

NSVS 5860878 = Dauban V 171: a new Mira variable in Cygnus

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Abstract: We present details of a new Mira variable in the constellation of Cygnus. The variability of the NSVS 5860878 source was detected in January of 2012 by Ivan Adamin, based on photometric data from the Northern Sky Variability Survey, as a part of data mining project, the VS-COMPAS. Lately, by the time the star's data was finally analyzed in 2013, the object was identified as the Dauban V171 in the VSX catalog, with no period and classification specified. Thus, a revision with actual data was submitted.

During the candidates selection process in the constellation of Cygnus as a part of data mining activity performed by VS-COMPAS Project team in January of 2012, the source identified as NSVS 5860878 was considered a variable. The object was not on the record in the AAVSO International Variable Star Index (VSX).

The photometric data of NSVS 5860878 was analyzed in 2013. By that time the object was submitted to the VSX as a result of the Dauban Survey activity. The Dauban Survey project is a collaboration between Francois Kugel and Jerome Caron (2012).

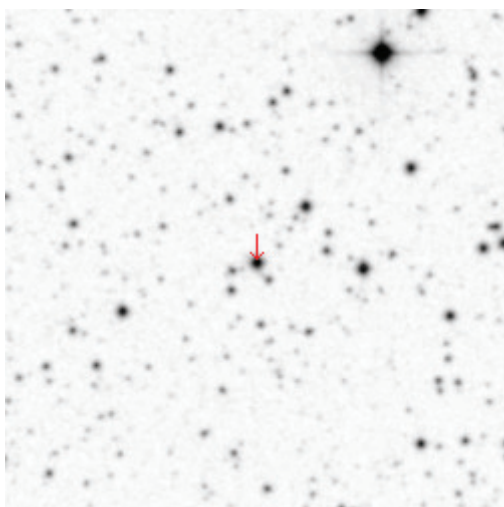


Figure 1. – NSVS 5860878 and Dauban V171 references to the same object

The Northern Sky Variability Survey (Woźniak et al., 2004) has a moderate resolution, so there are cases when the source object for the photometric set is uncertain in the crowded fields. NSVS 5860878 was later cross-identified as *Dauban V171*, but the corresponding record in the VSX did not contain any information about the period or classification. The pictures made by the Dauban Survey clearly demonstrate that the variable object in the area referencing by NSVS 5860878 is the unique variable source among its neighbors.

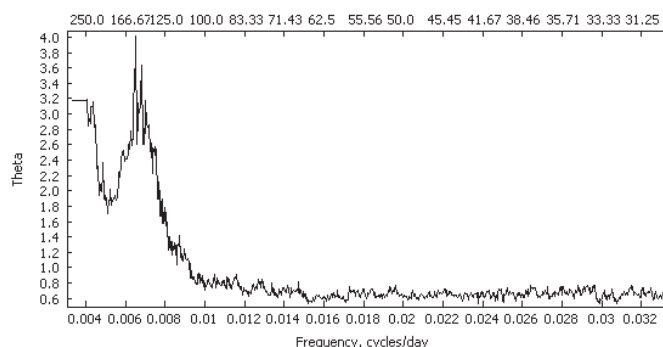


Figure 2. – Periodogram for NSVS 5860878, based on data from the NSVS

Detailed analysis was made by Siarhey Hadon in September 2013. Periodogram analysis revealed a strong peak (cf. Figure 2) around a period value of 150 days. Further investigation ended up with a statistically strong period of 149.78 days. This value has a good match with the photometric data points gathered by Kugel and Caron.

The light curve data from the NSVS database was contaminated by two neighboring non-variable stars:

- 1) 2MASS J21245238+4624154
J-K = 1.02, V = 14.7, sep. 38"
- 2) 2MASS J21244963+4623437
J-K = 1.32, V = 14.4, sep. 53"

Performed deblending of the light curve data allowed to find the real magnitude range. Taking in to consideration other properties of the star and its color index, it was classified as a Mira variable. The revision is submitted to the VSX.

Below there is a phased light curve along with a short summary for the NSVS 5860878 is presented. This is a typical light curve for Miras (cf. Figure 3).

This research has made use of the SIMBAD and VizieR databases operated at the Centre de Données Astronomiques (Strasbourg) in France; of the International Variable Star Index (AAVSO), and

of the Two Micron All Sky Survey (2MASS). Period search and analysis software is created by Andrey Prokopovich and Ivan Adamin, members of the VS-COMPAS data mining project.

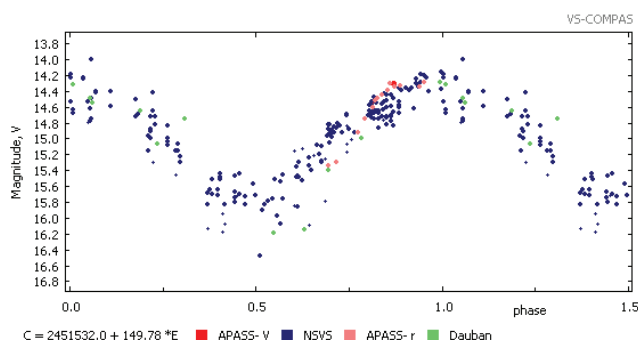


Figure 3. – *Generated phased light curve for NSVS 5860878. The period is 149.78 days. J-K = 1.66*

Table 1. – A short summary of the NSVS 5860878 object with updated elements.

NSVS 5860878 = Dauban V171	
AAVSO UID	--
Constellation	Cygnus
Other Names	2MASS J21245478+4623475 AKARI-IRC-V1 J2124548+462347 GSC2.3 N31G094716 UCAC4 682-102837
Coordinates	21 24 54.79 +46 23 47.4 (J2000.0)
Mag. range	14.2 - <17.5 V
Epoch	19 Dec 1999 (HJD 2451532)
Period	149.78 days
Var. type	M

References

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Mira variables named after the star Mira, are a class of pulsating variable stars characterized by very red colors, pulsation periods mostly between 100 and 800 days, and amplitudes greater than one magnitude in infrared and 2.5 magnitude at visual wavelengths by definition. Mira is the brightest and most famous long-period pulsating variable in the sky.

The variability of Mira was recorded by the astronomer David Fabricius beginning in August 1596. At first he believed it to be another nova, as the whole concept of a recurring variable did not exist at that time. When he saw Mira appeared again in 1609, it became clear that a new kind of object had been discovered in the sky.

What is interesting about Mira is that it has a companion star. This allows for a variety of physical investigations, such as mass determination. The binary star system consists of a red giant (Mira A) undergoing mass loss and a high temperature white dwarf companion (Mira B) that is accreting mass from the primary. The companion star was resolved by the Hubble Space Telescope in 1995, when it was 70 astronomical units from the host star.

The companion's orbital period around Mira is approximately 400 years. It means that it did only a single turnover since its discovery by Fabricius in XVI century.

