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Period–radius relation for semiregular and Mira stars

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There is a number of studies in which the $\log P$ vs $\log R$ relation for radially pulsating variable stars has been studied (mainly for Cepheids and RR Lyraes, with some efforts on δ Scuti and long-period stars). This relation might serve to test whether the pulsation is radial or nonradial, similarly to the $\log P$ vs $\log g$ relation (Szatmáry & Kiss, 2002). Furthermore, if the observed period and radius do not fit the relation but the pulsation is evidently radial, the shift from the relation would indicate the presence of overtone pulsation. There is a possibility of mode discrimination and mass estimation based on this relation. Previous analyses covered wide period range from the δ Scuti stars (0.06 days) to the classical Cepheids (120 days). The main goal of our study is to extend the relation into the domain of semiregular (SR) and Mira variables. For this, we have collected a few tens of long period pulsators with published radii. They were determined via Baade-Wesselink analysis, surface-brightness method and infrared interferometry. We presented and compared earlier results and a new $\log P - \log R$ diagram for 233 pulsating variables, from δ Scuti stars to Miras (more details can be found at `http://astro.u-szeged.hu`).

We note the large uncertainty of the radii caused by many problematic aspects of radius determination for red giant SR and Mira stars: the radius depends on the pulsational phase; the limb darkening is wavelength-dependent; the presence of strong molecular absorption in IR bands and gas and dust envelopes around the star, deviations from the spherical symmetry or duplicity can have hardly accountable systematic effects.

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