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**PHOTOMETRIC SEQUENCES AND ASTROMETRIC POSITIONS  
OF NOVA Sgr 2007 AND NOVA Vul 2007**

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Nova Sgr 2007 (= V5558 Sgr) was discovered by Y. Sakurai at  $\sim 10.3$  mag on Apr 14.777 UT (cf. Nakano 2007a). It was recovered on pre-discovery images by K. Haseda at mag 11.2 on Apr. 11.792 UT (cf. Yamaoka 2007). On April 20, spectroscopic confirmation was provided by Iijima (2007a), who argued that the object could be a rather peculiar nova seen in the pre-maximum phase, and by Naito et al. (2007), who concluded the object is probably not a classical nova. Later, Iijima (2007b) recapped the spectroscopic evolution until mid July and concluded the object is indeed a nova with a very peculiar behaviour. A detailed description of the first three months of photometric and spectroscopic evolution of Nova Sgr 2007 was provided by Munari et al. (2007a), that also highlighted the similarity with Nova Cas 1995 (V723 Cas) and reported about their positive detection of the nova in the X-rays with the SWIFT satellite. Further evolution in optical and infrared spectra were reported by Kiss and Sarneczky (2007a) and Lynch et al. (2007). According to Munari et al. (2007a), maximum brightness occurred around July 10.0 UT with  $V = 6.53$ ,  $B - V = +0.96$ ,  $V - I_C = +1.22$ . According to the AAVSO International Database, Nova Sgr 2007 went through five further progressively fainter maxima.

Nova Vul 2007 (= V458 Vul) was discovered on August 8.54 UT by H. Abe at 9.5 mag (cf. Nakano 2007b). Spectroscopic confirmation was obtained on the following day by Munari et al. (2007b), Buil (2007) and Fujii (2007). A description of the spectrum for August 18 was reported by Kiss and Sarneczky (2007b). According to the AAVSO International Database, Nova Vul 2007 went through three distinct maxima of similar  $\sim 8.2$  mag brightness on August 9, 13 and 19, before entering a stable decline.

In this note we present a  $BVR_CI_C$  photometric sequence around both novae. These sequences are based on the visual sequences used by the AAVSO, with a wider color range for CCD calibration. To calibrate the sequences, we obtained CCD photometry with the Sonoita Research Observatory 0.35-m robotic telescope on several distinct photometric nights, using  $BVR_CI_C$  filters and an SBIG STL-1001E CCD camera. Pixel size is  $1''25/\text{pix}$  and the field of view is  $20' \times 20'$ . Observations on each photometric night included following an extinction star from low to high airmass, along with  $BVR_CI_C$  exposures of Landolt standard fields (Landolt 1983, 1992). The photometric sequences are presented in Figures 1 and 2.

Astrometry was performed using SLALIB (Wallace 1994) linear plate transformation routines in conjunction with the UCAC2 reference catalog. Errors in coordinates were

less than 0.1 arcsec in both coordinates, referred to the mean coordinate zero point of the reference stars in each field. The coordinates we derived for Nova Sgr 2007 are  $\alpha_{J2000} = 18^{\text{h}}10^{\text{m}}18^{\text{s}}258 (\pm 0^{\text{s}}.046)$ ,  $\delta_{J2000} = -18^{\circ}46'51''.95 (\pm 0''.047)$ , close to the coordinates reported by Nakano (2007a) at position end figures 18<sup>s</sup>27 and 52<sup>''</sup>.1, and by Koff (2007) at position end figures 18<sup>s</sup>21 and 51<sup>''</sup>.8. No progenitor is visible on POSS plates within a few arcsec from this position, which would set the outburst amplitude to  $\Delta B \geq 13.4$  mag. 7.2 arcsec north of the nova lies field star GSC2 S9JJ000329, for which we measured psf-fit magnitudes as given in Table 1 and position (J2000)  $\alpha=18^{\text{h}}10^{\text{m}}17^{\text{s}}99$ ,  $\delta=-18^{\circ}46'46''.0$ .

