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CHANDRA X-RAY RESULTS ON V426 OPHIUCHI

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RESUMEN

De las observaciones de 45 ks de *Chandra* de V426 Oph hemos obtenido espectros de rayos X de alta resolución con relación señal-a-ruido moderada, y una curva de luz no interrumpida de buena calidad. Los espectros se adaptan razonablemente a un modelo de flujo de enfriamiento, similar a EX Hya y U Gem. Nuestro análisis de las curvas de luz de *Chandra* y las adicionales de rayos X/óptico revela una modulación persistente a 4.2 hr desde 1988 hasta 2003, probablemente el período de giro de la enana blanca, indicando una naturaleza polar intermedia para V426 Oph.

ABSTRACT

From a 45ks *Chandra* observation of V426 Oph we have obtained high-resolution X-ray spectra at moderate signal-to-noise, and a good quality, uninterrupted lightcurve. The spectra are reasonably fit with a cooling flow model, similar to EX Hya and U Gem. Our analysis of the *Chandra* and additional X-ray/optical lightcurves reveals a persistent modulation at 4.2 hr from 1988 to 2003, likely the white dwarf spin period indicating an intermediate polar nature for V426 Oph.

Key Words: ACCRETION, ACCRETION DISKS — STARS: INDIVIDUAL (V426 OPHIUCHI)

1. INTRODUCTION

The cataclysmic variable V426 Oph has proven to be somewhat enigmatic, despite extensive study. First identified as a bright nova-like ($V=11.5-13.4$) with an emission line spectrum (Herbig 1960), a detailed spectroscopic study by Hessman (1988) revealed a K3 dwarf secondary in a 6.85 hr orbit with a white dwarf (WD), with an inclination of 53° and at a distance of 200 pc. He also concluded this was a Z Cam type of dwarf nova (DN). However, there are several observational clues that V426 Oph might harbor a magnetic WD: (i) an unusually flat flux distribution in the UV, possibly due to the truncation of a hot inner disk, (ii) the X-ray flux at quiescence is larger than for typical DNe (Szkody 1986), (iii) the emission lines show flaring activity and a phase shift from a location near the WD (Hessman 1988), (iv) quasi-periodic variability has been seen in the optical and X-ray at periods from 30 min to 4.5 hr (Szkody 1986, Szkody et al 1990, Rosen et al. 1994; but see Hellier et al. 1990). To further explore these ideas, and to try to resolve the nature of the accre-

UT Date	Observatory	UT Time	Notes
2002 05 30	Chandra: HETGS	21:40 – 11:02	45.15 ks
2002 05 31	BO	07:04 – 11:30	V phot
2002 05 30	CTIO: YALO	08:17 – 09:34	V phot
2002 05 31	APO: DIS	06:20 – 06:25	spectrum
2003 07 25	MRO	06:00 – 10:04	R phot
2003 07 28	MRO	04:35 – 10:51	I phot

tion in V426 Oph, we obtained a *Chandra* observation at quiescence together with simultaneous optical photometry and a single contemporaneous spectrum. Additional photometry was later obtained (see summary in table).

2. DATA ANALYSIS

Chandra grating spectra and response files were extracted with CIAO. We performed cooling flow fits in XSPEC and more detailed modelling using key line fluxes. We also constructed a *Chandra* lightcurve from the PSF wings plus part of the 1st order spectrum in CIAO (Fig. 1). We obtained past *ROSAT* and *Ginga* data from the HEASARC archive, and supplementary optical lightcurves (some simultaneous). To search for both sinusoidal and more irregular morphology modulations we undertook period searches with Lomb-Scargle and PDM techniques and fitted sinusoids at the candidate periods.

3. IP NATURE OF V426

The classic signature of an IP is the presence of two or more coherent periodic modulations corresponding to the binary orbit, white dwarf spin and

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