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XY Pic: A DETACHED BINARY MISCLASSIFIED AS A W UMa SYSTEM

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Recently Selam (2004) published a list of 64 genuine W UMa-type binaries observed by *HIPPARCOS*. These had been extracted from a larger sample based on theoretical fitting of their light curves, using the simplified light curve synthesis by Rucinski (1993), yielding the fundamental system parameters. During the selection process, detached and semi-detached systems were excluded.

We here report on observations of one of the supposedly genuine W UMa or EW-type systems, XY Pic (HD 38873), which we show is not an EW system. The *HIPPARCOS* light curve is shown in Fig. 1 (taken from the on-line *HIPPARCOS* catalogue; ESA 1997). The light curve resembles somewhat an EW system, although with some asymmetry. In the GCVS (e.g. Kazarovets et al. 2003) it is also listed as an EW type variable.

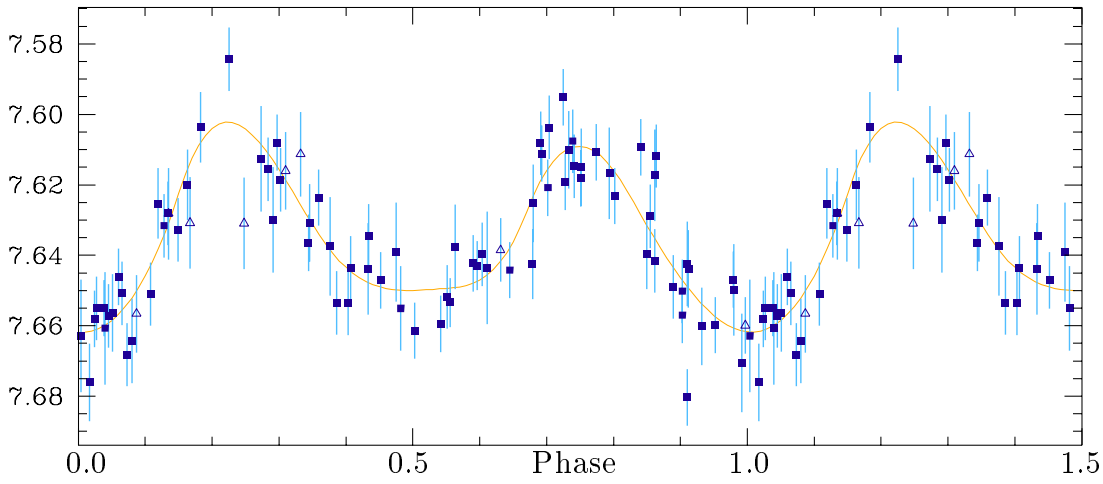

Figure 1. The HIPPARCOS light curve of XY Pic from ESA (1997).

We observed XY Pic on February 5 and 7, 2005 using the FEROS spectrograph at the ESO/MPI-2.20m telescope at La Silla, Chile. Standard data reduction was performed with MIDAS including bias and flatfield correction, order extraction and wavelength calibration. The spectra have a FWHM resolution of 0.15 Å (R∼48000) and cover the range 3800–9000 Å.

In Fig. 2 we show a part of the three spectra, labeled by modified Julian date, and with the rest-wavelength of the prominent Ca I line at 6162.173 Å indicated. As can be seen, the star is not a fast rotator as expected for an EW system, and also the period $P = 0.2972608$ d^{-1} is incompatible with the observed spectral line shift. The star may indeed be a binary, as indicated by the shift of the lower spectrum, but with a period much larger than typical EW-type periods.

