TIC 422230169: clustered 2.8-percent dips in one sector, unconfirmed

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Tustin, California. Research note from the 2.4 degree repeating-dip scan around V345 Lac, 18 November 2026.

Status: Unconfirmed dips. Not a planet claim. Found 18 Nov 2026. Not filed with VSX. Not yet checked from the ground.

Abstract

TIC 422230169 (Tmag 11.336) showed 5 clean dips of at least 0.5 percent in TESS Quick-Look Pipeline photometry, median depth 2.84 percent, median duration 1.4 hours. The dips are shallow enough that, on a star of the TIC radius 1.13 $R_\odot$, a dark body of about 1.89 R_{Jup} could produce them. That is a depth conversion only; it is not a planet measurement. The star is 2.059 degrees from V345 Lac, in the 2.00–2.10° ring. No single period from the gaps fits all 5 dips. This uses the longest gap between consecutive dips, 18.3730 days, as the period, counted from the dip at BTJD 2849.057. As of 18 November 2026, 12:00 UTC, the next listed time is 29 Nov 2026, 12:19 UTC with a window of ± 24.3 hours. That window is huge and is not usable for planning an observation. Nothing in this note has been checked from the ground or submitted to VSX. This is not a planet claim.

1. How the star was found

A repeating-dip scan of TESS stars around V345 Lacertae (TIC 421726141) ran on 18 November 2026. It covered every TESS Input Catalog star within 2.4 degrees of V345 Lac with a TESS magnitude of 13.0 or brighter, 20,840 stars. The light curves are QLP SAP_FLUX, cadences with a quality flag of exactly zero, each sector divided by its own median. The period search uses the multiharmonic χ^2 periodogram approach of Rutkowski & Poleski (2026), run with 12 harmonics: a 12-term Fourier series is fitted at every trial frequency. Rutkowski & Poleski (2026) also introduced the fast Toeplitz-solver technique that accelerates this periodogram (their Toeplitz-LS code). The scan did not run the Toeplitz-LS code. It computed the same 12-harmonic periodogram with the finufft_chi2 backend of nifty-ls (Garrison et al. 2024), a separate package, which matched the Toeplitz-LS results in a test on our own TESS eclipsing binaries on 17 November 2026 and ran about twice as fast. The trial periods run from 0.4 to 30 days, with a frequency step of 1/(10T), where T is the time span of the light curve. The periodogram uses the median-normalized flux with no detrending. A box least-squares (BLS) search (Kovács, Zucker & Mazeh 2002), as implemented in Astropy, is the cross-check. It runs on a copy divided by a one-day running median and binned to 30 minutes, with trial durations of 1.5, 3, 5 and 8 hours. A star is kept as a candidate when at least two separate eclipses fall on the adopted period, the folded eclipse has a signal-to-noise ratio of at least 8, and the depth is at least 0.2 percent. TIC 422230169 did not pass as a periodic eclipse candidate under those cuts, but it had 5 clean dips of at least 0.5 percent. Its median dip depth was small enough that, on a star of its TIC radius, the body that would cause a transit of that depth could be under two Jupiter radii, so it is listed on the Planet-sized dips page. That page is a depth test only. None of these stars is a confirmed planet. The measurements below are made again from the scan's cached QLP light curves (Huang et al. 2020; Kunimoto et al. 2021). Sectors 16 and 17 are 30-minute cadence; later sectors used here are 200-second cadence. SAP_FLUX is used with the quality flag exactly zero, and each sector is divided by its own median. No detrending is applied unless a caption says otherwise. Catalog values are from the TESS Input Catalog (Stassun et al. 2019) as held in the scan catalog. No new observations were obtained.

