

Five New Variable Stars Discovered During a Campaign to Determine the Rotation Period of Asteroids

Antonio Catapano

Luca D’Avino

Andrea Di Dato

Maurizio Mollica

Luigi Morrone

AstroCampania—Osservatorio Astronomico “Salvatore Di Giacomo” (L07), Agerola (Na), Italy

Alfonso Noschese

AstroCampania—Osservatorio Astronomico “Salvatore Di Giacomo” (L07), Agerola (Na), Italy, and Osservatorio Astronomico Elianto (K68), Pontecagnano (Sa), Italy

Nello Ruocco

AstroCampania—Osservatorio Astronomico “Salvatore Di Giacomo” (L07), Agerola (Na), Italy, and Osservatorio Astronomico “Nastro Verde” (C82), Sorrento (Na), Italy; nello_ruocco@hotmail.com

Antonio Vecchione

AstroCampania—Osservatorio Astronomico “Salvatore Di Giacomo” (L07), Agerola (Na), Italy

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Abstract This paper describes the discovery of five new variable stars, AC_V1–AC_V5—two binary systems and three pulsating stars—between 2017 and 2019. They have been included in the AAVSO Variable Star Index, but are being published now. We encourage all observers to further observe these stars so as to better characterize them. It might be interesting to make subsequent observations for constructing O–C diagrams as well as for modeling the binary systems.

1. Introduction

In this paper we describe the results of the discovery of five new variable stars, made between 2017 and 2019 during a scheduled northern sky survey to determine light curves of asteroids using the robotic telescope of the astronomical observatory “S. Di Giacomo” in Agerola, Italy. The stars have been named with the acronym AC (AstroCampania—the amateur astronomy club that manages Agerola’s Observatory) followed by the progressive discovery number.

2. Instruments and methods

All the observations have been made remotely using the 0.5-m f/8 Ritchey-Chretien telescope and a FLI PL4240 CCD in Agerola and, only for the High Amplitude Delta Scuti (HADS)

stars, the T25 iTelescope, a Planevawe CDK 431-mm with a FLI PL6303E CCD in New Mexico. The search for new variable stars was carried out with the MUNIWIN2 software (Hroch 2014) and the differential photometry was made with MAXIM DL1 (Diffraction Limited 2012). The light curve and the calculation of its main parameters was made with PERANSO3 (Vanmunster 2004–2021).

3. Results

Table 1 summarizes the main parameters for the five new variables. Each of them can be easily searched in the AAVSO VSX database (Watson *et al.* 2014) through their identifier as it appears in the first column. In the table, Epoch indicates the time of maximum brightness for pulsating stars and time of primary minimum for eclipsing binaries.

Table 1. Information and results for the new variables discovered.

<i>Star</i> (VSX identifier)	<i>R.A. (J2000)</i> h m s	<i>Dec. (J2000)</i> ° ' "	<i>Const.</i>	<i>V</i>	<i>Period</i> (days)	<i>Epoch</i> (HJD)	<i>Type</i>
AC_V1	17 30 53.42	−12 55 58.1	Ser	18.06–18.51	0.05797	2457921.4725	HADS
AC_V2	17 30 14.60	−12 56 26.0	Ser	15.7–16.11	0.134508	2457921.413	HADS
AC_V3	19 22 11.76	−17 03 10.0	Sgr	16.5–16.75	0.046238	2457929.4157	HADS
AC_V4	07 05 01.31	+20 27 26.7	Gem	15.79–16.30	0.376400	2458125.3333	EW
AC_V5	07 05 29.29	+20 22 54.7	Gem	17.93–18.37	0.262094	2458125.536	EW

3.1. AC_V1

AC_V1 is a HADS star with a period of 0.05797 d (83.48 m), an amplitude of about 0.45 magnitude, and a range between 18.06 and 18.51 V. In Figure 1, the light curve is phased with the main period of the pulsator. Figure 2 shows the field from the ALADIN interactive sky atlas (Bonnarel *et al.* 2000) with the new variable star in the center.

3.2. AC_V2

AC_V2 is a HADS star with a period of 0.134508 d (3.2282 h), an amplitude of about 0.41 magnitude, and a range between 15.7 and 16.11 V. In Figure 3, the light curve is phased with the main period of the pulsator. Figure 4 shows the field from the ALADIN interactive sky atlas (Bonnarel *et al.* 2000) with the new variable star in the center.

3.3. AC_V3

AC_V3 is a HADS star with a period of 0.046238 d (66.583 m), an amplitude of about 0.23 magnitude, and a range between 16.5 and 16.75 V. In Figure 5, the light curve is phased with the main period of the pulsator. Figure 6 shows the field from the ALADIN interactive sky atlas (Bonnarel *et al.* 2000) with the new variable star in the center.

