



UNIVERSIDAD DE CONCEPCIÓN
DIRECCIÓN DE POSTGRADO

AN ECLIPSING BINARY DISTANCE
DETERMINATION TO THE LARGE
MAGELLANIC CLOUD

TESIS PARA OPTAR AL GRADO DE
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Chapter 1

Abstract

We present analysis of a new, detached eclipsing binary OGLE-LMC-ECL-25658 in the Large Magellanic Cloud. The system consists of two late G-type giant stars on eccentric orbit and orbital period of ~ 200 days. The system has total eclipses and similar temperature of components making it ideal for distance determination. Using multi-color photometric and high resolution spectroscopic data, we have performed an analysis of both light curve and radial velocity curves simultaneously using the Wilson Devinney code. We derived orbital and physical parameters of the binary with high precision of $< 1\%$. The masses of components and surface metallicities are virtually the same and equal to $2.23 \pm 0.02 M_{\odot}$ and $[\text{Fe}/\text{H}] = -0.63 \pm 0.10$ dex. However their radii and rates of rotation show distinct trace of differential stellar evolution. The distance to the system was calculated using infrared calibration between V-band surface brightness and $(V - K)$ color and resulting distance modulus is $(m - M) = 18.452 \pm 0.023$ (statistical) ± 0.046 (systematic). Because OGLE-LMC-ECL-25658 lays relatively far from the LMC barycenter we applied geometrical correction for its position in the LMC disc. The resulting distance to the galaxy $d_{\text{LMC}} = 50.30 \pm 0.53$ (stat.) kpc is in perfect agreement with earlier result by Pietrzyński et al.