OPEN EUROPEAN JOURNAL ON VARIABLE STARS
August 2026 https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

NEW VARIABLE STARS DISCOVERED BY THE CAMPANIA STAR HUNTERS PROJECT

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Abstract: We report the discovery of twenty-nine new variable stars found as serendipitous by-products of photometric monitoring campaigns carried out between 2015 and 2019 by the Campania Star Hunters Project (CSHP), a multi-site collaborative network of amateur observatories in southern Italy. Targets were observed in fields spanning eight constellations: Draco, Cygnus, Aquila, Draco, Cassiopeia, Perseus, Lacerta, and Andromeda. The sample includes twenty EW-type W UMa contact binaries, three EA-type Algol systems, four EB-type (β Lyr) binaries, one DSCT pulsating variable (the only non-eclipsing object), and one EA-type system. Periods range from 0.055 d (79 min, CSHP_V25) to 0.864 d (CSHP_V18) and visual amplitudes from 0.07 to 0.75 mag. All discoveries have been submitted to the AAVSO International Variable Star Index (VSX) and received permanent identifiers. A detailed physical analysis of CSHP_V29, including orbital and stellar parameters derived from empirical relations and light-curve modelling, is presented in Appendix A.

1 Introduction

During systematic photometric monitoring of known variable stars it is common practice to follow all field stars simultaneously and search for previously unrecognised variability — a technique sometimes called field-mining. The Campania Star Hunters Project (CSHP) is a multi-site collaborative observing network based in Campania and neighbouring regions (southern Italy), grouping the Osservatorio Astronomico "Nastro Verde" (MPC Code C82, Sorrento), the Unione Astrofili Napoletani (UAN–OACN, Napoli), the Associazione Astrofili Aurunca (Sessa Aurunca, Caserta), the Gruppo Astrofili Beneventani (Benevento), and the Osservatorio Astronomico "M57".

In this paper we present twenty-nine new variable stars discovered during monitoring campaigns carried out between November 2015 and November 2018. All have been submitted to VSX and received permanent identifiers.

2 The Campania Star Hunters Project

The Campania Star Hunters Project (CSHP) was born on 5 November 2015, during the AstroUAN Meeting held in Naples. On that occasion, Antonio Marino, Andrea Tomacelli, and Antonio Porcelli presented the Colacevich remote telescope project being developed by the Unione Astrofili Napoletani (UAN) at the Osservatorio Astronomico di Capodimonte (OACN), and announced the detection of a probable new variable star in the constellation Draco.

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Following the presentation, Pasquale Ago and Lattanino Cupolino of the Associazione Astrofili Aurunca (AAA), who operated a well-established remote observatory in Sessa Aurunca (CE), offered their collaboration. On the same day, Nello Ruocco of the Osservatorio Astronomico "Nastro Verde" in Sorrento also joined the group. Work began the very next day, and on 17 November 2015 the discovery of GSC 04244-00959 was submitted to the AAVSO — this object later became CSHP_V1, the first entry in the project catalogue.

From this spontaneous collaboration emerged the idea of forming a dedicated variable star research group, named the "CSH Project — Campania Star Hunters" (Progetto Campania ricercatori di stelle). A strong scientific partnership thus developed between the UAN, the AAA, and the Osservatorio Nastro Verde. Within the first two years, the Gruppo Astrofili Beneventani (GAB) also joined the network.

In July 2017 alone, six new variable stars were announced, prompting the group to adopt a formal naming convention: CSHP_V1, CSHP_V2, CSHP_V3, and so on, where CSHP stands for Campania Star Hunters Project. For one object (CSHP_V23), the designation was submitted to the AAVSO Variable Star Index (VSX) through a formal revision process, after which the CSHP name was officially accepted as a valid alias. By 2019, the group had discovered a total of 28 variable stars, spanning six constellations and covering a wide range of variability types. The present paper constitutes the first comprehensive catalogue of all CSHP discoveries.

3 Observations

Observations were performed at four sites. At the Osservatorio Astronomico "Nastro Verde" (MPC C82, Sorrento), a Meade LX200 Schmidt-Cassegrain telescope of 254 mm aperture working at f/10 was coupled to a SBIG ST-8 CCD camera during earlier campaigns; a 356 mm (14″) Meade LX200 with SBIG ST-10 was used in later campaigns. At the Unione Astrofili Napoletani (UAN–OACN, Napoli), three instruments were used: a Celestron C11 f/10 with Atik 383 camera (unfiltered) on a GM2000HPS mount; a Ritchey-Chrétien 0.40 m with Atik 383 camera (unfiltered); and a Meade LX200 254 mm f/6.3 (Colacevich telescope) with Atik 383 camera on an EQ6 mount. At the Associazione Astrofili Aurunca (Sessa Aurunca, Caserta), a Celestron C11 Edge HD f/10 with Magzero Mz-9m camera (filter L) on a 10 Micron GM2000 mount was used. At the Osservatorio Astronomico "M57", a Celestron CPC 925 f/7 with MZ8L camera was employed.

All frames were reduced with standard bias, dark, and flat-field corrections. Differential aperture photometry was applied using non-variable comparison stars selected from the same field. Heliocentric Julian Date (HJD) corrections were applied to all timestamps. Image reduction and aperture photometry were performed with MaxIm DL (Diffraction Limited) and MuniWin (Hrůch 1998). Period analysis and phase-folded light curves were produced with Peranso (Paunzen & Vanmunster 2016), implementing phase dispersion minimisation (PDM) and analysis of variance (AoV) algorithms.

For several objects (CSHP_V13, V15, V16, V17, V18, V19, V20, V21, V23, V27), archival photometric data from the ASAS-SN survey (Kochanek et al. 2017) were combined with the authors' own observations to achieve better-constrained period determinations. For CSHP_V27, ZTF data (Chen et al. 2020) were also incorporated.

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Table 2: Instrumentation used by the observers. Unfiltered photometry uses a clear passband unless otherwise noted.

Observer(s)	Affiliation	Telescope	Camera	Mount	Filter
A. Marino, A. Tomacelli, A. Porcelli	UAN–OACN, Napoli	Celestron C11 f/10, 279 mm	Atik 383	GM2000HPS	Clear
A. Marino, A. Tomacelli, A. Porcelli	UAN–OACN, Napoli	Ritchey-Chrétien 0.40 m	Atik 383	—	Clear
A. Tomacelli, A. Marino, A. Porcelli	UAN–OACN, Napoli	Meade LX200 254 mm f/6.3 (Colacevich)	Atik 383	EQ6	Clear
P. Ago, L. Cupolino, T. Aniello	Oss. Astr. Aurunca, Sessa Aurunca (CE)	Celestron C11 Edge HD f/10, 279 mm	Magzero Mz-9m	10 Micron GM2000	L
N. Ruocco	Oss. Astr. “Nastro Verde”, Sorrento (NA)	Meade LX200 254 mm f/10	SBIG ST-8	—	Clear
N. Ruocco	Oss. Astr. “Nastro Verde”, Sorrento (NA)	Meade LX200 356 mm (14″) f/10	SBIG ST-10	—	Clear
L. Cupolino	Oss. Astr. “M57”	Celestron CPC 925 f/7, 235 mm	MZ8L	—	Clear
D. Castellano	Gr. Astrofili Beneventani, Benevento	—	—	—	—

Note: N. Ruocco used the 254 mm + SBIG ST-8 setup during earlier campaigns (2016–2017) and the 356 mm (14") + SBIG ST-10 setup during later campaigns. The exact transition point is not documented.

4 New Variable Stars

In the subsections below, we describe each of the twenty-nine newly discovered variables. For each object, we give the catalogue designation, equatorial coordinates (J2000.0), variability type, period and epoch, magnitude and amplitude, filter, and VSX identifier. The complete set of parameters is collected in Table 1. Phase-folded light curves and finding charts are provided for each object where available.

4.1 CSHP_V1 — GSC 04244-00959 — Draco

CSHP_V1 is an EW-type variable discovered in Draco. Discovered in Draco during photometric monitoring in November 2016. Cross-identifications: 2MASS J20081103+6541368; ASASSN-V J200811.08+654137.1; UCAC4 779-034567. The phase-folded light curve (Fig. 2) shows the characteristic continuous EW morphology. Archival APASS photometric data were incorporated alongside the authors’ own measurements to refine the period. Observers: Ago (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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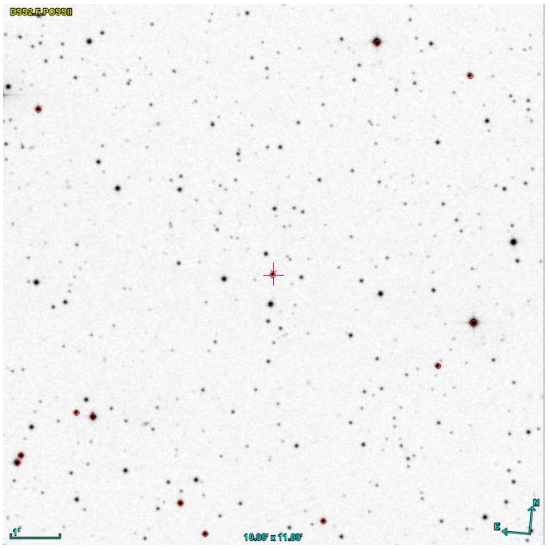

Fig. 1: DSS2 F.POSSII finding chart for CSHP_V1 (GSC 04244-00959). Field ~10.9′×11.8′. North up, East left. Cross marks the variable.

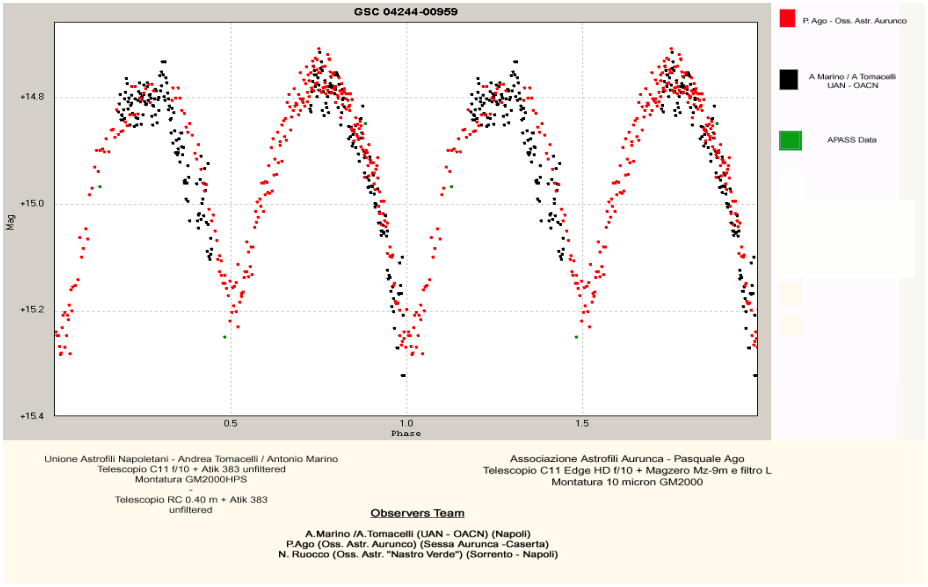

Fig. 2: Phase-folded light curve of CSHP_V1 (EW, P = 0.37891 d). Red: P. Ago (Oss. Astr. Aurunca); Black: A. Marino / A. Tomacelli (UAN–OACN); Green: APASS archival data.

4.2 CSHP_V2 — 2MASS J19282599+3314102 — Cygnus

CSHP_V2 is an EW-type variable discovered in Cygnus. Discovered in Cygnus during photometric monitoring sessions on 2–6 June 2017. Cross-identifications: CMC15 J192825.9+331409. The phase-folded light curve (Fig. 4) shows the characteristic continuous EW morphology. Observers: Ago, Cupolino, Muscianese, Paonessa, Castellano (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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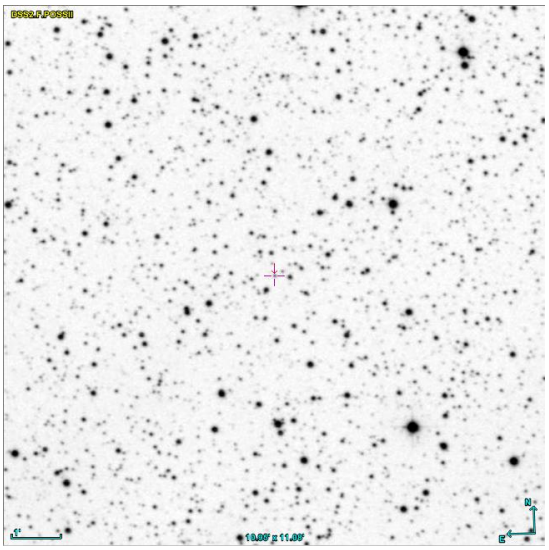

Fig. 3: DSS2 F.POSSII finding chart for CSHP_V2 (2MASS J19282599+3314102). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

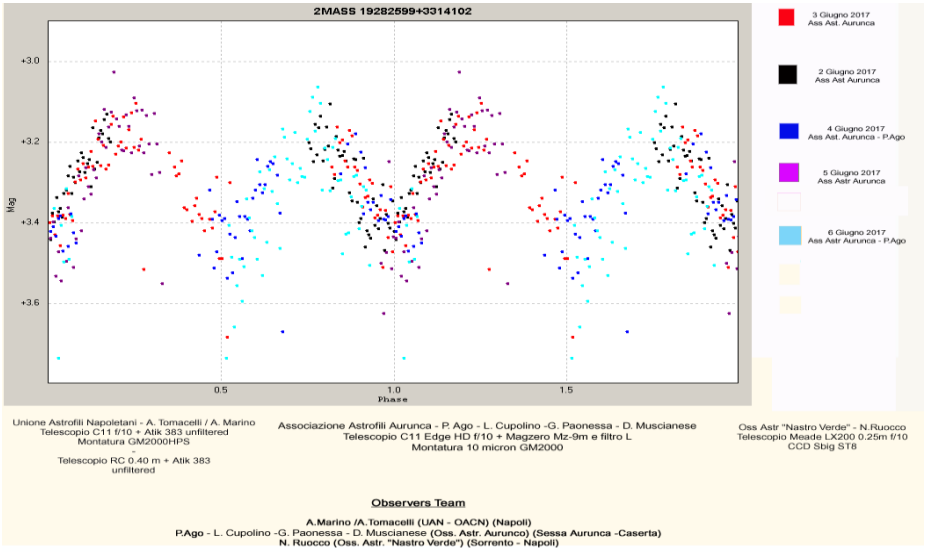

Fig. 4: Phase-folded light curve of CSHP_V2 (EW, P = 0.391032 d). Colours indicate different observing sessions (Jun 2017).

