

Is V994 Her composed of doubly eclipsing binaries? - Photometric and spectroscopic evidences

Chung-Uk Lee¹, Seung-Lee Kim¹, Jae Woo Lee¹, Chun-Hwey Kim²

¹*Korea Astronomy and Space Science Institute*

²*Dept. of Astronomy and Space Science, Chungbuk National University*

We report that V994 Her is possibly composed of doubly eclipsing binaries in a quintuple system corresponding to a hierarchy of ab-cd-e. The discovery is based on photometric and spectroscopic observations of V994 Her at three observatories; 18 nights using the 24-inch reflecting telescope at Sobaeksan Observatory with B and V bands, 38 nights using the 16-inch reflecting telescope at Chungbuk National University Observatory with V band only, and 84 Echelle spectra using the BOES at Bohyunsan Observatory. From the synthetic analysis, we found that there exist, at least, four possible evidences to explain the multiplicity in V994 Her. At first, light curves themselves show the apparent double eclipsing phenomenon with two orbital periods of 2.083 days and 1.420 days, respectively, inferring a double eclipsing ab and cd configuration. Secondly, the simulated light curve, which was reproduced with two light elements and light curve synthesis, does fit satisfactorily to the observed light curve. Thirdly, two pairs of radial velocities are derived from the spectrum disentangling analysis. Finally, positions of the color-magnitude diagram indicate that components of the multiple system may have the same distance. The hierarchical model of V994 Her system will be presented.