

HD 205798: A NEW LOW-AMPLITUDE VARIABLE STAR IN CYGNUS

TORRES, G.; LATHAM, D.W.; STEFANIK, R.P.; MADER, J.

Harvard-Smithsonian Center for Astrophysics, 60 Garden St., Cambridge, MA 02138, USA,
e-mail: gtorres@cfa.harvard.edu

The star HD 205798 (also HIP 106708; BD+33°4307; $\alpha = 21^{\text{h}}36^{\text{m}}53^{\text{s}}.8$, $\delta = +33^{\circ}43'06''$, J2000; Sp. type F0; $V = 8.04$) is one of nearly 700 objects in a large spectroscopic survey of F stars carried out at the Center for Astrophysics. The purpose of this survey is to determine their kinematical properties and investigate various issues related to the formation and evolution of the galactic disk (Nordström et al. 1997). We have continued to observe the velocity variables in the sample in order to study the frequency and orbital characteristics of spectroscopic binaries among the early F stars.

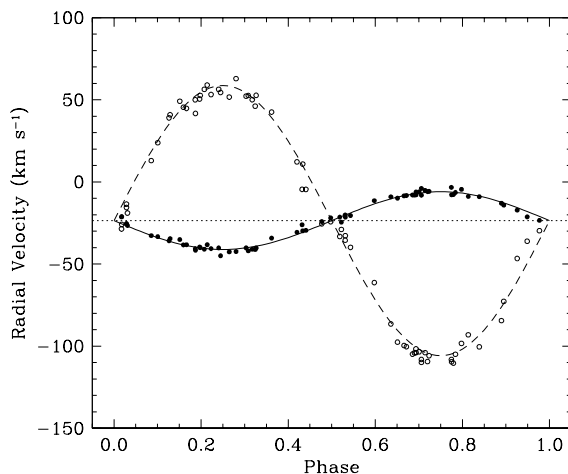


Figure 1. Spectroscopic orbital solution for HD 205798.

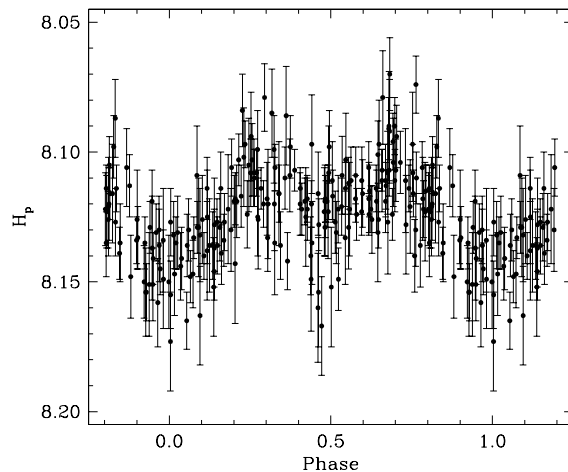


Figure 2. HIPPARCOS photometry for HD 205798 phased with the ephemeris above.

Early in the course of this work HD 205798 was found to be double-lined, and a preliminary mass ratio and center-of-mass velocity were reported by Nordström et al. (1997). Only recently with many more observations have we been able to determine the period, which is 0.6563 days. The radial velocity measurements and our orbital solution are shown in Figure 1, and the preliminary elements are listed in Table 1. The small minimum masses $M \sin^3 i$ indicate that the inclination angle is fairly low if we assume that the primary component has a mass typical for an F star. Thus light variations, if any, are expected to be small.

Table 1: Spectroscopic orbital solution for HD 205798.

Parameter	Value
P (days)	$0.65627696 \pm 0.00000053$
γ (km s ⁻¹)	-23.53 ± 0.21
K_A (km s ⁻¹)	17.58 ± 0.29
K_B (km s ⁻¹)	82.24 ± 1.02
e	0 (fixed)
T_I (HJD - 2,400,000)	$50\,576.8561 \pm 0.0012$
$a_A \sin i$ (10 ⁶ km)	0.1587 ± 0.0027
$a_B \sin i$ (10 ⁶ km)	0.7422 ± 0.0094
$M_A \sin^3 i$ (M _⊙)	0.05571 ± 0.00190
$M_B \sin^3 i$ (M _⊙)	0.01191 ± 0.00037
$q \equiv M_B/M_A$	0.2138 ± 0.0045
N	67
Time span (days)	4435
σ_A (km s ⁻¹)	1.8
σ_B (km s ⁻¹)	6.4

The ephemeris for the primary minimum derived from our spectroscopic solution is

$$T_I \text{ (HJD)} = 2\,450\,576.8561(12) + 0.656\,276\,96(53) \cdot E.$$

The HIPPARCOS catalog (ESA 1997) does not flag this object as a photometric variable. The median apparent brightness is listed as $H_p = 8.1216$, with a scatter of 0.018 mag. However, when the epoch photometry is phased with the above ephemeris the variations become quite obvious (Figure 2). There is a noticeable decrease in brightness at phase 0.0, and a somewhat shallower secondary minimum at phase 0.5, although the variation seems more or less continuous, as in the ellipsoidal variables. The depth of the primary eclipse is only about 0.05 mag.

The precise nature of the system is as yet unclear. Further photometric observations in standard filters are needed for a full solution of the light curve. These observations are already underway, along with a more definitive analysis of the spectroscopic material.

References:

- ESA 1997, The Hipparcos and Tycho Catalogues, ESA SP-1200
 Nordström, B., Stefanik, R. P., Latham, D. W., & Andersen, J. 1997, *A&AS*, **126**, 21