4.3 CSHP_V3 — UCAC4 617-074055 — Cygnus

CSHP_V3 is an EW-type variable discovered in Cygnus. Discovered in Cygnus in the same field as CSHP_V2, during the same June 2017 campaign. Cross-identifications: 2MASS J19272690+3312495; ASASSN-V J192726.92+331249.5. The phase-folded light curve (Fig. 6) shows the characteristic continuous EW morphology with amplitude ~0.53 mag. The two minima exhibit slightly different depths, indicating the presence of an O'Connell effect. Observers: Ago, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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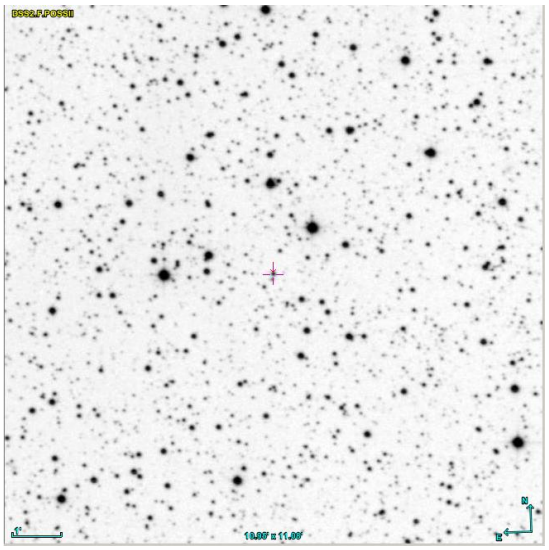

Fig. 5: DSS2 F.POSSII finding chart for CSHP_V3 (UCAC4 617-074055). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

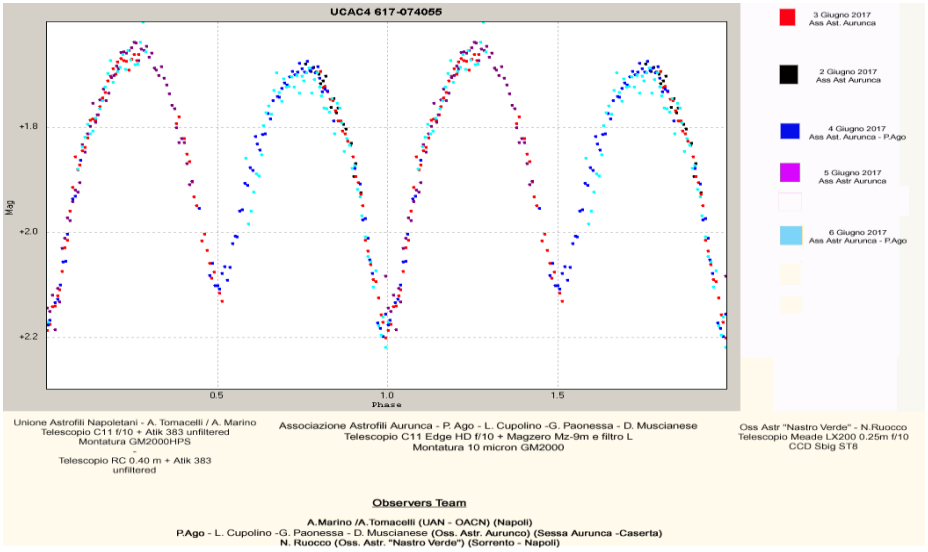

Fig. 6: Phase-folded light curve of CSHP_V3 (EW, P = 0.386591 d). Note the O'Connell effect visible in the unequal minima depths.

4.4 CSHP_V4 — 2MASS J20304919+5652006 — Cygnus

CSHP_V4 is an EB-type variable discovered in Cygnus. Discovered in the photometric field of V1197 Cyg during observations on 11–13 July 2017. Cross-identifications: URAT1 735-309033. The phase-folded light curve (Fig. 8) shows the characteristic β Lyr-type continuous variation. Observers: Ago, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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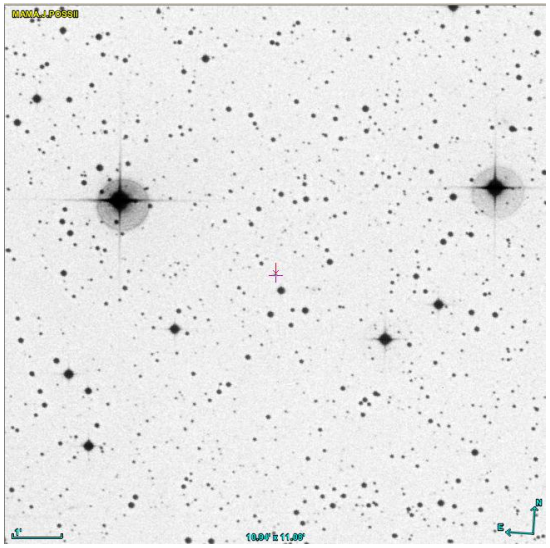

Fig. 7: DSS2/MAMA finding chart for CSHP_V4 (2MASS J20304919+5652006). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

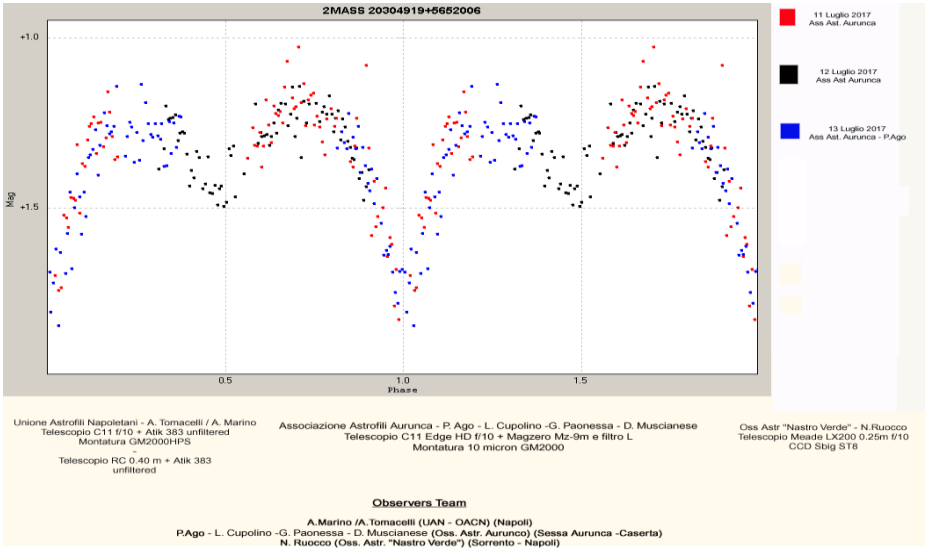

Fig. 8: Phase-folded light curve of CSHP_V4 (EB, P = 0.43936 d). Red: 11 Jul 2017; Black: 12 Jul 2017; Blue: 13 Jul 2017 (Ass. Ast. Aurunca – P. Ago).

4.5 CSHP_V5 — 2MASS J20143132+5239570 — Cygnus

CSHP_V5 is an EW-type variable discovered in Cygnus. Discovered in the photometric field of V1044 Cyg during observations on 27–28 July 2017. Cross-identifications: URAT1 714-310815. The phase-folded light curve (Fig. 10) shows the characteristic continuous quasi-sinusoidal EW morphology. Observers: Ago, Castellano, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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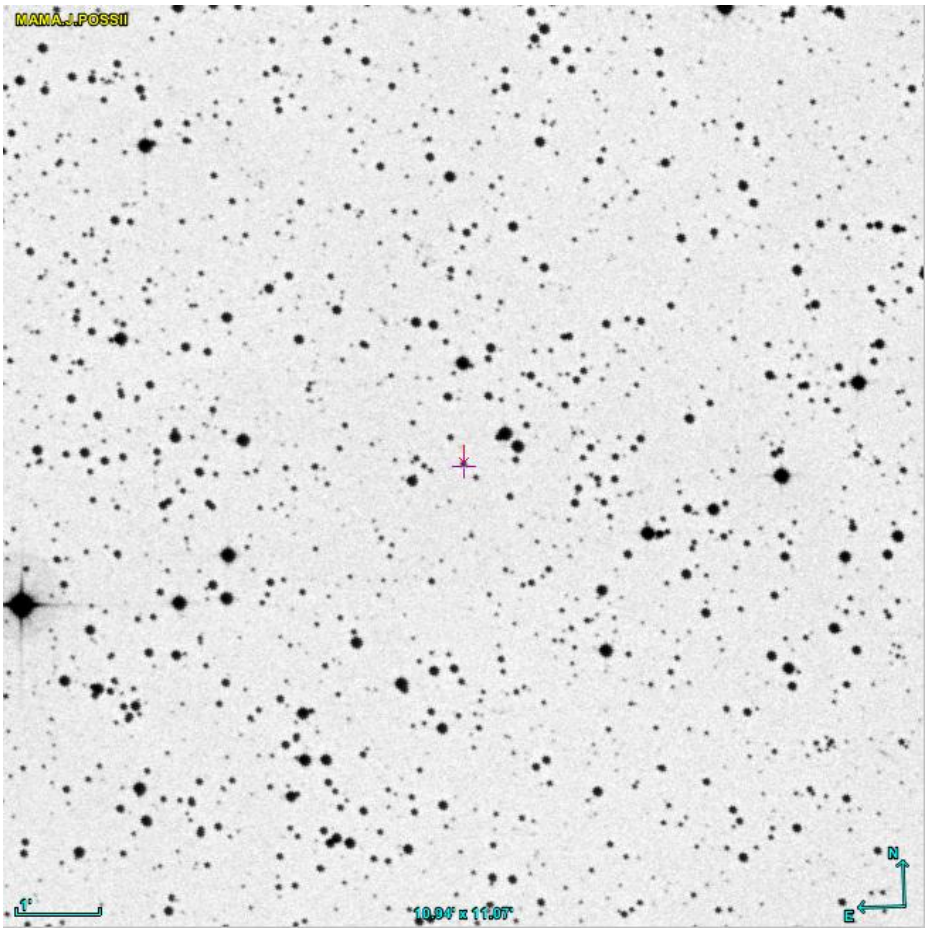

Fig. 9: DSS2/MAMA finding chart for CSHP_V5 (2MASS J20143132+5239570). Field ~10.9′×11.1′. North up, East left. Cross marks the variable.

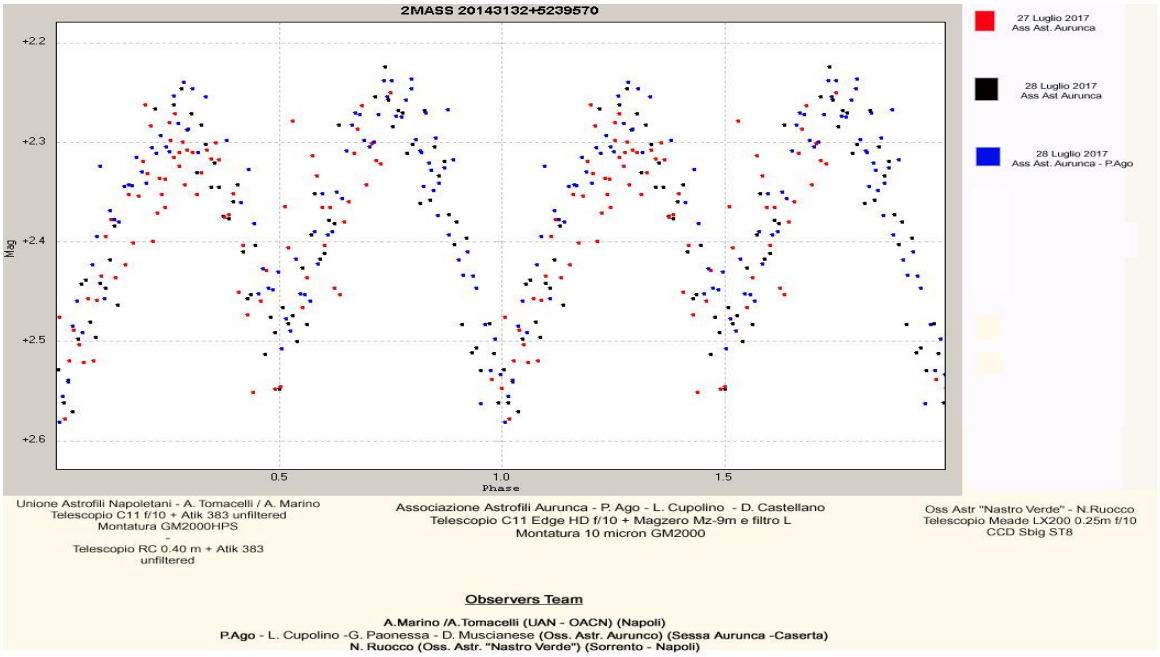

Fig. 10: Phase-folded light curve of CSHP_V5 (EW, P = 0.2776 d). Red: 27 Jul 2017 (Ass. Ast. Aurunca); Black: 28 Jul 2017; Blue: 28 Jul 2017 (P. Ago).

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4.6 CSHP_V6 — 2MASS J20152176+5241138 — Cygnus

CSHP_V6 is an EW-type variable discovered in Cygnus. A second EW-type binary was discovered in the V1044 Cyg field, during the same 27–28 July 2017 sessions. Cross-identifications: URAT1 714-311576. The phase-folded light curve (Fig. 12) shows the characteristic continuous EW morphology. Observers: Ago, Castellano, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

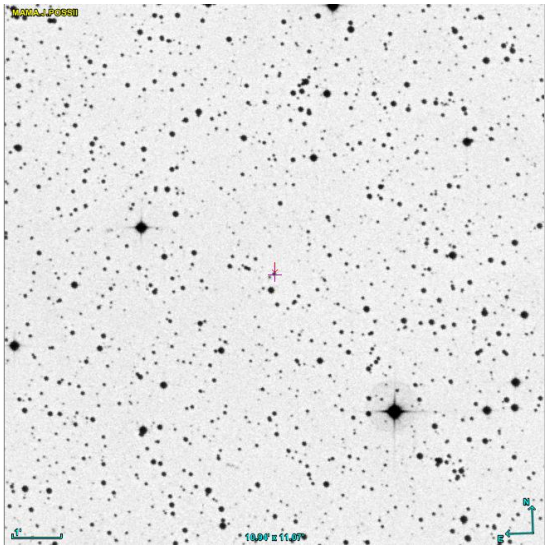

Fig. 11: DSS2/MAMA finding chart for CSHP_V6 (2MASS J20152176+5241138). Field ~10.9′×11.1′. North up, East left. Cross marks the variable.

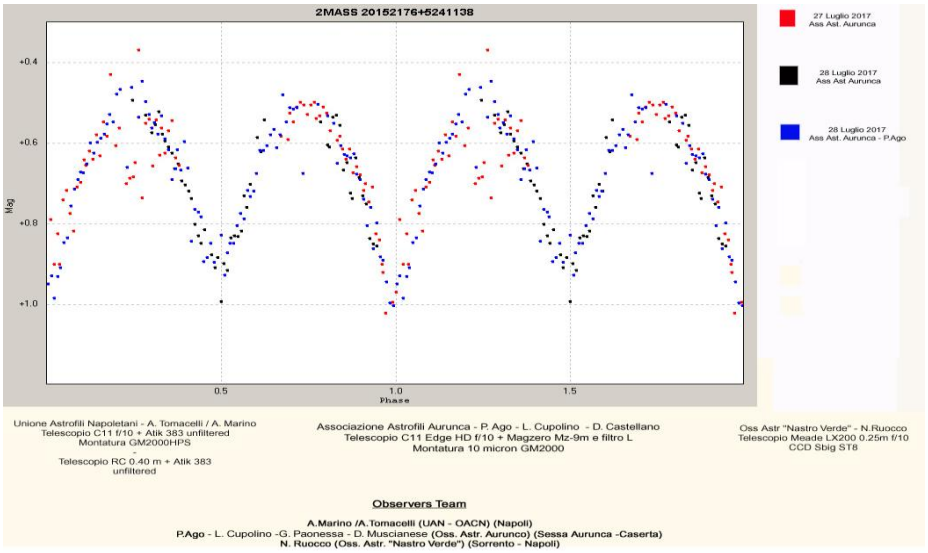

Fig. 12: Phase-folded light curve of CSHP_V6 (EW, P = 0.304372 d). Red: 27 Jul 2017; Black: 28 Jul 2017; Blue: 28 Jul 2017 (P. Ago).

4.7 CSHP_V7 — UCAC4 596-086558 — Cygnus

CSHP_V7 is an EW-type variable discovered in Cygnus. Discovered in the photometric field of V902 Cyg, observed on 19–22 July 2017. Cross-identifications: 2MASS J19340835+2906545; ASASSN-V J193408.35+290654.5. The phase-folded light curve (Fig. 14) shows the characteristic continuous

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EW morphology. Observers: Ago, Castellano, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

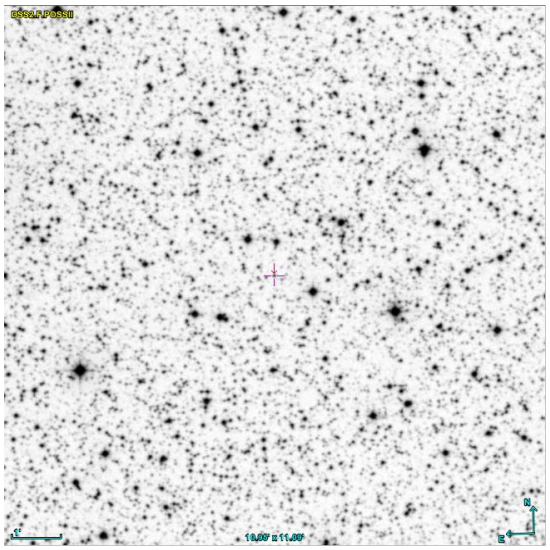

Fig. 13: DSS2 F.POSSII finding chart for CSHP_V7 (UCAC4 596-086558). Field ~10.9′×11.8′. North up, East left. Cross marks the variable.

