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Eta Orionis

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1. Introduction

Eta Orionis is an interesting multiple system of early type stars. It consists of a visual triple system (A, B, C), a spectroscopic triple system (Aabc) and an eclipsing binary Aab. A is a triple system consisting of a 7.989 day eclipsing binary Aab and a gravitationally bound third component Ac with orbital period of about 9.5 years. All components of the pair AB have spectral types in the range O9-B3 (C. Waelkens & P. Lampens 1988). The radial velocity curve is used to constrain the orbital elements and properties of the binary Aab.

The second component Ab is a B-type star that displays rapid absorption line profile variability. Regular patterns are easily visible in the data.

2. Observations

All high resolution spectra were obtained with ESO's CES Spectrograph linked to the 1.4m CAT telescope in December 1993. Mean exposure times of 2 minutes yielded signal-to-noise ratios of about 400. We obtained 36 and 40 spectra of Si III-4552 on 2 successive nights HJD 2449338.5 and HJD 2449339.5. The spectra were reduced using the MIDAS software package.

The Si III-profiles of Ab vary strongly over our observing run. The spectra are corrected for the orbital motion.

3. Line profile variations (LPV)

To demonstrate the reality of the LPV, the longest nightly sequences of observations are used. We subtracted the nightly mean profile from the observed ones. The residuals have been combined into two-dimensional gray-scale pictures. This diagram reveals a blue-to-red movement of spectral sub-features (bumps at about $\pm$ 1% of the continuum) across the rotationally broadened line profiles. The time scale for a sub-feature to traverse the width of the line profile is of the order of hours. The bumps extend over a large fraction of the profile. At least 2 bumps are visible at any time. Small but significant equivalent width variations are also observed.

A detailed frequency analysis of the equivalent width of the secondary component has been carried out for the full data set using the phase dispersion minimisation method. The analysis reveals that the most significant frequency is 7.54 cycles/day.

Mode-identifications were obtained by means of the moment method (Aerts et al. 1992). *If* the line profile variations are due to stellar pulsation, they cannot be due to an axisymmetric nor to a radial mode as derived from the moment variations. Assuming pulsation, the best result is l=4, m=–3.

References

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