

The field of Lacerta OB1[†]

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Abstract. We present a new analysis of the Galactic structure in the field of Lacerta. The investigation uses precise *uvby* photometry and the recalculated *Hipparcos* parallaxes to provide an improved homogeneous distance scale to the main stellar groups in the field. The OB association Lac OB1 (Lac OB1b) is reliably identified as a very compact young group at an average distance of 520 ± 80 pc. The characteristics of the older Lac OB1a group and the open cluster NGC 7243 are extensively studied based on photometric diagrams and the inferred distances. A good agreement between the photometry-derived distances and the recalculated *Hipparcos* parallaxes is found for the Lac OB1 group, but in general discrepancies still exist for this particular field.

Keywords. stars: distances, open clusters and associations: individual (Lac OB1), stars: individual (10 Lac)

1. Introduction

Harboring one of the nearest OB associations, the field of Lacerta presents a unique opportunity to study the influence of massive stars on the interstellar medium. A reliable reconstruction of the star-forming history of the field should be possible once the spatial distribution of the young stars has been determined reliably. Despite extensive efforts to clarify the basic structural parameters of and distances to the young stellar groups in Lacerta, discrepancies still remain in published studies.

The field considered in this contribution extends between 90° and 110° Galactic longitude and from -25° to -5° in Galactic latitude. All available *uvby* photometry of O and B stars within this coordinate range was extracted from the catalog of Hauck & Mermilliod (1998). The sample contains 55 stars with complete photometry and homogeneously derived color excesses and distances. The color excesses were obtained using the calibration of Crawford (1978) for luminosity III, IV, and V, and based on the calibration of Kilkenny & Whittet (1985) for luminosity classes II, Ib, Iab, and Ia. The calibration of Balona & Shobbrook (1984) was used for all stars to derive absolute magnitudes. The photometry-derived stellar parameters are used to study the stellar content, the distribution of interstellar absorption and the structure of the field to reveal spatially coherent groups and layers, and provide precise stellar distances to the main apparent groupings in this direction (Kaltcheva 2009).

2. Results

Based on the derived photometric distances used in conjunction with the photometric diagrams, Lac OB1 (Lac OB1b; Blaauw 1958) is identified as a compact group of 12 low-reddening main-sequence stars located at a distance of 520 ± 20 pc in the direction

[†] The full poster (in pdf format) is available at
<http://www.astro.iag.usp.br/~iaus266/Posters/pKaltcheva.pdf>.

$l = 96.4^\circ$, $b = -16.6^\circ$. The available radial-velocity and proper-motion measurements support the impression that this is a real group. The recalculated *Hipparcos* parallaxes (van Leeuwen 2007) provide a much better agreement with the photometric parallaxes of the stars of the Lac OB1 group than the original *Hipparcos* values.

The stars in the northeastern part of the field (Lac OB1a group; Blaauw 1958) do not form a physical group, but are rather located in a layer between 140 and 400 pc, with some more distant stars towards $l \sim 104^\circ$. For this subsample, a disagreement between the photometric and the recalculated *Hipparcos* parallaxes is still present. Based on the brightest members, an estimate of 678 ± 50 pc is obtained for the distance to the open cluster NGC 7243, which is in good agreement with that obtained by Jilinski *et al.* (2003).

The photometric distance to the O9V star 10 Lac (HD 214680) is estimated at 715_{-92}^{+107} pc. Although there is agreement within the errors, this photometric distance is considerably larger than the estimate of 529_{-50}^{+70} pc based on the new *Hipparcos* parallax (van Leeuwen 2007). However, the agreement with the recalculated parallax is much better in comparison to the old *Hipparcos* estimate of 325_{-55}^{+82} pc. This star is a standard star for $H\beta$ photometry, with numerous $uvby\beta$ measurements collected. The star does not show peculiar behavior in the photometric diagrams. Since the $uvby\beta$ photometric distance in general is not influenced by rotation (Kaltcheva & Knude 1998), the photometric distance of 715 pc should be considered reliable. It is difficult, however, to conclude whether or not Lac 10 is a member of the Lac OB1 association. Photometrically, the star is significantly more distant than the Lac OB1 group. On the other hand, the radial velocity for 10 Lac suggests that the star might indeed be a member of the association.

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