3.3. AC_V4

AC_V4 is an EW star with a period of 0.376400 d (9.0336 h), an amplitude of about 0.51 magnitude, and a range between 15.79 and 16.30 V. In Figure 7, the light curve is phased with the main period of the binary. Red dots are our observations; black dots are ASAS-SN data. Figure 8 shows the field from the ALADIN interactive sky atlas (Bonnarel *et al.* 2000) with the new variable star in the center.

3.4. AC_V5

AC_V5 is an EW star with a period of 0.262094 d (6.2903 h), an amplitude of about 0.44 magnitude, and a range between 17.93 and 18.37 V. In Figure 9, the light curve is phased with the main period of the binary. Figure 10 shows the field from the ALADIN interactive sky atlas (Bonnarel *et al.* 2000) with the new variable star in the center.

4. Conclusion

Five new variable stars, AC_V1–AC_V5 (two binary systems and three pulsating stars), discovered between 2017 and 2019 have been included in the AAVSO Variable Star Index, and are now described here for the first time. We encourage all observers to further observe these stars so as to better characterize them. This work of discovery should only be the starting point from which to start in order to continue following these stars and their trend over time, perhaps by building periodic O–C diagrams and checking whether or not there are changes in the system.

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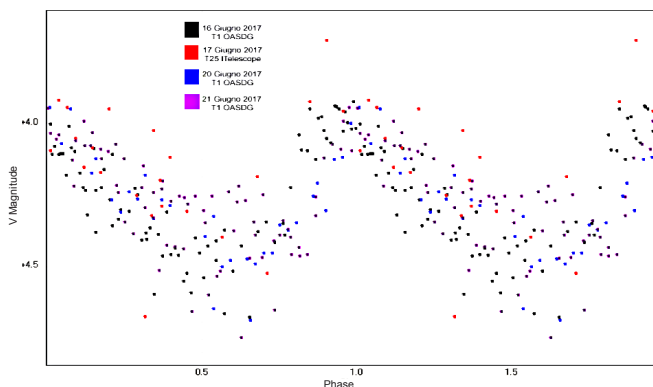


Figure 1. V light curve of AC_V1.

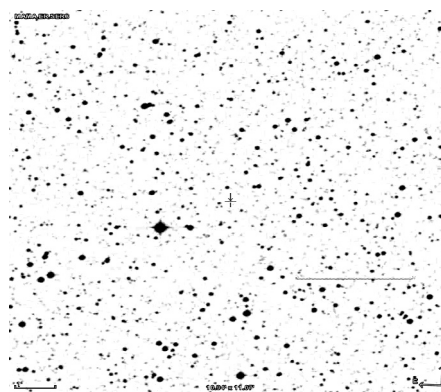


Figure 2. Field of AC_V1 from ALADIN (Bonnarel *et al.* 2000).

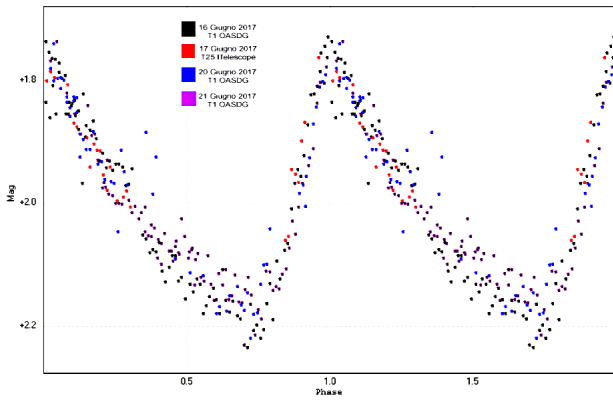


Figure 3. V light curve of AC_V2.

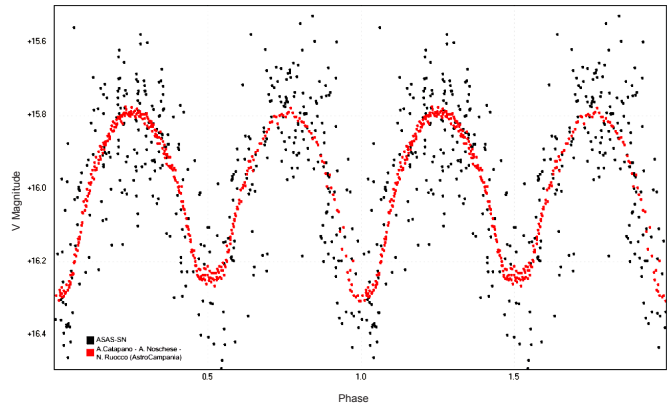


Figure 7. V light curve of AC_V4.

