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The Halo Outskirts With Variable Stars (HOWVAST) survey: detecting Milky Way mass tracers beyond 100 kpc.

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According to our currently favored cosmological framework, the Lambda- Cold Dark Matter model, galaxies like the Milky Way were built through the accretion and merger of smaller systems. In this scenario, the extended halo of the Milky Way must retain information about this process. Key to unveiling this information is our ability to trace the outermost regions of the halo by detecting and studying the properties of bound objects. One of the most relevant family of such objects is the low-mass, old-population, RR Lyrae (RRL) pulsational variables, ubiquitous in the halo and for which precise distances can be obtained. In this context, I report our search for faint RR Lyrae stars using Dark Energy Camera (DECam) data over ˜400 sq. deg., as part of the Halo Outskirts With Variable Stars (HOWVAST) survey, where we detect more than ~500 RR Lyrae candidates ranging in heliocentric distances from 7 to 270 kpc. 27 of these stars are located beyond 100 kpc from the Galactic center, increasing our current sample of distant mass tracers, critical to improve current Milky Way mass determinations which suffer from at least 50% uncertainty. HOWVAST represents our effort to carry out frontier Galactic science done with RRLs, and should only be surpassed once the Vera C. Rubin Observatory Legacy Survey of Space and Time (LSST) begins scientific operations, which is expected for early 2026.

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