Multiwavelength Analysis of the Intermediate Polar Cataclysmic Variable IGR J17014–4306

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Abstract

Cataclysmic variables (CVs) are the most abundant class of interacting binary systems containing compact stellar remnants, offering unique opportunities to investigate stellar evolution and accretion physics. Within this group, intermediate polars host magnetized white dwarfs and display rich variability signatures in both X-ray and optical domains. In this study, we present a multiwavelength investigation of the intermediate polar IGR J17014–4306. We employed X-ray spectral analysis using data from the NuSTAR, XMM-Newton, and Swift observatories, deriving key physical parameters such as the maximum temperature of the accretion column (kT_{max} = 50.3 ± 5.5 keV), metallicity (0.56 ± 0.10), mass accretion rate (9.7 × 10^{-11} $M_\odot$/yr), and the equivalent radius of the emitting region (147 km). Time-series analysis of X-ray light curves was performed to explore the source's temporal variability. Additionally, optical photometric monitoring from the TESS satellite and spectroscopic observations with the SOAR telescope were analyzed to investigate light curve morphology and search for periodicities. The integration of these datasets enables a detailed characterization of the source, enhancing our understanding of accretion processes in magnetic CVs. Keywords: Stellar Astrophysics, Cataclysmic Variables, Intermediate Polars, X-ray Astronomy, Optical Spectroscopy, Photometry, Accretion