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QUIESCENT PHOTOMETRY OF V5115 SGR

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V5115 Sgr (Nova Sgr 2005) was independently discovered by Nishimura (2005) and Sakurai (2005). At peak, it reached a visual magnitude of 7.8 on March 29.7, in 2005. The AAVSO light curve for this nova is given in Figure 1.

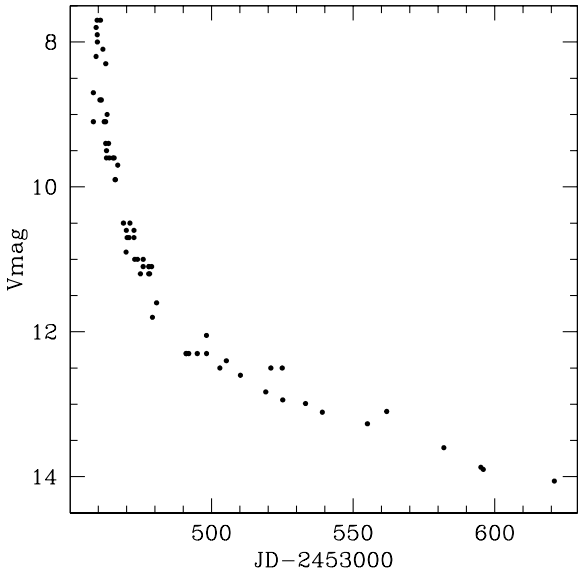

Figure 1. AAVSO light curve of V5115 Sgr. Points are a mixture of visual observations and CCD V-band observations.

Kiss and Derekas (2005) confirmed the nova classification based on H-alpha emission with a strong P-Cyg profile with full-width-zero-intensity exceeding 5000 km/s. The Na D doublet was saturated, indicating high interstellar reddening. Rudy et al. (2005) indicate that the reddening derived from the NIR O I lines was $E(B-V) = 0.53$. Likewise, the Schlegel et al. (1998) galactic extinction maps give $E(B-V) = 0.586$mag, and a total extinction of 1.942mag at V-band. The light curve looks like a typical fast nova, with the time to drop 3 magnitudes (t_3) of about 12 days.

Several independent astrometric positions were given for the nova, as given in Table 1. Three additional measurements are given there, based on new astrometric measurements

of B-band images taken by Di Scala (DSI), reduced using the UCAC2 astrometric catalog (Zacharias et al. 2004), and also recent imagery from the U.S. Naval Observatory, Flagstaff Station (NOFS) as described later.

Table 1. V5115 Sgr astrometric positions

Observer	Epoch	RA(J2000)	DEC(J2000)
Nakano (2005a)	2005.33	18:16:59.04	−25:56:38.8
Nakano (2005b)	2005.33	18:16:58.96	−25:56:38.9
Nakano (2005b)	2005.33	18:16:58.97	−25:56:39.1
DSI	2005.58	18:16:58.95	−25:56:39.7
DSI	2005.66	18:16:58.96	−25:56:39.6
NOFS	2007.40	18:16:58.96	−25:56:39.6

As this is a very crowded region near the center of the Galaxy (galactic longitude 6.0464 degrees; latitude −4.5674 degrees) and is heavily reddened, no progenitor was identified in the IAUC. Yamaoka (2005) noted that there was a nearby bright infrared source in the 2MASS catalog.

Other than these initial reports, no additional information has been published on this nova. Hans-Guenter Diederich asked on the BAV mail list on May 8, 2007, about the proper identification for V5115 Sgr now that it has faded. In addition, late-time photometry for novae is often neglected. For these reasons, we made further observations of V5115 Sgr at NOFS in May, 2007.

DSI observed V5115 Sgr during the outburst, using a 30cm telescope, SBIG ST-6 CCD camera and Custom Scientific BVR_c filters. Standard dark subtraction and flatfielding were performed. Stars were extracted using `AIP4WIN` software. First order extinction corrections as well as transformation coefficients were applied. Since this field was not yet calibrated, the DSI observations are all-sky, using SA109-747 as the primary standard. Table 2 gives the BVR_c photometry during outburst.

