Highlights of Astronomy, Volume 15
XXVIIth IAU General Assembly, August 2009
Ian F. Corbett, ed.

doi:10.1017/S1743921310011683

Abundance gradients: tracing the chemical properties of the disk

Roberto D.D. Costa[1] **and Walter J. Maciel**[1]

[1]Depto. de Astronomia, IAG/USP, Rua do Matão 1226, 05508-090, São Paulo/SP, Brazil
email: roberto@astro.iag.usp.br, maciel@astro.iag.usp.br

Abstract. Abundance gradients are key parameters to constrain the chemical evolution of the galactic disk. In this review recent determinations for the radial gradient are described, including its slope as derived from different objects such as planetary nebulae, HII regions, cepheids, or B stars, and for different elements. Inner and outer limits for the radial gradient, as well as its time evolution, both related to the chemical evolution of the Galaxy, are also described. The possible existence of azimuthal and vertical gradients is also discussed.

Keywords. Galaxy: abundances, Galaxy: disk, Galaxy: evolution

1. Introduction

The existence of abundance gradients in the Milky Way has been known for a long time now. It can be traced using different objects such as HII regions, planetary nebulae, cepheids, B-stars or open clusters. Another important point that appears in both observational data and models is the temporal variation of the gradient, in the sense that younger objects display a flatter gradient. Results are less clear, however, when vertical or azimuthal abundance variations are investigated.

2. Summary of the results

Starting with early studies concerning the solar neighborhood, the radial gradient is now well established. Recent works such as Rudolph *et al.* (2006) or Costa & Maciel (2006) review this gradient, and despite some discrepancies concerning the true slope for each tracer, the results are qualitatively in agreement. They all show the gradient keeping the same slope from the inner edge of the disk up to nearly 10 kpc. Beyond this point results are less clear. Many of them indicate a flattening, which is consistent with the hypothesis of lower star formation rates at large galactocentric distances compared to those in more central regions. Time variation in the radial gradient appears when progenitors with different ages are used to trace it (for details, see Maciel *et al.* 2006).

There is a well known decrease in abundances when comparing thin disk, thick disk, inner halo and outer halo populations, and evidences of a *stricto sensu* vertical gradient now begin to appear (e.g., from the SDSS data). On the other hand, although some results indicate that different galactic longitudes may present distinct average abundances, currently it is not possible to define an azimuthal gradient throughout the galactic disk.

References

Costa, R. D. D. & Maciel, W. J. 2006, *Proc. IAU Symp. 234*, 243
Maciel, W. J., Lago, L. G., & Costa, R. D. D. 2006 *A&A* 453, 587
Rudolph, A. L., Fitch, M., Bell, G. R. *et al.* 2006, *ApJS* 162, 343