

A Period and Light-curve Synthesis for the Algol-type Semi-detached Binary XX Cephei

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We have obtained CCD photometric observations of the Algol-type semi-detached binary XX Cep during 15 nights from 17 September 2002 to 2 February 2003 and then on 21 January 2005. Except for those data taken on the last observing run of the first season, the 3881 measurements were obtained over a interval of only 106 nights. From these data, four new times of minimum light were calculated. The (O-C) diagram formed from all available timings, and thus the orbital period of the system, can be explained by a beat effect between two cyclical variations with different periods ($P'_1 = 48 \text{ yr}$, $P'_2 = 133 \text{ yr}$) and amplitudes ($K_1 = 0.019 d$, $K_2 = 0.056 d$). Both physical and non-physical interpretations of these cycles are investigated. The long-term sinusoidal variation is too long for magnetic cycling in solar-type single and close binary stars. In addition, we have studied the effect of a possible secular period variation. By analyzing the residuals from our WD98 binary model, we found small light variations with a period of $5.9906 d$ with amplitudes growing toward longer wavelengths. We think that these oscillations may be produced by instabilities at the L_1 -point of the cool star and that these instabilities are, in turn, caused by non-uniform and sporadic convection. There is also a short-period oscillation in the light residuals that is attributed to accretion onto the mass-gaining primary component from a feeble gas stream from the cool donor star.