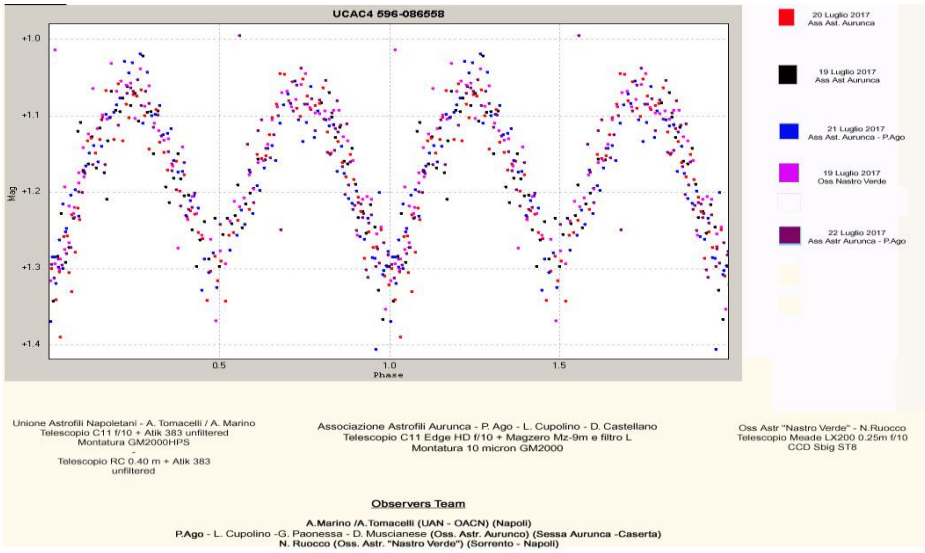

Fig. 14: Phase-folded light curve of CSHP_V7 (EW, P = 0.253840 d). Red: 20 Jul 2017; Black: 19 Jul 2017; Blue: 21 Jul 2017 (P. Ago); Magenta: 19 Jul 2017 (Oss. Nastro Verde); Dark: 22 Jul 2017 (P. Ago).

4.8 CSHP_V8 — UCAC4 635-080002 — Cygnus

CSHP_V8 is an EW-type variable discovered in Cygnus. Discovered in the photometric field of V689 Cyg, observed on 22–25 August 2017. Cross-identifications: 2MASS J19514739+3648138; ASASSN-V J195147.39+364813.8. The phase-folded light curve (Fig. 16) shows the characteristic continuous EW morphology. The two minima exhibit slightly different depths, suggesting the presence of an O'Connell effect. Observers: Ago, Castellano, Cupolino, Muscianese, Paonessa (Oss. Astr. Aurunca); Marino, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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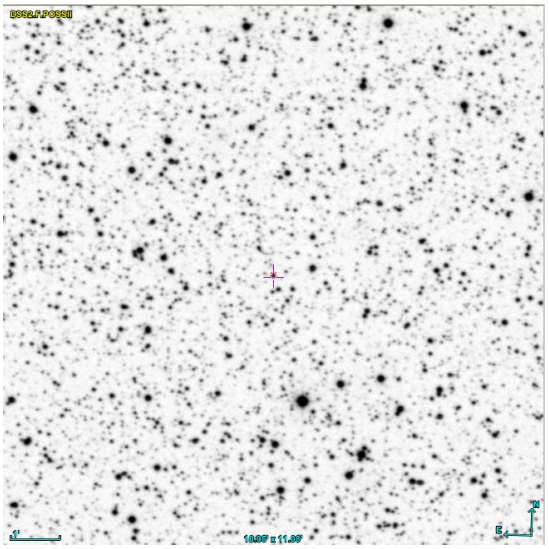

Fig. 15: DSS2 F.POSSII finding chart for CSHP_V8 (UCAC4 635-080002). Field ~10.9′×11.8′. North up, East left. Cross marks the variable.

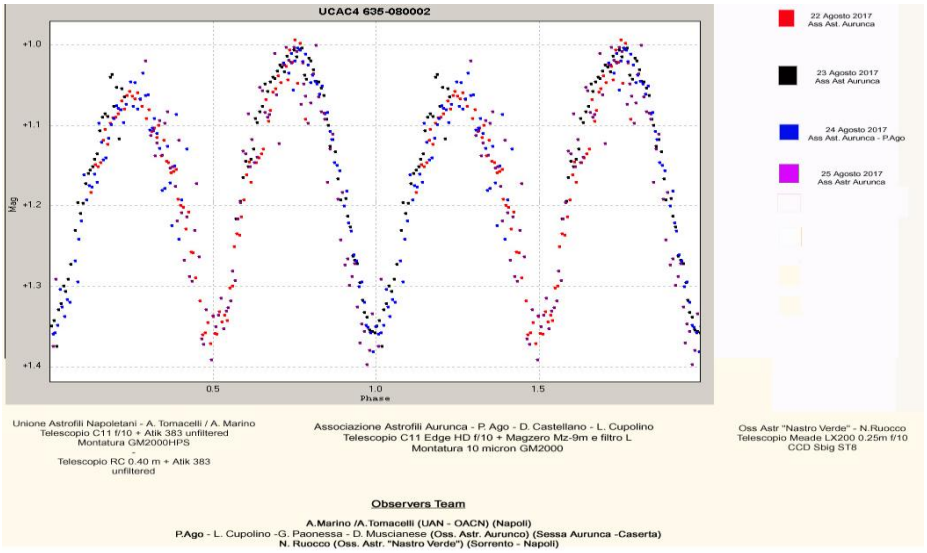

Fig. 16: Phase-folded light curve of CSHP_V8 (EW, P = 0.3839 d). Red: 22 Aug 2017; Black: 23 Aug 2017; Blue: 24 Aug 2017 (P. Ago); Magenta: 25 Aug 2017.

4.9 CSHP_V9 — UCAC4 511-109216 — Aquila

CSHP_V9 is an EA-type variable discovered in Aquila. Discovered in the photometric field of V1148 Aql. The phase-folded light curve (Fig. 18) shows two distinct minima of unequal depth, consistent with Algol-type geometry, with eclipse duration ~12% (~1.59 h). Observers: Ago, Castellano, Cupolino (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde).

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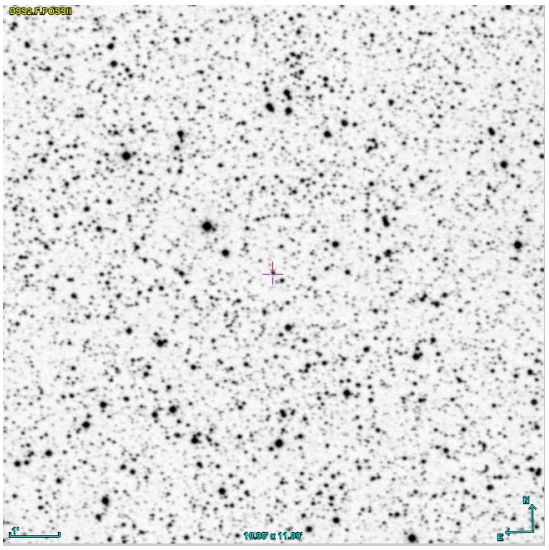

Fig. 17: DSS2 F.POSSII finding chart for CSHP_V9 (UCAC4 511-109216). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

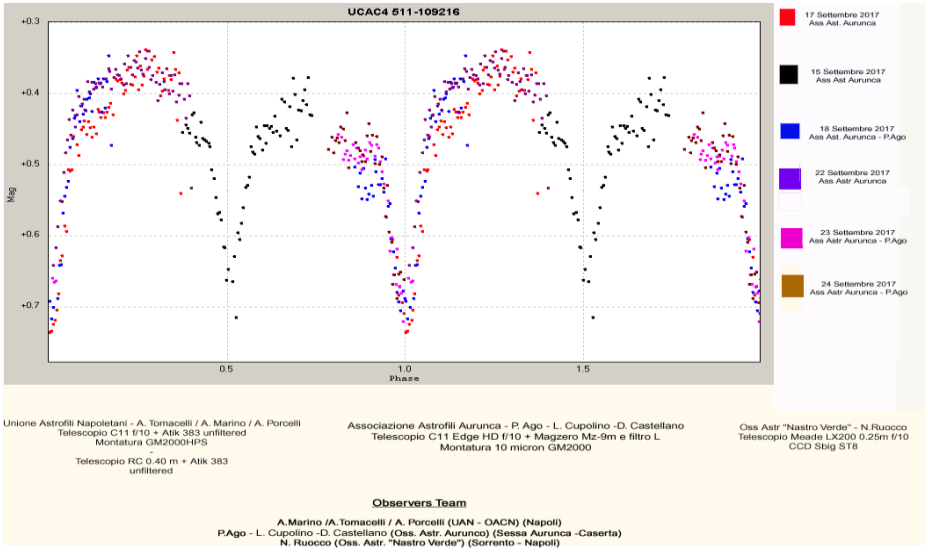

Fig. 18: Phase-folded light curve of CSHP_V9 (EA, P = 0.552486 d). Colours indicate different observing sessions (Sep–Oct 2017).

4.10 CSHP_V10 — UCAC4 511-109187 — Aquila

CSHP_V10 is an EW-type variable discovered in Aquila. Discovered in the same V1148 Aql field as CSHP_V9. The phase-folded light curve (Fig. 20) shows the characteristic continuous quasi-sinusoidal variation with two minima of comparable depth. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Ausanio, Marino, Porcelli, Tomacelli (UAN–OACN); Castellano (Gr. Astrofili Beneventani); Ruocco (Oss. Astr. Nastro Verde).

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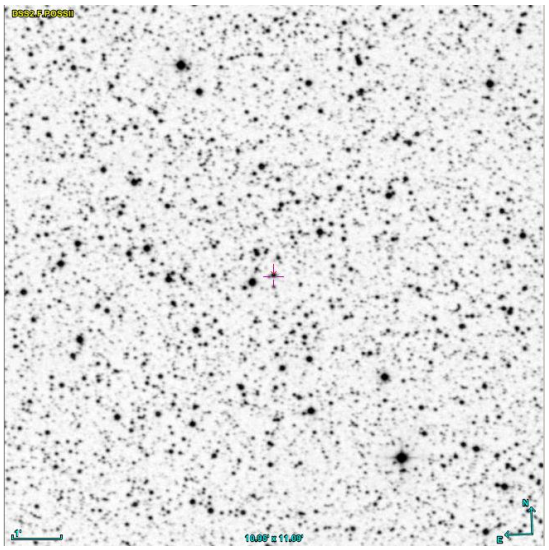

Fig. 19: DSS2 F.POSSII finding chart for CSHP_V10 (UCAC4 511-109187). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

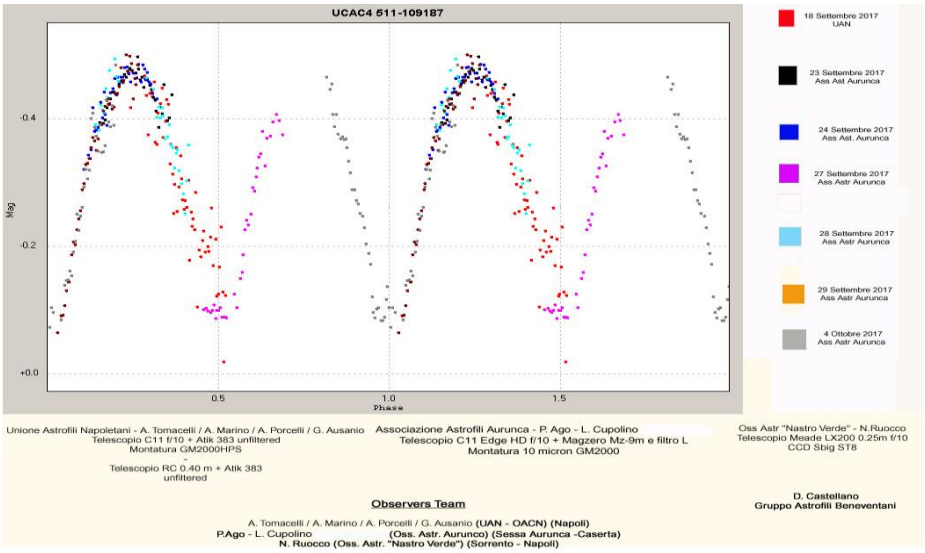

Fig. 20: Phase-folded light curve of CSHP_V10 (EW, P = 0.5577 d). Colours indicate different observing sessions (Sep–Oct 2017).

4.11 CSHP_V11 — UCAC4 511-109598 — Aquila

CSHP_V11 is an EA-type variable discovered in Aquila. A second EA-type eclipsing binary was found in the V1148 Aql field. The phase-folded light curve (Fig. 22) shows a clear primary minimum of ~0.75 mag and a shallower secondary minimum, consistent with Algol-type geometry, with eclipse duration ~13% (~3 h). Observers: Ago, Cupolino (Oss. Astr. Aurunca); Ausanio, Marino, Porcelli, Tomacelli (UAN–OACN); Castellano (Gr. Astrofili Beneventani); Ruocco (Oss. Astr. Nastro Verde).

DOI: 10.5817/OEJV2026-0276

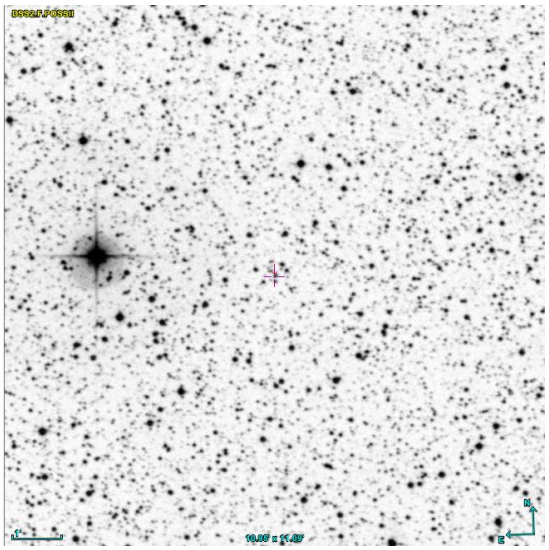

Fig. 21: DSS2 F.POSSII finding chart for CSHP_V11 (UCAC4 511-109598). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

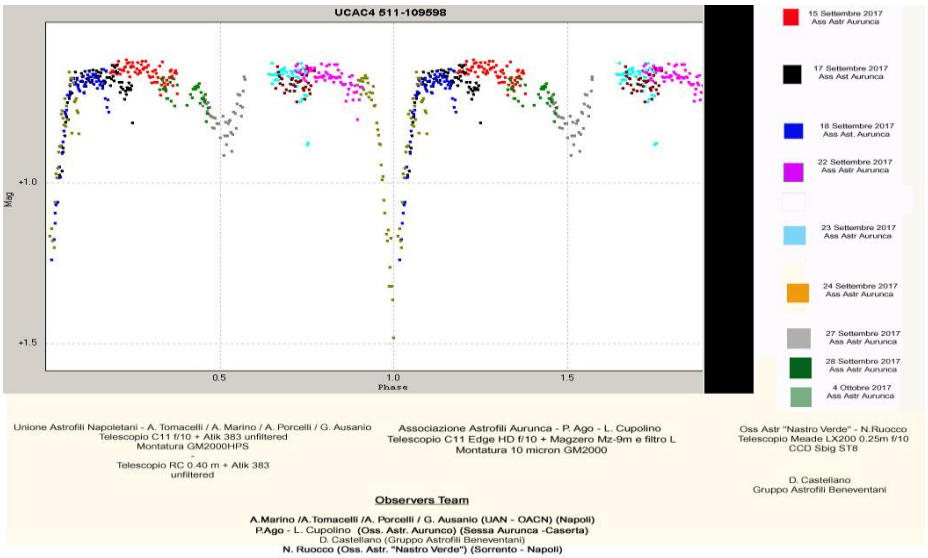

Fig. 22: Phase-folded light curve of CSHP_V11 (EA, P = 1.0694 d). Colours indicate different observing sessions (Sep–Oct 2017).