2. The star

TIC 422230169 is Gaia DR3 2006260312944170624 in the scan catalog. The TIC v8.2 position used by the scan is 22h 23m 22.43s, +56° 37′ 40.2″ (J2000), RA 335.84344°, Dec +56.62783°. The TIC lists Tmag = 11.336, R = 1.13 $R_{\odot}$, and a contamination ratio of 1.065. T_{eff} = 6102 K from TIC v8.2. The TIC record used by the scan does not give a spectral type, so the spectral type is unknown here. Those catalog values assume a single star and are copied as published. From the scan positions of this star and of V345 Lac, the separation is 2.059 degrees, 123.5 arcmin, at position angle 18°, to the north-northeast. In 0.1-degree rings around V345 Lac it sits in the 2.00–2.10° ring. A VSX entry lies 10 to 30 arcsec away, Gaia DR3 2006260317256045568 (ROT), 13" away. At that distance it shares TESS pixels with this star.

Quantity	Value
TESS sectors in the cached light curve	16, 17, 56, 57, 83, 84
Sectors with a counted dip	56
12-harmonic χ^2 periodogram peak	24.43648 d, SNR 766
BLS peak	1.49489 d, SNR 19.3, depth 0.18%
Clean dips ≥ 0.5%, off systematic times	5, depths 2.74–2.98%, median 2.84%
Median listed duration	1.4 h
BTJD range of the counted dips	2829.962 – 2849.138
TIC radius and implied body (depth only)	1.13 R_sun, about 1.89 R_Jup
TIC contamination ratio	1.065
Scan flags	chi2_peak_is_other
Period confidence on the page	low; window wider than ±10 hours (very low confidence list)
Adopted period used for the listed next time	18.3730 ± 0.0121 days; fallback reason: nofit

Table 1. Scan quantities for TIC 422230169, from the scan's own result file and the Planet-sized dips records. Depths are not corrected for light from other stars.

3. Dip times and shape

Each counted dip below is taken from the scan's dip list: barycentric time, depth in percent of the local light, a duration in hours, and the TESS sector. The shapes are judged by eye from the individual panels of Figure 2, each normalized to a line or median through the nearby light. An automatic comparison of box, V, U and sine models was also computed; it is not used as the verdict, because a sine can appear to fit a shallow, noisy fade. The verdicts below are the visual ones.

#	BTJD	Sector	Depth (%)	Duration (h)
1	2829.962	56	2.84	1.4
2	2830.587	56	2.98	2.0
3	2830.684	56	2.80	1.0
4	2849.057	56	2.96	0.6
5	2849.138	56	2.74	1.9

Table 2. Counted dips of TIC 422230169 from the 18 November 2026 scan.

Five dips of 2.74 to 2.98 percent were counted, all in sector 56, in two tight clusters (three events near BTJD 2830 and two near BTJD 2849). The listed durations are short, 0.6 to 2.0 hours. The events are noisy and do not show a flat bottom. Several are only a few points below the local light. Events a fraction of a day apart in the same cluster are not what a single long-period transit looks like. A fold on the 18.373-day gap between the clusters does not produce a clean eclipse, and no period fits all five dips.

4. The adopted period and the next times

The Planet-sized dips page predicts a next time for every star when the page loads. The method is the one written on that page: gaps between dips are divided by 1 through 10, trial

periods of 0.4 days or longer that fit every dip and are not ruled out by TESS coverage come first, and when none survive the page falls back to a low-confidence period, either the one that missed the fewest predicted times or the longest gap. A period is ruled out when the TESS light curve has good data at another predicted time and shows no dip there. The window is four hours either side, or the timing error carried forward to that cycle if that is larger: σ_t (hours) = 24 × √(v_{T0} + E^2 v_P + 2 E cov), using the values stored with the period. For TIC 422230169 the period used for the listed next time is low confidence and the window is wider than ±10 hours, so the star sits in the Very low confidence section of the page. The times below are computed for 18 November 2026, 12:00 UTC, BTJD 4363.0, the same clock zero as the pages, without a new fit. The live pages recompute the next cycle when they load.

Min ≈ BTJD 2849.05730 + E × 18.37300000, with P ± 0.01214782 d.

No single period from the gaps fits all 5 dips. This uses the longest gap between consecutive dips, 18.3730 days, as the period, counted from the dip at BTJD 2849.057.

