TABLE 3

PARAMETERS ADOPTED IN DIFFERENT CASES (A,...,E) FOR 5 SAMPLE STARS (SEE TEXT FOR DETAILS)

Run	ML	W	D
A	1.25	1	2
B	1.25	0	2
C	1.32	1	2
D	1.25	1	1
E	1.25	1	0

problem of the downhill method. If the code reaches a solution with $\chi^2 > 1$, then the program restarts the iteration process using the last solution as a new initial condition. The restart is recomended by Press et al. (1992) in the downhill method to eliminate a probable local minimum of the function. The code restarts the iteration process only once. The user also could manually restart the process using the last solution, for instance, as the new initial condition and FUNDPAR will try to reach a solution with a smaller χ^2.

4. DERIVATION OF THE MODEL ATMOSPHERES

Together with the FUNDPAR code, we provide another independent program called `atlas.launcher`, which prepares and executes the Kurucz's ATLAS9 in LTE. As input of `atlas.launcher` the fundamental parameters $T_{\rm eff}$, $\log g$, [Fe/H] and ξ are used. The output is an ATLAS solar-scaled model atmosphere corresponding to these parameters. The program uses a parameter file called `atlas.par` that contains different parameters used by ATLAS, such as the mixing-length parameter (usually taken as 1.25), and the overshooting weight parameter W, defined in Castelli, Gratton, & Kurucz (1997). A list of files used by ATLAS (grid of precalculated models, Rosseland and ODFs, and a sample of `atlas.par`) is presented in the file `install.txt`.

Then, the model atmosphere and the equivalent widths are introduced in the MOOG program. We incorporated in this code the solar abundances of Grevesse & Sauval (1998) instead of the original from Anders & Grevesse (1989), except for Fe for which we adopted [Fe/H]=7.47 dex. The NEWODF opacities use these abundance values (Castelli & Kurucz 2003). MOOG use a parameter file (`batch.par`) where some options[6] could be modified, such as the molecular equilibrium and the van der Waals line damping options.

Literature authors have different preferences for the choice of ATLAS and MOOG parameters. The user is free to modify the parameters according to his/her own criteria, and then FUNDPAR will find the corresponding solution. To give an idea of the sensivity of the results, we rederived the fundamental parameters of 5 sample stars (HD 106252, HD 177830, HD 190228, HD 195019 and HD 202206) using different combinations of the parameters. In the Table 3 we show the values of the parameters adopted in different calculations A,...,E. The parameters shown are the mixing-length parameter (ML), the overshooting parameter (W) and the line damping option (D). We start the execution of case A adopting ML=1.25, W=1 and D=2. In case B we switched off the overshooting, while in case C we adopted a slightly higher ML. In cases D and E we used different options for the line damping.

The variation of $T_{\rm eff}$, $\log g$, [Fe/H] and ξ (adopting different ML, W and D) is different from star to star. For instance, varying W increases the $T_{\rm eff}$ for some stars, and decreases it for others. Probably the variation depends on the fundamental parameters of the stars. Then, in the Figure 1 we show the difference (called Δ) between the parameters derived for case A and the parameters derived for cases B, C, D and E. The differences are plotted vs. $T_{\rm eff}$ only for the 5 stars previously mentioned. All differences are derived with respect to case A. The symbols used in the panels are filled circles (results B-A), diagonal crosses (results C-A), empty circles (results D-A) and squares (results E-A). The panels seems to show a slight dependency on $T_{\rm eff}$. Switching on/off the overshooting (case B), $\Delta T_{\rm eff}$, $\Delta \log g$ and Δ[Fe/H] seem to show a dependency on $T_{\rm eff}$. Increasing ML from 1.25 to 1.32 (case C), we find no clear tendency and the differences are small. Using the damping option 1 instead of 2 (case D), $T_{\rm eff}$, $\log g$ and [Fe/H] increase by an average of $\sim$48 K, $\sim$0.14 dex and $\sim$0.05 dex, respectively. Using the damping option 0 (case E), $T_{\rm eff}$, $\log g$, [Fe/H] and ξ increase by an average of $\sim$70 K, $\sim$0.20 dex, $\sim$0.06 dex and $\sim$0.1 km s^{-1}, respectively. We caution that these preliminary differences have been derived using only 5 stars. A larger number of stars is needed to properly determine how the parameters ML, W and D modify the derived fundamental parameters.

[6]For a complete list of options, see the manual of the MOOG program, `http://verdi.as.utexas.edu/moog.html`.