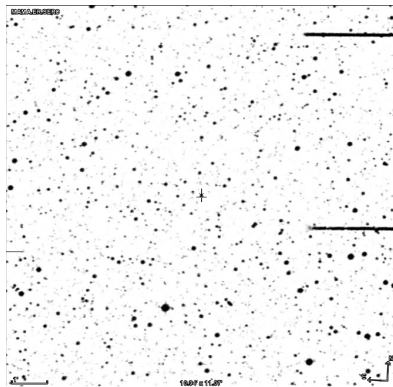


Figure 4. Field of AC_V2 from ALADIN (Bonnarel *et al.* 2000).

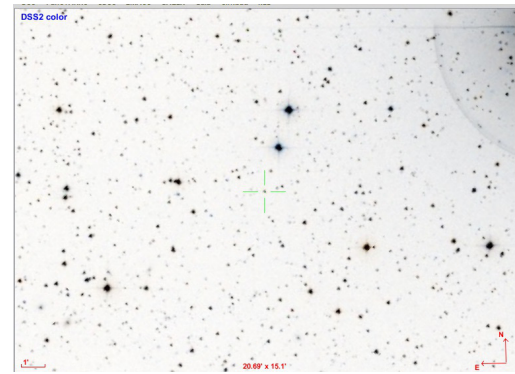


Figure 8. Field of AC_V4 from ALADIN (Bonnarel *et al.* 2000).

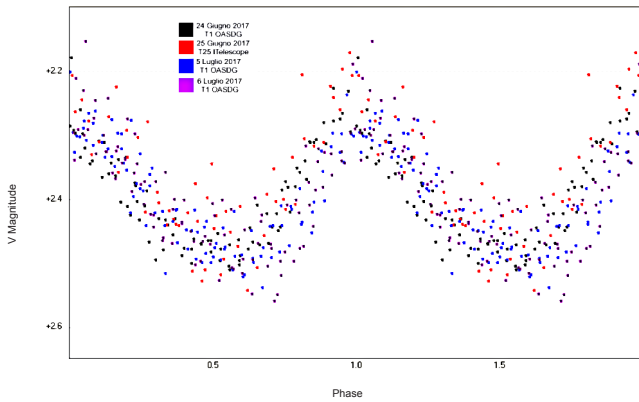


Figure 5. V light curve of AC_V3.

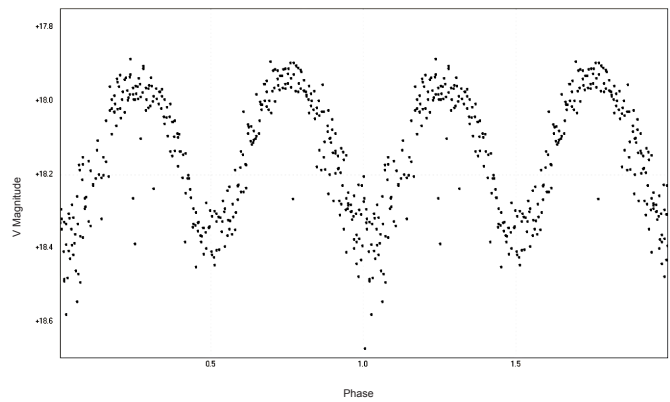


Figure 9. V light curve of AC_V5.

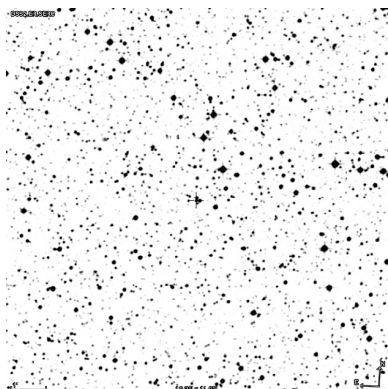


Figure 6. Field of AC_V3 from ALADIN (Bonnarel *et al.* 2000).

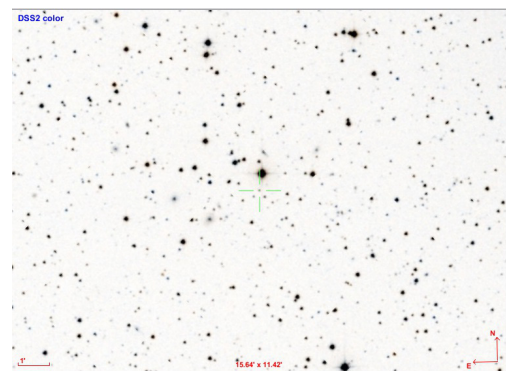


Figure 10. Field of AC_V5 from ALADIN (Bonnarel *et al.* 2000).