Revista Mexicana de Astronomía y Astrofísica, **47**, 3–14 (2011)

FUNDPAR: A PROGRAM FOR DERIVING FUNDAMENTAL PARAMETERS FROM EQUIVALENT WIDTHS

C. Saffe

Instituto de Ciencias Astronómicas, de la Tierra y del Espacio (ICATE), San Juan, Argentina

Received 2 July 2010; accepted 14 September 2010

RESUMEN

Implementamos un programa en Fortran que determina parámetros fundamentales de estrellas de tipo solar, a partir de anchos equivalentes del Fe. La solución debe verificar tres condiciones en el método estándar: equilibrio de ionización, equilibrio de excitación e independencia entre abundancias y anchos equivalentes. Calculamos modelos de atmósfera de Kurucz con opacidades NEWODF. Detalles como el parámetro de longitud de mezcla, el sobre impulso convectivo, etc. se calculan con un programa independiente. FUNDPAR calcula las incertezas por dos métodos: el criterio de Gonzalez & Vanture (1998) y utilizando la función χ^2. Los resultados derivados con FUNDPAR están de acuerdo con determinaciones previas en la literatura. En particular obtuvimos parámetros fundamentales de 58 estrellas con exoplanetas. El programa está disponible en la red[1].

ABSTRACT

We implemented a Fortran code that determines fundamental parameters of solar type stars from a list of Fe line equivalent widths. The solution should verify three conditions in the standard method: ionization equilibrium, excitation equilibrium and independence between metallicity and equivalent widths. Solar-scaled Kurucz model atmospheres with NEWODF opacities are calculated with an independent program. Parameter files control different details, such as the mixing-length parameter and the overshooting. FUNDPAR derives the uncertainties following two methods: the criterion of Gonzalez & Vanture (1998) and the dispersion using the $\chi 2$ function. The code uses the 2009 version of the MOOG program. The results derived with FUNDPAR are in agreement with previous determinations in the literature. The program is freely available from the web[1].

Key Words: stars: abundances — stars: fundamental parameters

1. INTRODUCTION

Different methods have been used in the literature to derive fundamental parameters and metallicities of solar type stars. For instance, some studies begin with a photometric estimation of temperature and gravity and then derive the metallicity using equivalent widths. Useful codes such as WIDTH9 (Kurucz 1993; Kurucz 1995, private communication) or BLACKWEL[2] (an implementation of the Blackwell method) are widely used in the literature (e.g., Saffe & Levato 2004). However, the temperature and gravity are usually considered as fixed parameters. The observed stellar spectra could be compared with a grid of previously calculated synthetic spectra (e.g., Fischer & Valenti 2005; Saffe et al. 2008) to determine fundamental parameters. However, in this case the instrumental broadening should be taken into account and the rotational velocity could be considered as another independent parameter.

Recently, Sousa et al. (2010) derived an effective temperature calibration based on line equivalent width ratios of different absorption lines. Also, the equivalent widths of Fe lines could be used to determine the parameters of solar type stars. The solution should verify three conditions in the standard

[1] `http://icate-conicet.gob.ar/saffe/fundpar/`.

[2] `http://www1.appstate.edu/dept/physics/spectrum/spectrum.html`.