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STRONTIUM ABUNDANCES IN COOL DWARF STARS OF GALACTIC THIN AND THICK DISKS

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ABSTRACT. We revise the strontium abundances in FGK stars with metallicities ranging from $-1.0 < [\text{Fe}/\text{H}] < +0.3$. The observed stars belong to the substructures of the Galaxy thick and thin discs. The observations were conducted using the 1.93 m telescope at Observatoire de Haute-Provence (OHP, France) equipped with the echelle type spectrographs ELODIE and SOPHIE. The values of the Sr abundance were obtained using synthetic spectra using LTE model atmosphere. The comparison of our data with models of chemical evolution was made.

Keywords: stars: abundances

Strontium, as one of the abundant neutron-capture elements, has been extensively investigated in the past few decades. The data obtained will allow exploring ways of production and enrichment by strontium of the galactic substructures and the Galaxy generally.

The high-resolution echelle spectrographs SOPHIE ($R = 75000$) and ELODIE ($R = 42000$) on board 1.93m telescope of OHP (France) for the wavelengths range 4400–6800 Å were used. Spectral processing carried out by (Katz et al., 1998; Galazutdinov, 1992).

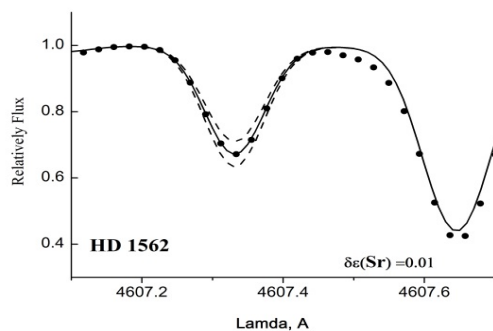


Figure 1: Spectrum synthesis fitting of observed profiles of SrI line 4607 Å

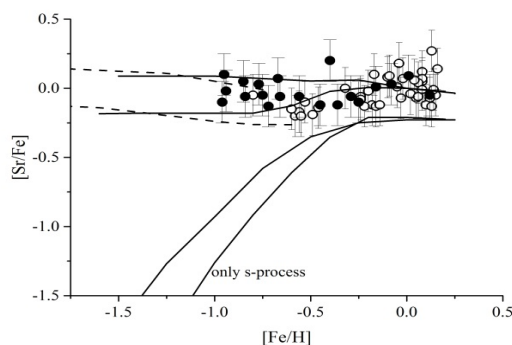


Figure 2: The run of $[\text{Sr}/\text{Fe}]$ with $[\text{Fe}/\text{H}]$.

The effective temperatures T_{eff} , the surface gravities $\log g$, the microturbulent velocity V_t , and metallicities of the studied stars were estimated earlier in our paper (Mishenina et al., 2013; Kovtyukh et al., 2003).

Determination of the Sr abundance was made by STARSPT LTE spectral synthesis code (Tsymbal, 1996) from the Sr I line 4607 Å. The example of comparison of synthetic and observed spectra for Sr line is shown in Fig.1. The mean determination error is ± 0.15 . Departures from NLTE for 4607 Å: the correction is positive, from 0.1 to 0.2 dex (Bergemann et al., 2012). The dependence of the obtained LTE strontium abundance versus $[\text{Fe}/\text{H}]$ is presented in Fig.2. The thin and thick disc stars are marked as open and black circles, correspondingly.

Results & conclusions

To provide diagnostics of the types of n-capture processes forming Sr, we used the calculations of the Galactic enrichment by Travaglio et al. (2004) and Serminato et al. (2009). Both these models taken into account the contribution of s-process yields from asymptotic giant branch (AGB) stars and a primary (weak s-process component) and r-process production in the Galaxy from Type II supernovae stars (bottom line – Serminato et al. (2009), top – Travaglio et al. (2004) for thin disc and by dotted line for thick at Fig.2). The primary process (or LEPP) is also taken into account in model of Travaglio et al. (2004). Serminato et al. (2009) used first the r-process residual method ($s = 1 - r$) and then the r – contribution from Type II Supernovae. Both models (Travaglio et al., 2004; Serminato et al., 2009) describe quite the behavior of a thin disc stars, albeit in some different ways. Note, the models which consider only the contribution in n-capture enrichment from s-process do not depict well the observation.

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