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Spectroscopic observations of the oEA-type variable AB Per

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Abstract. We present spectroscopic results of the Algol-type semi-detached eclipsing binary AB Per. The binary system had shown short-periodic light variations of about 0.2 day by our previous photometric study (Kim et al. 2003). We have obtained high-resolution echelle spectra in order to investigate the variability source. The spectra show strong emission at H_α 6563Å, indicating that AB Per has circumstellar gases around the primary component. We identified spectral lines of the primary and secondary components separated by the Doppler shift, and found that both components do not rotate fast enough to interpret the short-periodic light variations as a rotation effect. In conclusion, the short-periodic light variations are originated from pulsation of the primary component and then AB Per is a bona-fide member of the oscillating EA stars.

Key words. Stars: eclipsing binary – Stars: pulsation – Stars: spectroscopic observations

1. Introduction

Mkrtichian et al. (2002) have introduced very interesting objects, oEA (oscillating EA) stars. This group has been defined as "the (B)A-F spectral type mass-accreting main-sequence pulsating stars in Algol-type semi-detached eclipsing binary systems". Their pulsation characteristics are similar to those of normal δ Scuti-type stars, but their evolution scenario is very different due to mass accretion (Mkrtichian et al. 2004). Up to now, the oEA stars have been known only eighteen including the latest variable IU Per (Kim et al. 2005).

Kim et al. (2003) had discovered short-periodic light variations of AB Per and classified it as an oEA star. In this study, we present spectroscopic results to investigate whether the short-periodic variations are originated from pulsation with the period of about 0.2 day or rotation (ellipsoidal) effect with a rotation period of about 0.4 day.

2. Observation and result

Spectroscopic observations were performed for 4 nights on March 2005, using a high-resolution echelle spectroscopy and a 1.8m telescope at Bohyunsan Optical Astronomy Observatory in Korea. Spectral resolution was 1.5Å / mm at 5000 Å and exposure time was about 1800 ~ 3600 seconds. CCD frames were reduced with the IRAF/Echelle package.

Figure 1 shows spectroscopic results of AB Per. Strong emission at H_α 6563Å line gives us a good evidence that there are circumstellar gases around the primary component; the gases had been transferred from the secondary which

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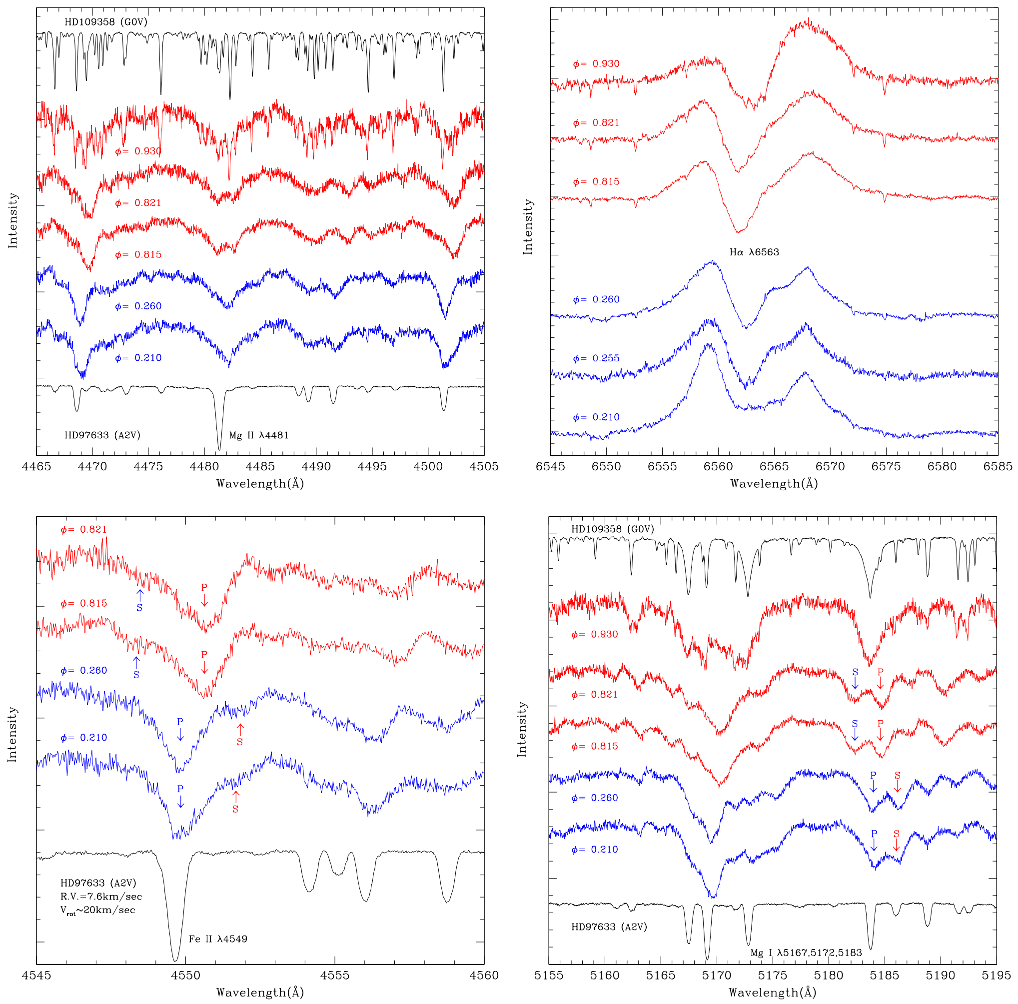

Fig. 1. High-resolution spectra of the eclipsing binary AB Per. Observing results for a few standard stars are also displayed for comparison. ϕ is the orbital phase of AB Per. A character "P" represents the spectral line by the primary component and "S" by the secondary one.

fills its Roche lobe. We identified spectral lines of the primary and secondary components separated by the Doppler shift. Rotational velocities of both components look to have similar values: $v sin i \leq 90$ km/sec was deduced from the line Fe II 4549Å at $\phi = 0.26$. The value would not be high enough for an early A spectral type main-sequence star (the primary) to rotate with a period of about 0.4 day. In conclusion, the short-periodic light variations are originated from pulsation of the primary component, not from rotation effect, and then AB Per is a bona-fide member of the oEA stars.

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