Transient observed in Sagittarius from September to November 2013

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We report the discovery and subsequent observation of a bright transient in Sagittarius, at the position 18 40 29.13 -27 09 59.3 (J2000.0). The new star has been detected on 23.8074 Sept 2013 at magnitude 13.4 CR, and followed photometrically over 45 days. No known star is found at this position on DSS images. The transient lies at 2 arcsec and is distinct from the star UCAC4 315-213098 at 18:40:28.99 -27:09:59.6 (V=17.2 in SPM4.0), as shown consistently by the astrometry and several images where both stars are individually resolved. A spectrum of the transient show a blue continuum free of spectral structures with only a slight Hbeta absorption. The obtained spectrum does not seem consistent with a nova, and suggests a different object whose nature is not understood.

1. Discovery

The Dauban Survey [1] consists in a 80mm F/7.5 refractor taking images at regular time intervals in the Milky Way to detect variables stars and transients. The setup is located at Dauban (France), IAU A77 and is operated since spring 2012. Each image is a median stack of 3 exposures of 10 sec, and covers 1.7 deg times 1.3 deg with a resolution of 3.7 arcsec per pixel. The typical reached limit magnitude is 15.

On 23.8074 Sept 2013 a new object was detected with this setup at the approximate position 18 40 29.1 -27 09 57, with magnitude 13.4 CR. Photometry on previous dates did not show any star brighter than magnitude 14.7. It was found on DSS images that the star UCAC4 315-213098 could possibly match the new object position. As we will see this star is actually distinct from the transient. It has a faint V magnitude: V=16.8 derived from UCAC3, V=17.2 in SPM4.0 or V=17.3 derived from CMC-14. Due to its normal color (J-K=0.61) we thought that even if the match was confirmed, the object could not be a mira ceti star. Therefore it was decided to make complementary observations.

Confirmation images were taken by several observers within a few days, see Fig.1. The images confirm the presence of a bright star at the detected position.

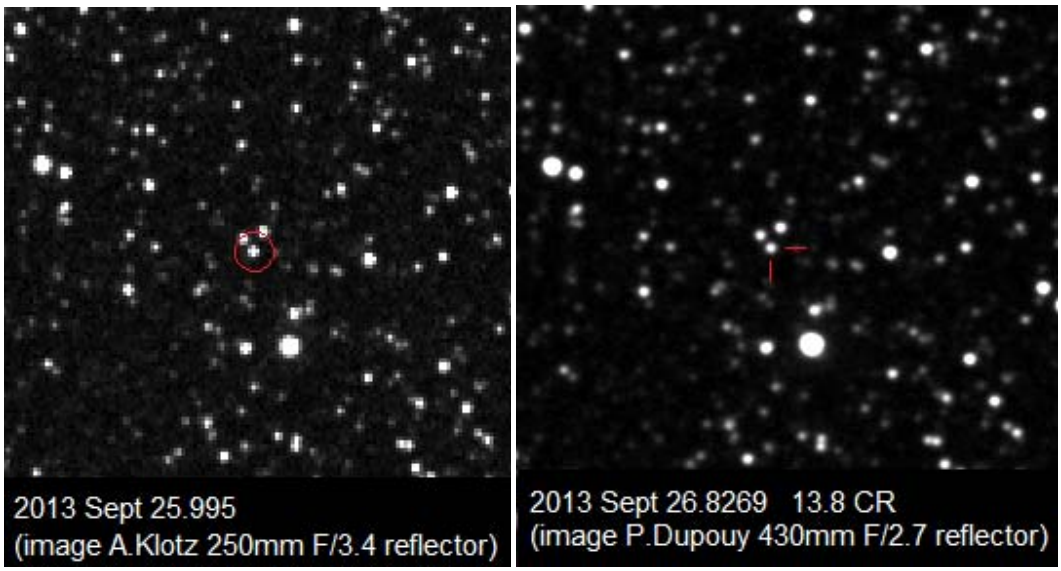

Fig.1 *Confirmation images.*

2. Photometry

Photometric and astrometric observations of the transient have been conducted by several observers. A list of setups is presented in table 1. Clear photometry was performed in most cases, and offers the best temporal coverage. All reported photometric measurements include both the transient and the star UCAC4 315-213098. No attempt was done to correct the measured magnitudes from the flux of the UCAC4 star (deblending).

