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ORIGINAL ARTICLE

Discovery of a coherent oscillation with a 1.07 h period in the suspected cataclysmic variable FBS 1220 + 753 (Dra 7)

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Abstract We report results of extensive photometry of the suspected cataclysmic variable FBS 1220 + 753. The observations were obtained over 28 nights in 2010, 2011 and 2012. The total duration of the observations was 160 h. We clearly detected the highly coherent oscillation with a period of 1.0712887 ± 0.0000013 h and a stable semi-amplitude of 0.03 mag. In a time scale of years, the oscillation period is very stable ($dP/dt < (4.1 \pm 1.4) \times 10^{-10}$). The light curves of FBS 1220 + 753 show no obvious flickering. The significant brightness changes on large time intervals are also absent. Therefore, it is unlikely that FBS 1220 + 753 is a cataclysmic variable. The period is compatible with oscillations seen in δ Sct variables. But its high stability and the unchangeable oscillation amplitude suggest that the oscillation cannot be caused by multiperiodic stellar pulsations. The average pulse shape of the oscillation is very sinusoidal with slightly sharper maxima compared with minima, but it is somewhat changeable from year to year. The light curves obtained in 2011 and folded with the doubled oscillation period reveal that the adjacent oscillation cycles have slightly different depths of the minima and different steepness of the rise and decline. This behaviour resembles the behaviour of the binary subdwarf–white dwarf systems, in which the variability is caused by ellipsoidal variations. However, the folded light curve obtained from the data of 2010 reveal nearly equal shapes of the adjacent oscillation cycles, and this does not conform to such an interpretation. Thus, the nature of the oscillation seen in FBS 1220 + 753 remains puzzling. To solve this puzzle, detailed spectroscopic observations are needed.

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1 Introduction

Cataclysmic variables (CVs) are interacting binaries that consist of a white dwarf primary accreting matter from a low mass secondary filling its Roche lobe. The path that the transferred matter takes depends strongly on the magnetic field of the white dwarf. A bright accretion disk forms in non-magnetic systems, while matter swirling along field lines releases energy in their magnetic counterparts. Because CVs are interacting binary systems, their emission from the X-rays to the infrared is generally totally dominated by the release of the gravitational energy of the accreted matter in a disk or an accretion column and not by the emission of the stellar components. In most cases CVs show emission line spectra. One of the most striking photometric characteristics common to all CVs are the variations with amplitudes from some hundredth of a magnitude up to one magnitude which have time scales ranging from seconds to a few dozen minutes, where higher amplitudes of variability occur at lower frequencies. This phenomenon is called flickering.

The First Byurakan Survey (FBS) was the first systematic objective prism survey of the extragalactic sky. Although the FBS was conducted originally to search for galaxies with UV-excess, the huge amount of spectral information contained in the plates allowed the development of several other projects based on the FBS, the most important being the discovery and investigation of blue stellar objects. The nature of many of them is still not clear (Mickaelian 2008). The object FBS 1220+753 (hereafter FBS1220) was selected from