EPSILON AURIGAE: A SUPERGIANT AND A SUPER DISK

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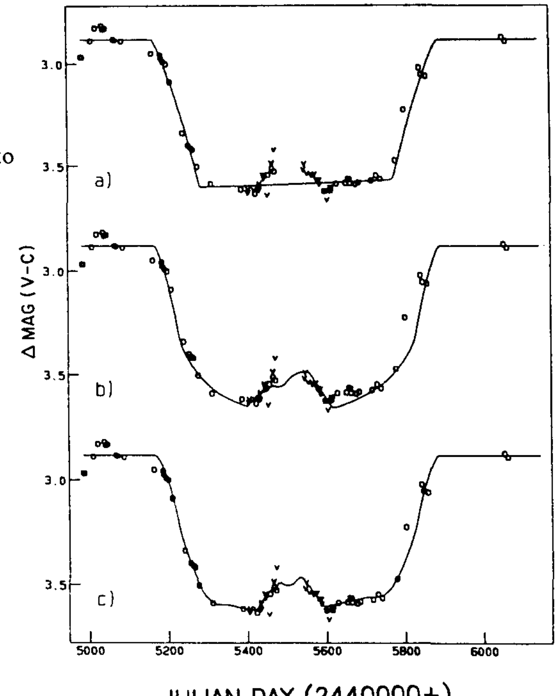
The eclipsing binary Epsilon Aurigae consists of an F0 supergiant and a cool, mysterious eclipsing companion with an orbital period of 27.1 years. The light curve of this system reveals two sources of variability: the eclipses themselves and the intrinsic variation of the supergiant. Multifilter photoelectric observations were made with the 38 cm reflector at the Villanova University Observatory. These data were analyzed along with other sources to reveal the nature of the components of the Epsilon Aurigae system. The system undergoes low-amplitude semi-regular light variations with a characteristic period of 110 days and perhaps a longer period of 500-600 days. The proximity of Epsilon Aur to the Cepheid instability strip on the H-R diagram suggests that the pulsation mechanism for this star may be similar to that of Cepheids.

The leading explanations of the nature of the eclipsing object have been the edge-on disk proposed by Huang (1965, Ap.J. **141**, 976) and the tilted disk proposed by Wilson (1971, Ap.J. **170**, 529). We have developed a computer code to model the eclipse, and explored three configurations of the disk: a thick disk seen edge on; a tilted, opaque disk with a small central hole; and a tilted disk with a central hole and a large, semi-opaque central region. A hot object at the center of the disk could account for the transparency of the central regions. The first two models (a,b) were unable to accurately reproduce the observed light curve, while the last (c) was able to fit the data extremely well (Fig. One). The parameters which provided the best fit suggest a disk that is ten times the radius of the bright star, tilted relative to the orbital plane by about 2^{o}. If the radius of the supergiant is 200 solar radii then the radius of the disk would be 9.3AU, near to the size of Saturn's orbit.



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