Setup	Operators	Location	IAU	Instrument	Type of photometry	Resolution for astrometry [arcsec/pix]
1	F.Kugel, J.Caron	Dauban, France	A77	80 mm F/7.5 refractor	Clear	3.7
2	A.Klotz	La Silla, Chile	809	250 mm F/3.4 reflector	BVRI	3.3
3	J.F.Soulier, A.Maury	San Pedro d'Atacama, Chile	W96	400 mm F/8 reflector	Clear, R	0.70 (bin2*2) 0.35 (bin1*1)
4	P.Dupouy	Dax, France	958	430 mm F/2.7 reflector	Clear	1.6
5				254 mm F/6 reflector	Clear	2.5
6				300 mm F/5.5 reflector	Clear	2.2

Table 1. *List of setups for photometry.*

The obtained lightcurve is presented on figure 2. It shows a peak around magnitude 13.4 CR and then a rapid decrease towards 16.0 CR. A second peak was observed at 14.8 CR about 40 days after the first

maximum. This peak is short as it is surounded by two measurements at 16.5 R and 16.4 CR obtained respectively 2 days earlier and 3 days later (see fig.3). A measurement was taken on 01.01 December 2013 as the star becomes difficult to observe due to its proximity with Sun. The weak magnitude suggests that only the UCAC4 star was measured. A last observation, performed on 31.38 January 2014 in the morning sky, confirmed that the event was finished.

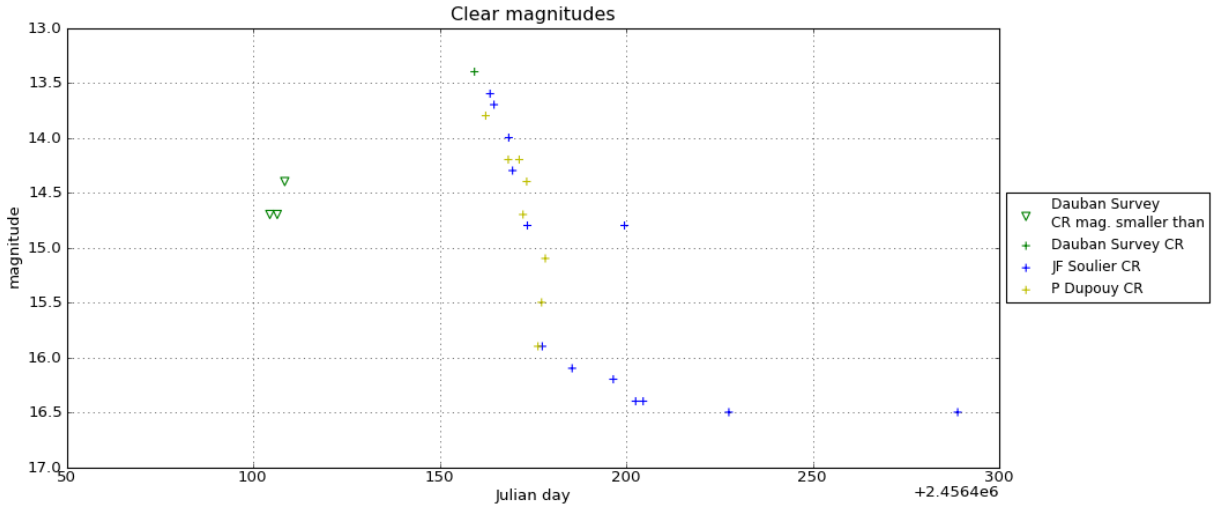

Fig. 2. *Lightcurve obtained without filters. The values include both the transient and the star UCAC4 315-213098 (no deblending).*

