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A SPECTROSCOPIC STUDY OF HD 5797 - PROGRESS REPORT

I.KH. ILIEV*, I.S. BARZOVA*, P.S. PEEVA"
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National Astronomical Observatory., Smolyan, Bulgaria

Public Astronomical Observatory, Kardzhali, Bulgaria

After reporting the first results of line spectrum variations of the CP2 star HD5797 during the previous SAO Conference (Barzova and Iliev, 1988 = BI everywhere thereafter in the text) it became clear that our work on this star needs to be continued. In this report we represent our new measurements based upon all spectrograms obtained till the end of 1990. It will be useful to remind in brief the main characteristics of this interesting star.

HD 5797=V551 Cas is a faint SrCr CP2 star. Adelman (1973) placed it in his list of 21 cool sharp-lined stars. Wolff (1975) observed photometric changes and proposed four probable periods - 45.5, 57.0, 67.5 and 69.0 days. According to Wolff's conclusions the greatest period is preferable. Our first observations (BI) showed line intensity variations by about 1.5 times in Fe, Cr and Ti lines and 2 times for Sr lines. The measured radial velocity changes are, unfortunately, not larger than the accuracy - 2-3 km/s.

Now our collection is consisting of 14 blue spectrograms with a dispersion of 18 A/mm and a spectral resolution of 0.35 A obtained with the 2-m RCC telescope of BNAO. In addition there is 1 Zeeman spectrogram with a dispersion of 9 A/mm obtained with the 6-m telescope of SAO.

The entire set of spectrograms were scanned with the Joyce-Loebl microdensitometer and then processed on PC/AT with ReWiA code for stellar spectra reduction (Borkowski, 1988). The next improvement was that much more lines for equivalent width measurements were used. We were able to select 59 unblended spectral lines of FeI, FeII, CrI, CrII, TiII, SrII, CaII, MgII and MnII. In comparison with BI the number of plates increases 1.5 times, twice more are the lines, elements like Ca, Mg and especially Mn are added to our new list. So, we obtain the possibility to look closer at the line spectrum variations of the HD 5797.

The measured equivalent widths and central depths for the different elements and

ions are normalized and then averaged by the commonly accepted manner. More details of this procedure are described, for example, in our paper concerning HD 51418 (Iliev and Barzova, 1988).

Due to the increased number of lines and advantages of the used digital data processing the accuracy of the obtained results reaches 3-5%. This is twice better than our previous achievement.

Starting with the discussion, first of all we want to mention that the earlier obtained amplitudes of line intensity variations are completely confirmed. We confirm also that the lines of EuII and especially 4205 A are not so remarkable as Adelman (1973) asserted. It seems to be caused by worse spectral resolution of ours. The other fact deserving attention is the weakness of CaII 3933 A line as it can be expected from the temperature or spectral class. There are many spectrograms on which some metallic lines like SrII ,4077 A, SrII 4215 A, MgII 4481 A or even TiII 4300 A are deeper and stronger than CaII 3933 A. It is likely that this is not a question of wrong temperature estimation, because the Balmer-lines wings show the temperature of about 9000 K.

The gravest problem that we met is connected with the photometric periods proposed by Wolff (1975). In our previous paper (BI) periods of 57.0 and 67.5 days were rejected. The new results show, first, that 45.5 days period is ineligible too and, second, 67.5 days period becomes as acceptable as 69.0 days period. It is quite clear that neither nine nor fourteen spectrograms are enough to take the right decision about the true period. That is why we do not represent any figures of line intensities versus phase diagrams. To determine the photometric period more exactly a new observational campaign with large time base is needed.

Having a Zeeman spectrogram of good quality we estimated magnetic field strength of the HD 5797 by two different ways. First of them was the classical one - by using Barwik's type oscilloscopic comparator. The positions of 33 unblended lines in both left- and right-polarized parts of the spectrum were measured. The Lande factors of these lines were taken from Romanyuk (1984). The mean effective magnetic field obtained in this case is -2200±350 Gs.

The second approach was to convert both left- and right-polarized parts in "wavelengths intensity" form each one with its own dispersion curve. Microdensitometer scans and ReWiA code were used. This allowed us to measure directly the displacement in angstroms between the two components of a given line. The well-known formula connects this displacement with the magnetic field strength, Lande factor, wavelength and some atomic constants. In this second case we obtained for the mean field the value -2000±200 Gs.

These two estimations are in good agreement. Thus, the presence of magnetic field in the CP2 star HD 5797 is ascertained by direct measurements.

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