4.12 CSHP_V12 — UCAC4 743-061745 — Draco

CSHP_V12 is an EB-type variable discovered in Draco. Discovered in the photometric field of BM Dra (Draco) during observations on 1–17 November 2017. Cross-identifications: 2MASS J19435766+5833070. The phase-folded light curve (Fig. 24) shows the characteristic β Lyr-type continuous variation with two minima of unequal depth. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN, Colacevich telescope); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

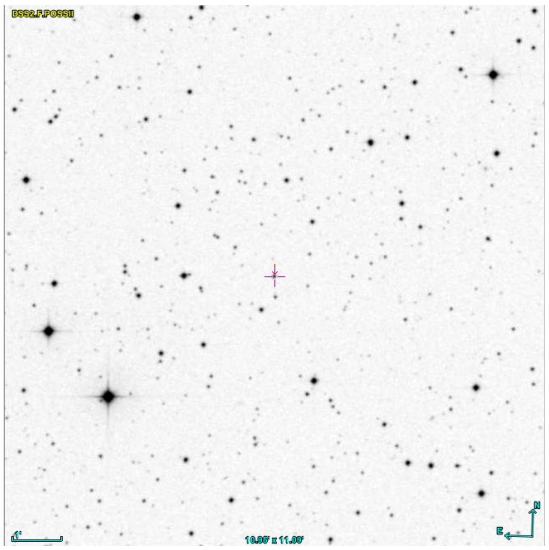

Fig. 23: DSS2 F.POSSII finding chart for CSHP_V12 (UCAC4 743-061745). Field ~10.9′×11.0′. North up, East left. Cross marks the variable.

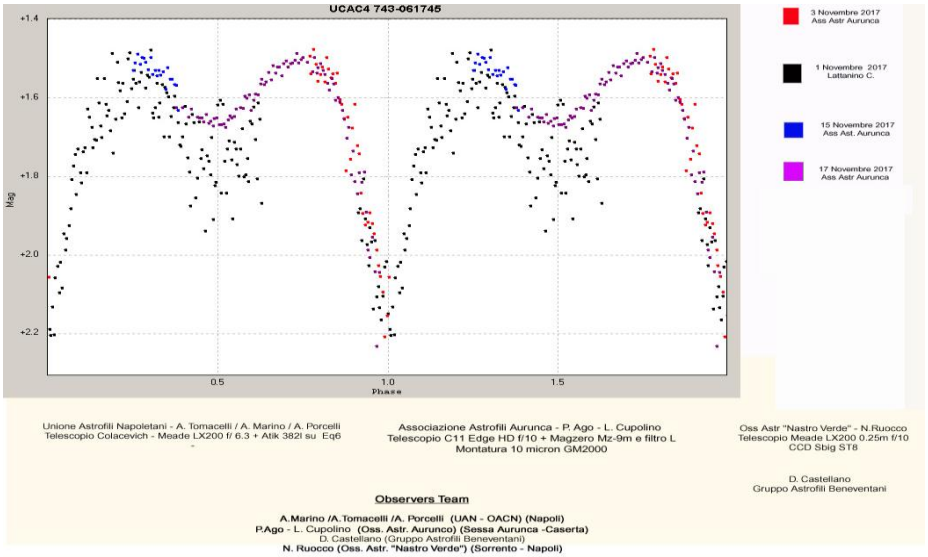

Fig. 24: Phase-folded light curve of CSHP_V12 (EB, P = 0.4524 d). Red: 3 Nov 2017; Black: 1 Nov 2017 (L. Cupolino); Blue: 15 Nov 2017; Magenta: 17 Nov 2017.

4.13 CSHP_V13 — UCAC4 740-094278 — Cassiopeia

CSHP_V13 is an EW-type variable discovered in Cassiopeia. Discovered in the field of V436 Cas (Cassiopeia). Own observations were combined with archival ASAS-SN data (Kochanek et al. 2017) to achieve a well-constrained period. The phase-folded light curve (Fig. 25) shows the characteristic continuous EW morphology. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

DOI: 10.5817/OEJV2026-0276

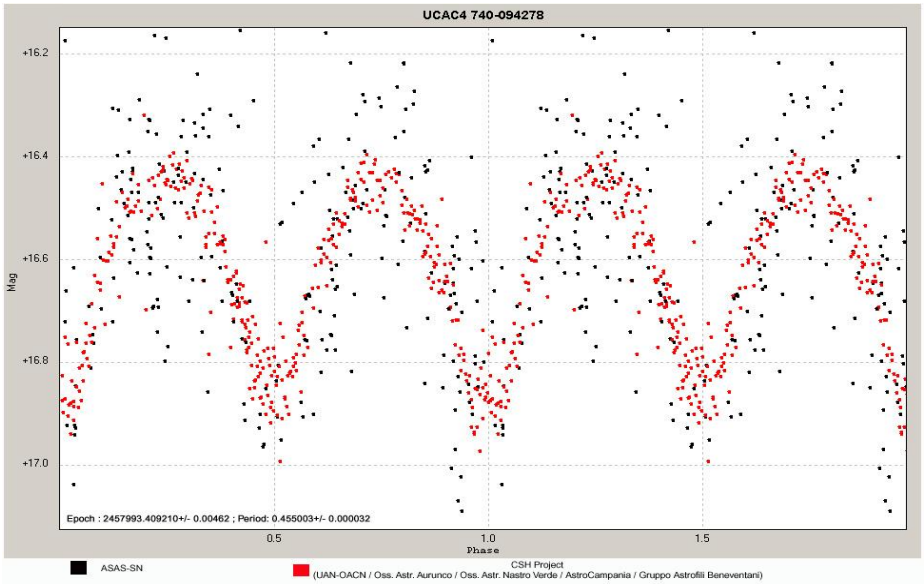

Fig. 25: Phase-folded light curve of CSHP_V13 (EW, P = 0.455003 d). Black: ASAS-SN data; Red: CSH Project observations.

4.14 CSHP_V14 — GSC 02882-00081 — Perseus

CSHP_V14 is an EW-type variable discovered in Perseus. Discovered in Perseus during photometric monitoring in December 2017. Cross-identifications: 2MASS J04161650+4057473; ASASSN-V J041616.50+405749.2. The spectral type was subsequently classified as G4 by Qian et al. (2020). Own observations were combined with archival ASAS-SN data. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. “M57”); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

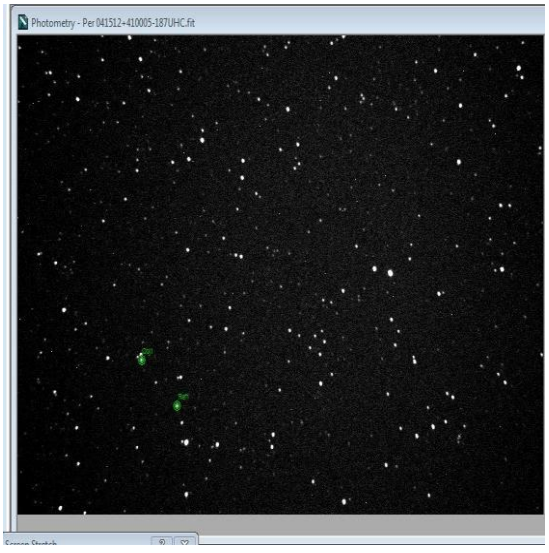

Fig. 26: Field image of CSHP_V14 (GSC 02882-00081). The variable and comparison stars are marked.

OPEN EUROPEAN JOURNAL ON VARIABLE STARS
August 2026 https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

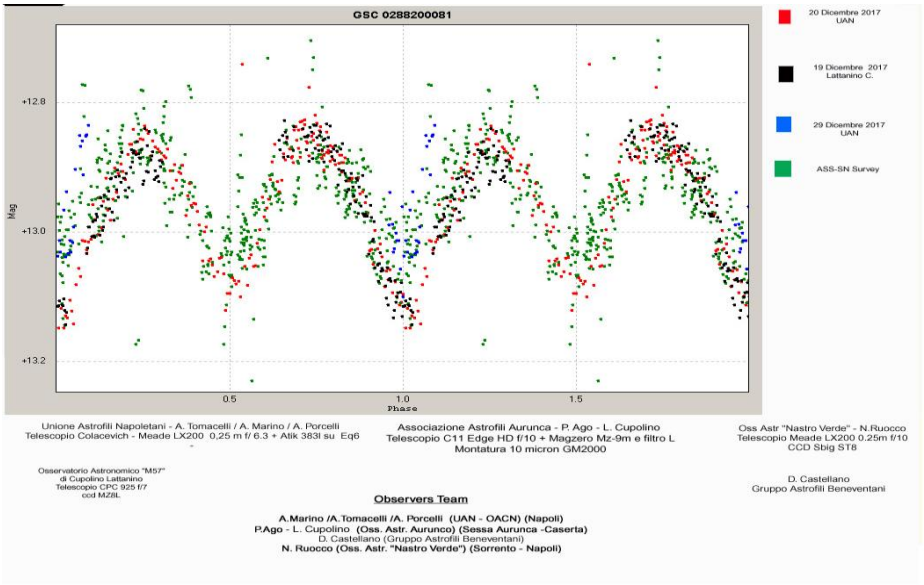

Fig. 27: Phase-folded light curve of CSHP_V14 (EW, P = 0.3470 d, G4). Red: 20 Dec 2017 (UAN); Black: 19 Dec 2017 (L. Cupolino, Oss. M57); Blue: 29 Dec 2017 (UAN); Green: ASAS-SN data.

4.15 CSHP_V15 — UCAC4 687-118494 — Lacerta

CSHP_V15 is an EW-type variable discovered in Lacerta. Discovered in the photometric field of V431 Lac (Lacerta). Own observations were combined with archival ASAS-SN data (Kochanek et al. 2017) to achieve a well-constrained period. The phase-folded light curve (Fig. 28) shows the characteristic continuous EW morphology. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

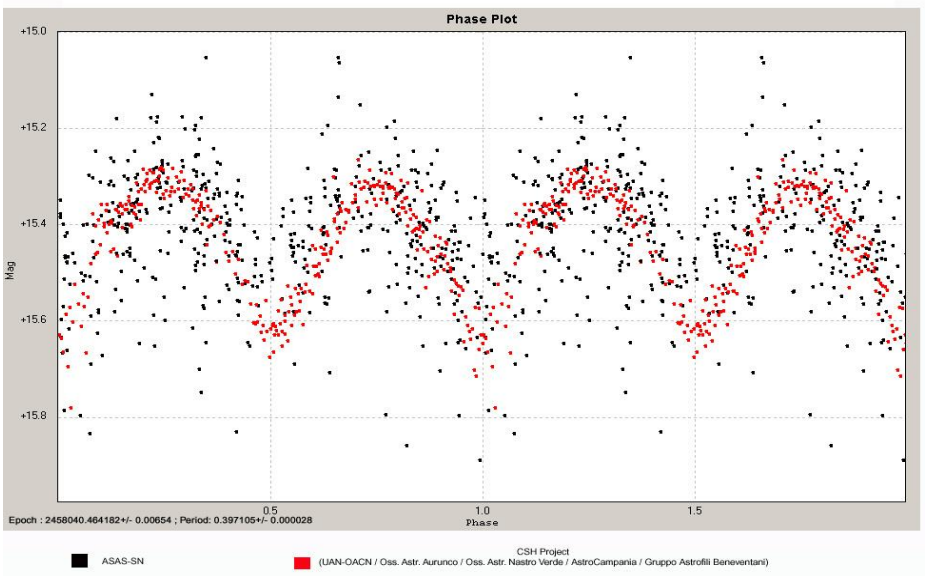

Fig. 28: Phase-folded light curve of CSHP_V15 (EW, P = 0.397105 d). Black: ASAS-SN data; Red: CSH Project observations.

DOI: 10.5817/OEJV2026-0276

4.16 CSHP_V16 — UCAC4 660-021871 — Perseus

CSHP_V16 is an EB-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign, in the same field as CSHP_V14. Own observations were combined with archival ASAS-SN data. With P = 0.627 d, this was the longest-period binary until CSHP_V18. The phase-folded light curve (Fig. 29) shows a prominent primary minimum and shallower secondary. Observers: Ago, Cupolino (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

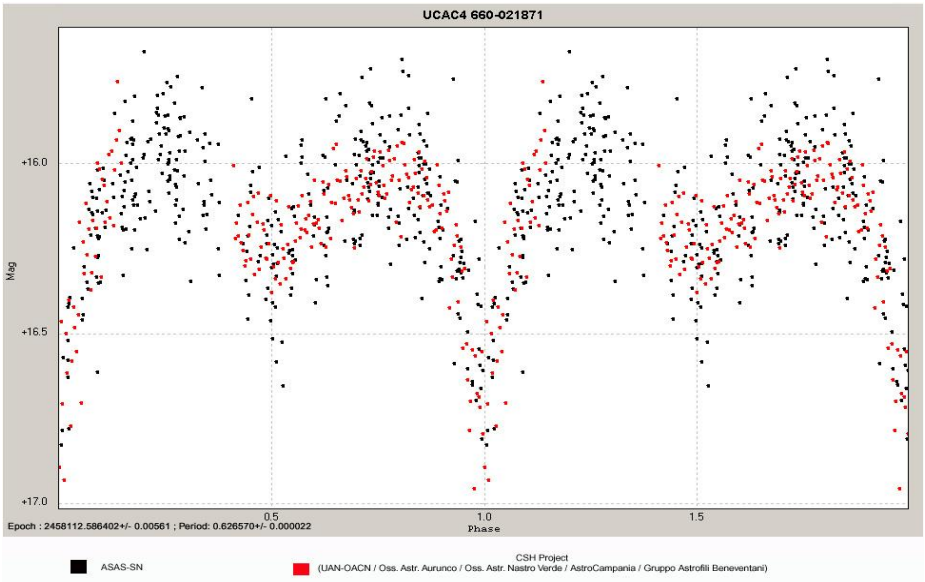

Fig. 29: Phase-folded light curve of CSHP_V16 (EB, P = 0.626570 d). Black: ASAS-SN data; Red: CSH Project observations.

4.17 CSHP_V17 — UCAC4 660-021707 — Perseus

CSHP_V17 is an EA-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: 2MASS J04133025+4149492. Own observations were combined with archival ASAS-SN data. The phase-folded light curve (Fig. 30) shows two distinct minima of unequal depth, consistent with Algol-type geometry, with eclipse duration ~17% (~2.10 h). Observers: Ago (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. “M57”); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

DOI: 10.5817/OEJV2026-0276

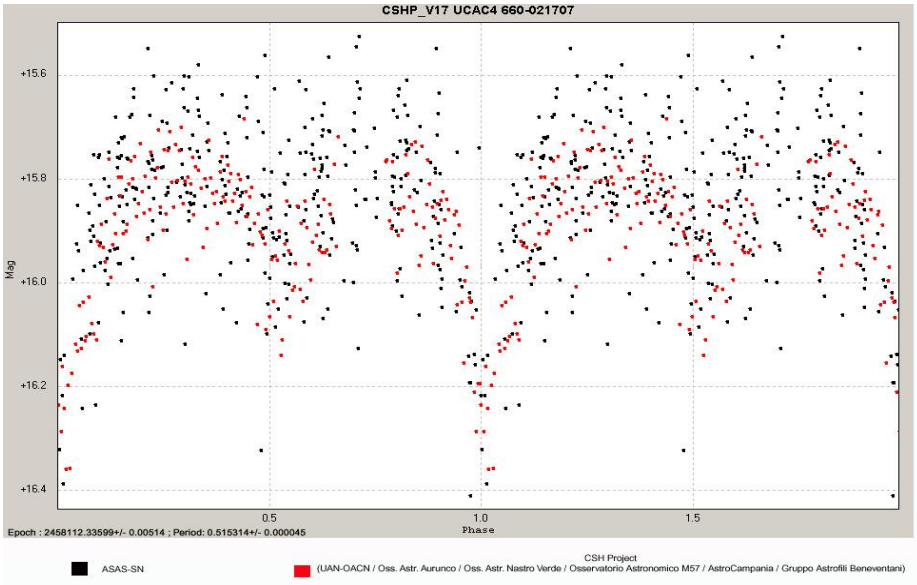

Fig. 30: Phase-folded light curve of CSHP_V17 (EA, P = 0.515314 d). Black: ASAS-SN data; Red: CSH Project observations.