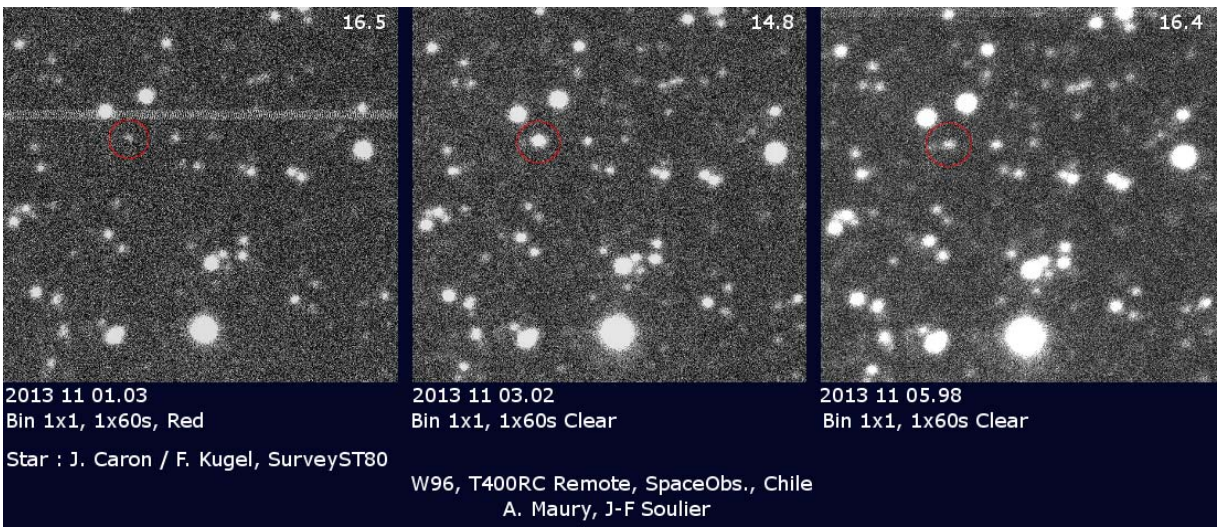

Fig. 3. *Secondary magnitude peak.The horizontal stripe on the left image is a read-out artefact which does not impact the measurements.*

Color photometry has still to be measured on the images obtained with filters: (to be added later).

3. Spectrum

A spectrum was obtainedby T.Bohlsen, observing from Armidale (Australia) on 29.4799 Sept 2013 (Julian date 2456564.9799) as the transient was bright. A 280mm F/10 Schmidt-Cassegrain telescope was used, with a LISA spectrometer and a 23 micrometer slit. The achieved resolving power is 1340. After 33 min exposure, a SNR of about 15 was reached. The spectrum is presented on fig.4. Despite the rather low signal, the obtained spectrum shows clearly a blue continuum with no spectral structure except a slight Hbeta absorption. Unfortunately, no other spectral measurement could be performed.

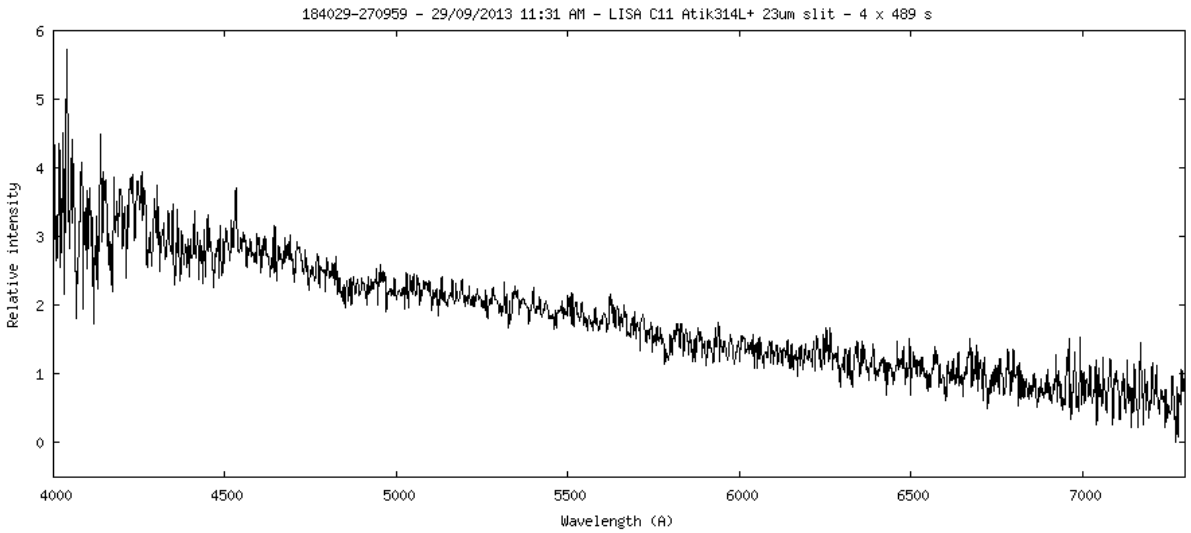

Fig. 4. *Spectrum from the transient.*

4. Evidence that the transient is distinct from UCAC4 315-213098

The astrometric measurements obtained as the transient was bright, and therefore as the astrometric reduction was accurate, are presented in table 2.