E	BTJD	UTC	Pacific	Window (1σ floor 4 h)
83	4374.0163	29 Nov 2026, 12:19 UTC	29 Nov 2026, 04:19 PST	± 24.3 hours (σ = 24.3 hours)
84	4392.3893	17 Dec 2026, 21:18 UTC	17 Dec 2026, 13:18 PST	± 24.6 hours (σ = 24.6 hours)
85	4410.7623	5 Jan 2027, 06:16 UTC	4 Jan 2027, 22:16 PST	± 24.9 hours (σ = 24.9 hours)
86	4429.1353	23 Jan 2027, 15:15 UTC	23 Jan 2027, 07:15 PST	± 25.2 hours (σ = 25.2 hours)

Table 3. The next four times on the adopted period for TIC 422230169, as of 18 November 2026, 12:00 UTC. Times are converted from BTJD for this star's position, as on the pages. Pacific times are America/Los_Angeles.

5. Light curves and a finder chart

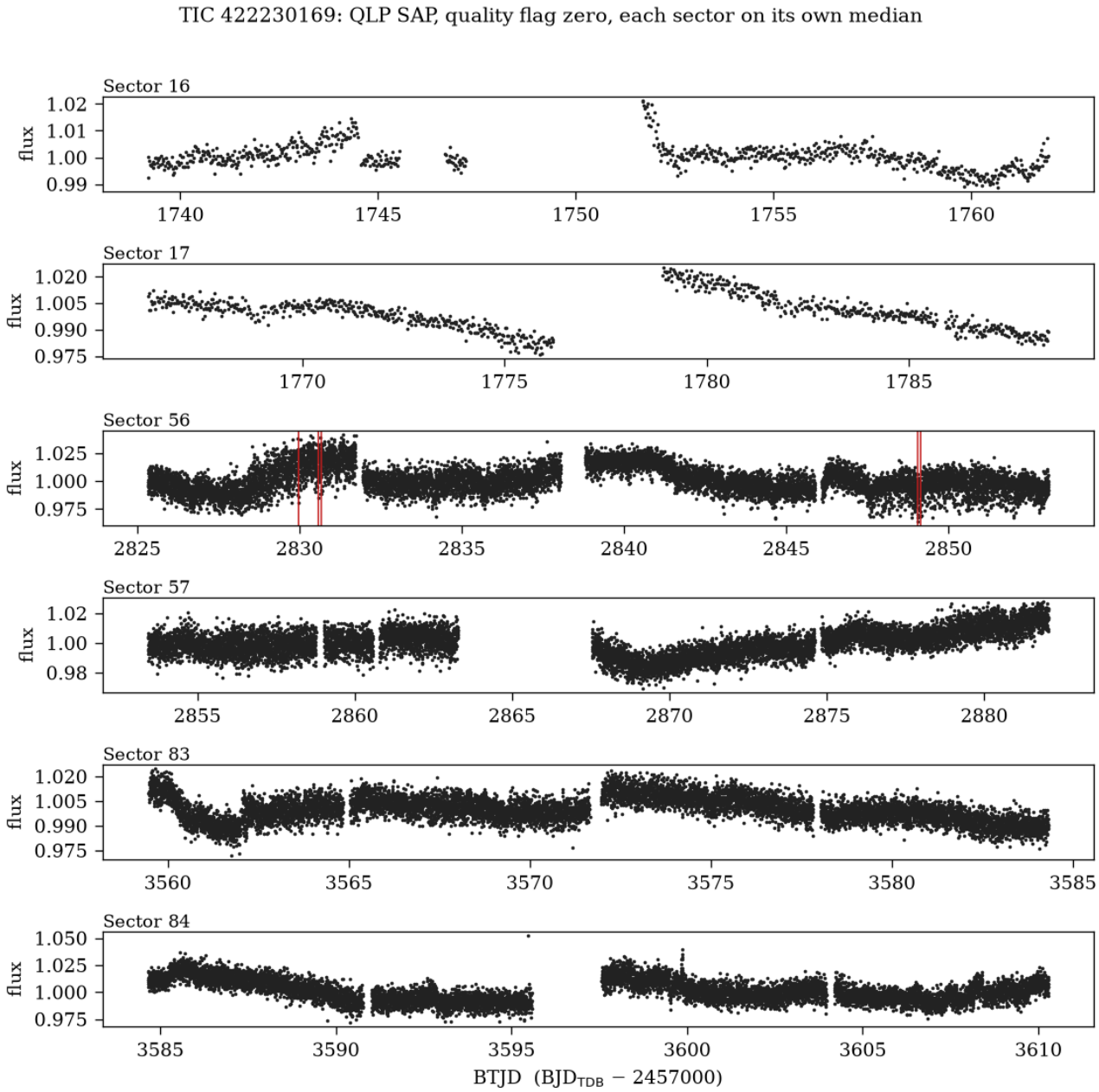


Figure 1. QLP SAP light curves of TIC 422230169, quality flag zero, each sector on its own median. Red lines mark the counted dips of Table 2.

