Contributed Talk

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The O–C diagram of V391 Peg revisited: planet or not?

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V391 Peg is a hybrid pulsating subdwarf B star that shows both pressure and gravity modes. By studying the arrival times of the p-mode maxima and minima through the O–C method, Silvotti et al. 2007 inferred the presence of a planet with an orbital period of 3.2 years and a minimum mass of 3.2 Jupiter masses. The 2007 results were based on photometric data spanning from 1999 to 2006.

Silvotti et al. have recently submitted a detailed updated O–C analysis using a data set that covers the period between 1999 and 2012. Comprising 1066 hours of photometric time series, this data set is about 2.5 times larger in terms of number of data points than in the previously published analysis.

The analysis of the new data revisits the O–C diagrams that can be constructed for the two rapid main pulsation frequencies at mean values of f_1=2860.938272(06) μHz and f_2=2824.096225(10) μHz. Up to the end of 2008, the new O–C diagram of the main pulsation frequency f_1 is compatible with (and improves) the previous 2-component solution representing the long-term variation of the pulsation period (parabolic component) and the giant planet (sine wave component). Since 2009, the overall O–C trend of f_1 changes in a surprising way. And while the O–C diagram of the secondary pulsation frequency f_2 continues to show 2 components (parabola and sine-wave) like in the previous analysis, the sinusoidal component now shows a different period and amplitude.

We discuss various solutions and their implications for the giant planet scenario. At the same time, $\dot{P}$ measurements are improved. A rotational splitting of f_2 is suggested by the new data, leading to the measurement of the stellar rotation period. The main g-mode pulsation periods of the star are constrained.