Astronomy and Astrophysics in the Gaia sky
Proceedings IAU Symposium No. 330, 2017
A. Recio-Blanco, P. de Laverny, A.G.A. Brown
& T. Prusti, eds.

doi:10.1017/S1743921317005749

CNO distributions in the Solar neighborhood with Gaia data

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Abstract. A spread of lifebuilding elements, such as carbon, nitrogen, and oxygen in the Galactic discs is yet not well investigated. In this study, we use spectra from the UVES spectrograph (Gaia-ESO survey) and the VUES spectograph (SPFOT-PLATO survey) and determine the carbon, nitrogen, and oxygen abundances in FGK stars using the same technique. For some of our target stars the Gaia space observatory has already presented accurate distances, thus we overview the first results of radial and vertical CNO abundance distributions in the Galactic thin and thick disc populations.

Keywords. Stars:abundances, galaxy:abundances

1. Introduction

Distributions of C, N, and O are particularly interesting in a context of the Galactic chemo-dynamical evolution studies. These elements participate in many nucleosynthetic reactions during the stellar evolution. Stars can experience dredge-ups and extra mixing processes that alter abundances of these elements in stellar atmospheres. Thus, the analysis of C, N, and O is quite complex, especially in the context of Galactic abundance distributions. Accurate stellar distances are also very important. The large astrometric *Gaia* mission is a very important source of stellar distances. In this work, we use the Tycho-Gaia astrometric solution (Michalik *et al.* 2015, Arenou *et al.* 2017) as a source of distances and the C, N, and O abundances from the Gaia-ESO survey (Gilmore *et al.* 2012) fouth internal data release and the SPFOT-PLATO survey which we are running at the Molėtai Astronomical observatory of the Vilnius University (Ženovienė *et al.* 2017).

2. Overview

Carbon and nitrogen abundances are affected by stellar evolution; however, the summed abundance of carbon and nitrogen (C+N) conserves the initial conditions of stellar formation. Thus, in order to avoid the evolutionary effects, we analyse gradients of the summed [C+N/Fe] ratios. We taged the thin and thick disc populations using alpha-element abundance-to-iron ratios similarly as in Mikolaitis *et al.* (2014) and Masseron & Gilmore (2015). We find that the radial [C+N/Fe] gradients are slightly negative for both discs (Fig. 1). Therefore, the thin disc [C+N/Fe] vertical abundance gradient is slightly negative, but the thick disc vertical [C+N/Fe] abundance gradient is slightly positive.

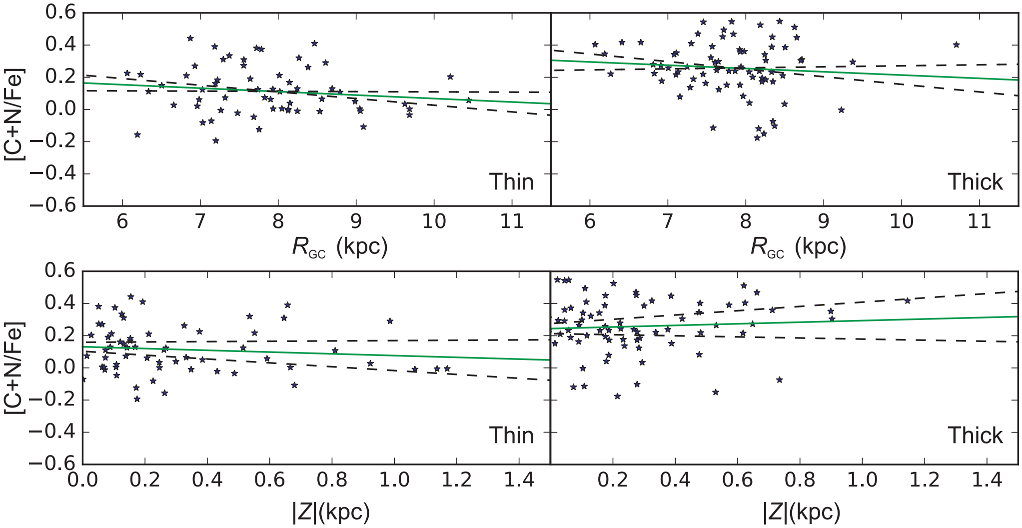

Figure 1. [C+N/Fe] radial (upper panel) and vertical (lower panel) gradients of thin and thick disc stars.

3. Implications

A good model of the Galactic chemical evolution should explain radial and vertical chemical element abundance gradients. For example, our oxygen results agree with the models of Cescutti *et al.* (2007), which assumed an inside-out build-up. However, the thick disc formation is still unclear. The data set is still insufficient to make clear conclusions, however in the future when new releases of high-resoluton spectroscopic surveys will be opened and the *Gaia* distances from DR2 will be provided, C, N and O abundance distributions will be studied with much higher precision.

Acknowledgements

This work has made use of data from the European Space Agency (ESA) mission *Gaia* (https://www.cosmos.esa.int/gaia), processed by the *Gaia* Data Processing and Analysis Consortium (DPAC, https://www.cosmos.esa.int/web/gaia/dpac/consortium). Funding for the DPAC has been provided by national institutions, in particular the institutions participating in the *Gaia* Multilateral Agreement. Based on data products from observations made with ESO Telescopes at the La Silla Paranal Observatory (programme ID 188.B-3002) and from observations at the Molėtai Astronomical Observatory of Vilnius University (funded by the Research Council of Lithuania, LAT-16019).

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Ženovienė, R., Mikolaitis, Š., Gražina Tautvaišienė, *et al.* 2017, *IAUS 330*, *in press*

https://doi.org/10.1017/S1743921317005749 Published online by Cambridge University Press