Hubble Space Telescope

Cycle 16 AR Proposal

The Variable Magnetic White Dwarf in the Hyades Eclipsing Binary V471 Tauri

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Total Budget Amount: $80,000

Abstract

V471 Tau is a detached eclipsing binary in the Hyades cluster consisting of a hot magnetic white dwarf and a rapidly rotating K dwarf companion. With an orbital period of only 12.5 hour, the stellar components emerged from common envelope interactions which drastically reduced their initially wide separations. It is the prototypical pre-cataclysmic binary. The white dwarf exhibits soft X-ray, EUV and optical variations on its 9.25 minutes rotation period. These variations are due to heavy elements accreted onto the WD's magnetic poles from the companion's wind. The implied accretion rate from the companion's wind, however, is so low that a magnetic propeller mechanism must be rejecting most of the material that attempts to accrete.

We propose a comprehensive analysis of all existing HST STIS echelle spectroscopic observations that will focus on: (1) the variation of line strengths of accreted ions in the WD photosphere over the 9.25 minute rotation period of the WD, covering the four years over which STIS echelle spectra were taken; (2) probe the Zeeman splitting we first detected in a greater mix of metallic absorptions species, thus accurately determining the magnetic field strength and its variation at the rotational period; (3) determine the chemical abundances of accreted metals and study the process of magnetic accretion onto, and diffusion of heavy elements out of, the photosphere of the magnetic white dwarf using newly available models and diffusion parameters by Co-I J. Dupuis; (4) refine the mass of the WD and other system parameters with a more complete radial velocity curve.

Investigators:

	Investigator	Institution	Country
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CoI	Dr. Howard E. Bond	Space Telescope Science Institute	USA/MD
CoI	Dr. Jean Dupuis	Canadian Space Agency	
CoI	Dr. Patrick Godon	Villanova University	USA/PA

Number of investigators: 4

Dataset Summary:

Instrument	No. of Datasets	Retrieval Method	Retrieval Plan
STIS	14	FTP	The dataset will be retrieved as the proposed research begins