Numerical results of the Global Polytropic Model for the orbits of 15 planetary systems

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Abstract: In the framework of the Global Polytropic Model, we assume hydrostatic equilibrium for a planetary system, and solve the resulting Lane-Emden differential equation in the complex plane. We thus obtain polytropic spherical shells defined by successive roots of the Lane-Emden function $\theta$. These shells provide hosting orbits for the planets of the systems under consideration. In the present poster, we present the results within this framework, for 15 stars hosting planetary systems: 55 Cnc, $\mu$ Ara, $\upsilon$ And, HD 40307, HD 10180, Kepler-11, Kepler-20, Kepler-26, Kepler-32, Kepler-33, Kepler-62, Kepler-33, Kepler-62, Kepler-90, Kepler-102, Kepler-102, Kepler-186, Kepler-275.
• Bars represent the radii of the host stars. At the end of the bar we display the spectral type of the star; the calculated polytropic index \( n \); the average error for the orbit radii \( d_{ij} \) computed by the Global Polytropic Model.

• Black diamonds represent the semi-major of the planets.

• Gray error bars represent the respective measurement errors.

• Gray dotted lines represent the maximum values for periastron and aphiastron, as calculated from the measured eccentricity.

• Gray diamonds represent additional planets, not yet verified.

• Gray vertical lines represent the limits of the corresponding polytropic cell.

• Black squares represent the computed semi-major axis of the planets.

• Gray squares represent the computed semi-major axis of the unverified planets. It also marks an alternative computed semi-major axis for Kepler-32 b, supposing that there is a third undiscovered planet in that polytropic cell.

References