4.18 CSHP_V18 — UCAC4 658-021599 — Perseus

CSHP_V18 is an EB-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: 2MASS J04160134+4130229; CMC15 J041601.3+413022. Own observations were combined with archival ASAS-SN data. With P = 0.864 d, this is the longest-period binary in the entire CSHP sample. Observers: Ago (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. "M57"); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

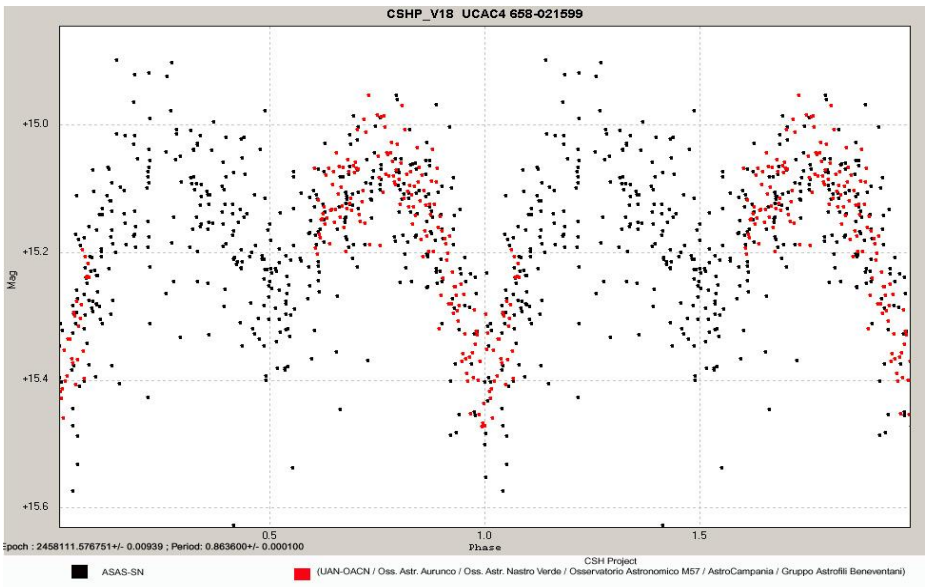

Fig. 31: Phase-folded light curve of CSHP_V18 (EB, P = 0.8636 d). Black: ASAS-SN data; Red: CSH Project observations.

DOI: 10.5817/OEJV2026-0276

4.19 CSHP_V19 — UCAC4 656-020136 — Perseus

CSHP_V19 is an EW-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: 2MASS J04144960+4108198; CMC15 J041449.6+410819. The spectral type was subsequently classified as G8 by Qian et al. (2020). Own observations combined with ASAS-SN data. The phase-folded light curve (Fig. 32) shows the characteristic continuous EW morphology. Observers: Ago (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. "M57"); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

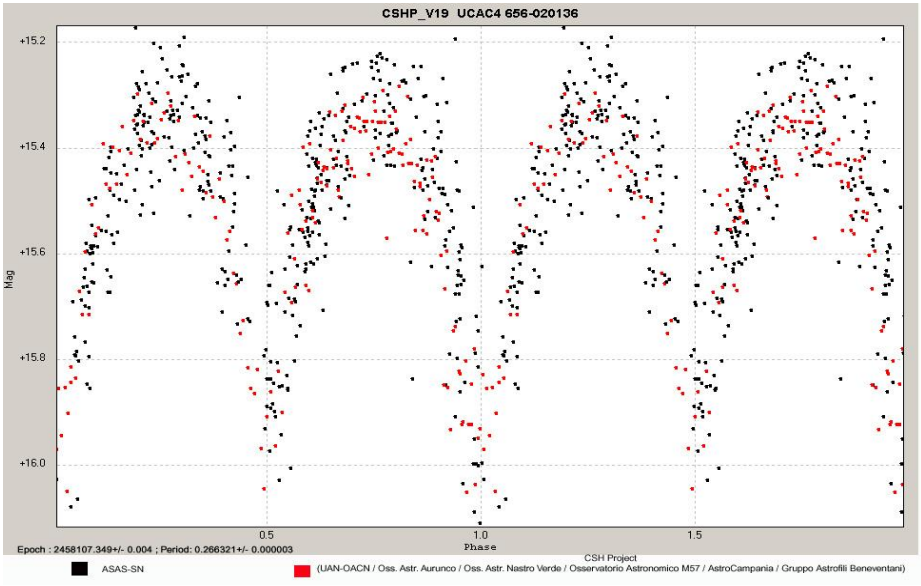

Fig. 32: Phase-folded light curve of CSHP_V19 (EW, P = 0.266321 d, G8). Black: ASAS-SN data; Red: CSH Project observations.

4.20 CSHP_V20 — GSC 03313-00711 — Perseus

CSHP_V20 is an EW-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: 2MASS J03345562+4512524; CMC15 J033455.6+451252. Own observations combined with ASAS-SN data. A nearby star (V∶16.0, separation ~8″) falls within the ASAS-SN aperture; this slight contamination has been accounted for. The phase-folded light curve (Fig. 33) shows the characteristic continuous EW morphology. Observers: Ago (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. "M57"); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

DOI: 10.5817/OEJV2026-0276

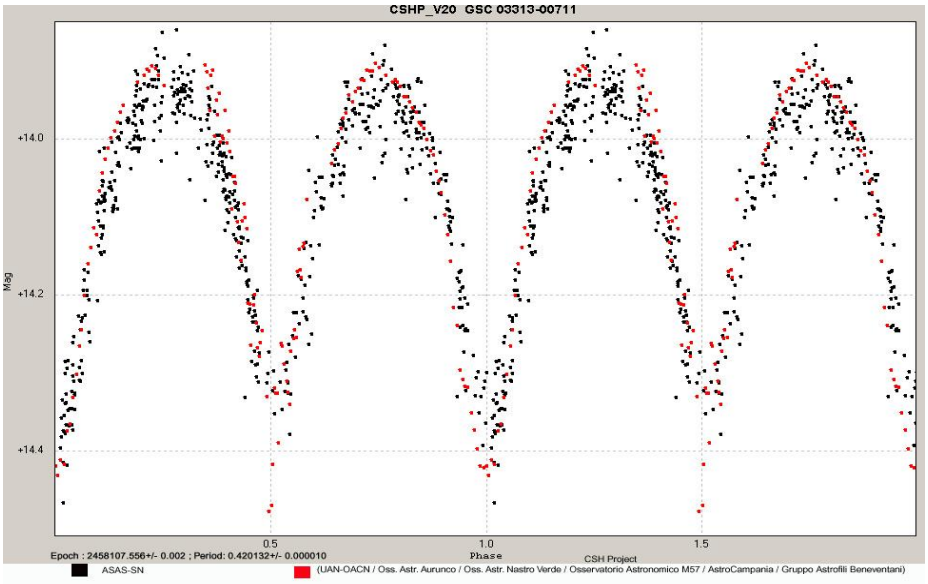

Fig. 33: Phase-folded light curve of CSHP_V20 (EW, P = 0.420132 d). Black: ASAS-SN data (minor contamination from nearby star); Red: CSH Project observations.

4.21 CSHP_V21 — UCAC4 677-007898 — Andromeda

CSHP_V21 is an EW-type variable discovered in Andromeda. Discovered in Andromeda during photometric monitoring in November 2018. Cross-identifications: 2MASS J01305367+4519363; CMC15 J013053.6+451936. Own observations combined with ASAS-SN data. The ASAS-SN photometry is affected by two nearby stars (sep. 16″ and 18″); the magnitude range has been corrected accordingly. The phase-folded light curve (Fig. 34) shows the characteristic continuous EW morphology. Observers: Ago (Oss. Astr. Aurunca); Cupolino, L. (Oss. Astr. “M57”); Marino, Porcelli, Tomacelli (UAN–OACN); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

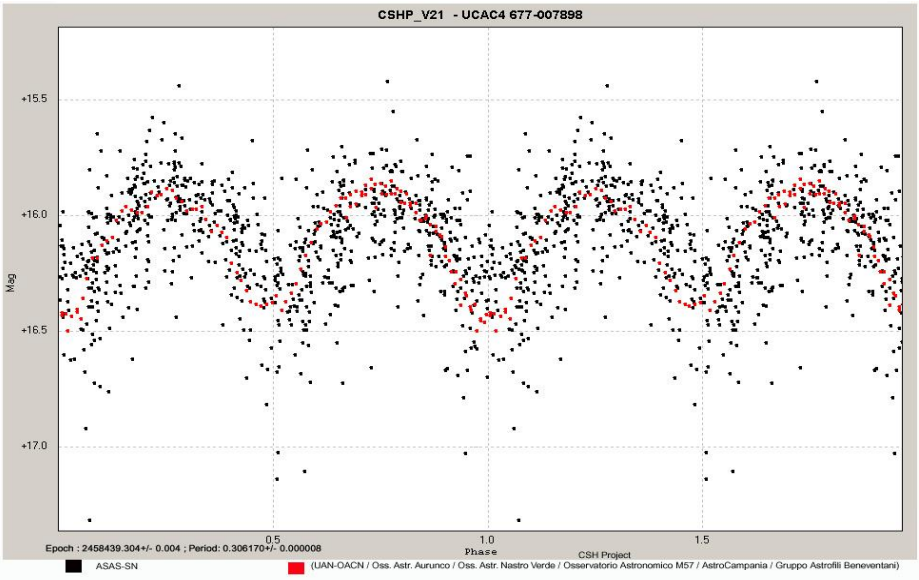

Fig. 34: Phase-folded light curve of CSHP_V21 (EW, P = 0.306170 d). Black: ASAS-SN data (corrected for contamination); Red: CSH Project observations.

DOI: 10.5817/OEJV2026-0276

4.22 CSHP_V22 — 2MASS J01290553+4553254 — Andromeda

CSHP_V22 is an EW-type variable discovered in Andromeda. Discovered in Andromeda during the same November 2018 campaign as CSHP_V21. Cross-identifications: ASASSN-V J012905.55+455325.4. The phase-folded light curve (Fig. 37) shows the characteristic continuous EW morphology. Observers: Ago (Oss. Astr. Aurunca); Ausanio, Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

Fig. 35: Finding chart for CSHP_V22 (2MASS J01290553+4553254) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~11.9′×6.0′. North up, East left. The variable is indicated by the red arrow.

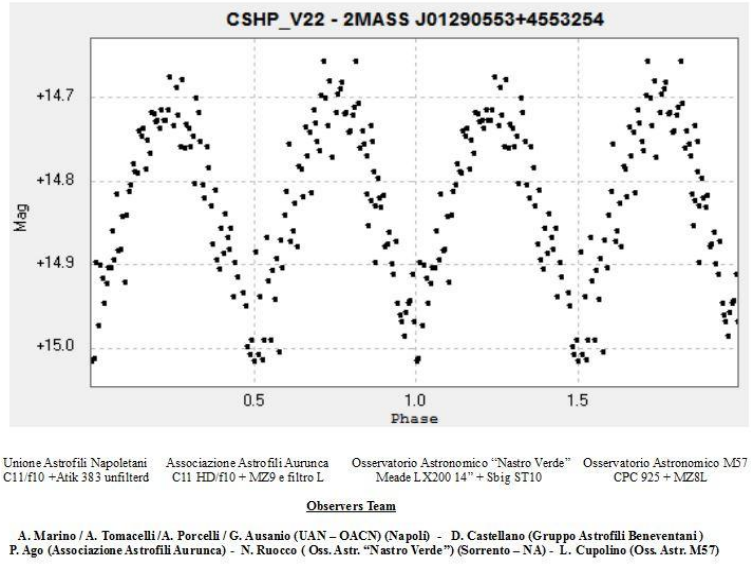

Fig. 36: Phase-folded light curve of CSHP_V22 (EW, P = 0.4487 d). Observations by UAN–OACN, Oss. Astr. Aurunca, Oss. Astr. Nastro Verde, Oss. Astr. M57.

4.23 CSHP_V23 — 2MASS J04170774+4214245 — Perseus

CSHP_V23 is an EW-type variable discovered in Perseus. This object was originally catalogued as WISE J041707.7+421424 (Chen et al. 2018). Following a formal VSX revision process, the

DOI: 10.5817/OEJV2026-0276

designation CSHP_V23 was submitted and officially accepted as a valid alias. Cross-identifications: ZTF J041707.75+421424.5. The spectral type was subsequently determined as F0 by Qian et al. (2020), and VSX notes the presence of a very close fainter companion star. The period has been refined by ZTF photometry (Chen et al. 2020). The phase-folded light curve (Fig. 37) shows the characteristic continuous EW morphology. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

A DSS2 finding chart for this object was not available at the time of submission.

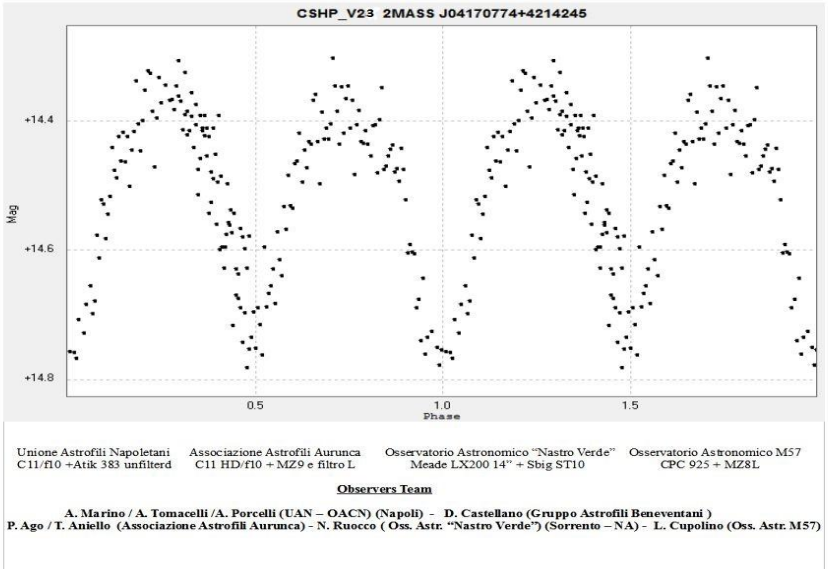

Fig. 37: Phase-folded light curve of CSHP_V23 (EW, P = 0.3880871 d, F0). Observers: CSH Project multi-site team.

4.24 CSHP_V24 — 2MASS J22312152+4708222 — Lacerta

CSHP_V24 is an EW-type variable discovered in Lacerta. A second EW-type binary discovered in the field of V431 Lac (Lacerta), in the same October 2017 campaign that yielded CSHP_V15. Cross-identifications: UCAC4 686-121610. The phase-folded light curve (Fig. 39) shows the characteristic continuous EW morphology. Observers: Ago, Aniello (Oss. Astr. Aurunca); Ausanio, Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

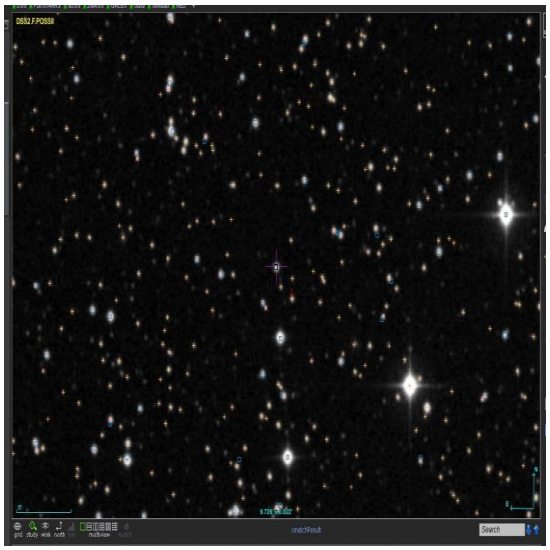

Fig. 38: Finding chart for CSHP_V24 (2MASS J22312152+4708222) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~9.7′×6.0′. North up, East left. Cross marks the variable.

