TABLE 2

LIST OF THE INPUT AND OUTPUT FILES USED BY FUNDPAR

Filename	Directory	Comment
Input Files:		
`filenames.txt`	`datain`	List of files containing the equivalent widths
`hd001.txt`	`datain`	Equivalent widths of the star HD 001
...	...	...
`hd999.txt`	`datain`	Equivalent widths of the star HD 999
Parameter Files:		
`atlas.par`	`atlas.launcher`	Parameters used by ATLAS
`batch.par`	FUNDPAR	Parameters used by MOOG
`fundpar.par`	FUNDPAR	Parameters used by FUNDPAR
Output Files:		
`hd001.mod`	`dataout`	Model atmosphere of HD 001 from ATLAS9
`hd001.out1.txt`	`dataout`	Output file 1 from MOOG
`hd001.out2.txt`	`dataout`	Output file 2 from MOOG
...	...	...
`output1.screen`	`dataout`	Similar output to the screen
`output2.results`	`dataout`	Table of results for all the stars

termination. The file `output1.screen` displays similar information on the screen and `output2.results` lists the final parameters and their uncertainties.

3. THE DOWNHILL SIMPLEX METHOD: MINIMIZATION OF χ^2

In this section we briefly review the minimization procedure for χ^2 as a function of four independent variables, using a Numerical Recipes routine called `amoeba` (Press et al. 1992). The downhill simplex method is due to Nelder & Mead (1965) and requires only function evaluations, not derivatives. A simplex could be considered to be a geometrical figure of $N+1$ vertices in N-dimensional space (in our case, $N=4$). Taking any vertex as the origin, then the four other points define possible vector directions in the 4-dimensional volume.

The downhill simplex method starts with a group of $N+1$, i.e., 5 vertices rather than a single point or vertex. These vertices are displaced with a scale length characteristic of the problem. In our case, χ^2 is initially calculated adopting displacements of 200 K, 0.1 dex, 0.1 dex and 0.1 km s^{-1} for the variables $T_{\rm eff}$, $\log g$, [Fe/H] and ξ, respectively. The characteristic lengths could be modified in the file `fundpar.par` (see Table 1). FUNDPAR executes an initial calculation of χ^2 at the vertices of the simplex, before the iteration process begins. Then, the downhill method takes a series of steps, usually moving the highest point of the simplex, i.e., where χ^2 is maximum. Succesive steps could be visualized as reflections, expansions and contractions of the 4-dimensional object. When the simplex finds a valley, it contracts itself down the valley. An appropriate sequence of these steps will converge to the minimum of χ^2.

As explained by Press et al. (1992), the termination criterion is usually delicate in the minimization process. The program requires that the decrease in the function value in the terminating step be fractionally smaller that some tolerance (variable `ftol` within the `amoeba` subroutine). The method just described exactly follows Nelder & Mead (1965). However, in practice we found that for some stars the routine converges in a few iteration steps to a solution with $\chi^2 \gg 1$. In such cases the code decreases the tolerance and continues the iteration process from the last point. We verified that it is not necessary in this case to restart the process, because the effect of modifying the tolerance determines only at which iteration the program stops. We also note that decreasing the tolerance does not guarantee convergence of the solution: we are only modifying the termination step or the termination criterion.

With the adopted values of w_1,...,w_4, the program usually takes less than $\sim$200 iterations to reach a solution. The number of iterations is a known