DETERMINATION OF T_{eff} FOR CANDIDATE STANDARD STARS BASED ON COMPARISON WITH MODEL ATMOSHPERES

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ABSTRACT. A systematic analysis, as complete as possible, of early type standard stars has been undertaken at the Astronomical Observatory of Trieste, in order to obtain a sequence of carefully determined spectroscopic data to be used in the comparison of "normal" and "chemically peculiar" stars. As an intermediate and necessary step, effective temperatures are derived. The determination of T_{eff} is performed either by comparing observed and computed flux distributions, or by using a calibration of UV-visual photometric index versus T_{eff}. The results for a sample of stars in the spectral type range B2-F8 are presented, and an analysis of the influence of the adopted value of log g on the derived T_{eff} values is reported. As a check on the validity of the results, the T_{eff} and log g values are used to construct a synthetic spectrum which is compared with the IUE high resolution observations of the stars in our list.

1. INTRODUCTION

The sample of candidate standard stars, proposed by Vladilo et al. (1983), has been selected in order to arrive at a reference sequence to be analyzed homogeneously. All these stars are bright stars, with quite low Vsin i values, already known to have solar chemical composition. To arrive at a quantitative analysis of the spectra, an accurate determination of the most important atmospheric parameter, T_{eff}, is required. We report here on the T_{eff} determination for the stars listed in Table I, and discuss the influence of the gravity values on its accuracy. The atmospheric parameters are used as input for the computation of synthetic spectra in the IUE UV region, in order to derive information about the chemical composition.

D. S. Hayes et al. (eds.), Calibration of Fundamental Stellar Quantities, 535–538.

TABLE I.

Parameters for Non-Supergiant Stars

HR	HD	Sp.	Type	E(B-V)	T1	T2	log g1	Log g2
39	886	B2	IV	0.01	21.77	21.78	3.64	4.0
153	3360	B2	IV	0.04	21.79*			
269	5448	A5	V	0.00	8.01	8.14	3.52	4.0
811	17081	B7	V	0.00	13.16	13.17	3.83	4.0
1034	21278	B5	V	0.07	15.05	15.32	3.27	4.0
1292	26462	F4	V	0.00	6.72	6.56	3.30	4.5
1380	27819	A7	V	0.00	7.99	8.22	3.56	4.5
1637	32537	F0	V	0.01	7.18*			
1810	35708	B2.5	IV	0.07	18.62	19.72	2.97	4.0
2010	38899	B9	IV	0.00	10.71	10.73	4.50	4.0
2085	40136	F1	III	0.00	7.05*			
2421	47105	A0	IV	0.02	9.43	9.28	3.39	4.0
2818	58142	A1	V	0.00	9.37*			
2943	61421	F5	IV-V	0.00	6.60	6.44	3.59	4.5
4049	90277	F0	V	0.00	7.25*			
4141	91480	F1	V	0.00	7.24*			
4359	97633	A2	V	0.00	9.55	9.38	3.20	4.0
4399	99028	F2	IV	0.04	6.86	6.94	3.58	4.5
4540	102870	F8	V	0.02	6.14	5.95	3.24	4.5
4564	103578	A3	V	0.03	-	8.12	-	4.0
5404	126660	F7	V	0.00	6.20	6.09	3.54	4.5
5447	128167	F3	V	0.00	7.03	7.03	4.33	4.5
6092	147394	B5	IV	0.01	14.84	15.00	3.72	4.0
6396	155763	B6	III	0.02	-	13.11	-	4.0
6588	160762	B3	V	0.02	17.50	17.46	3.89	4.0
7001	172167	A0	V	0.01	9.67	9.53	3.33	4.0
7371	182564	A2	III	0.00	8.65*			
7773	193432	B9.5	V	0.00	9.93	9.97	4.09	4.0
8641	214994	A1	IV	0.00	9.59	9.56	3.92	4.0
8805	218470	F5	V	0.00	6.95*			

2. MATERIALS AND METHODS

The list of 30 non-supergiant stars, with spectral types between B2 and F8, is given in Table I, together with the adopted E(B-V) corrections. For the determination of the atmospheric parameters we apply the method described in Malagnini et al. (1984), based on the comparison between observed and computed flux distributions. The observational data refer to the visual region in the wavelength range 3187-10000 Å, and are derived from the Breger Catalogue (Breger 1976). The computed data are from the grid of Kurucz' models (Kurucz 1979), with solar chemical composition. We performed the analysis keeping the gravity value fixed and leaving the three parameters, T_{eff}, log g, and angular diameter free. The Breger Catalogue lists 22 of the 30 program stars; for the 8 remaining stars, the T_{eff} values are derived by applying the calibration of the dereddened UV-Visual index, R=log (F[1965]/F[5445]), versus temperature, as proposed by Malagnini et al. (1984).

3. RESULTS

The results labelled "1" in Table I refer to the fit performed when the parameters T_{eff}, log g, and angular diameter are left free. Those labelled "2" refer to the fit performed by assuming a fixed value for log g. Temperatures are given in thousands of degrees K. The 8 results marked by * are only provisional, in the sense that a complete calibration of R versus T_{eff} is in progress. For the remaining 22 stars, the fit performed by leaving the gravity free produces results that are, in general, different from those achieved by keeping the gravity fixed. In particular, log g1 is lower than log g2, except in two cases. The differences between T1 and T2 are generally on the order of the uncertainties in the solutions, but there are some stars for which the difference is significant. Since the flux distribution for non-supergiant stars is largely independent of gravity, the log g1 values may not be very significant. Therefore, the dependence of the T_{eff}'s on log g has been analyzed by comparing the solutions obtained at log g = 3.0, 3.5, 4.0, and 4.5, respectively. For 20 out of 22 stars, there is a monotonic trend of T_{eff} with log g. This trend is positive for T_{eff}>13000 K and between 7000 and 9000 K; it is negative otherwise. The percentage of the range in T_{eff}, for different log g's, with respect to the T2 values, increases with T_{eff}, and reaches the maximum value of 11% at T2 = 21780 K.

4. REFERENCES

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DISCUSSION

ADELMAN: In your list of candidate stars, you include Omicron Peg. It is a hot Am star which is slightly metal-rich and as such does not belong with the normal stars. The increase in the metallicity has a slight effect on the derived effective temperature. Model atmospheres for such stars are not as certain as for solar composition stars.

MOROSSI: We will start with the assumption of solar abundance, but if we find a problem we will not use that star.