BN CVn Distance determination using Period-Luminosity-Metallicity Relation

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Abstract

A precise distance measurement to the RR Lyrae variable star BN CVn is presented based on multi-band CCD observations. The study involved obtaining apparent magnitudes in the B, V, I, and Z bands and correcting them for interstellar extinction. Absolute magnitudes were calculated by applying a metallicity–luminosity relation in the V filter and period–luminosity–metallicity relations in the I and Z filters, using a pulsation period of 0.56501 ± 0.01319 days and adopting [Fe/H] = –2.0 ± 0.2 from recent spectroscopic studies. The resulting weighted mean distance was found to be 2105 ± 29 pc. This result shows excellent agreement (within 3.3%) with previous RR Lyrae photometric studies while being 6.9% lower than Gaia EDR3's parallax measurement, reflecting remaining systematic uncertainties in astrometric solutions for pulsating variables. The findings demonstrate that carefully calibrated photometric methods can provide reliable distances and support the continued importance of RR Lyrae stars for Galactic structure studies, particularly when combined with improved Gaia astrometry.