Table 1. Nova optical companions

<i>companion to:</i>	<i>V</i>	<i>(B - V)</i>	<i>(V - R<sub>c</sub>)</i>	<i>(R<sub>c</sub> - I<sub>c</sub>)</i>
V5558 Sgr	12.25 $\pm$ 0.05	+1.39 $\pm$ 0.05	+0.77 $\pm$ 0.08	+0.73 $\pm$ 0.06
V458 Vul	15.96 $\pm$ 0.05	+1.80 $\pm$ 0.08	+1.01 $\pm$ 0.05	+ 0.97 $\pm$ 0.08

Our coordinates for Nova Vul 2007 are:  $\alpha_{J2000} = 19^{\text{h}}54^{\text{m}}24^{\text{s}}628 (\pm 0^{\text{s}}.061)$ ,  $\delta_{J2000} = +20^{\circ}52'52''.02 (\pm 0''.049)$ , close to the coordinates reported by Nakano (2007b) at position end figures 24<sup>s</sup>64 and 51<sup>''</sup>.9. Within 0.61 arcsec from our position of the nova lies USNO-B1.0 1108-0460444, at catalog  $B=18.2$  and  $R=17.8$  mag. The blue color and  $\Delta B=10.5$  mag outburst amplitude make this object a viable progenitor for the nova. 7.4 arcsec south of the nova lies USNO-B1.0 1108-0460435, for which we measured psf-fit magnitudes as given in Table 1 and position (J2000)  $\alpha=19^{\text{h}}54^{\text{m}}24^{\text{s}}52$ ,  $\delta=+20^{\circ}52'44''.8$

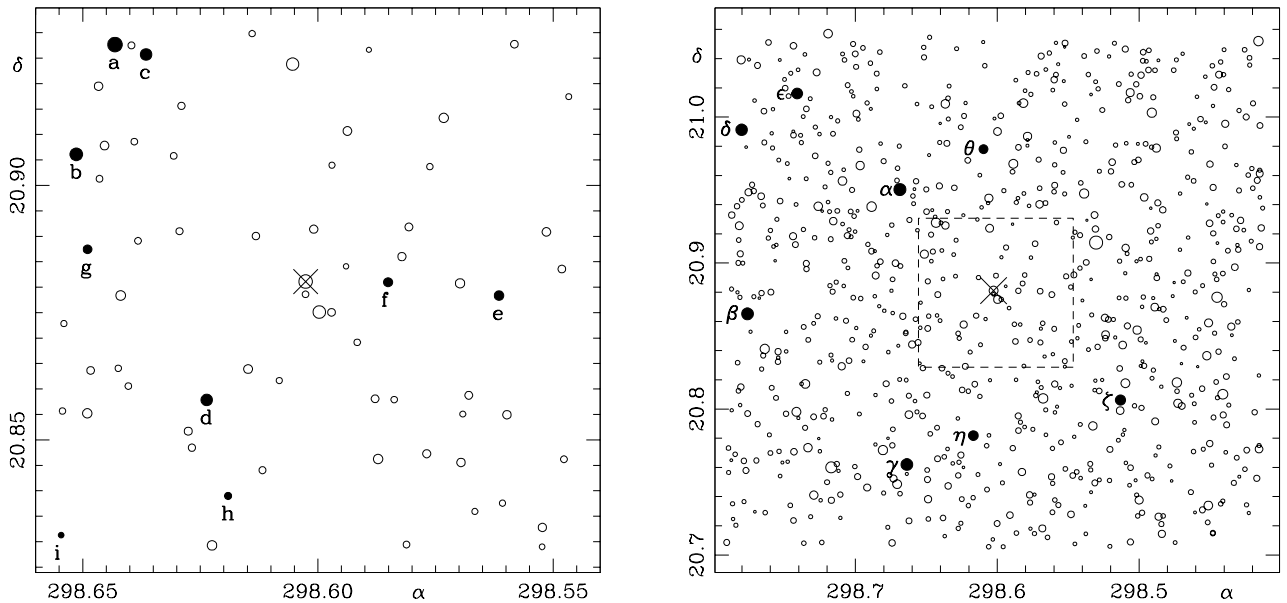
We would like to thank J. Gross, W. Cooney and D. Terrell for their help in setting up the SRO observations and relinquishing their observing time.