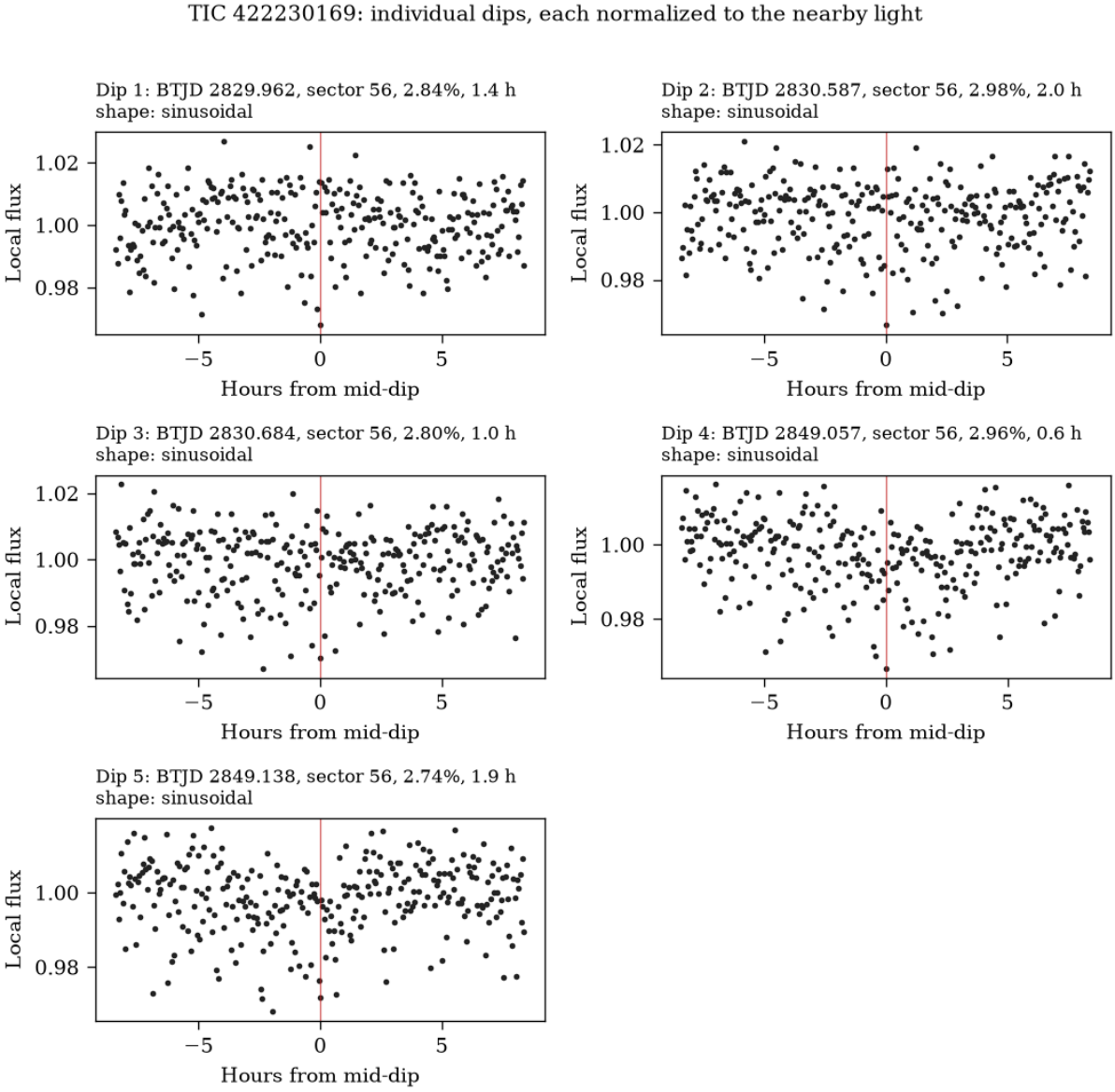


Figure 2. Individual counted dips of TIC 422230169, each normalized to the nearby light. The vertical line is the scan mid-time. These panels, not the fold, are the basis of the shape notes in Section 3.

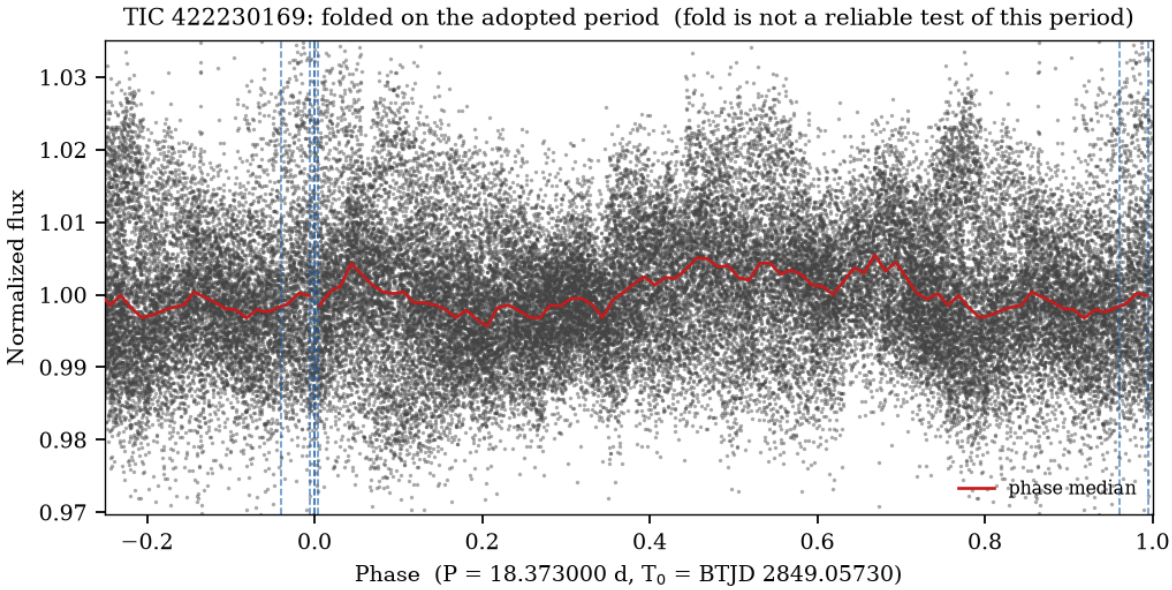


Figure 3. TIC 422230169 folded on the adopted period P = 18.373000 d, counted from BTJD 2849.05730. Black points are the cached QLP cadences; the red line is a phase median; the dashed blue lines are the phases of the counted dips. This fold is not a reliable test of the period: the period is a fallback, or a two-dip alias, or already ruled out. The individual dips in Figure 2 should be used instead.

