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H II REGIONS AND PROTOSOLAR ABUNDANCES IN GALACTIC CHEMICAL EVOLUTION

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RESUMEN

Presentamos modelos de evolución química del disco galáctico con diferentes rendimientos dependientes de Z. Encontramos que una tasa moderada de pérdida de masa en estrellas masivas de metalicidad solar produce un excelente ajuste con los gradientes de C/H y C/O del disco de la Galaxia. El mejor modelo reproduce: las abundancias de H, He, C y O derivadas de líneas de recombinación en M17, las abundancias protosolares y las relaciones C/O-O/H, C/Fe-Fe/H y O/Fe-Fe/H derivadas de estrellas de la vecindad solar. La concordancia del modelo con las abundancias protosolares implica que el Sol se originó a una distancia galactocéntrica similar a la actual. El modelo para $r = 3$ kpc implica que una fracción de las estrellas en la dirección del bulbo se formó en el disco interno. Nuestro modelo reproduce la relación C/O-O/H derivada de regiones H II extragalácticas en galaxias espirales.

ABSTRACT

We present chemical evolution models of the Galactic disk with different Z-dependent yields. We find that a moderate mass loss rate for massive stars of solar metallicity produces an excellent fit to the observed C/H and C/O gradients of the Galactic disk. The best model also fits: the H, He, C, and O abundances derived from recombination lines of M17, the protosolar abundances, and the C/O-O/H, C/Fe-Fe/H, and O/Fe-Fe/H relations derived from solar vicinity stars. The agreement of the model with the protosolar abundances implies that the Sun originated at a Galactocentric distance similar to the one it has now. Our model for $r = 3$ kpc implies that a fraction of the stars in the direction of the bulge formed in the inner disc. We obtain a good agreement between our model and the C/O versus O/H relationship derived from extragalactic H II regions in spiral galaxies.

Key Words: galaxies: abundances — galaxies: evolution — Galaxy: bulge — H II regions — ISM: abundances — Sun: abundances

1. INTRODUCTION

The comparison of detailed Galactic chemical evolution models, GCE models, with accurate abundance determinations of stars and gaseous nebulae provides a powerful tool to test the chemical evolution models and the accuracy of observational abundance determinations of stars of different ages and of H II regions located at different galactocentric distances.

In this paper we will compare our models with stellar and H II region abundances to test if the H II region abundances derived from recombination lines agree with the stellar abundances, in particular with the protosolar abundances that correspond to those present in the interstellar medium 4.5 Gyr ago. Also, our GCE models can be used to constrain the C yields for massive stars. The C yield is not well known and we will vary it to obtain the best fit between our GCE models and the observational data.

Carigi & Peimbert (2008, hereinafter Paper I) presented chemical evolution models of the Galactic disk for two sets of stellar yields that provided good fits to: (a) the O/H and C/H gradients (slope and absolute value) derived from H II regions based on recombination lines (Esteban et al. 2005) and includ-