A shallow 4.52-day minimum: TIC 329864959

Sean League
Tustin, California. Research note from the 1.005–1.105 degree ring around V345 Lac, 15 October 2026.
Nothing in this note has been submitted to VSX.

Abstract
TESS QLP photometry of TIC 329864959, a V = 8.54 star, shows a minimum every 4.52285 days. 30 times give an O−C scatter of 44 minutes. The minimum falls to 0.973 of the sector median, 0.03 mag, and lasts about 4.5 hours. No second minimum is seen. The dip is too shallow, and the timing too soft, to file. Nearby VSX objects are fainter stars a few tens of arcseconds away, not this star. This note is not a VSX submission.

1. How the star was found

Public TESS Quick-Look Pipeline light curves around V345 Lacertae were searched on stars brighter than about V = 12.5. This star is 1.080° from V345 Lac, in the ring from 1.005° to 1.105° (241 stars). A dip was kept when quality-zero cadences fell about 1.2 percent or more below the local median, stayed down for several cadences, and did not bounce straight back. The same pass recovered known variables. Those are not given new notes here. Sectors 16 and 17 are 30-minute cadence and use KSPSAP_FLUX. Sectors 56, 57, 83 and 84 are 200-second cadence and use DET_FLUX where that column is present. Sectors 76 and 77 have no QLP v01 file for these TICs. Cadences with a nonzero quality flag were removed, including the QLP poor-quality bit. Each sector was divided by its own median. Catalog values are from the TESS Input Catalog, Gaia DR3, 2MASS and AllWISE. No new observations were obtained.

2. The star

TIC 329864959 is TYC 3969-01411-1, HIP 109669, 2MASS J22125879+5359043, at 22h 12m 58.79s, +53° 59′ 04.3″. It is 65 arcmin southwest of V345 Lac. The TIC lists no Gaia source. Gaia DR3 source 2004653277938044672 lies 0.14 arcsec from the TIC position and is the star: G = 9.02, BP = 8.55, RP = 8.40. That source has no Gaia parallax. The TIC lists the Hipparcos parallax 1.61 ± 0.95 mas and a distance of 324 pc. The parallax error is more than half the parallax, so no distance is adopted here. V = 8.54, B = 8.64, T = 8.44. 2MASS gives J, H, Ks = 8.295, 8.328, 8.303. AllWISE gives W1, W2 = 8.294, 8.333. B − V is 0.10 mag. The TIC lists no temperature and no contamination ratio.

3. The ephemeris

Minima below flux 0.988 were timed with a parabola. The bottom is shallow, so the vertex is less sharp than for a deep eclipse. 30 minima give

Min = BTJD 2848.0774 + 4.52285 E

The period is 4.52285 ± 0.00004 d. The formal error on this epoch is 8 minutes. The rms residual is 44 minutes and the largest is 83 minutes. No minimum was rejected by the clip. 2 predicted times that land on quality-zero data stay above 0.988 and are not in the solution. 2 other predicted times fall inside a sector but on too few quality-zero points to time. The median minimum is flux 0.973, 0.03 mag. The median halfway width is 4.1 hours and the outer width is 4.5 hours. Odd and even cycles are flux 0.974 and 0.973. The deepest phase bin away from phase 0 is flux 0.999 at phase 0.455. There is no second minimum. The residuals of tens of minutes are the measurement: a three-percent dip with a round bottom does not time to a minute.

Sector	Cycle	Mid-eclipse	UTC	Min. flux	O−C (min)
16	-245	1739.997	2019-09-13 11:50	0.973	+26.0
16	-244	1744.483	2019-09-17 23:30	0.972	-27.2
16	-242	1753.578	2019-09-27 01:46	0.977	+44.4
16	-241	1758.086	2019-10-01 13:58	0.976	+23.3
17	-239	1767.115	2019-10-10 14:40	0.972	-0.5
17	-238	1771.600	2019-10-15 02:18	0.973	-55.7
17	-237	1776.114	2019-10-19 14:38	0.975	-69.0