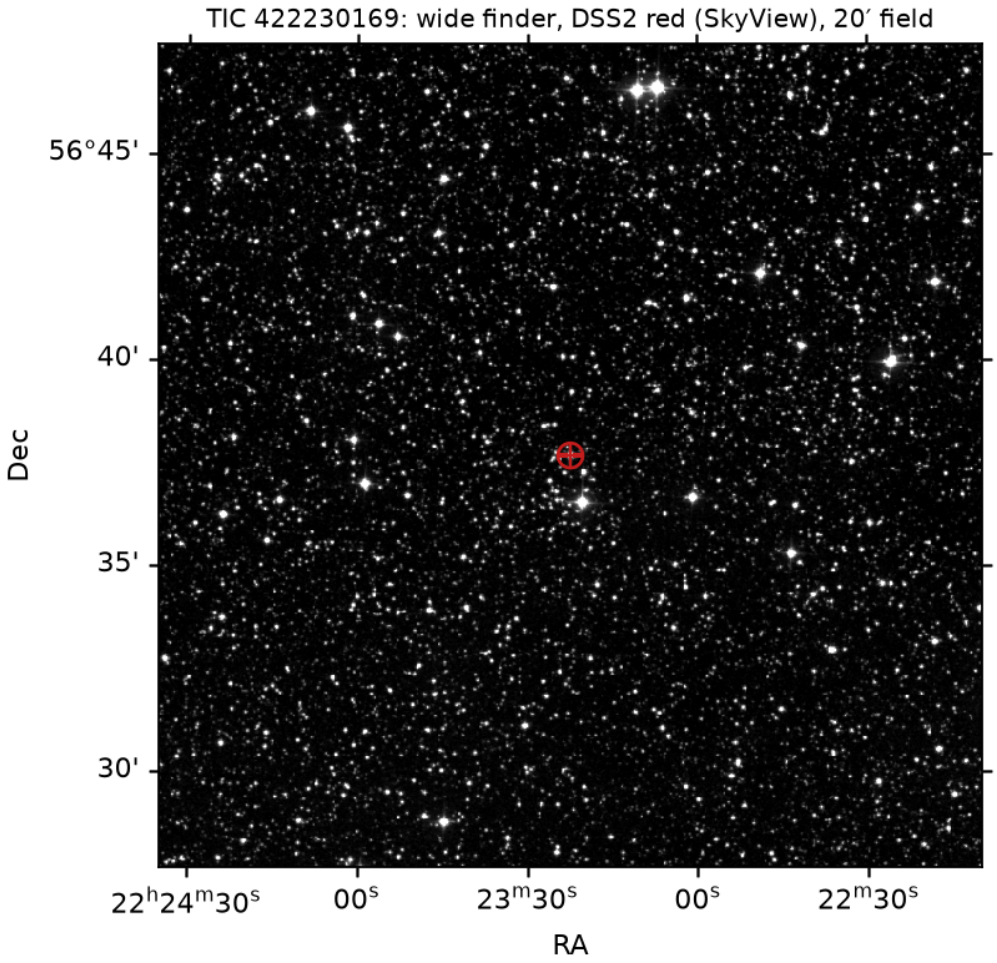


Figure 4. Wide finder for TIC 422230169, DSS2 red via NASA SkyView, 20 arcmin field. The red marks are the TIC position. TESS pixels are 21 arcseconds wide.

