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Catalogs of temperatures and [Fe/H] averages for evolved G and K stars*

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Abstract. A catalog of mean values of [Fe/H] for evolved G and K stars is described. The zero point for the catalog entries has been established by using differential analyses. Literature sources for those entries are included in the catalog. The mean values are given with rms errors and numbers of degrees of freedom, and a simple example of the use of these statistical data is given. For a number of the stars with entries in the catalog, temperatures have been determined. A separate catalog containing those data is briefly described.

Key words: catalogs

1. Introduction

Published values of [Fe/H] are now available for more than 1000 evolved G and K stars. If those data are to be as useful as possible, it is desirable to reduce them to a common zero point, average them, and present the averages in a catalog with corresponding rms errors. This paper is the fourth in a series that considers such a catalog. In the three preceding papers, the analysis used to produce the catalog data has been described (see Taylor 1998a,b, 1999). This paper describes the catalog itself and an auxiliary catalog of derived stellar temperatures.

2. The [Fe/H] catalog

2.1. Contents

The [Fe/H] catalog contains entries for 1117 G and K stars with luminosity classes from II through IV. The contents of the catalog include

1. mean values of [Fe/H],
2. rms errors for those means,
3. numbers of degrees of freedom,
4. numbered comments,
5. literature references, and
6. a FORTRAN search program.

Reddenings derived for particular stars are included in the numbered comments. The literature references include remarks about the treatment of the input data for the catalog. The references include a number of potential data sources for the catalog that were not used. Reasons for not using those data are given with the references. Catalog users who wish to know why a particular reference was not used may find the reference by searching for the name of its first author.

The search program deserves special attention. Given an input list of HD or comparable numbers, the program compiles three output lists. One list contains primary data from the catalog, while a second list contains numbered comments. The third list includes all literature sources from which the catalog values of [Fe/H] for the input list of stars have been drawn. The search program is included for two reasons: to make it possible to use the catalog conveniently, and to encourage catalog users to cite original sources for the catalog data.

Users with questions about the analysis used to produce the catalog are encouraged to consult the following sources: Taylor (1998a) for the preparation of the analysis, Taylor (1998b) for values of [Fe/H] for standard stars, and Taylor (1999) for a description of the analysis itself and its basic results.

2.2. Statistics

Some users may find the number of degrees of freedom to be unfamiliar. To show one way in which those data may be applied, the important problem of comparing catalog

* Catalog only available at the CDS via anonymous ftp to cdsarc.u-strasbg.fr (130.79.128.5) or via http://cdsweb.u-strasbg.fr/Abstract.html

values of [Fe/H] may be considered. Given entries for stars 1 and 2, one calculates

$$\Delta[\mathrm{Fe/H}] = |[\mathrm{Fe/H}]_1 - [\mathrm{Fe/H}]_2|, \quad (1)$$

$$\sigma^2 = \sigma_1^2 + \sigma_2^2, \quad (2)$$

$$t = \Delta[\mathrm{Fe/H}]/\sigma, \quad (3)$$

and

$$\nu = (\sigma_1^2 + \sigma_2^2)^2 / (\sigma_1^4/\nu_1 + \sigma_2^4/\nu_2). \quad (4)$$

In these equations, σ is rms error, ν is number of degrees of freedom, and quantities without subscripts are net quantities. When values of t and ν have been obtained, they are used as arguments in a "two-tailed" t table[1]. If $[\mathrm{Fe/H}]_1$ and $[\mathrm{Fe/H}]_2$ differ significantly, the confidence level C obtained from the table should equal or exceed C_0, where

$$C_0^N = 0.95 \quad (5)$$

and N is the number of values of $\Delta[\mathrm{Fe/H}]$ that are currently being tested. (For more about t tests, see pp. 197–201 of Bethea et al. 1985. For a derivation of Eq. (5), see Appendix A of Taylor 1996).

3. The temperature catalog

The temperature catalog contains entries for 346 stars. Most (though not all) of those stars have entries in the [Fe/H] catalog. The contents of the temperature catalog include

1. values of $(V-K)_\mathrm{J}$,
2. rms errors for $(V-K)_\mathrm{J}$,
3. values of $\theta \equiv 5040/T_\mathrm{eff}$,
4. rms errors for θ, and
5. values of $E(B-V)$.

Readers who wish to learn about the derivation of these data should consult Sect. 5 of Taylor (1998a).

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[1] Both one-tailed and two-tailed tables are available. To make sure that a two-tailed table is being consulted, the entry for $\nu = \infty$ and 95% confidence (or 5% false-alarm probability) may be checked. That entry should be 1.960.