A period study of the double eclipsing spectroscopic binaries V994 Her: Detection of double apsidal motions and a light effect

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V994 Her (ADS 11373 AB, HIP 90483) has been recently known as a quadruple system which consists of double eclipsing and double-lined spectroscopic binaries (Lee et al. 2008). BV CCD photometric observations of the intricate star system were made during the observing seasons from 2007 to 2008 with the 35cm reflector of the Campus station of the Chungbuk National University Observatory. From the observations a total of 10 times of minimum lights were newly determined. All timings collected, including ours, were intensively analyzed to yield new interesting findings: 1) two eclipsing binaries with the orbital periods of 2.08326 and 1.42001 in V994 Her system show possibly apsidal motions with different apsidal periods of 46.4 and 15.3, and eccentricities of 0.058 and 0.082, respectively. 2) a light-time effect with a period of 0.93 may be possible, implying that a third-body be revolving around the binary with the orbital period of 2.08326.

The Solar-Type Contact Binary BX Pegasus Revisited

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We present the results of new CCD photometry for the contact binary BX Peg, made during three successive months beginning on September 2008. As do historical light curves, our observations display an O'Connell effect and the November data by themselves indicate clear evidence for very short-time brightness disturbance. For these variations, model spots are applied separately to the two data sets of Group I (Sep.–Oct.) and Group II (Nov.). The former is described by a single cool spot on the secondary photosphere and the latter by a two-spot model with a cool spot on the cool star and a hot one on either star. These are generalized manifestations of the magnetic activity of the binary system. Twenty light-curve timings calculated from Wilson–Devinney code were used for a period study, together with all other minimum epochs. The complex period changes of BX Peg can be sorted into a secular period decrease caused dominantly by angular momentum loss due to magnetic stellar wind braking, a light-travel-time (LTT) effect due to the gravitational effect of a low-mass third companion, and a previously unknown short-term oscillation. This last period modulation could be produced either by a second LTT orbit with a period of about 16 yr due to the existence of a fourth body or by the effect of magnetic activity with a cycle length of about 12 yr.

Radiative Transfer Schemes for Hydrodynamical Stellar Surfaces

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We have investigated the radiational fields through a hydrodynamical stellar model atmosphere. Stellar convection zone is the extremely turbulent region composed of partly ionized compressible gases in high temperature. Moreover, super-adiabatic layers are the transition region in energy transport from convection to radiation. Therefore, opacities and thermodynamic properties due to interaction of matter and radiational fields vary significantly with depth. In order to describe radiational fields accurately, the Opacity Distribution Function (ODF) and the Accelerated Lambda Iteration (ALI) have been applied to hydrodynamic medium. As the first result of our radiative transfer, we present time-depending variations of radiational fields and thermodynamic structures. Our non-gray transfer model has