Setting the scene for Gaia and LAMOST
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The abundance distribution of [α/Fe] in the Galactic disk stars

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Abstract. The abundance ratio [α/Fe] is a useful tracer to probe the history of star formation and the chemical evolution of the Galaxy. We present a statistical analysis of [α/Fe] in 953 dwarf stars to investigate the distributions of [α/Fe] in the the thin- and thick-disk stars.

Keywords. Galaxy: disk, stars: abundances, stars: kinematics, stars: fundamental parameters

1. Introduction

Whether the distribution of [α/Fe] ratios is continuous or separated between the thin- and thick-disks is still in controversy both for high-resolution (e.g., Bensby *et al.* 2003; Chen *et al.* 2000) and low-resolution observations (e.g., Lee *et al.* 2011; Bovy *et al.* 2012). We present a statistical analysis for the distributions of [α/Fe] with the metallicity [Fe/H], the kinematical parameters U,V,W, and the orbital parameters $R_{\rm m}$ and $z_{\rm max}$ in the Galactic disk stars.

2. Stellar sample

Our sample stars were compiled from 18 works of abundance analysis based on high-resolution stellar spectra (Edvardsson *et al.* 1993, Nissen & Schuster 1997, Jehin *et al.* 1999, Prochaska *et al.* 2000, Fulbright 2000, Chen *et al.* 2000, Mishenina & Kyukh 2001, Mishenina *et al.* 2004, Fuhrmann *et al.* 2004, Reddy *et al.* 2003, 2006, 2008, Bensby *et al.* 2003, 2005, Grraton *et al.* 2003, Jonsell *et al.* 2005, Brewer & Carney 2006, Zhang & Zhao 2006), which is consist of 953 dwarf stars including 672 thin- and 281 thick-disk stars classified by the criteria of pure kinematics (Bensby *et al.* 2003).

3. Results and conclusions

Fig. 1 shows the Toomre diagram of our sample sample stars. The distributions of [α/Fe] ratios with the metallicity [Fe/H] and the mean Galactocentric distance $R_{\rm m}$ are shown in Fig. 2 and Fig. 3, respectively. The results show that the thick disk is a kinematically hotter and possesses higher [α/Fe] ratios than the thin disk in average, but the thin and thick disk stars can not be separated clearly with the [α/Fe] ratios. The statistical result does not support the conclusions derived from individual observations, which implies observations of small sample suffering from some selection effects. Observations from the surveys of LAMOST and GAIA will present a large and unbiased stellar sample and help us to confirm the distributions of [α/Fe] ratios in the Galactic disk stars.

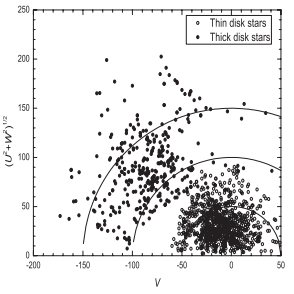

Figure 1. The Toomre diagram.

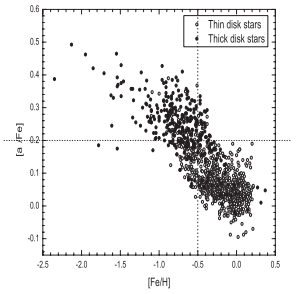

Figure 2. α/Fe] ratios vs. [Fe/H] of our sample.

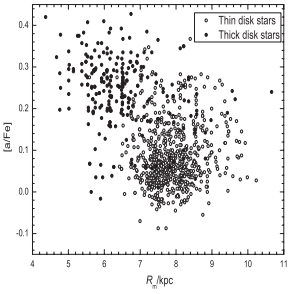

Figure 3. [α/Fe] ratios vs. $R_{\rm m}$ in thin and disk stars.

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