#### References:

- Buil, C., 2007, *IAUC*, **8862**  
 Fujii, M., 2007, *IAUC*, **8862**  
 Iijima, T., 2007a, *CBET*, **934**  
 Iijima, T., 2007b, *CBET*, **1006**  
 Kiss L., Sarneczky, K., 2007a, *CBET*, **1039**  
 Kiss L., Sarneczky, K., 2007b, *CBET*, **1038**  
 Koff, R., 2007, *IAUC*, **8832**  
 Landolt, A. U., 1983, *AJ*, **88**, 439  
 Landolt, A. U., 1992, *AJ*, **104**, 340  
 Lynch D. et al., 2007, *IAUC*, **8874**  
 Munari, U. et al., 2007a, *CBET*, **1010**  
 Munari, U. et al., 2007b, *CBET*, **1029**  
 Nakano, S., 2007a, *IAUC*, **8832**  
 Nakano, S., 2007b, *IAUC*, **8861**  
 Naito, H., Matsuda K., Yamaoka H., 2007, *CBET*, **934**  
 Wallace, P., 1994, *ASP Conf. Ser.*, **61**, 481, in Astronomical Data Analysis Software and Systems III,  
 Yamaoka, H., 2007, *IAUC*, **8832**

Nova Vul 2007      $\alpha_{J2000} = 19\ 54\ 24.63$       $\delta_{J2000} = +20\ 52\ 52.0$

	$\alpha_{J2000}$ ( $\pm''$ )		$\delta_{J2000}$ ( $\pm''$ )		N	V ( $\pm$ )		B-V ( $\pm$ )		V-R <sub>C</sub> ( $\pm$ )		R <sub>C</sub> -I <sub>C</sub> ( $\pm$ )		V-I <sub>C</sub> ( $\pm$ )	
a	298.643151	0.040	+20.927677	0.020	3	11.548	0.015	1.221	0.080	0.678	0.016	0.651	0.016	1.333	0.012
b	298.651372	0.023	+20.906116	0.041	3	12.522	0.018	0.623	0.003	0.377	0.012	0.406	0.014	0.788	0.012
c	298.636528	0.040	+20.925733	0.077	3	13.054	0.023	1.948	0.015	1.153	0.020	1.162	0.030	2.331	0.025
d	298.623639	0.040	+20.857857	0.020	3	13.148	0.022	0.431	0.012	0.251	0.025	0.282	0.033	0.536	0.023
e	298.561497	0.053	+20.878355	0.143	3	14.089	0.026	1.319	0.045	0.744	0.041	0.780	0.037	1.535	0.034
f	298.585079	0.117	+20.880976	0.088	3	14.376	0.026	0.795	0.024	0.459	0.042	0.463	0.032	0.925	0.036
g	298.648972	0.117	+20.887449	0.150	3	14.522	0.019	0.902	0.080	0.510	0.040	0.498	0.042	1.009	0.049
h	298.619093	0.185	+20.838994	0.220	3	15.310	0.016	1.706	0.069	0.919	0.037	0.976	0.040	1.912	0.024
i	298.654575	0.348	+20.831294	0.299	2	16.103	0.008	0.719	0.037						
$\alpha$	298.668638	0.081	+20.950372	0.022	3	9.826	0.017	1.167	0.006	0.624	0.008	0.590	0.013	1.216	0.016
$\beta$	298.776093	0.139	+20.865219	0.065	3	10.020	0.018	1.169	0.008	0.628	0.012	0.570	0.017	1.197	0.010
$\gamma$	298.663720	0.089	+20.762015	0.027	3	10.138	0.025	0.061	0.003	0.062	0.008	0.083	0.017	0.143	0.016
$\delta$	298.780210	0.118	+20.991291	0.052	3	10.266	0.032	0.165	0.007	0.096	0.009	0.151	0.015	0.250	0.014
$\epsilon$	298.741060	0.104	+21.016166	0.051	3	10.804	0.028	0.982	0.011	0.542	0.011	0.504	0.009	1.045	0.005
$\zeta$	298.513049	0.083	+20.806158	0.020	3	11.154	0.023	0.164	0.007	0.109	0.006	0.141	0.015	0.250	0.012
$\eta$	298.616811	0.051	+20.781844	0.035	3	11.444	0.019	0.510	0.005	0.304	0.009	0.318	0.011	0.624	0.010
$\theta$	298.609665	0.043	+20.978029	0.026	3	11.959	0.020	1.363	0.014	0.756	0.008	0.698	0.015	1.455	0.015