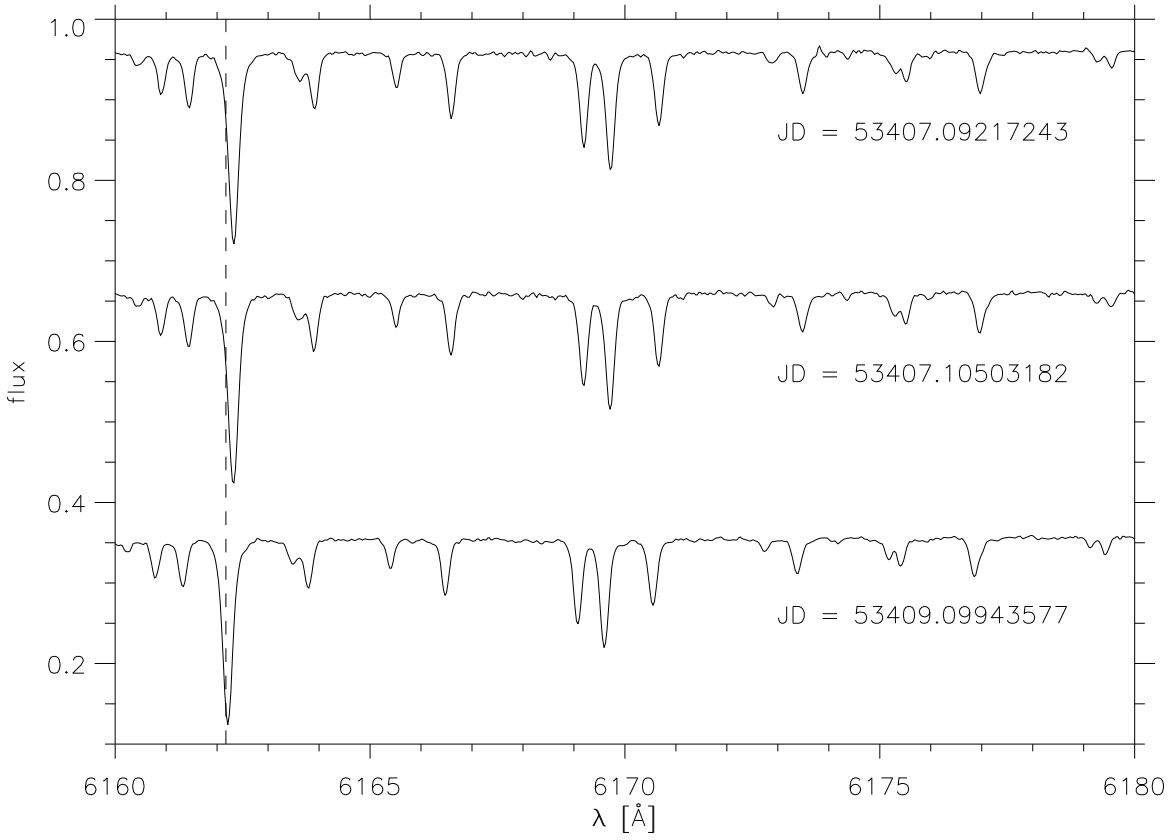

Figure 2. A part of the three spectra of XY Pic, including the 6162.173 Ca I line (dashed line).

Table 1: The atmospheric parameters and the derived abundances for XY Pic. Errors on abundances are rms around the mean for all lines used. n is the number of lines of each element. Abundances are given relative to solar values, i.e. $\mathrm{A(M)} = \mathrm{[M/H]} = \log N_\mathrm{M}/N_\mathrm{H} - (\log N_\mathrm{M}/N_\mathrm{H})_\odot$.

T_eff	6900 ± 100 K
$\log g$	3.80 ± 0.15
ξ_t	1.6 ± 0.2 km s^{-1}
A(Fe)	$-0.05(10)$, $n = 236$
A(Ca)	$+0.04(6)$, $n = 12$
A(Cr)	$+0.18(18)$, $n = 38$
A(Ni)	$-0.17(11)$, $n = 47$
A(Ti)	$+0.10(11)$, $n = 24$

Using the procedures described in Dall et al. (2005a, 2005b) we performed an abundance analysis following the fitting of an atmospheric Kurucz (1993) model using 236 Fe I and Fe II lines. The results are listed in Table 1. Using the list of global stellar parameters by Gray (1992) we find that the atmospheric parameters correspond to a spectral type of F0III (SIMBAD quotes F0III/IV).

We propose that XY Pic may be a wide binary with an unseen lower-mass companion, and that the *HIPPARCOS* light curve can be explained by δ Scuti type pulsation, which would be consistent with the observed period, the amplitude of the variation and with the spectral type.

This example demonstrates that even the most careful light curve analysis is not enough to determine the true variability nature of an object, and that spectroscopy is needed to secure a positive identification.

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