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Short Period Dwarf Carbon Stars

B. R. Roulston¹, P. J. Green², S. Toonen³, J. Hermes⁴

¹Smithsonian Astrophysical Observatory, Cambridge, MA; Department of Astronomy, Boston University, Boston, MA,

²Smithsonian Astrophysical Observatory, Cambridge, MA,

³Anton Pannekoek Institute, University of Amsterdam, Amsterdam, Netherlands,

⁴Department of Astronomy, Boston University, Boston, MA

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Dwarf carbon stars are main sequence stars showing carbon molecular bands, with properties consistent with all being carbon-enriched by mass transfer from a previous asymptotic-giant-branch (AGB) companion, which has since evolved to a white dwarf. Previous studies have found radial velocity variations, but few dC periods exist in the literature. We have analyzed photometric light curves from the Zwicky Transient Facility (Bellm et al. 2019) for a sample of 944 dC stars. We have identified 27 new periodically variable dC stars from these light curves - 3% of the entire dC sample. Surprisingly, 22 (82%) of these have periods of less than a day. These new short-period dCs are likely post-common-envelope binary systems (PCEBs) and present challenges for traditional PCEB formation pathways. We discuss evolutionary scenarios that these binaries may have taken to accrete sufficient C-rich material while nevertheless avoiding truncation of the thermally pulsing AGB phase needed to provide such C-rich enhancement.