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Chemical analysis of a new kinematically identified stellar group

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Abstract. We have started a study of chemical composition of a new kinematically identified group of stars in the Galactic disc. Based on dynamical properties those stars were suspected to belong to a disrupted satellite. The main atmospheric parameters and chemical composition were determined for thirty-two stars from high resolution spectra obtained at the Nordic Optical Telescope with the spectrograph FIES. In this contribution the preliminary results of chemical composition study are presented. The metallicity of the investigated stars lie in the interval –0.2 < [Fe/H] < –0.6, their abundances of oxygen and alpha-elements are overabundant in comparison to the Galactic thin disc dwarfs at this metallicity range. This provides further evidences of their common and possibly extragalactic origin.

Key words. Stars: abundances – Galaxy: evolution – Galaxy: disc – Galaxy: formation

1. Introduction

Ancient mergers of dwarf galaxies are believed to play an important role in the formation of the Milky Way galaxy. Evidences of small dwarf galaxy mergers to our Galaxy are the Sagittarius (Ibata et al. 1994) and Canis Major (Martin et al. 2004) dwarf irregular galaxies. However, there is much harder to discern relicts of past accretion events in the galactic disc, where spatial, kinematic and metallicity distributions overlap.

Helmi et al. (2006), using the F- and G-type dwarf star survey by Nordström et al. (2004), identified three new coherent groups of stars. Simulations of conserved orbital parameters suggest that those stars might correspond to remains of disrupted satellites. Stars in those groups have distinct kinematics, metallicity [Fe/H] and age distribution, providing evidences of their extragalactic origin.

According to Helmi et al., one of the newly identified groups (Group 2) contains 86 stars and shows evidences of three populations with ages of 8 Gyr (15 %), 12 Gyr (36 %) and 16 Gyr (49 %), respectively. We started to investigate the detailed chemical composition of stars in this group.

Detailed chemical abundances are the key tools to reveal the origin of such stellar groups. Using the high resolution spectra we measure

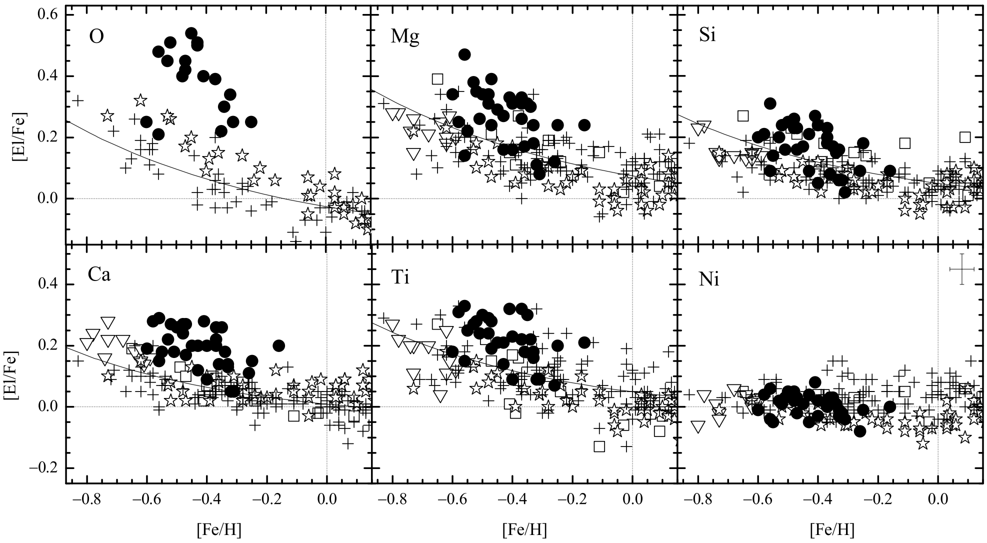

Fig. 1. [El/Fe] ratio as a function of [Fe/H] in the investigated stars suspected to belong to a disrupted satellite (filled circles). The data for the Milky Way disc dwarfs are taken from Edvardsson et al. (1993, plus sings), Bensby et al. (2005, stars), Reddy et al. (2006, squares), Zhang & Zhao (2006, triangles). The Galactic thin disc chemical evolution model is shown by the solid line (Pagel & Tautvaisiene 1995).

abundances of oxygen, α-elements and iron group elements and make a comparison with Galactic thin disc stars. Here we present the preliminary results for the stars of the Group 2. All the details about the method of analysis can be found in Stonkutė et al. (2012).

2. Results and conclusions

Our investigations show that the sample of stars is chemically homogeneous (Fig. 1) which supports a common origin of those stars. The averaged value of [Fe/H] for the stars investigated in the Group 2 is −0.4 ±0.1 dex. The iron-group element to iron abundances are close to solar while the mean abundances of oxygen and α-elements are overabundant in comparison to the Galactic thin disc dwarfs and the Galactic thin disc chemical evolution model by Pagel & Tautvaisiene (1995). The distinct chemical composition together with the kinematic properties give further evidences that the Group 2 stars might be of the extra-galactic origin.

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