reduction by	reference catalog	date	measured J2000.0 position	arcsec/pix
P.Dupouy	UCAC3	2013 Sep 26.8193	18 40 29.13 -27 09 59.0	1.58
P.Dupouy	UCAC3	2013 Oct 02.8682	18 40 29.17 -27 09 58.4	2.45
P.Dupouy	UCAC3	2013 Oct 05.8084	18 40 29.17 -27 09 59.1	2.45
P.Dupouy	UCAC3	2013 Oct 06.8113	18 40 29.16 -27 09 58.9	2.45
P.Dupouy	UCAC3	2013 Oct 07.8103	18 40 29.13 -27 09 59.1	2.45
J.F.Soulier	UCAC4	2013 Sep 27.9918	18 40 29.12 -27 09 59.4	0.70
J.F.Soulier	UCAC4	2013 Sep 29.0402	18 40 29.13 -27 09 59.4	0.70
J.F.Soulier	UCAC4	2013 Oct 03.0046	18 40 29.14 -27 09 59.6	0.70
J.F.Soulier	UCAC4	2013 Oct 04.0108	18 40 29.12 -27 09 59.5	0.70
J.F.Soulier	UCAC4	2013 Oct 07.9949	18 40 29.12 -27 09 59.5	0.70
J.F.Soulier	UCAC4	2013 Nov 03.0233	18 40 29.13 -27 09 59.4	0.70
J.Caron	USNO-B1.0	2013 Sep 27.9865	18 40 29.18 -27 09 59.0	0.70
J.Caron	USNO-B1.0	2013 Sep 29.0230	18 40 29.16 -27 09 59.1	0.70
J.Caron	USNO-B1.0	2013 Oct 02.9938	18 40 29.16 -27 09 59.1	0.70
J.Caron	USNO-B1.0	2013 Oct 04.0058	18 40 29.16 -27 09 59.1	0.70
J.Caron	USNO-B1.0	2013 Oct 07.9819	18 40 29.16 -27 09 59.1	0.70
J.Caron	USNO-B1.0	2013 Nov 03.0233	18 40 29.16 -27 09 59.0	0.70

Table 2. *Astrometric reductions.*

The UCAC4 star has the following positions:

catalog	J2000.0 position
2MASS J18402900-2709597	18:40:29.01 -27:09:59.7
UCAC3 126-491519	18:40:28.99 -27:09:59.4
CMC14 J184029.0-270959	18:40:29.00 -27:09:59.5
UCAC4 315-213098	18:40:28.99 -27:09:59.6
GSC2.3 S9TY023055	18:40:28.99 -27:09:59.3

Table 3. *Names and catalog positions for the neighboring star UCAC4 315-213098.*

The reduction were done by 3 different persons, with 3 different catalogs (UCAC3, UCAC4, USNO-B1.0). The results are consistently deviating from the position of the UCAC4 315-213098 star.

At the end of October 2013 and during November 2013, as the transient was fading it started to become oblate. On several occasions we could resolve the two stars (UCAC4 315-213098 and the transient) with the 0.4m F/8 reflector. The obtained pictures are presented on figures 5 and 6. We see that the astrometry of the East component coincides with the positions measured on the bright transient reported in table 2, while the astrometry of the West component corresponds to the catalog star in table 3.

Finally, another evidence for the two stars being distinct is the observed blue color while the UCAC4 315-213098 has a normal color with J-K = 0.61 in 2MASS.