Sector	Cycle	Mid-eclipse	UTC	Min. flux	O−C (min)
17	-236	1780.719	2019-10-24 05:10	0.975	+49.3
17	-235	1785.208	2019-10-28 16:54	0.972	+1.2
56	-5	2825.504	2022-09-03 00:00	0.974	+58.2
56	-4	2829.971	2022-09-07 11:13	0.972	-21.2
56	-3	2834.504	2022-09-12 00:00	0.972	-6.7
56	-2	2838.974	2022-09-16 11:17	0.979	-82.7
56	-1	2843.527	2022-09-21 00:33	0.973	-39.4
56	0	2848.119	2022-09-25 14:45	0.974	+60.6
56	1	2852.633	2022-09-30 03:05	0.973	+47.3
57	2	2857.094	2022-10-04 14:09	0.974	-42.1
57	5	2870.691	2022-10-18 04:29	0.974	-0.6
57	6	2875.270	2022-10-22 18:23	0.975	+79.6
57	7	2879.712	2022-10-27 05:00	0.974	-36.5
83	158	3562.701	2024-09-09 04:44	0.973	+18.7
83	159	3567.243	2024-09-13 17:44	0.975	+46.0
83	161	3576.280	2024-09-22 18:37	0.971	+33.6
83	162	3580.746	2024-09-27 05:48	0.972	-47.9
84	163	3585.273	2024-10-01 18:27	0.975	-42.3
84	164	3589.870	2024-10-06 08:47	0.974	+64.8
84	165	3594.365	2024-10-10 20:40	0.973	+24.7
84	166	3598.840	2024-10-15 08:04	0.973	-43.9
84	167	3603.389	2024-10-19 21:14	0.974	-7.4
84	168	3607.879	2024-10-24 09:00	0.973	-54.3

Table 1. Minima used in the fit.

