

COMMISSIONS G1 AND G4 OF THE IAU
INFORMATION BULLETIN ON VARIABLE STARS

Volume 63 Number 6255 DOI: 10.22444/IBVS.6255

Konkoly Observatory
Budapest
15 September 2018
HU ISSN 0374 – 0676

REVISED COORDINATES OF VARIABLES IN THE FIELD OF M16-M17

NESCI, R.

INAF/IAPS, via Fosso del Cavaliere 100, 00133 Roma, Italy, e-mail: roberto.nesci@iaps.inaf.it

Abstract

The identifications of the variable stars published on IBVS #985 have been checked on the basis of the original finding charts and digitized Asiago plates. Cross check with the 2MASS catalog allowed to get more accurate coordinates. For 19 stars (out of 207) a significant coordinates difference is found and new identifications are given. The interpretation of NSV 10848 as a Nova is briefly discussed.

1 Introduction

A list of 207 red variables was published by Maffei (1975) on the basis of 7 years of observations using infrared (I-N + RG5) and blue (103aO) plates taken with the Asiago Observatory Schmidt (65/90/215 cm) telescope. The plates cover a field of 2.5 degrees radius centered at galactic coordinates $l = 16^\circ$, $b = 0^\circ$ (midway between M16 and M17). This variable stars sample is statistically well defined, being magnitude limited. A catalog including the finding charts for all the stars, and the phased light curves for 176 Mira and SR stars, is available at CDS (Maffei and Tosti 2013), based on a printed publication of the Perugia University: unfortunately, in a few cases the finding charts are of poor quality.

In the course of a larger on-going research on the Mira stars of the galactic plane, I found for some of these stars strong inconsistencies between the optical and the near infrared (*JHK*) magnitudes, derived from the cross correlation of the General Catalog of Variable Stars (Vizier B/gcvs, Samus et al. 2017) with the 2MASS (Cutri et al. 2003) catalog, suggesting that some misidentifications have occurred. This may have happened given that in the original paper (Maffei 1975) the coordinates were given with an accuracy of $6''(0.1)$ and the galactic plane is very crowded of stars.

In the family archive of the late Prof. Paolo Maffei¹ I was able to recover the original paper enlargements of the Asiago plates, with pencil annotations by Maffei of the detected variables. Also all the original Asiago plates were available as fits files, from scans made at Perugia University (Nesci et al. 2014).

¹<http://www.archiviomaffei.org>

Table 1: Revised 2MASS identifications of variable stars in the field of M16-M17.

Maffei id	Name	2MASS counterpart	comment
M005	NSV 10849	2MASS J18110190-1422595	small offset
M024	NSV 10899	2MASS J18295552-1518384	45'' offset
M027	NSV 10671	2MASS J18212641-1311525	small offset
M028	NSV 10677	2MASS J18213621-1242312	1' offset
M035	NSV 10522	2MASS J18182855-1725289	small offset
M051	NSV 10408	2MASS J18144139-1503536	small offset
M053	NSV 10741	2MASS J18242539-1703515	2 bright NIR stars very near
M086	V3918 Sgr	2MASS J18290441-1353350	coordinates misprint
M087	NSV 10832	2MASS J18274962-1343087	small offset
M089	V3904 Sgr	2MASS J18110608-1613039	small offset
M091	NSV 10249	2MASS J18082415-1535166	coordinates misprint
M127	V3950 Sgr	2MASS J18283838-1603253	small offset
M150	NSV 10848	J2000 18:28:11.7 -13:44:37	probable Nova
M151	V409 Sct	2MASS J18294001-1400178	30'' offset
M161	NSV 10490	2MASS J18171849-1734104	small offset
M166	NSV 10299	2MASS J18102428-1532157	30'' offset
M174	NSV 10271	2MASS J18091451-1429483	small offset
M183	NSV 10772	2MASS J18254743-1611475	small offset
M184	NSV 10757	2MASS J18250968-1610350	small offset

2 Identification

Comparison of the original finding charts with the digitized Asiago plates, the Digitized Sky Survey (IV-N emulsion), the SIMBAD archive, and its interactive AladinLite tool, allowed to check the identification of all the variables and to find the 2MASS counterpart. In a few cases the published finding chart was not accurate enough to identify the star, and I had to look at the original plates blinking some of them to pick up the real variable. Overall, only in 19 cases, out of 207, was the position given by SIMBAD found to be significantly incorrect (more than 2''), leading to misidentification or lack of a NIR counterpart in SIMBAD.

For these stars I report in Table 1 the original Maffei provisional number, the variable star name as given in GCVS or NSV, the actual 2MASS counterpart, and a comment. In the case of NSV 10848, classified by Maffei as a probable Nova, no 2MASS counterpart was found.

Out of these stars, only 3 are Miras, V3918 Sgr, V3904 Sgr, and V409 Sct, while V3950 Sgr is an SRa. All the others are classified by Maffei as irregular or eclipsing variables.

3 Remarks on individual stars

Having defined accurate coordinates, I checked if these variables had been rediscovered by other surveys. This sky area is not covered by the VVV survey (Minniti et al. 2010) but is covered by the Galactic Disk Survey (GDS, Hackstein et al. 2015): remarkably, only four of our stars were rediscovered by the survey. As a further check, I also looked for these stars in the VSX on-line database²: only two stars have coordinates consistent

²<https://www.aavso.org/vsx/>

with the 2MASS counterpart, namely M087 and V409 Sct. Below are further comments on some remarkable stars.