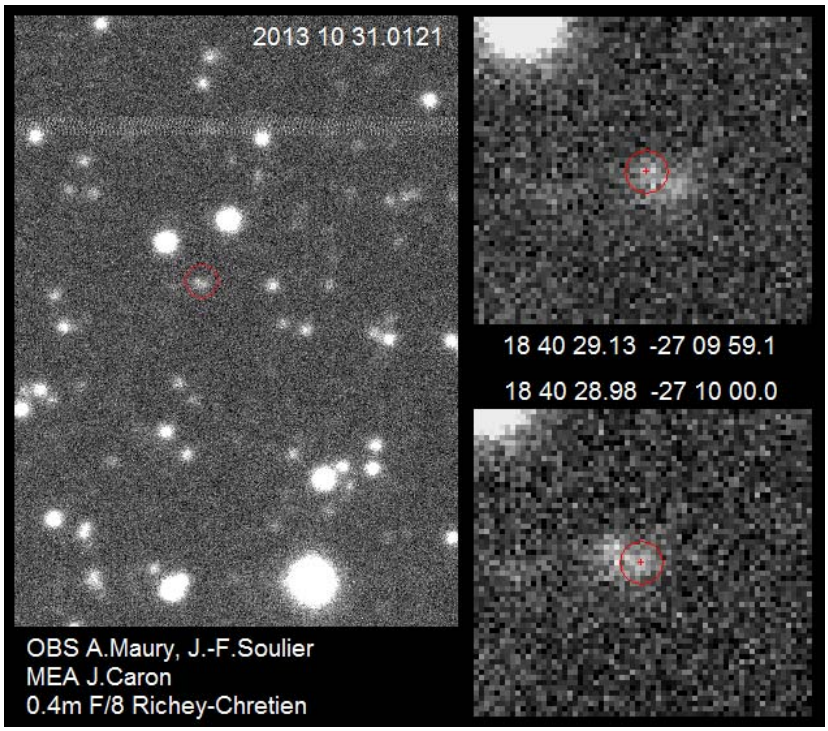

Fig. 5. *Image taken on 31.0121 Oct 2013, astrometry J.Caron with USNO-B1.0 catalog.*

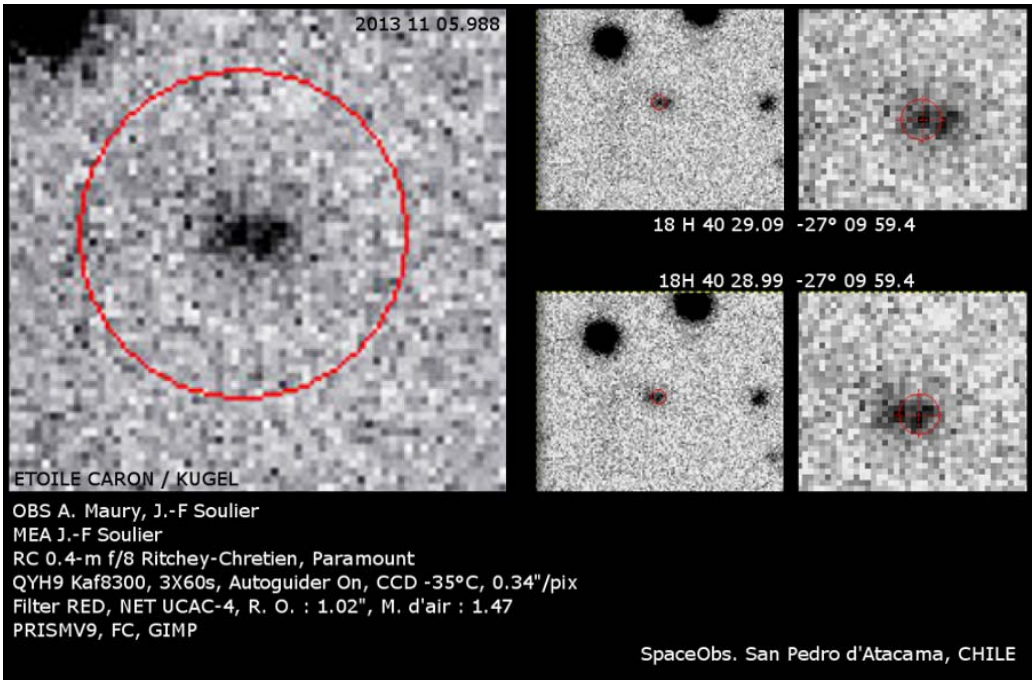

Fig. 6. *Image taken on 05.988 Nov 2013, astrometry J.-F. Soulier with UCAC4 catalog.*

Acknowledgments

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References

[1] Dauban Survey is operated by F.Kugel and J.Caron. See http://www.aspylib.com/newsurvey/survey.html.