SPECTRAL VARIATIONS OF AG DRA BETWEEN 1981 AND 1985

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After a long quiet phase AG Dra underwent an outstandingly active phase with two outbursts in 1980 Nov. and 1981 Nov.(Viotti et al, 1984). Since then a new quiet phase has followed. In this work we analyse two spectra of AG Dra, of which, one was taken in 1981 by C.C. Huang at the Haute-Provence Observatory using the Marly spectrograph with a dispersion of 80 A/mm at the 1.2 m telescope, the other was obtained by Dr Y.Andrillat in 1985 with the same instrument.

Figure 1 shows the spectral variations of AG Dra between 1981 and 1985. The main features of the emission line spectrum are not much different between the two spectra, except that in 1985 there was a new wide weak emission line at 3488 A possibly due to FeII. There were a lot of strong emission lines due to H, HeI, HeII and OIII in both spectra. The spectrum of the late-type component was much more obvious in 1985 than in 1981. In 1985 the lines of CaII K, CaIλ4227 and the G-band of CH were quite strong. In addition we measured a lot of absorption lines due to FeI, SrII and TiII on the 1985 plate. The Balmer continuum emission and the blue contiuum were enhanced in 1981. On the 1981 plate the stellar spectrum in ultraviolet can be traced beyond 3200 A and the blue continuum heavily veiled the spectrum of the cool component. In 1985 they were much weaker.

Table 1. Relative intensities and FWHM of emission lines

Plate QA 1165 (1985 June 18)			Plate CT 87 (1981 July 1)	
Lines	I(max)/I(cont)	FWHM	I(max)/I(cont)	FWHM
H	6.0	3.6	11.8	4.7
HeII λ4686	5.4	3.1	7.6	3.3
HeII λ4541	1.3		1.4	
HeI λ4471	1.3		1.8	3.3
H	5.2	2.4	6.7	3.6
H	4.7	3.2	6.2	3.9
H	11.1	2.4	7.3	3.2

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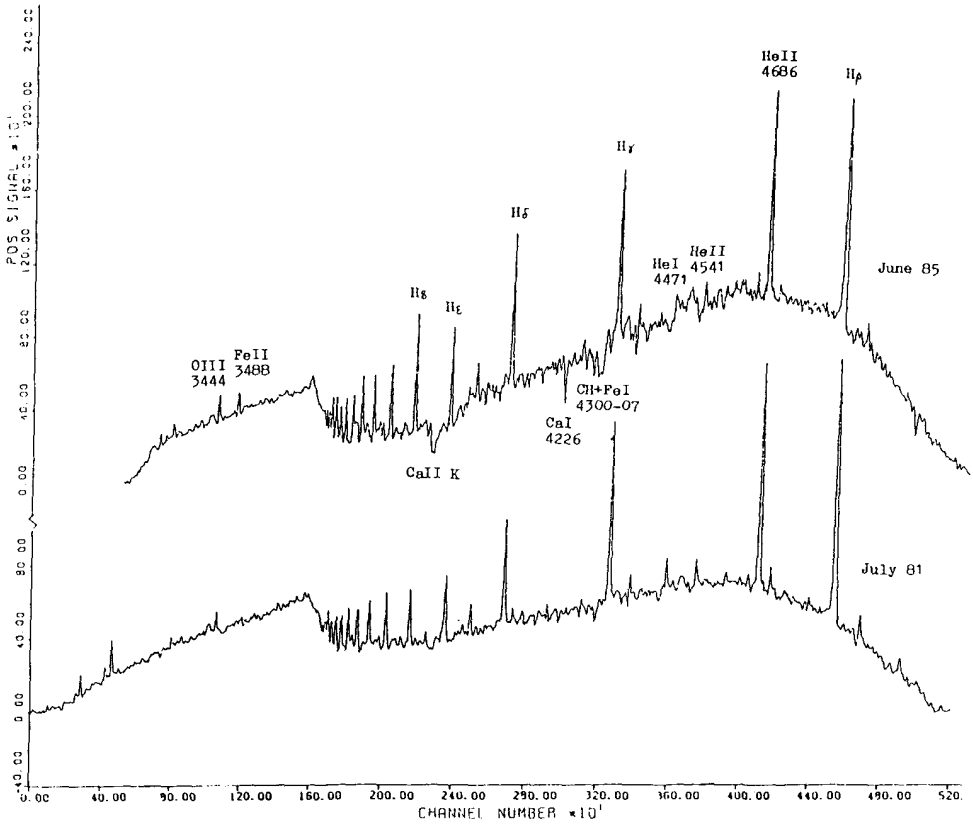

Figure 1. Density tracings of the spectrum of AG Dra.
Ordinates are Dx800 above fog.

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Table 1 lists the relative intensities I(max)/I(cont) and FWHM in A of some emission lines. In 1981 the relative intensities of all the emission lines, besides Hϵ , were much greater than in 1985. The great relative intensity of Hϵ in 1985 is possibly caused by a greater decrease of the blue continuum in that spectral region. The line HeIλ4471 was a little stronger than the line HeIIλ4541 in 1981, while it was as strong as the latter in 1985. The FWHM of the emission lines were all larger in 1981 than in 1985.

Table 2. Radial velocities for AG Dra

	1985 Emission Lines		1981		1985 Absorption Lines		1981	
	V	n	V	n	V	n	V	n
H	-142.1±7.0	13	-146.0±2.8	20	-171.1±12.1	6	-157.9±7.2	5
HeI	-130.2±6.6	7	-154.4±3.0	15				
HeII	-140.1±0.8	2	-164.8±4.9	5				

Redial velocities were measured for emission and absorption lines with the 1985 plate and are summarized in Table 2. For comparison in this table we also list the radial velocities of 1981 taken from our previous measurements (Huang, 1982). The radial velocities of emission lines all decreased in 1985. This is in agreement with the possible periodic variations of radial velocity for emission lines of AG Dra (cf. Huang 1982, Fig. 2). Besides, the variations of radial velocity of HeI and HeII are much larger than that of H. The radial velocities of absorption lines probably continued to increase in 1985 (cf. Huang 1982, Table 1).

From the above results it can be seen that during the active phase in 1981 the emission lines and the Balmer continuum, as well as the blue continuum, were enhanced. However there was almost no diference in line excitation between the 1981 active phase and the quiet phase of 1985. This corresponds well with the results of the IUE observations of Viotti et al.(1984). As well, during the quiet phase in 1985, when the blue continuum faded, the spectrum of the cool star, which has a spectral type of KOIb according to Huang (1982), appeared again. Finally, the difference in the radial velocities and their different variations between HeI, HeII and H indicate that they are from different regions.

Our optical data seem to support a binary model of AG Dra, but more radial velocity measurements with higher accuracy for both emission and absorption lines are required to clarify the nature of this interesting star.

We would like very much to express our thanks to Dr. Y.Andrillat for her valuable spectrum of AG Dra.

References

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