M024: identified by finding chart. Independently rediscovered by the GDS survey as GDS_J1829555-151838.

M028: mismatch between coordinates and finding chart; the actual variable was found blinking some Asiago plates.

M053: two very near bright stars in 2MASS, the right one is the eastern (and brighter) one.

M086: the published finding chart is wrong, star identified with the original chart and plates. Independently rediscovered by the GDS survey as GDS_J1829044-135334.

M087: independently rediscovered by the GDS survey as GDS_J1827496-134308.

M091: offset of several arcmin, identified with the original finding chart.

M127: independently rediscovered by the GDS survey as GDS_J1828384-160325.

M151 (V409 Sct): SIMBAD identifies this star with another very bright NIR star 30" N, which is the variable GDS_J1829396-135936. However, Maffei's coordinates and finding chart consistently point to 2MASSJ18294001-1400178. Checked also blinking the original plates.

M166: coordinates misprint, found with the finding chart.

4 The possible Nova

M150 (NSV 10848) was indicated by Maffei as a possible Nova; I have checked that the star was visible on 2 IR plates only: #860 (1967-09-25) and #913 (1967-10-03) while it was invisible on the simultaneous B ones. It was still not visible on 1967-09-05, and it was not possible to define when the star went below the threshold because no other plates were taken until June of the following year. The star never reappeared in the following years.

Maffei (1975) does not report magnitudes for this star. From the digitized plates, using the UCAC4 (Zacharias et al. 2012) catalog as reference and aperture photometry with IRAF/apphot, I derived a brightness of $I \sim 13.3$ mag for both plates, and an upper limit of $B = 17.5$ mag. The star was therefore very red ($B - I > 4.0$). If the observed color is due just to absorption, the $E(B - V)$ is at least 1.7 mag and the absorption in the I band is at least 3.2 mag. The distance of the Nova (assuming an absolute magnitude $M = -8$) would be less than 40 kpc, compatible with being inside our Galaxy.

Besides the classification as a Nova, an alternative identification could be with a cataclysmic variable of the WZ Sge type. These stars undergo large (6 mag or more) brightenings at several years interval, so it is not strange that only one such brightening was detected during this monitoring sampled to look for long period variables (120 plates from 1967 to 1975). In this case the star might be visible still now, likely in quiescence around the 20th magnitude, surely reddened by interstellar absorption. The PanSTARRS/DR1 image (Chambers et al. 2016) shows a possible candidate at RA 18:28:11.7, DEC $-13:44:37$ (J2000), with magnitudes $g = 21.65$, $r = 20.05$, $i = 19.07$, $z = 18.52$. The star is present also in Gaia DR2 (Gaia collaboration, 2018) as source id 4104434785790095104, with magnitudes $G = 19.70$ mag, $G_{\text{Bp}} = 19.84$ mag, $G_{\text{Rp}} = 18.21$ mag. The $G_{\text{Bp}} - G_{\text{Rp}}$ color (1.63) is much redder than the expected one ($G_{\text{Bp}} - G_{\text{Rp}} \sim 0$) for a quiescent WZ Sge star. Assuming an intrinsic PanSTARRS color $g - z = -0.4$ as WZ Sge in quiescence, the color excess would be $E(B - V) = 1.5$, corresponding to an absorption of $A_i = 3.15$ and $A_g = 5.74$. The differential absorption between the B and I Asiago bands would be

therefore only ~ 2.6 mag and the star in outburst should have been visible also on the blue plates: the Nova interpretation is therefore more likely.

Acknowledgements: The Digitized Sky Survey is available on-line from the Space Telescope Science Institute at http://archive.stsci.edu/cgi-bin/dss_plate_finder. The SIMBAD AladinLite tool is on-line at <http://simbad.u-strasbg.fr/simbad/>. This work has made use of the VIZIER, SIMBAD, STScI, GDK, VSX, and Gaia DR2 databases.

References:

- Chambers, K. C., Magnier, E. A., Metcalfe, N., et al. 2016, *arXiv:1612.05560*
Cutri, R.M., Skrutskie, M.F., vanDyk, S., et al., 2003, *CDS Vizier catalog*, II/246
Gaia collaboration, 2018, *A&A*, **616**, A1 DOI
Hackstein, M., Fein, Ch., Haas, M., et al., 2015, *AN*, **336**, 590 DOI
Maffei, P., 1975, *IBVS*, **985**, 1
Maffei, P. and Tosti, G. 2013 *CDS Vizier catalog*, II/320
Minniti, D., Lucas, P.W., Emerson, J.P., et al., 2010, *New Astronomy*, **15**, 433 DOI
Nesci, R., Bagaglia, M., Nucciarelli, G. 2014, *Astroplate 2014, Prague*, 75
Samus, N.N., Kazarovets, E.V., Durlevich, O.V., et al., 2017, GCVS v5.1, *CDS Vizier catalog*, B/gcvs
Zacharias N., Finch C.T., Girard T.M., 2012, *CDS Vizier catalog*, I/322A