

On the Period Doubling Behaviour of Three W Vir Stars

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We examined archive data of W Vir type stars to search and study period doubling behaviour. We discovered that W Vir, the eponym of the group, and SZ Mon both show interchanging events in the order of the deep and shallow minima during the past decades. We also demonstrate that ST Pup, known for its strong period change, also exhibited a period doubling episode.

1 Introduction

The alternation of the low- and high-amplitude cycles in the light curve of classical pulsating stars, called period doubling (PD), is the manifestation of nonlinear interaction between near-resonant radial modes. It is a characteristic of RV Tau stars, but recently it was discovered in RR Lyrae, BL Her, and W Vir type stars (for details we refer to Plachy et al. (2017) and the references in there) and in a classical Cepheids as well (Molnár et al., 2017). The temporal variation of period doubling has not been studied in detail yet, however, interchanges in the order of low- and high-amplitude cycles were examined in RR Lyrae and RV Tau stars (Plachy et al., 2014). Theoretical calculations predict possible period ranges where PD can be expected in BL Her and W Vir type stars (Smolec, 2016), but only a few observational examples have been reported so far. We present here some results of our systematic search for PD in archive data of W Vir type stars.

2 Results

We used the ASAS (Pojmanski, 1997) and the Harvard DASCH photometry (Grindlay et al., 2009), the latter is available only for W Vir. The alternation of cycles can be visualized in phased light curves folded by twice the pulsation period. In Fig. 1 we plotted phased light curves for different time epochs to demonstrate the interchange in PD for the stars W Vir and SZ Mon. We also show that ST Pup displayed PD right before its period increased from 18.69 days to 19.13 days.

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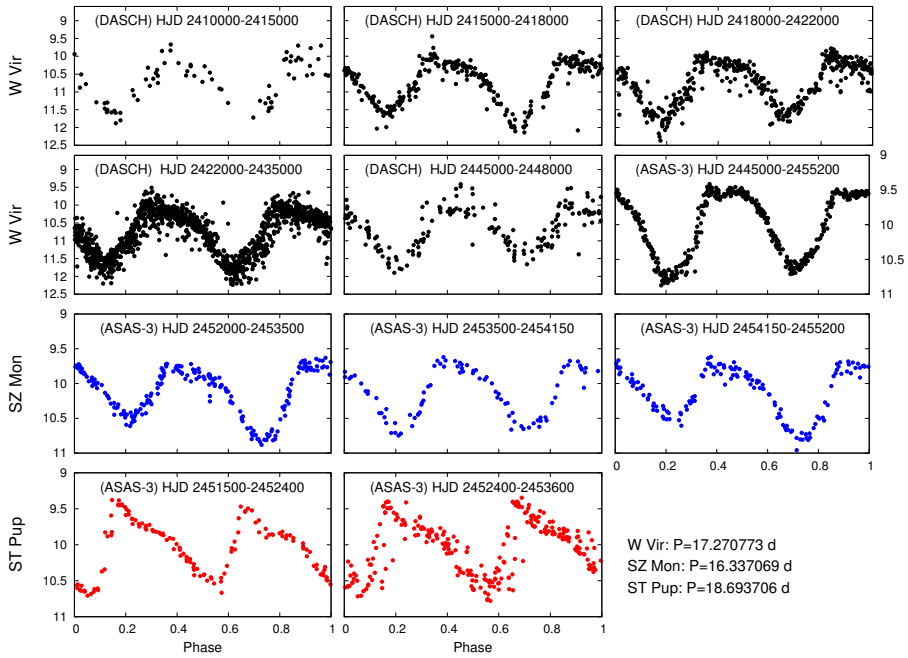


Fig. 1: Folded light curves of W Vir, SZ Mon and ST Pup in different epochs (V mag). Note that the different passbands of DASCH and ASAS-3 photometry were not transformed. The variation of the minima is clearly visible.

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