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Mid-IR Observations of Dwarf Novae at Dome C

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Abstract. We briefly discuss about the possibility to detect mid-IR emission from a selected sample of Dwarf Novae observable at Dome C with IRAIT. Relatively little is known about their infrared properties, and the suggested investigation will contribute to the understanding of the cool outer disk, the accretion stream, and the eventual circumstellar dust.

Key words. Cataclysmic Variables – Antarctica - Infrared

1. Introduction

Dwarf Novae (DNe) are cataclysmic variables that have semiperiodic outbursts of amplitude from 2 to 8 mag. They are usually modeled as close binaries with orbital period of few hours, with a late main sequence star which transfer mass to a white dwarf primary. If the white dwarf has a weak magnetic field, the matter accumulates in an accretion disk which usually provides an important contribute to the system light, especially during the outburst (see, e.g., Warner 1995).

Why are we interested to observe these sources in the mid-IR? Essentially for the fact that DNe are well known in the high-energy range, while there is a lack of information about the secondary star, the cold fraction of the accretion disk, the accretion stream, and the eventual presence of circumstellar dust.

Jameson et al. (1987) reported the IRAS detection of only SS Cygni at 12 and 25 μm during outbursts, among their extraction of data for five DNe. Harrison & Gehrz (1992) found that IRAS detected 34 of the 44 DNe in their list, and only 23 in the mid-IR (see Table 1). There are also sporadic detections from the MSX satellite, that confirm the presence of a mid-IR contribute to the overall emission of a sample of these systems. For example, V1830 Sgr has been detected by MSX and it is enclosed in the 5th Infrared Point Source Catalog (Egan et al. 1999) with a flux density in the A band of 0.66 Jy. In the same manner, FQ Sco has A = 0.34 Jy, and FY Vul has A = 0.29 Jy.

Obviously there are many plausible scenarios able to explain these detections (circumstellar dust, accretion disk, etc.), but the results are confusing and probably the real processes at work in these systems are not well understood. For example, Howell et al. (1996) reanalyzed the IRAS database and concluded that the cause of the far-IR emission is due to cirrus, and then DNe are not sources of long-wavelength emission. The situation is different in the mid-IR, from 10 to 20 μm, where the emission is intrinsic. The secondary star is usually a

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Table 1. IRAS data for some DNe

Name		12μm (Jy)	25μm (Jy)
VZ	Aqr		0.16±0.04
UU	Aql		0.19±0.04
FV	Ara		0.23±0.03
SS	Aur	0.35±0.05	0.10±0.04
Z	Cam	0.09±0.03	
SY	CnC	0.15±0.03	
BV	Cen	0.12±0.04	
V422	Cen	0.27±0.04	
SS	Cyg		0.15±0.04
IR	Gem		0.15±0.04
AH	Her	0.10±0.02	0.05±0.01
VW	Hyi		0.06±0.02
T	Leo	0.08±0.04	
X	Leo	0.32±0.05	
TU	Leo		0.26±0.06
TU	Oph	0.22±0.04	0.26±0.06
RU	Peg		0.16±0.04
V1830	Sgr	0.53±0.07	
UZ	Ser	0.33±0.09	0.57±0.16
HW	Tau	0.12±0.03	
SW	UMa		0.11±0.02
BC	UMa	0.09±0.02	
CU	Vel		0.20±0.04

K or M main sequence dwarf, with a peak energy distribution around 1 μm. The fact that the sporadic detections are obtained during the outburst suggests that there is a reprocessing of the high-energy photons, for example a lightening in the cool outer part of the accretion disk. What we need is a real **mid-IR light-curve** to distinguish the constant emission from the contribute due to the outburst.

2. Observations with IRAIT at Dome Concordia

The Italian Robotic Antarctic Infrared Telescope (IRAIT) is a fully automatic 80 cm telescope (see, e.g., Tosti et al. 2003) that will be placed at Dome C during 2004-05. The telescope will be equipped with a mid-infrared camera to measure the real capabilities of the site (see Fiorucci et al., this Proceedings), and will obtain photometric data immediately after the installation. The choice of a high-flux Si:As array will permit to detect many astronomical sources, thanks to an expected sensitivity of $\sim$ 20 mJy at 10 μm, and $\sim$ 0.05 Jy at 20 μm. The performances are enough to permit at least the detection of all the southern sky DNe observed by IRAS.

Table 2. Sub-sample of Dwarf Novae suggested for observation from Antarctica

Name		coordinates (J2000)	
VZ	Aqr	21 30 24.56	-02 59 17.6
UU	Aql	19 57 18.68	-09 19 20.8
BV	Cen	13 31 19.55	-54 58 33.6
MU	Cen	13 49 37.30	-42 28 26.0
BM	Cha	13 08 04.20	-77 54 45.0
V1830	Sgr	18 13 50.64	-27 42 21.7
UZ	Ser	18 11 24.90	-14 55 33.9
FQ	Sco	17 08 04.44	-32 42 02.1

In some sense, DNe can be considered ideal candidates for IRAIT, especially in the N window around 10 μm, where some of them are expected to be quite bright. Many DNe have recurrent outbursts every 20-40 days, with a typical duration of the maximum phase of several days, therefore they can be easily monitored in time-scales of a few months. Although it would be important the monitoring of the fast fluctuations, we suggest at least the observation, once a day, of the list of DNe reported in Table 2, with the aim to trace the light curve around 10 μm (the bands 8.8, 10.3 and 11.7 would be recommended) during all the outburst cycle. The target is to verify the source of the mid-IR emission, to get information about the physical mechanism responsible of the mid-IR emission, and to constrain theoretical models about DNe outbursts.

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