The field of V5115 Sgr was also observed at BVR_cI_c on May 26, 2007 (UT) and at BV on May 28, 2007, using the 1.0m R/C telescope at NOFS. Conditions were photometric. A BVR_cI_c calibration of the field was obtained, with results given in Table 3 (available through the IBVS website as `5783-t3.txt`). For each night, multiple Landolt (1983, 1992) fields were observed to both obtain the transformation coefficients as well as extinction. As this field is at −25 degrees declination, it transits at relatively high airmass, so the quality of the calibration is not as high as for other fields. In addition, the high airmass results in poorer image quality; the typical seeing on these two nights was about 2.5arcsec for this field. Note that automated starfinding routines were used to generate Table 3, and that many spurious objects will be present due to blending. Take care when using this table to identify isolated objects.

Each image was bias subtracted and flatfielded using standard procedures. The images were then psf-fit using DAOPHOT (Stetson, 1987) as implemented in IRAF. The photometry was calculated using inhomogeneous ensemble photometry techniques similar to Honeycutt (1992). Astrometry was performed using the SLALIB astronomical library (Wallace, 2002) along with UCAC2.

This is a very crowded region and exposures were shorter than necessary for high-precision photometry. However, we report the new photometry for V5115 Sgr also in Table 2.

Yamaoka (2005) noted that there was a nearby bright infrared source in the 2MASS

Table 2. V5115 Sgr multifilter data from DSI and NOFS

JD	V	err	$(B-V)$	err	$(V-R_c)$	err	Observer
2453498.2049	12.05	0.05	0.25	0.10	1.40	0.10	DSI
2453505.2479	12.40	0.02	–	–	1.18	0.04	DSI
2453519.1458	12.83	0.02	0.07	0.04	1.16	0.04	DSI
2453525.1417	12.94	0.02	0.05	0.03	1.06	0.03	DSI
2453533.1875	12.99	0.02	0.18	0.04	0.85	0.04	DSI
2453539.1188	13.11	0.02	0.10	0.04	0.97	0.04	DSI
2453555.0451	13.27	0.02	0.32	0.04	0.80	0.04	DSI
2453582.0090	13.60	0.02	0.36	0.04	0.50	0.04	DSI
2453595.0833	13.87	0.03	–	–	0.55	0.05	DSI
2453595.9507	13.90	0.02	0.29	0.04	0.58	0.04	DSI
2453621.0278	14.06	0.02	0.43	0.04	0.69	0.04	DSI
2454246.9038	18.50	0.06	0.50	0.08	–	–	NOFS
2454248.9211	18.42	0.08	0.29	0.09	–	–	NOFS

catalog. The recent BVR_cI_c images make it clear that V5115 Sgr has a red companion about 4.2arcsec due west of the variable. The BVR_cI_c photometry for the red companion is given in Table 4. Table 5 gives the astrometry for the companion from existing catalogs as well as from the recent NOFS images. The NOFS astrometry has internal errors around 50mas. Based on the astrometry shown in the Table, there is no detectable proper motion for the red companion.

Table 4. Red companion optical photometry

V	err	$(B-V)$	err	$(V-R_c)$	err	(R_c-I_c)	err
17.154	0.022	2.409	0.086	2.491	0.023	2.358	0.015

Table 5. Red companion information

Source	Epoch	RA(J2000)	Dec(J2000)	i'	err	J	err	H	err	K	err
USNO-B	1969.7	18:16:58.63	−25:56:38.6	–	–	–	–	–	–	–	–
GSC2.3.2	1996.70	18:16:58.65	−25:56:39.1	–	–	–	–	–	–	–	–
DENIS	1999.52	18:16:58.62	−25:56:38.3	12.263	0.03	9.297	0.06	–	–	7.764	0.09
2MASS	2000.82	18:16:58.67	−25:56:39.0	–	–	9.243	0.048	8.142	0.036	7.690	0.026
NOFS	2007.40	18:16:58.66	−25:56:39.2	–	–	–	–	–	–	–	–

The MACHO and OGLE databases were searched for progenitor photometry, with none found. Likewise, ASAS does not show any outbursts of this nova, including the 2005 outburst to V=8. This may be due to the continuing hard drive failures that the system is having. No CFHT, Gemini, HST, AAT or ING images were found during CADC searches that covered the field of V5115 Sgr.