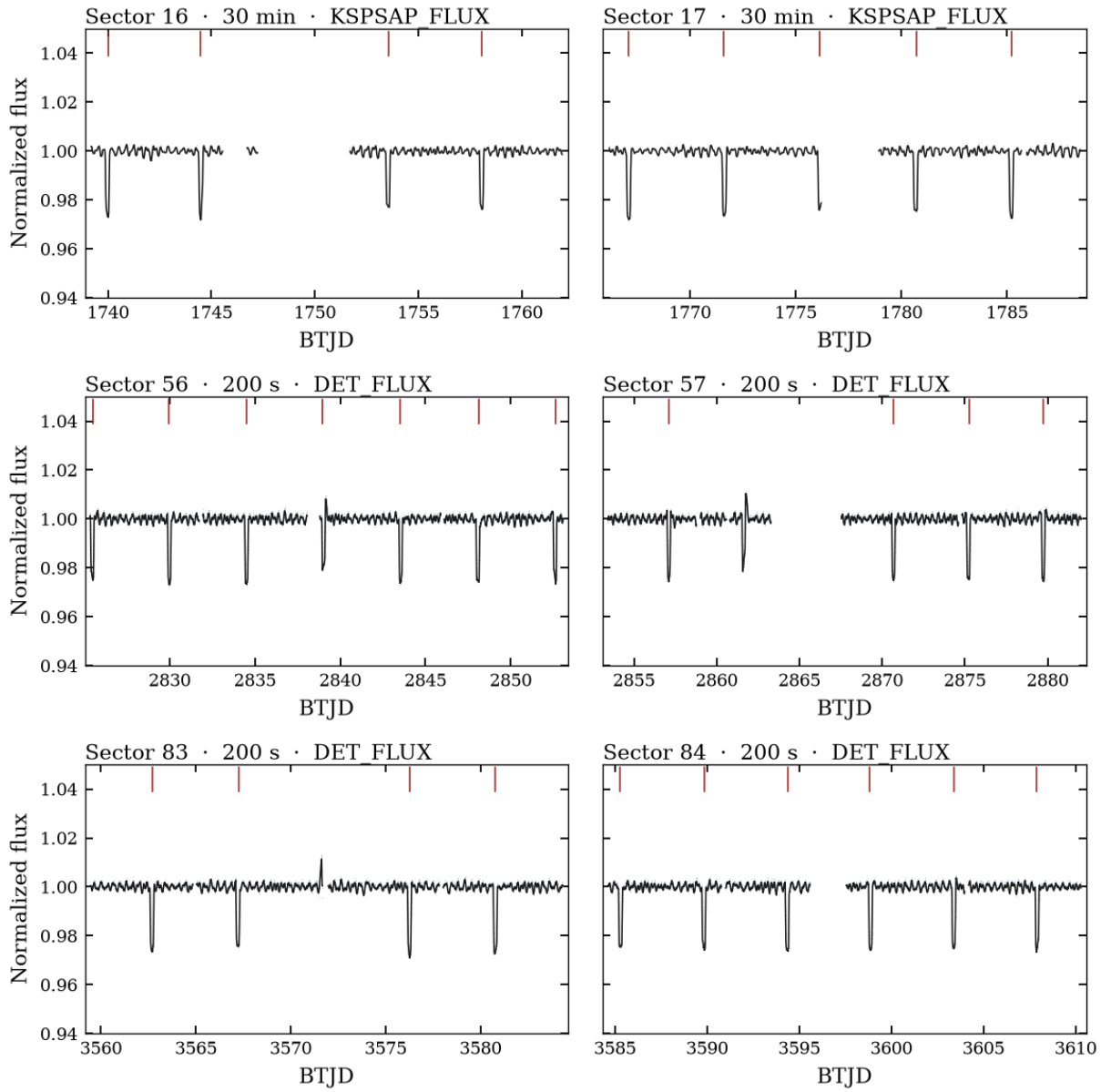

Figure 1. Six sectors. Red ticks are the minima in Table 1. The dips are easy to miss on a sector plot.

TIC 329864959. The minimum is shallow and about four hours wide.

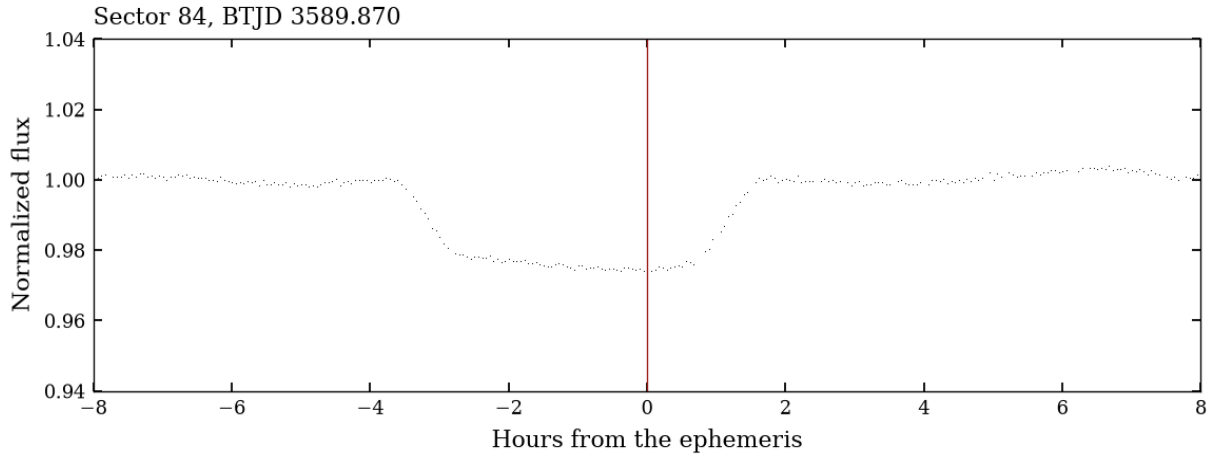

Figure 2. One minimum. The vertical line is the ephemeris, not a hand-picked bottom.