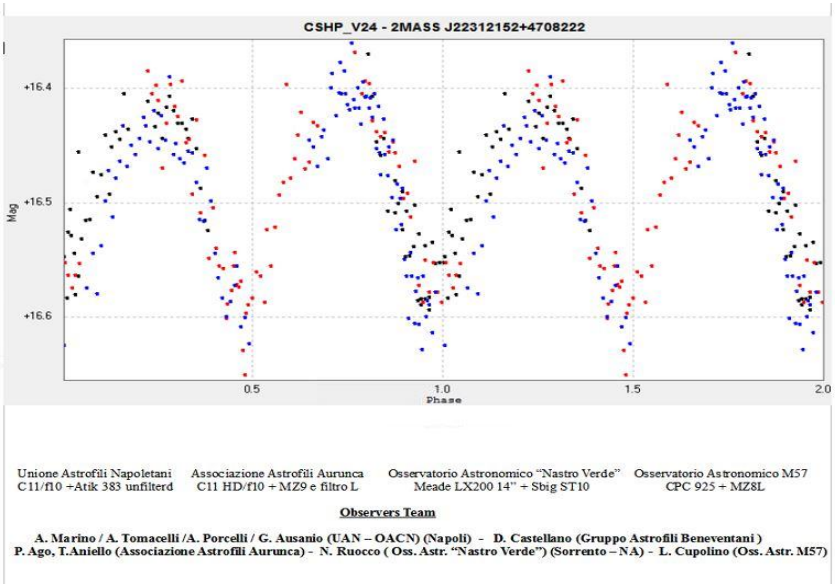

Fig. 39: Phase-folded light curve of CSHP_V24 (EW, P = 0.288 d). Observers: CSH Project multi-site team.

4.25 CSHP_V25 — 2MASS J19461800+5836497 — Draco

CSHP_V25 is an DSCT-type variable discovered in Draco. This δ Scuti pulsating variable is the only non-eclipsing object in the CSHP catalogue. Discovered in Draco during October–November 2017 observations. Cross-identifications: GSC 03946-01048; UCAC4 744-058913. The phase-folded light curve (Fig. 41) shows the characteristic asymmetric pulsation profile with rapid rise and slower decline, typical of the DSCT class, with amplitude of only ~0.07 mag. The very short period of P = 0.055 d (79 min) is typical of low-amplitude DSCT pulsators. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

Fig. 40: Finding chart for CSHP_V25 (2MASS J19461800+5836497) from Aladin Sky Atlas. North up, East left. Cross marks the variable.

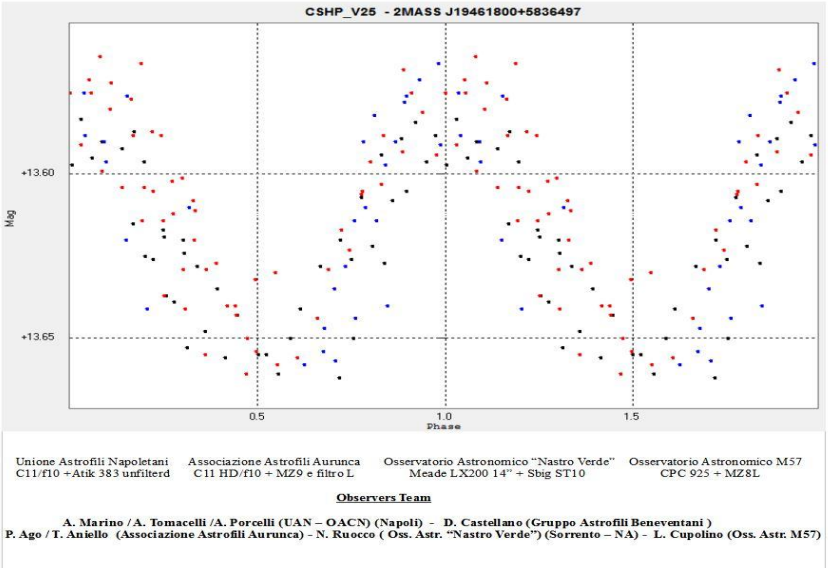

Fig. 41: Phase-folded light curve of CSHP_V25 (DSCT, P = 0.055 d, 79 min). The asymmetric profile with rapid rise and slower decline is characteristic of δ Scuti pulsators.

4.26 CSHP_V26 — 2MASS J01033330+4735211 — Andromeda

CSHP_V26 is an EW-type variable discovered in Andromeda. Discovered in Andromeda during photometric monitoring in November 2017. Cross-identifications: UCAC4 688-006478. The phase-folded light curve (Fig. 43) shows the characteristic continuous EW morphology. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

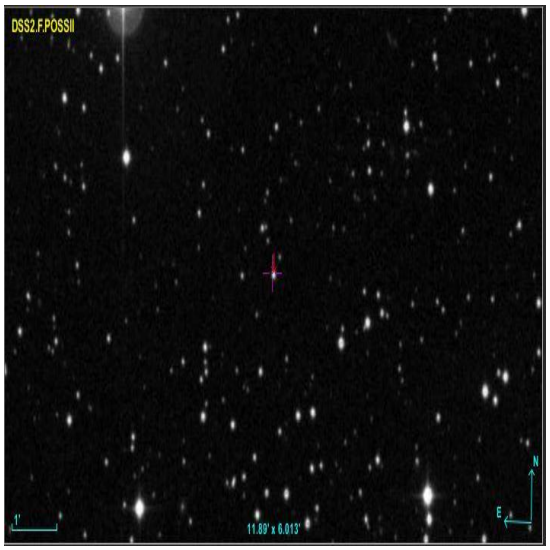

Fig. 42: Finding chart for CSHP_V26 (2MASS J01033330+4735211) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~11.9′×6.0′. North up, East left. Cross marks the variable.

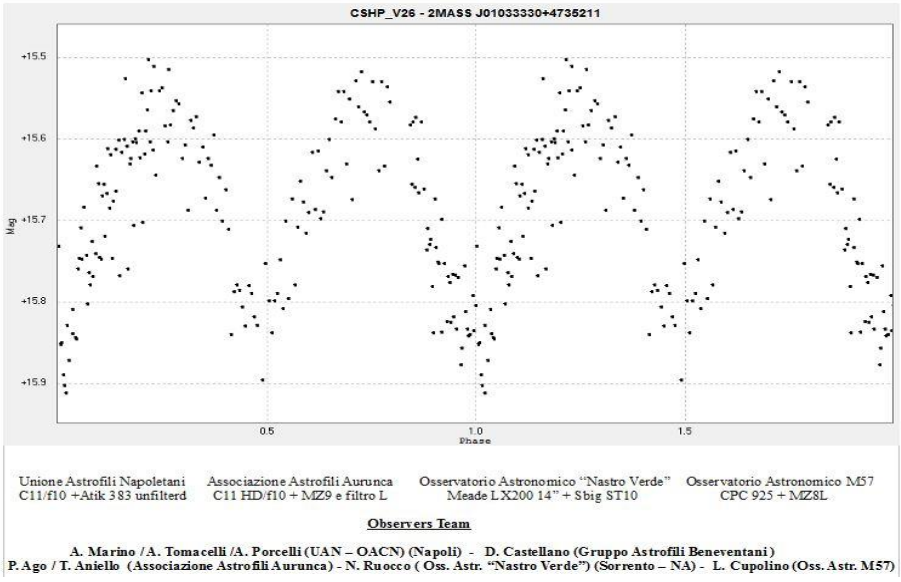

Fig. 43: Phase-folded light curve of CSHP_V26 (EW, P = 0.309 d). Observers: CSH Project multi-site team.

4.27 CSHP_V27 — 2MASS J04011677+4215100 — Perseus

CSHP_V27 is an EW-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: ZTF J040116.19+421507.2. The period has been confirmed and refined by the ZTF Catalog of Periodic Variable Stars (Chen et al. 2020). The phase-folded light curve (Fig. 45) shows the characteristic continuous EW morphology. With a mean magnitude of ~18.2 (instrumental), this is one of the faintest variables in the CSHP sample. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

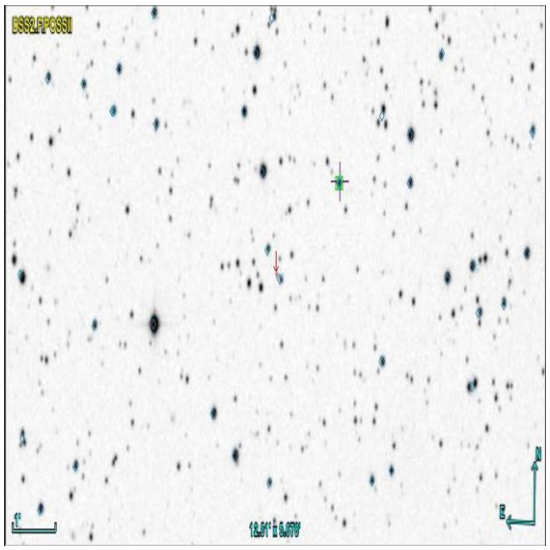

Fig. 44: Finding chart for CSHP_V27 (2MASS J04011677+4215100) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~12.5′×5.7′. North up, East left. Cross marks the variable.

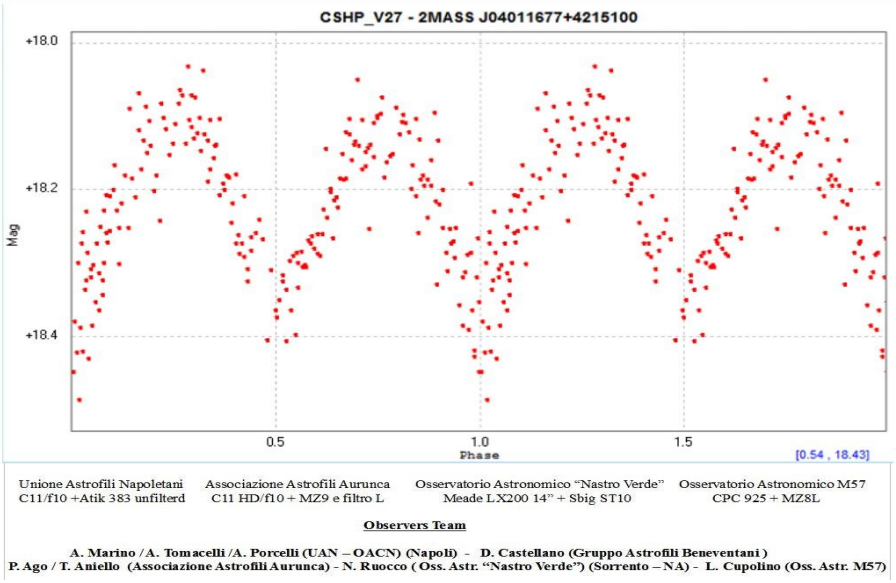

Fig. 45: Phase-folded light curve of CSHP_V27 (EW, P = 0.3726966 d). Observers: CSH Project multi-site team.

4.28 CSHP_V28 — 2MASS J03360512+4513402 — Perseus

CSHP_V28 is an EW-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign. Cross-identifications: ASASSN-V J033605.15+451341.3; UCAC4 677-020806. The phase-folded light curve (Fig. 47) shows the characteristic continuous EW morphology with two well-defined minima. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

DOI: 10.5817/OEJV2026-0276

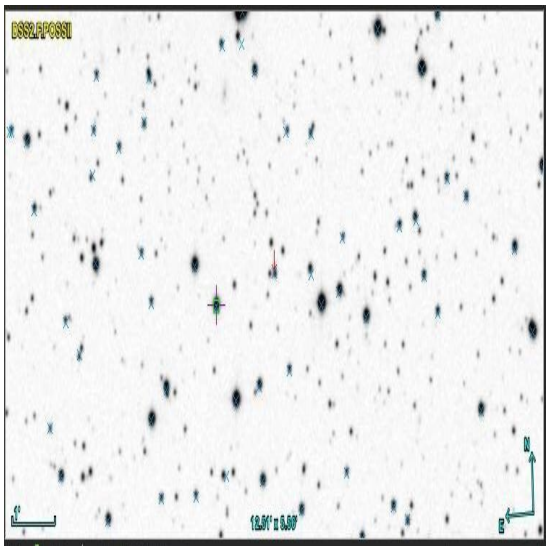

Fig. 46: Finding chart for CSHP_V28 (2MASS J03360512+4513402) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~12.5′×5.6′. North up, East left. Cross marks the variable.

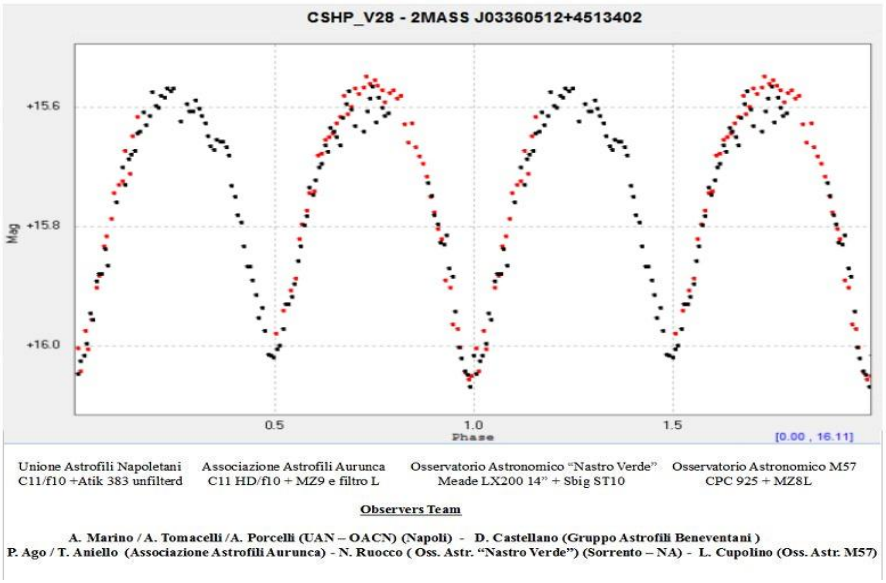

Fig. 47: Phase-folded light curve of CSHP_V28 (EW, P = 0.381 d). Black: UAN–OACN; Red: Oss. Astr. Aurunca.

4.29 CSHP_V29 — 2MASS J04143939+4106505 — Perseus

CSHP_V29 is an EW-type variable discovered in Perseus. Discovered in Perseus during the December 2017 campaign, in the same field as CSHP_V19. Cross-identifications: UCAC4 656-020116. The phase-folded light curve (Fig. 49) shows the characteristic continuous EW morphology with amplitude ~0.65 mag, one of the largest in the CSHP sample. A detailed physical and orbital analysis of this object, including mass, radius, and distance estimates derived from empirical relations and light-curve modelling, is presented in Appendix A. Observers: Ago, Aniello (Oss. Astr. Aurunca); Marino, Porcelli, Tomacelli (UAN–OACN); Cupolino, L. (Oss. Astr. "M57"); Ruocco (Oss. Astr. Nastro Verde); Castellano (Gr. Astrofili Beneventani).

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August 2026 https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

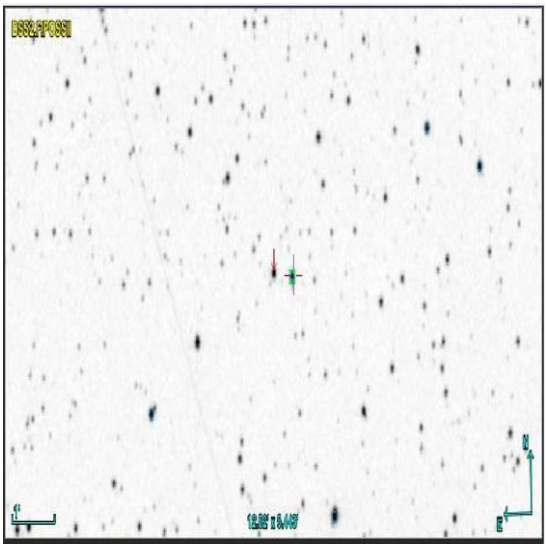

Fig. 48: Finding chart for CSHP_V29 (2MASS J04143939+4106505) from Aladin Sky Atlas (DSS2 F.POSSII). Field ~12.5′×5.4′. North up, East left. Cross marks the variable.