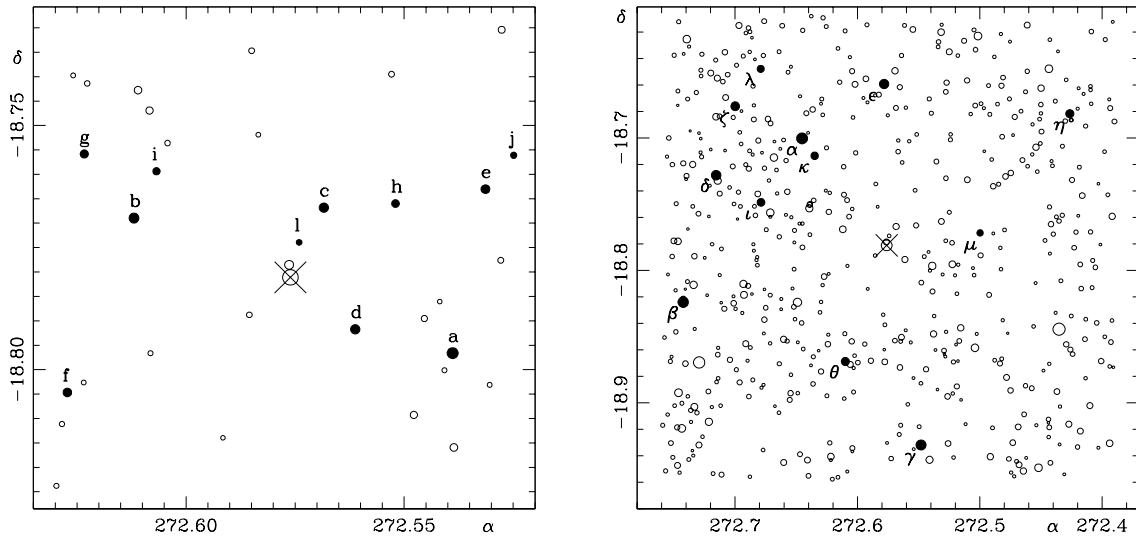


**Figure 1.**  $BVR_C I_C$  photometric comparison sequence around Nova Vul 2007. The cross indicates the nova.  $N$  is the number of nights in which the given star has been measured in the given band. The error in  $\alpha$  and  $\delta$  are in arcsec. The panel on the right covers a  $20' \times 20'$  area centered on the nova and shows stars down to  $V=16.5$ . The dashed  $6' \times 6'$  area is zoomed in on the left panel.

$\alpha$  = HD 345257 (K5),  $\beta$  = HD 345267 (K2),  $\gamma$  = HD 345266 (B5),  $\delta$  = HD 345268 (B8),  
 $\epsilon$  = HD 345256 (G5) and  $\zeta$  = HD 345264 (A2).

Nova Sgr 2007      $\alpha_{J2000} = 18\ 10\ 18.26$       $\delta_{J2000} = -18\ 46\ 51.9$

