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LONG-TERM PHOTOMETRIC AND SPECTROSCOPIC BEHAVIOUR OF SYMBIOTIC SYSTEM AG Dra

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The general behaviour of AG DRA was studied in the context of the long-term photometry and radial velocity analysis.

AG DRA is a symbiotic binary with quiescent and active stages; the latter may be explainable by increased thermonuclear burning of a white dwarf accreting from the wind of the cool component.

In our previous studies a second period in addition to the orbital period of 549.7 days has been found for AG DRA. Such a period of about 350 days was indicated in our study using photometry (Friedjung et al. 1998, Petrík et al. 1998)as well as radial velocities (Gális et al. 1999 Friedjung et al. 2003). An explanation of major symbiotic activity was suggested by Gális et al. (1999), involving non-radial pulsations of the cool component, leading to higher accretion rates by the white dwarf at certain times. Van Hamme & Wilson (2002) proposed fluorescence model for AG DRA and they confirmed presence of 355-day variations. We have added radial velocities of Iijima & Viotti (2003) to previously studied ones to test the presence of the second period.

120 radial velocity values have been extracted from the literature (for detail description see Friedjung et al. 2003) and from Iijima & Viotti (2003). All radial velocity data have been determined using spectral absorption lines formed in the atmosphere of the red giant. The data incompletely cover the time interval from JD 2 446 578.500 to JD 2 451 676.869, but with good over-sampling of individual sets.

The results of period analysis of AG DRA radial velocities taken from original data of Iijima & Viotti (2003) are the following: the corresponding periodogram shows a few peaks, but the largest is connected with the orbital period $P_{orb} = (558.2 \pm 7.0)$ days. We also found in this data the second period $P_{orb} = (355.2 \pm 4.0)$ days and, in our opinion, represents the pulsation of the cool component of AG DRA.

We have combined the data of Iijima & Viotti (2003) with those used by Friedjung et al. (2003).

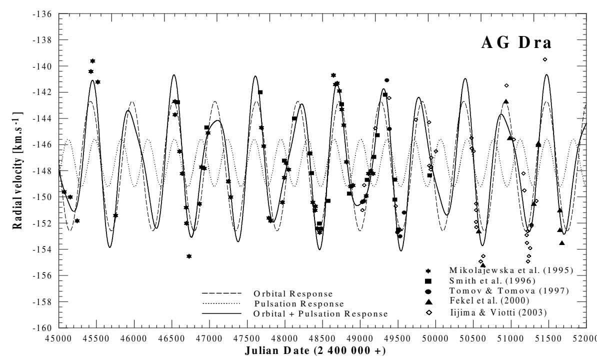

Fig. 1. Phase diagram of orbital radial velocities and comparison of circular and elliptical synthetic curves. Data by Iijima & Viotti (2003) are depicted individually

The preliminary period analysis of such combined data (120 values) gave us again two significant real periods: 549.9 days and 349.3 days. In the next iteration steps we have improved the parameters of orbital motion and pulsation. After removing the pulsation response the period analysis gave us the following parameters of orbital motion: $\gamma = (-147.6 \pm 0.1)\,\mathrm{km\,s^{-1}}$, $K = (4.9 \pm 0.2)\,\mathrm{km\,s^{-1}}$, $P = 549\overset{d}{.}8 \pm 0\overset{d}{.}8$, $JD_{max} = 2\,448\,996\overset{d}{.}4 \pm 2\overset{d}{.}8$. After removing the orbital response the analysis gave us the following parameters of pulsation: $\gamma = (-147.4 \pm 0.1)\,\mathrm{km\,s^{-1}}$, $K = (1.8 \pm 0.2)\,\mathrm{km\,s^{-1}}$, $P = 352\overset{d}{.}8 \pm 1\overset{d}{.}1$, $JD_{max} = 2\,449\,181\overset{d}{.}0 \pm 5\overset{d}{.}8$. The individual synthetic radial velocity curves are depicted in Fig. 1.

We can conclude that our analysis of the latest radial velocity measurements is in agreement with our previous conclusions and the presence of pulsations of the cool component is still a plausible explanation.

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