

Characteristics of the Galaxy according to Cepheids (& Young Massive Stars)

Daniel J. Majaess, David G. Turner, David J. Lane

Department of Astronomy and Physics, Saint Mary's University, Halifax, Nova Scotia, Canada;
The Abbey Ridge Observatory, Stillwater Lake, Nova Scotia, Canada;

Classical and Type II Cepheids are used to reinvestigate specific properties of the Galaxy. A new Type II reddening-free Cepheid distance parameterization is formulated from LMC Cepheids (OGLE), with uncertainties typically no larger than 5-15%. A distance to the Galactic centre of $R_0=7.8\pm 0.6$ kpc is derived from the median distance to Type II Cepheids in the bulge (OGLE), $R_0=7.7\pm 0.7$ kpc from a distance to the near side of the bulge combined with an estimated bulge radius of 1.3 ± 0.3 kpc derived from planetary nebulae. The distance of the Sun from the Galactic plane inferred from classical Cepheid variables is $Z_{\text{sun}}=26\pm 3$ pc, a result dependent on the sample's distance and direction because of the complicating effects of Gould's Belt and warping in the Galactic disk. Classical Cepheids and young open clusters delineate consistent and obvious spiral features, although their characteristics do not match conventional pictures of the Galaxy's spiral pattern. The Sagittarius-Carina arm is confirmed as a major spiral arm that appears to originate from a different Galactic region than suggested previously. Furthermore, a major feature is observed to emanate from Cygnus-Vulpecula and may continue locally near the Sun. Significant concerns related to the effects of metallicity on the VI-based reddening-free Cepheid distance relations used here are allayed by demonstrating that the computed distances to the Galactic centre, and to several globular clusters (M54, NGC 6441, M15, and M5) and galaxies (NGC 5128 and NGC 3198) which likely host Type II Cepheids: agree with literature results to within the uncertainties.

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Comments: alt. contact: turner@ap.smu.ca

Email: dmajaess@ap.smu.ca