FUNDAMENTAL PARAMETERS OF THE ATMOSPHERES OF δ SCT-TYPE STARS

A. I. Galeev [a,b*], ***E. R. Lyumanov*** [a], ***N. A. Sakhbullin*** [a,b]

[a] *Kazan Federal University, Kazan, Russia.*

[b] *Tatarstan Academy of Sciences, Kazan, Russia.*

During 2006-2019, using the Russian-Turkish 1.5-meter telescope (TUBITAK National Observatory, Turkey) and 6-m BTA telescope of SAO RAS (Russia) the spectroscopic observations of a large sample of stars of the δ Sct type-stars were carried out. At these observations a high-resolution spectra for 75 stars were obtained. In this work we present results of determinations the effective temperatures and gravity for all studied stars on the basis of photometric indices of Johnson and Strömgren systems using empirical dependences.

Keywords: δ Sct-type stars - Fundamental parameters - Effective temperatures.

1. PHOTOMETRICAL OBSERVATIONS

For more than ten years, the Department of astronomy and satellite geodesy of KFU has been conducting a multi-year program of complex researches of a sample of low-amplitude δSct-type stars. The main task is the analysis of the chemical composition of these stars and study the influence of the fundamental parameters on the effects of stratification in the atmosphere [1,2]. To implement this project, four sets of observations on the 6-m telescope BTA of SAO RAS and fifteen sets of observations on the 1.5-m Russian-Turkish telescope RTT-150 at TUBITAK National Observatory (Bakirletepe, Turkey) were perform. As a result, high-resolution spectra were obtained for 75 Delta Sct-type stars with magnitudes from 5 to 8 using the NES BTA spectrograph and the Coude-echelle spectrometer RTT-150. DECH20T software package was used for spectra processing - normalization, the measurement of radial velocities and equivalent widths of spectral lines.

* E-mail: almazgaleev2@yandex.ru

2. STELLAR FUNDAMENTAL PARAMETERS

To calculate the theoretical spectra of stars and to analyze observations, preliminary sets of parameters of their atmospheres (effective temperature and surface gravity) based on the analysis of photometric data on various color indices presented in the literature were determined. Observational data in the photometric systems of Strömgren and Johnson were used in combination with empirical calibrations of Balon [3] and Alonso et al. [4], respectively.

Table 1 presents the results of calculations of effective temperatures according to different indices for about a third of the studied δSct-type stars (all data are available from the authors), the analysis of which allows us to draw a number of interesting conclusions:

- the sample star effective temperatures are quite varied from 6200 K for HD 127986 to 9540 K for HD 172167, but the vast majority of stars are in the 7000 to 8000 K temperature range;

- calculations of temperatures for some indices give noticeable underestimated (H-K index) or overestimated (color indicators b-y, V-I) temperature values;

- a large variation in temperature values obtained from different photometric indices for some stars may also indicate the peculiarity of the chemical composition of these stars.

3. RESULTS

In this paper, on the basis of photometric data the values of effective temperatures and gravity for 75 δ Sct-type stars observed on RTT-150 and BTA were obtained. The analysis of the obtained atmospheric parameters is carried out. It is shown that the values of effective temperatures obtained by different color parameters demonstrate certain differences associated with the accuracy of the photometric data. The best agreement of effective temperatures is obtained for the photometric indices V-H, V-R, V-K. The temperatures calculated by the color index H-K for all stars show underestimated values by 2000-3000 K.

In the future, the fundamental parameters of the star atmospheres (Teff, log g, [Fe/H]) will be determined on the basis of studying the spectra and the parameters obtained by photometric and spectroscopic methods will be compared.

Acknowledgements. This work was supported by the subsidy allocated to Kazan Federal University for the state assignment in the sphere of scientific activities (3.9780.2017/8.9). We thank to TUBITAK, KFU and AST for partial supports in using RTT150 (Russian-Turkish 1.5-m telescope in Antalya). The authors also thank H. Esenoglu (Istanbul University) for observations of several delta Sct-type stars at the RTT-150.

Table 1. Temperatures and gravity for part of δ Sct-type stars obtained from photometrical data and comparison with published temperatures.

HD	Teff (K)	σ (K)	log g	Teff (K)	Papers
2628	7538	250	3.5	7335	2011A&A...531A.165P
17094	7180	220	3.8	7225	2003AJ....126.2048G
23607	7745	150	3.8	7586	2011A&A...531A.165P
26322	7090	200	3.4	6950	2012A&A...537A.120Z
27628	7225	250	4.0	7019	2012A&A...541A.150P
45311	6810	200		6826	2011A&A...530A.138C
50420	6910	250	2.9	7265	2012A&A...538A.143K
64491	7198	200	4.0	6968	2006A&A...450..735M
69242	7055	200	3.2	6894	2011A&A...530A.138C
71297	7790	200	4.1	7700	2013MNRAS.431.3258C
79781	6830	250		6749	2011A&A...530A.138C
85040	7565	250	3.6	7414	2014ApJ...791...58A
87696	7980	250	4.2	7870	2012A&A...537A.120Z
110951	7435	150	3.8	7113	2012A&A...542A.116A
115604	8098	300	3.6	7673	2014ApJ...791...58A
127986	6187	100	3.7	6430	2018A&A...614A..55A
152830	6845	220	3.5	6903	2011A&A...530A.138C
154225	6965	250		7138	2011A&A...530A.138C
172167	9538	150	4.0	9550	2014A&A...562A..84R
197461	7578	250	3.4	7334	2011A&A...531A.165P
204188	7627	200	4.2	7762	1999A&A...352..555A
214698	8845	250	3.7	9183	2018yCat.1345....0G
220564	7025	250		6828	2011A&A...530A.138C
223661	6925	100		6916	2011A&A...530A.138C

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