	$\alpha_{J2000}$ ( $\pm''$ )	$\delta_{J2000}$ ( $\pm''$ )	N	V ( $\pm$ )	B-V ( $\pm$ )	V-R <sub>C</sub> ( $\pm$ )	R <sub>C</sub> -I <sub>C</sub> ( $\pm$ )	V-I <sub>C</sub> ( $\pm$ )							
a	272.538878	0.034	-18.796609	0.057	4	11.732	0.023	1.716	0.019	0.973	0.014	0.916	0.020	1.888	0.024
b	272.611939	0.042	-18.768947	0.040	4	12.330	0.035	0.489	0.018	0.337	0.032	0.337	0.020	0.674	0.021
c	272.568396	0.037	-18.766809	0.040	4	12.790	0.030	1.554	0.015	0.854	0.023	0.751	0.014	1.597	0.027
d	272.561203	0.028	-18.791726	0.051	4	12.795	0.028	0.555	0.014	0.337	0.026	0.360	0.016	0.700	0.022
e	272.531353	0.039	-18.763034	0.055	4	13.076	0.029	0.653	0.025	0.407	0.031	0.446	0.014	0.858	0.024
f	272.627226	0.050	-18.804664	0.034	4	13.196	0.032	1.308	0.025	0.829	0.031	0.796	0.019	1.625	0.037
g	272.623339	0.044	-18.755838	0.033	4	13.471	0.029	0.785	0.024	0.491	0.033	0.455	0.016	0.943	0.030
h	272.551990	0.098	-18.765991	0.108	4	13.768	0.047	0.625	0.025	0.403	0.057	0.502	0.020	0.917	0.036
i	272.606784	0.103	-18.759362	0.079	4	14.010	0.043	0.720	0.043	0.415	0.049	0.414	0.043	0.830	0.054
j	272.524881	0.155	-18.756105	0.146	4	14.644	0.041	0.922	0.037	0.493	0.040	0.606	0.050	1.114	0.066
l	272.574081	0.246	-18.773926	0.207	4	14.993	0.048	0.831	0.094	0.510	0.087	0.569	0.029	1.087	0.076
$\alpha$	272.645233	0.039	-18.700251	0.045	4	8.726	0.028	1.181	0.013	0.628	0.038	0.516	0.064	1.134	0.101
$\beta$	272.742383	0.039	-18.824034	0.035	4	9.163	0.030	0.138	0.011	0.071	0.020	0.095	0.014	0.167	0.022
$\gamma$	272.547984	0.044	-18.931866	0.067	4	9.397	0.029	1.149	0.012	0.626	0.021	0.580	0.009	1.203	0.017
$\delta$	272.715511	0.028	-18.728065	0.037	4	9.864	0.032	0.262	0.019	0.162	0.026	0.167	0.020	0.328	0.019
$\epsilon$	272.578128	0.046	-18.659235	0.036	4	10.079	0.033	0.209	0.012	0.138	0.030	0.164	0.012	0.304	0.021
$\zeta$	272.699868	0.014	-18.675985	0.037	4	10.601	0.030	0.509	0.010	0.328	0.028	0.324	0.020	0.651	0.016
$\eta$	272.426442	0.046	-18.681610	0.028	4	11.127	0.024	0.554	0.016	0.350	0.033	0.393	0.020	0.748	0.017
$\theta$	272.609916	0.028	-18.868806	0.059	4	11.180	0.025	1.678	0.012	1.005	0.020	0.947	0.010	1.951	0.018
$\iota$	272.678816	0.020	-18.748600	0.025	4	11.392	0.034	1.561	0.026	0.848	0.037	0.755	0.012	1.596	0.024
$\kappa$	272.634969	0.031	-18.713396	0.047	4	11.718	0.030	0.369	0.008	0.200	0.021	0.243	0.014	0.447	0.013
$\lambda$	272.679044	0.048	-18.647745	0.028	4	12.026	0.036	0.535	0.009	0.335	0.030	0.328	0.020	0.662	0.025
$\mu$	272.499717	0.048	-18.771681	0.049	4	12.602	0.027	0.402	0.020	0.214	0.023	0.287	0.033	0.509	0.036



**Figure 2.**  $BVR_C I_C$  photometric comparison sequence around Nova Sgr 2007. The cross indicates the nova.  $N$  is the number of nights in which the given star has been measured in the given band. The error in  $\alpha$  and  $\delta$  are in arcsec. The panel on the right covers a  $20' \times 20'$  area centered on the nova and shows stars down to  $V=16.2$ . The dashed  $6' \times 6'$  area is zoomed in on the left panel.

$\alpha$  = HD 166240 (K0III),  $\beta$  = HD 166322 (B9IV),  $\gamma$  = HD 166145 (G5/G6III),  $\delta$  = HD 312752 (A0),  $\epsilon$  = HD 166189 (B9II) and  $\zeta$  = HD 312750.