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Absolute calibration of Type II Cepheid and RR Lyrae distance scales using Gaia DR3

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RR Lyrae and Type II Cepheid variables are sensitive probes for the precision stellar astrophysics and the distance scale. These population II variables are known to follow well-defined Period-Luminosity relation at NIR wavelengths and can provide an independent primary calibration of the cosmic distance ladder. We present an absolute calibration of Period-Luminosity-Metallicity relations (PLZR) for the Milky Way field and globular cluster Type II Cepheid and RR Lyrae variables at NIR wavelengths. The spectroscopic metallicities from Gaia-RVS and Gaia parallaxes together with multiband photometry are used to obtain an independent calibration of PLZR for Galactic field variables. Our new NIR photometry of globular clusters with CFHT/Gemini for a wide range of metallicities and the Gaia data are utilized to quantify metallicity dependence on pulsation properties of globular cluster variables. NIR observations of population II variables in peculiar globular clusters NGC 6441 and NGC 6388 are used to investigate the effect of possible helium enhancement on their pulsation properties. We also provide a comparison of RR Lyrae and Type II Cepheid pulsation properties with the theoretical predictions and explore stringent constraints on the impact of metallicity and helium on both evolutionary and pulsation models for helium burning horizontal-branch and post-horizontal-branch low-mass stars.

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Session Classification: Overview on Gaia data/products and their use