We examined available Schmidt plate material from the PMM archive at NOFS, and see no progenitor for V5115 Sgr to their plate limit (about 21mag). These plate searches indicate that any progenitor must have been V=21 or fainter, indicating that the full amplitude of the outburst is greater than 13 magnitudes.

Figure 2 is a B-band image from NOFS identifying V5115 Sgr and its red companion. Figure 3 is the corresponding field from a POSS-I survey plate, showing the red companion and the lack of a progenitor.

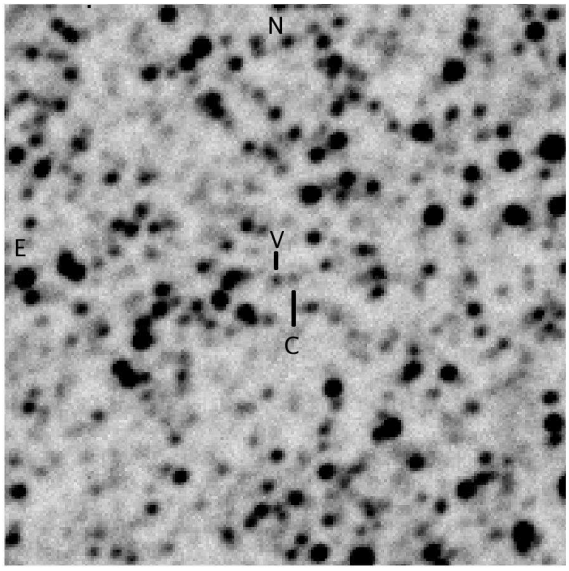

Figure 2. NOFS 1.0m B image of field. FOV 2×2arcmin. V=variable; C=companion

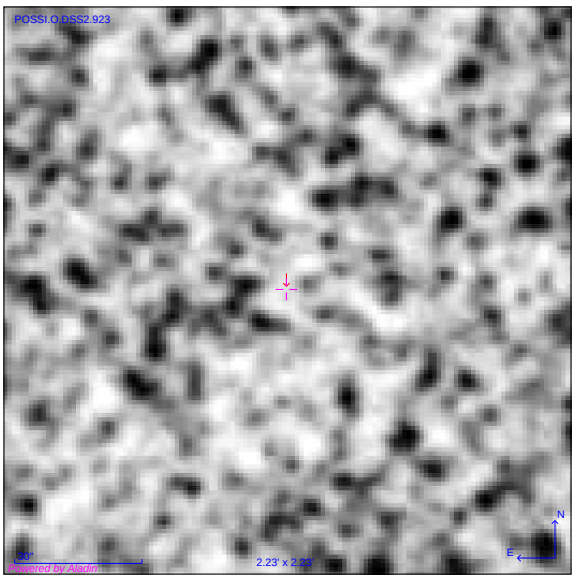

Figure 3. POSS-I O(blue) image of field.FOV 2×2arcmin

V5115 Sgr appears to be a typical fast nova, with an amplitude exceeding 13 magnitudes. No progenitor is known. It currently is at V=18.5, still above the quiescent level, but any new photometry must account for the nearby bright red companion and the otherwise extremely crowded field.

This research has made use of the SIMBAD database, operated at CDS, Strasbourg, France. This research made use of the facilities of the U.S. Naval Observatory, Flagstaff, Arizona USA. The astronomical catalog facility of VizieR (Ochsenbein et al. 2000) was also used.

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