Å absorption components of H_γ and H_δ lines were discovered. Equivalent widths of H_γ and H_δ lines have been measured. From available data the OB population of IZw18 was analyzed.

1. Introduction

IZw18 is the prototype of an isolated low metallicity blue compact dwarf galaxy experiencing an intense episode of star formation (Miguel Mas-Hesse & Kunth; 1998). During the last few years more than 120 scientific papers have been addressed to this galaxy.

The morphology of IZw18 has been extensively studied. The existence of an older population underlying the present young stellar population was discussed by several authors (Loose & Thuan 1986).

The very existence of Balmer absorption lines in the spectrum of this galaxy is the marker of its massive stellar population. From new high dispersion deep spectral observations of the galaxy IZw18, absorption components for H_γ and H_δ lines were discovered. In this poster, the results are presented and the contribution of the OB stellar population was determined.

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2. Observations, data reduction and results

The spectra of IZw18 were obtained at the OHP 193cm telescope. The equipment used was the CARELEC spectrograph. Spectra have been taken in the blue, between 4000Å and 4500Å with a dispersion of 33Å/mm. For the interpretation, published equivalent widths of OB stars have used (Cananzi et al.; 1993).

The data have been reduced using IRAF package. The wavelength calibration was done with a IRAF procedure relying on the argon spectrum. The one-dimensional spectra have been derived from the two-dimensional ones by averaging the CCD columns illuminated by the object. These one-dimensional spectra have been normalized by taking the continuum windows into account (Fig. 1). After removing of the emission components, equivalent widths of the Balmer H_γ and H_δ absorption lines were computed (Fig. 2).

The obtained equivalent widths are the following:

(1) $\mathrm{EW}(H_\gamma) = 2.38\text{Å} \pm 0.1$

(2) $\mathrm{EW}(H_\delta) = 2.51\text{Å} \pm 0.1$

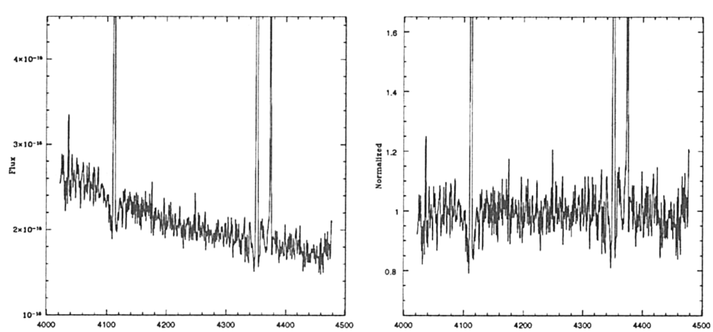

Figure 1. Left: The spectrum of IZw18 in the narrow spectral range between 4000Å and 4500ÅRight: The normalized spectrum of IZw18 in the same spectral range.

3. Discussion

A galactic spectrum is the sum of the spectra of individual stars with different characteristics. Other factors, like star velocity dispersion for instance, also play a role in the final appearance of a galactic spectrum.

Synthetic equivalent widths have been calculated using the tabulated equivalent widths of H_γ and H_δ lines for the OB main sequence stars (Cananzi et al.; 1993)

The stars are combined by O type and B type. The average equivalent width of O and B type stars was calculated. For the O type stars the average equivalent width of H_γ and H_δ lines are 2.32Å and 2.48Å respectively, for the B type stars the average equivalent width of H_γ and H_δ lines are 6.84Å and

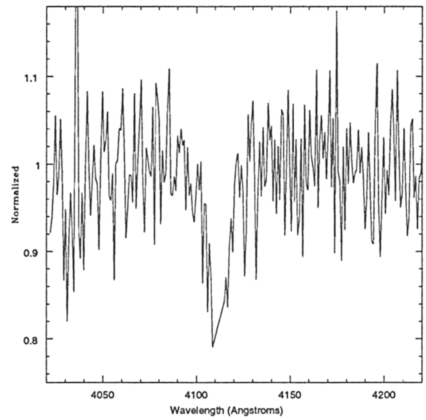

Figure 2. Smoothed spectrum. Absorption component of H_δ line of IZw18 after removing of emission line.

7.1Å respectively. Taking to account the calculated equivalent widths (1) and (2) from our observed spectra we can make up following equations:

(3) $2.32k_O + 6.84k_B = 2.38$, for H_γ line

(4) $2.48k_O + 7.1k_B = 2.51$, for H_δ line

Where k_O is a coefficient for O type stars and k_B is a coefficient for B type stars.

From (3) and (4) we obtain

$k_O \approx 0.55$,

$k_B \approx 0.16$

Now we can deduce the relative contribution of the OB stars as follows:

$$\alpha_O = \frac{k_O}{k_O + k_B} = \frac{0.55}{0.55 + 0.16} \approx 0.77,$$

$$\alpha_B = \frac{k_B}{k_O + k_B} = \frac{0.16}{0.55 + 0.16} \approx 0.23$$

Where α_O is the percentage of the O type stars (77%) and α_B is the percentage of the B type stars (23%).

Further work is in progress in a sample of 7 starburst galaxies.

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