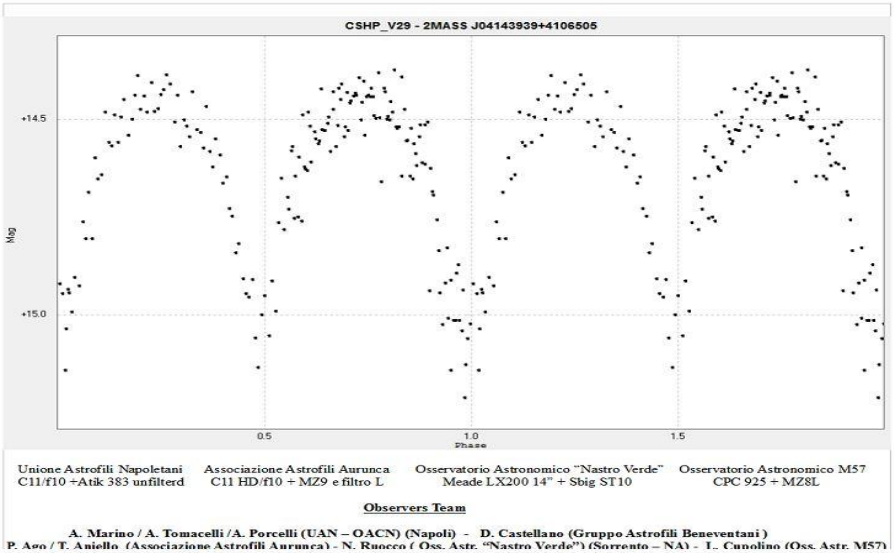

Fig. 49: Phase-folded light curve of CSHP_V29 (EW, P = 0.270 d). Note the relatively large amplitude (~0.65 mag).

DOI: 10.5817/OEJV2026-0276

5 Results

Table 1 summarises the photometric parameters of all twenty-nine new variables. Following the GCVS format required for OEJV discovery papers, we provide for each object: cross-identification, variability type, maximum magnitude, amplitude, passband, period, and epoch.

Table 1: Photometric parameters of the twenty-nine newly discovered variable stars. Epochs are given as HJD. Amplitudes (Amp.) in magnitudes. C = clear (unfiltered); V = Johnson V; r = ZTF r band; CV = unfiltered calibrated.

Designation	Type	Const.	Period (d)	Epoch (HJD)	Mag	Amp.	Flt	VSX ID
GSC 04244-00959 (CSHP_V1)	EW	Dra	0.37891	2457705.52152	14.76	0.50	V	475867
2MASS J19282599+3314102 (CSHP_V2)	EW	Cyg	0.391032	2457936.4468	17.0	0.25	C	512818
UCAC4 617-074055 (CSHP_V3)	EW	Cyg	0.386591	2457938.40867	15.7	0.53	C	512774
2MASS J20304919+5652006 (CSHP_V4)	EB	Cyg	0.43936	2457947.5286	17.8	0.54	C	512810
2MASS J20143132+5239570 (CSHP_V5)	EW	Cyg	0.2776	2457962.4311	17.1	0.29	C	512879
2MASS J20152176+5241138 (CSHP_V6)	EW	Cyg	0.304372	2457964.5484	17.5	0.50	C	512880
UCAC4 596-086558 (CSHP_V7)	EW	Cyg	0.253840	2457954.5633	16.4	0.23	C	512942
UCAC4 635-080002 (CSHP_V8)	EW	Cyg	0.3839	2457988.5508	15.16	0.36	C	513044
UCAC4 511-109216 (CSHP_V9)	EA	Aql	0.552486	2458015.4077	15.7	0.35	C	545325
UCAC4 511-109187 (CSHP_V10)	EW	Aql	0.5577	2458031.3441	14.51	0.38	C	545387
UCAC4 511-109598 (CSHP_V11)	EA	Aql	1.0694	2458031.3538	15.7	0.75	C	545392
UCAC4 743-061745 (CSHP_V12)	EB	Dra	0.4524	2458059.2741	15.27	0.65	C	554624
UCAC4 740-094278 (CSHP_V13)	EW	Cas	0.455003	2457993.40921	16.42	0.46	V	612032
GSC 02882-00081 (CSHP_V14)	EW	Per	0.3470	2458094.5015	13.4	0.41	C	608131
UCAC4 687-118494 (CSHP_V15)	EW	Lac	0.397105	2458040.4642	15.31	0.33	V	612075
UCAC4 660-021871 (CSHP_V16)	EB	Per	0.626570	2458112.5864	15.95	0.75	V	612089
UCAC4 660-021707 (CSHP_V17)	EA	Per	0.515314	2458112.336	15.75	0.45	V	624696
UCAC4 658-021599 (CSHP_V18)	EB	Per	0.8636	2458111.577	15.1	0.30	V	624815

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UCAC4 656-020136 (CSHP_V19)	EW	Per	0.266321	2458107.349	15.32	0.63	V	624821
GSC 03313-00711 (CSHP_V20)	EW	Per	0.420132	2458107.556	13.93	0.45	V	624827
UCAC4 677-007898 (CSHP_V21)	EW	And	0.306170	2458439.304	15.92	0.53	V	683655
2MASS J01290553+4553254 (CSHP_V22)	EW	And	0.4487	2458435.281	14.72	0.25	CV	684185
2MASS J04170774+4214245 (CSHP_V23)	EW	Per	0.388087	—	14.34	0.42	CV	636182
2MASS J22312152+4708222 (CSHP_V24)	EW	Lac	0.288	2458042.315	16.40	0.20	CV	684285
2MASS J19461800+5836497 (CSHP_V25)	DSCT	Dra	0.055	2458058.332	13.58	0.07	CV	684307
2MASS J01033330+4735211 (CSHP_V26)	EW	And	0.309	2458078.574	15.53	0.34	CV	684325
2MASS J04011677+4215100 (CSHP_V27)	EW	Per	0.372697	2458092.532	16.20	0.22	r	684336
2MASS J03360512+4513402 (CSHP_V28)	EW	Per	0.381	2458106.595	15.58	0.44	CV	684338
2MASS J04143939+4106505 (CSHP_V29)	EW	Per	0.270	2458107.354	14.43	0.65	CV	684344

Note: CSHP_V23 epoch not determined from CSHP observations; period refined by ZTF photometry (Chen et al. 2020).

5.1 Colour-Magnitude Diagram

To verify the consistency of the variability classifications and to place the newly discovered objects in an astrophysical context, we constructed a colour-magnitude diagram (CMD) using the near-infrared colour (J−K) from the 2MASS Point Source Catalogue (Skrutskie et al. 2006) and the absolute magnitude in the Gaia G band.M_G

Distances were derived from Gaia DR3 trigonometric parallaxes (Gaia Collaboration 2023) retrieved via the SIMBAD database (Wenger et al. 2000) for each target by coordinate cross-match within 3 arcseconds. Of the 29 programme stars, 4 had no SIMBAD counterpart or an unreliable parallax solution (CSHP_V19, plx_err/plx = 37%; CSHP_V26, plx_err/plx > 100%), and were excluded. A further 6 objects lacked 2MASS J and K photometry or had a parallax uncertainty exceeding 20% (CSHP_V2, V6), leaving a final sample of 19 objects with both a reliable Gaia DR3 parallax (plx_err/plx < 20%) and 2MASS J and K photometry.

The absolute magnitude was computed as: $= G + 5 \log_{10}(\pi/100)$, where π is the Gaia DR3 parallax in milliarcseconds and G is the Gaia DR3 mean magnitude. No interstellar reddening correction was applied, as the programme stars are distributed across several constellations and distance ranges (438–3053 pc).M_G

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https://oejv.physics.muni.cz
DOI: 10.5817/OEJV2026-0276
ISSN 1801-5964

The resulting CMD (Fig. 50) shows the EW-type systems distributed along and slightly above the main sequence, with (J−K) colours in the range 0.29–0.71, consistent with F- to K-type dwarf primaries. CSHP_V25 (DSCT) falls clearly to the blue side at (J−K) = 0.15, consistent with an A- or early F-type pulsating star. The overall distribution confirms that all objects are dwarf or subgiant stars.

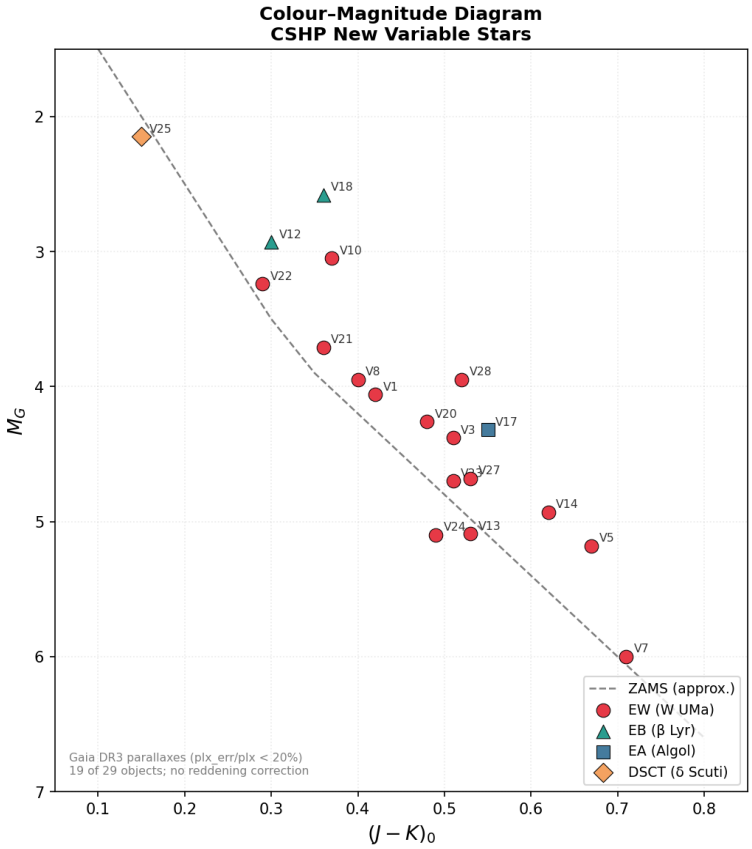

Fig. 50: Colour-magnitude diagram (MG vs. J−K) for 19 programme stars with reliable Gaia DR3 parallaxes (plx_err/plx < 20%) and 2MASS J, K photometry. Circles = EW; squares = EA; triangles = EB; diamond = DSCT. Dashed line: approximate ZAMS. No reddening correction applied.M_G

6 Conclusions

We have discovered twenty-nine new variable stars spanning eight constellations (Draco, Cygnus, Aquila, Cassiopeia, Perseus, Lacerta, Andromeda) as serendipitous by-products of photometric monitoring campaigns carried out between 2015 and 2019 by the Campania Star Hunters Project. All objects were submitted to the AAVSO International Variable Star Index (VSX) and received permanent identifiers.

The sample comprises: twenty EW-type W UMa contact binaries (periods 0.055–0.558 d); four EB-type β Lyr binaries (CSHP_V4, V12, V16, V18); three EA-type Algol systems (CSHP_V9, V11, V17); one DSCT pulsating variable (CSHP_V25, P = 0.055 d — the only non-eclipsing object and shortest period in the sample); and additional EA/EW systems in Perseus and Aquila. The longest period is CSHP_V18 (P = 0.864 d). Two objects (CSHP_V3, V8) show evidence of the O'Connell effect. Three objects have published spectral types: CSHP_V14 (G4), CSHP_V19 (G8), CSHP_V23 (F0) from Qian et al. (2020).

CSHP_V18, with P = 0.864 d, is the longest-period binary in the sample. For several objects, the combination of dedicated observations with archival ASAS-SN or ZTF data yielded well-determined periods, illustrating the value of merging survey photometry with targeted follow-up. Further photometric follow-up is encouraged, particularly for the EA-type systems CSHP_V9, V11, and V17, to refine eclipse durations and search for possible O–C variations.

Acknowledgements: The authors thank all members of the Campania Star Hunters Project for their observational effort and collaborative spirit. The authors also thank the AAVSO for maintaining the VSX database and for making it freely accessible to the community. This research has made use of the SIMBAD database and the VizieR catalogue access tool, both operated at CDS, Strasbourg, France (Wenger et al. 2000), and of data products from the Two Micron All Sky Survey (2MASS; Skrutskie et al. 2006). DSS2 finding charts were retrieved via the Aladin Sky Atlas (Bonnell et al. 2000). The colour-magnitude diagram was constructed using Gaia DR3 parallaxes (Gaia Collaboration 2023) retrieved via SIMBAD and 2MASS photometry. An AI assistant (Claude, Anthropic) provided support in the preparation, formatting, and editing of the manuscript text, tables, and figures, based entirely on the authors' observational data and analysis; all scientific content, data reduction, period determination, and variability classification were performed exclusively by the human authors.

References

Bonnell, A., Boch, T., Genova, F., et al. 2000, A&AS, 143, 33 (Aladin)
Chen, X., Wang, S., Deng, L., et al. 2018, ApJS, 237, 28 (WISE Catalog)
Chen, X., Wang, S., Deng, L., et al. 2020, ApJS, 249, 18 (ZTF Catalog)
Franco, L. 2011, Modellazione dei Sistemi Binari ad Eclisse, 7° Meeting sulle Stelle Variabili SSV-UAI-GRAV, La Spezia, 14–15 May 2011
Gaia Collaboration, Vallenari, A., Brown, A. G. A., et al. 2023, A&A, 674, A1 (Gaia DR3)
Gazeas, K. & Niarchos, P. 2006, MNRAS, 370, L29 (Masses and angular momenta of contact binary stars)
Gazeas, K. & Stepien, K. 2008, MNRAS, 390, 1577 (Angular momentum and mass evolution of contact binaries)
Hrůch, F. 1998, Proc. 29th Conf. Variable Star Research, Brno, p. 30 (MuniWin)
Kochanek, C. S., Shappee, B. J., Stanek, K. Z., et al. 2017, PASP, 129, 104502 (ASAS-SN)
Paunzen, E. & Vanmunster, T. 2016, Astron. Nachr., 337, 239 (Peranso)
Pickles, A. J. 1998, PASP, 110, 863 (Stellar Spectral Flux Library)
Qian, S.-B., Zhu, L.-Y., Liu, L., et al. 2020, RAA, 20, 163
Skrutskie, M. F., Cutri, R. M., Stiening, R., et al. 2006, AJ, 131, 1163 (2MASS)
Watson, C., Henden, A. A., Price, A. 2006, JAAVSO, 35, 414 (VSX)
Wenger, M., Ochsenbein, F., Egret, D., et al. 2000, A&AS, 143, 9 (SIMBAD)

Appendix A Detailed Physical Analysis of CSHP_V29 (2MASS J04143939+4106505)

This appendix reproduces, in adapted form, an extended physical analysis of CSHP_V29 originally presented by T. Aniello, A. Marino, A. Tomacelli, A. Porcelli, P. Ago, N. Ruocco, L. Cupolino, and T. Aniello, with the collaboration of Lorenzo Franco (Rome, 10 April 2019). It illustrates the level of physical modelling that can be achieved for CSHP discoveries using publicly available empirical relations and simulation tools.

August 2026 https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

A.1 Introduction

CSHP_V29 (2MASS J04143939+4106505, UCAC4 656-020116) is located in the constellation Perseus at coordinates (Gaia DR2) RA = 04h 14m 39.39s, Dec = +41° 06′ 50.5″, with a mean visual magnitude of V ≈ 14.78. Observations were carried out on the nights of 19 and 20 December 2017 using a Celestron C11 Schmidt-Cassegrain telescope (280 mm aperture), equipped with a CCD detector, 2×2 binning, a UHC filter, and f/1700.