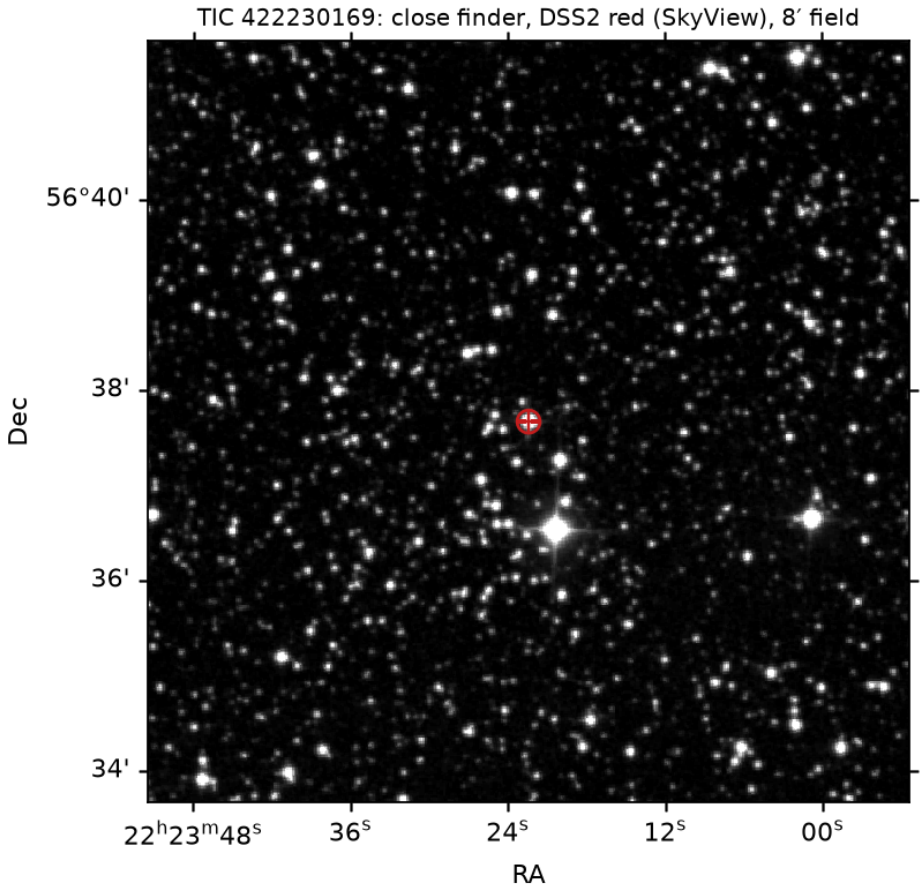


Figure 5. Close finder for TIC 422230169, DSS2 red, 8 arcmin field, to pick out the target and its nearest neighbors.

6. Best-guess classification

Unconfirmed clustered fades, likely a blend or a neighbor. Period not established. Low confidence. No single period from the gaps fits all five dips. The pages use the longest gap, 18.373 days, as a fallback. The timing window is ±24.3 hours, already wider than ±10 hours, too wide to plan a tight observation. The TIC contamination ratio is 1.065, the highest in this list, and a VSX rotational variable, Gaia DR3 2006260317256045568 (ROT), lies 13 arcsec away and shares TESS pixels with this star. The 2.8 percent fades may belong to the neighbor. This is not a planet claim.

This classification uses the TESS light curve and catalog values only. TESS pixels are 21 arcseconds wide, so the star that fades may be a neighbor, and the TIC temperature and radius are photometric estimates. The depths are not corrected for light from other stars. None of this has been checked from the ground. A depth that is consistent with a planet-sized body is not evidence that the body is a planet, or that the dip belongs to this star. This is not a planet claim.

7. Follow-up

Useful next steps are time-series photometry that covers a predicted time, with the close neighbors in the field and with a record of which star was in the aperture, and a low-resolution spectrum for the spectral type, which is not given in the TIC fields used here.

Because the present window is days or weeks wide, a single short visit is not enough; a long series, or a wait for a tighter period, is more useful. Nothing here has been submitted to VSX.

References

Brasseur C. E. et al., 2019, Astrocut: Tools for creating cutouts of TESS images, ascl:1905.007 (TESScut)
Gaia Collaboration, 2023, Astron. Astrophys., 674, A1 (DR3)
Garrison L. H., Foreman-Mackey D., Shih Y., Barnett A., 2024, Research Notes of the AAS, 8, 250 (nifty-ls)
Huang C. X. et al., 2020, Research Notes of the AAS, 4, 204 (QLP)
Kovács G., Zucker S., Mazeh T., 2002, Astron. Astrophys., 391, 369 (BLS)
Kunimoto M. et al., 2021, Research Notes of the AAS, 5, 234
Rutkowski K., Poleski R., 2026, Faster χ^2 periodogram: Accelerating linear algebra with fast Toeplitz solvers, arXiv:2611.20300
Stassun K. G. et al., 2019, Astron. J., 158, 138 (TIC)
Watson C., Henden A., Price A., 2006–, AAVSO International Variable Star Index (VSX)