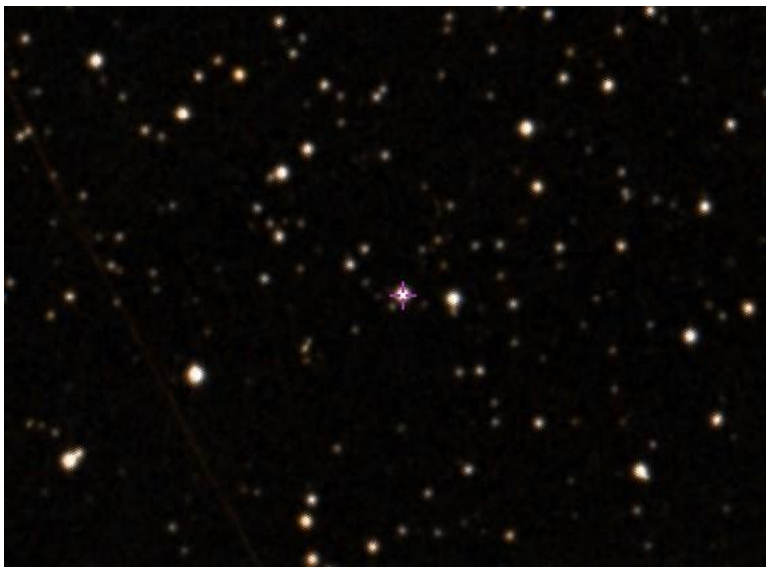

Fig. A1: Aladin Sky Atlas field of CSHP_V29 (2MASS J04143939+4106505).

A.2 Observational Parameters

The limiting magnitudes derived from the light curve are 14.43 and 15.08 V (Δ = 0.65 mag). The comparison star magnitudes used for differential photometry (MaxIm DL) were: Ref1 V = 14.945, Ref2 V = 13.403.

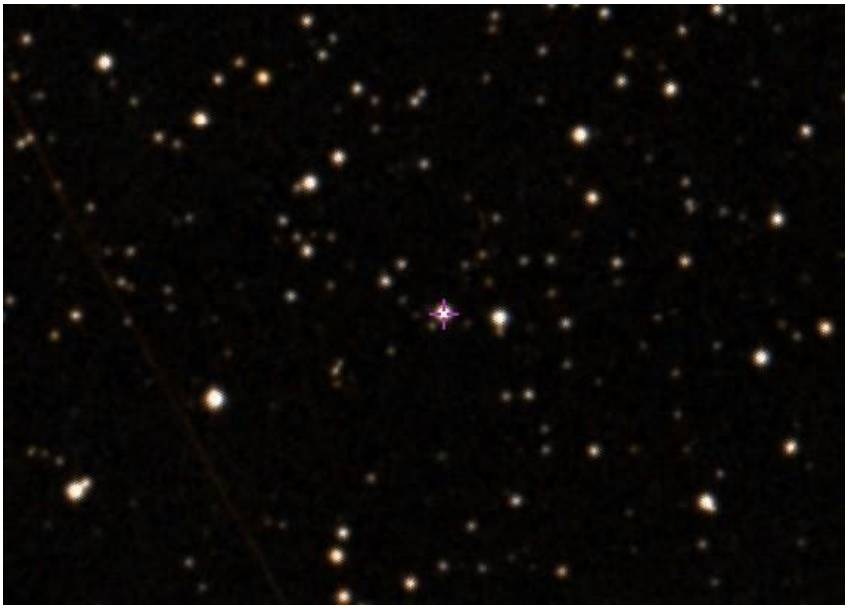

Fig. A2: Phase-folded light curve of CSHP_V29 (Peranso Phase Plot).

DOI: 10.5817/OEJV2026-0276

A.3 Derived Parameters

Period analysis with Peranso yielded a primary minimum epoch of HJD 2458107.354 and a period of P = 0.270 d (6.5 h).

Using the empirical period–mass relations of Gazeas & Niarchos (2006) and Gazeas & Stepien (2008): M1 = 0.97 M⊙, M2 = 0.50 M⊙, giving a mass ratio q = M2/M1 = 0.52. From Kepler's third law, a = (74.5·P²·(M1+M2))^(1/3), the semi-major axis is a = 1.91 R⊙. From the same empirical period–radius relations: R1/a = 0.47, R2/a = 0.29, giving R1 = 0.9 R⊙ and R2 = 0.6 R⊙.

A.4 Analysis

A period shorter than one day is typical of contact systems with ellipsoidal components, implying that the two stars share approximately the same temperature and spectral class. The magnitude difference between minimum and maximum brightness in such systems is generally below 1 mag, consistent with the present observations. The empirical relations were used to constrain parameters such as the mass ratio q that best reproduce the observed light curve.

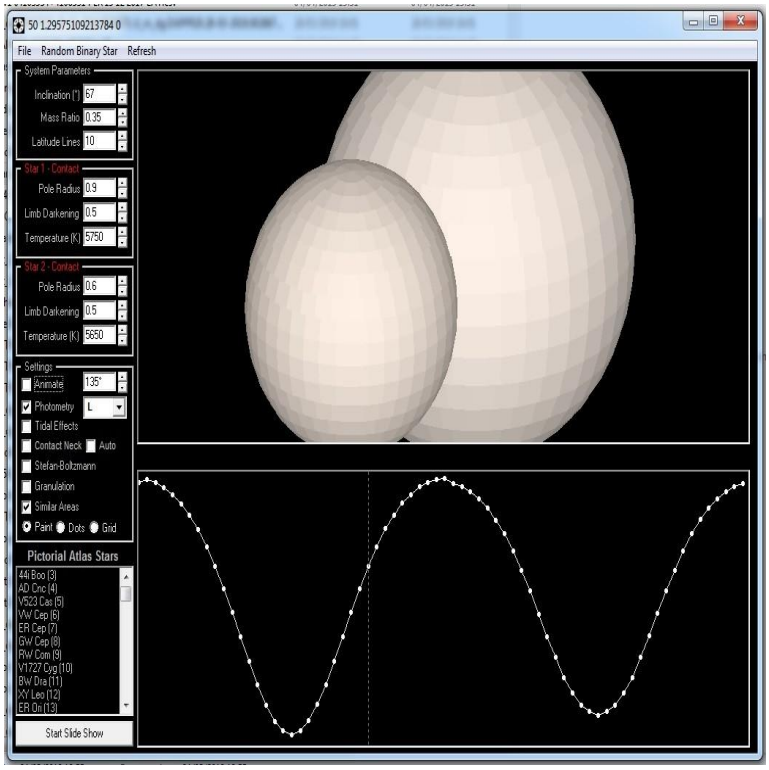

Fig. A3: Simulated light curve generated with StarLight Pro, compatible with the observed data.

https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

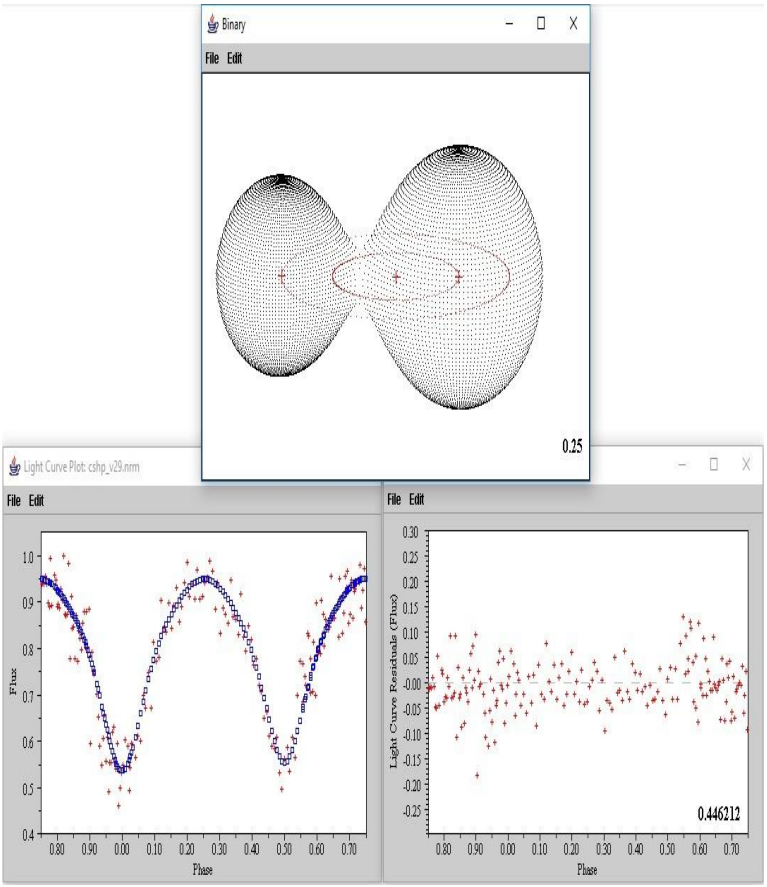

Fig. A4: Binary Maker 3.0 model: M1 = 0.81, M2 = 0.45 M⊙, q = 0.56, R1 = 0.84, R2 = 0.64 R⊙, a = 1.9, inclination = 78°. The lower-right panel shows the residuals between model and observed light curve.

From the colour index extrapolated from the UCAC4 catalogue (V−R = 0.32–0.33), the two component stars are consistent with a spectral class at the boundary between F and G (F8–G0). The light curve, showing two minima of comparable depth, further suggests that the two components share a similar temperature of approximately 5700–5800 K (Pickles 1998 tables).

TABLE 2
STELLAR LIBRARY COMPONENTS, PHYSICAL DATA, AND SYNTHETIC PHOTOMETRY

N (1)	Components[a, b] (2)	Type[c] (3)	log T_e (4)	$U_J - V$ (5)	$B_J - V$ (6)	$V - R_C$ (7)	$V - I_C$ (8)	$V - J$ (9)	$V - H$ (10)	$V - K$ (11)	[Fe/H][d] (12)	M_{bol} (13)	BC_V[e] (14)
1	1710 310002 3000	O5 V	4.600	−1.48	−0.38	−0.17	−0.36	−0.74	−0.99	−1.10	0	−8.9	−3.7
2	1310 600001 2100	O9 V	4.550	−1.39	−0.33	−0.19	−0.35	−0.72	−0.90	−0.99	0	−7.8	−3.3
3	1210 210001 1100	B0 V	4.450	−1.33	−0.34	−0.16	−0.31	−0.70	−0.83	−0.86	0	−5.9	−2.4
4	1710 101003 0000	B1 V	4.350	−1.14	−0.24	−0.12	−0.24	−0.63	−0.73	−0.78	0	−4.7	−2.0
5	1720 400011 1200	B3 V	4.280	−0.86	−0.20	−0.10	−0.15	−0.48	−0.73	−0.80	0	−3.5	−1.5
6	2720 200011 0000	B5–7 V	4.150	−0.55	−0.14	−0.07	−0.08	−0.32	−0.37	−0.40	0	−1.0	−1.0
7	1610 000001 0000	B8 V	4.070	−0.34	−0.11	−0.03	−0.06	−0.23	−0.26	−0.28	0	−2.1	−0.6
8	1310 001001 0000	B9 V	4.030	−0.20	−0.04	−0.34	−0.04	−0.14	−0.15	−0.16	0	−1.0	−0.8
9	1420 211001 1002	A0 V	3.980	0.04	0.02	−0.01	0.01	−0.18	0.00	−0.01	0	0.3	−0.3
10	1210 300002 1000	A2 V	3.950	0.10	0.03	0.01	0.05	−0.02	−0.15	−0.14	0	1.1	−0.08
11	1520 110000 1000	A3 V	3.944	0.15	0.09	0.04	0.10	0.04	−0.13	−0.13	0	1.3	−0.03
12	1430 101001 0000	A5 V	3.929	0.24	0.15	0.05	0.16	0.29	0.35	0.36	0	1.7	0.01
13	1260 210002 0000	A7 V	3.906	0.30	0.20	0.11	0.24	0.37	0.46	0.47	0	2.1	0.01
14	1431 300010 0000	F0 V	3.858	0.35	0.30	0.18	0.38	0.53	0.66	0.68	0	3.0	0.02
15	1210 101002 2000	F2 V	3.831	0.39	0.40	0.21	0.46	0.61	0.62	0.65	0	3.3	0.03
16	1120 311000 2000	F5 V	3.815	0.42	0.46	0.24	0.50	0.83	1.03	1.06	0.0	3.5	0.00
17	1110 210000 0000	wF5 V	3.820	0.35	0.44	0.25	0.51	0.78	1.01	1.04	−0.3	3.8	−0.02
18	1122 210003 2010	F6 V	3.798	0.48	0.47	0.27	0.56	0.90	1.11	1.13	0.0	3.8	−0.03
19	1110 110000 0000	rF6 V	3.786	0.56	0.51	0.30	0.60	0.95	1.21	1.24	0.3	3.3	−0.04
20	1120 410000 3100	F8 V	3.781	0.60	0.54	0.30	0.62	1.01	1.22	1.25	0.0	4.0	−0.04
21	1120 211000 0000	wF8 V	3.788	0.53	0.52	0.29	0.59	0.96	1.26	1.29	−0.5	4.3	−0.05
22	1111 200000 0000	rF8 V	3.761	0.68	0.57	0.33	0.68	1.05	1.36	1.39	0.2	3.7	−0.06
23	1120 101001 2100	G0 V	3.764	0.69	0.57	0.32	0.67	1.02	1.28	1.30	0.0	4.2	−0.04
24	1120 110000 0000	wG0 V	3.767	0.65	0.55	0.32	0.66	0.97	1.31	1.35	−0.8	4.7	−0.05
25	1110 210000 0000	rG0 V	3.751	0.77	0.59	0.35	0.72	1.08	1.40	1.44	0.4	3.8	−0.08
26	1112 210011 2021	G2 V	3.751	0.81	0.63	0.35	0.72	1.21	1.54	1.56	−0.2	4.6	−0.10
27	1110 101001 2000	G5 V	3.747	0.95	0.69	0.36	0.74	1.19	1.45	1.51	0.0	4.7	−0.08

Fig. A5: Stellar Spectral Flux Library tables (Pickles 1998), highlighting the F8V–G0V colour range matching CSHP_V29.

https://oejv.physics.muni.cz ISSN 1801-5964
DOI: 10.5817/OEJV2026-0276

Using the empirical period–absolute magnitude relation for W UMa-type contact binaries from Gazeas & Stepien (2008):

$$M\mathrm{V} = -8.4 \cdot \log P + 0.31 \quad \text{and} \quad d(\mathrm{pc}) = 10\text{^}[(V_0 - M\mathrm{V})+5]/5$$

a photometric distance of d ≈ 864 pc (≈ 2817 light-years) is obtained — in good agreement with the Gaia DR3 parallax-based distance reported for this object in Section 5.1 of the main text.

A.5 Conclusions

Both the observed and the calculated parameters support the classification of CSHP_V29 as an EW-type (contact) eclipsing binary, with components of similar temperature and spectral class, masses between roughly 0.5 and 1 solar mass, and radii close to or below one solar radius, orbiting each other with a period of a few hours on a plane nearly aligned with the line of sight. The derived models are preliminary and consistent with the observations, but a definitive solution would require radial velocities obtained through spectroscopic follow-up.

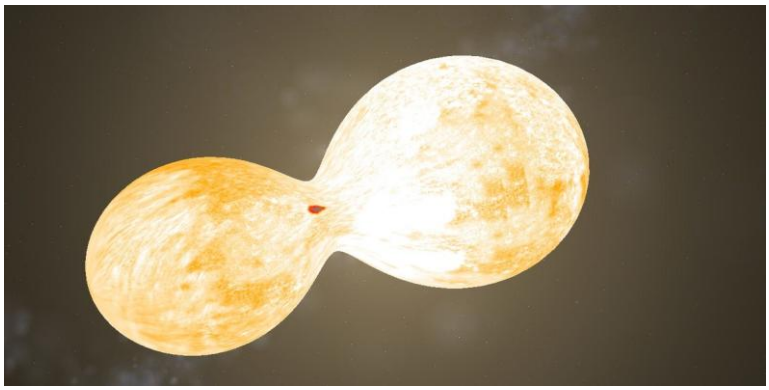

Fig. A6: Artist's impression of the CSHP_V29 contact binary system.