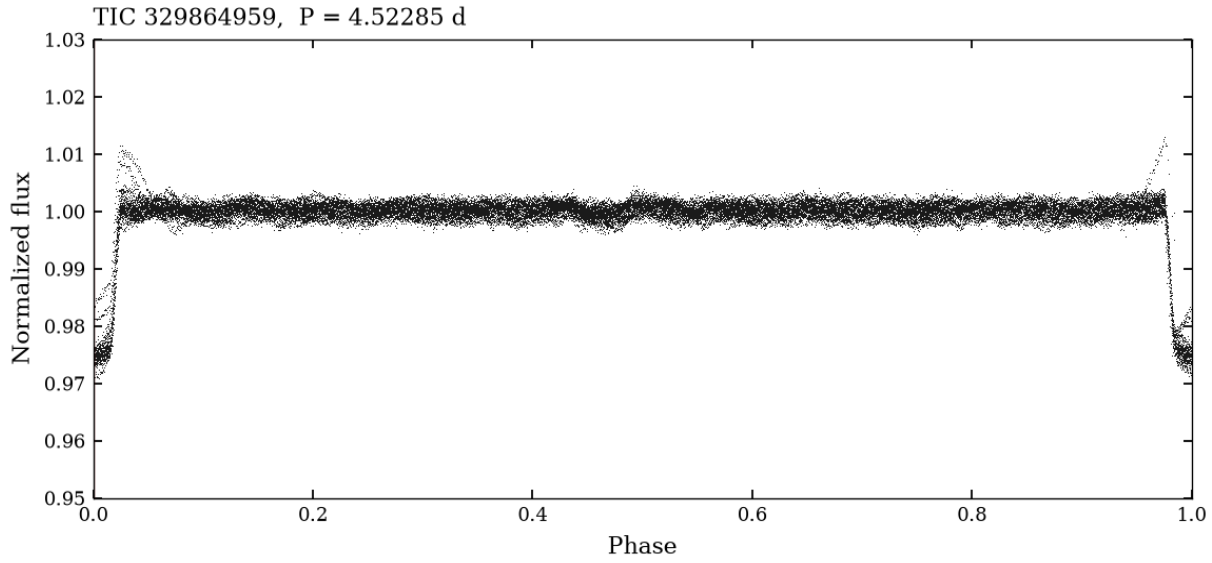

Figure 3. All six sectors folded on the period in section 3.

4. It is probably this star, and it is still not filed

The nearest TIC stars inside an arcminute are five magnitudes fainter: TIC 329864980 at 23 arcsec (V = 14.8), TIC 329864960 at 23 arcsec (V = 15.2), and TIC 329864957 at 28 arcsec (V = 13.7). A total eclipse of a star five magnitudes fainter is about one percent of this star's light, less than the dip. There is no brighter neighbor inside the 2.4 arcmin searched in the TIC. The dip is therefore hard to put on a neighbor. TIC 329864957's QLP file is not a useful check: in sector 84 the extraction collapses toward zero instead of tracing a three-percent dip, and other sectors do not cover these times cleanly. VSX objects at 23, 28 and 58 arcsec are those faint neighbors (types ROT, DSCT|GDOR|SXPHE, and RS). None is HIP 109669. The centroid shifts are sector 16: -2, +3 millipixels (scatter 8, 23), sector 17: -3, +4 millipixels (scatter 16, 7), sector 56: -3, -2 millipixels (scatter 20, 21), sector 57: +5, +8 millipixels (scatter 33, 30), sector 83: -0, -2 millipixels (scatter 16, 14), sector 84: -4, +1 millipixels (scatter 11, 14). They are not a consistent offset toward one neighbor.

5. What was not done

This note has not been submitted to VSX. A 0.03 mag dip, with residuals of tens of minutes and one as large as the maximum in section 3, is a candidate, not a catalogued eclipsing binary. A camera can measure it. A visual glance will not. The next two minima from this clock are BTJD 4331.573, 2026-10-18 01:39 UTC, and BTJD 4336.096, 2026-10-22 14:12 UTC. Use a window of about 83 minutes, not the minute. Keep the faint variables 23 and 28 arcsec away out of the aperture so their own short periods are not folded into the measurement.

References

Cutri R. M. et al., 2003, 2MASS All-Sky Catalog of Point Sources, VizieR II/246
Cutri R. M. et al., 2013, AllWISE Data Release, VizieR II/328
ESA, 1997, The Hipparcos and Tycho Catalogues, ESA SP-1200
Gaia Collaboration, 2023, Astron. Astrophys., 674, A1 (DR3)
Huang C. X. et al., 2020, Research Notes of the AAS, 4, 204 (QLP)
Jayasinghe T. et al., 2021, Mon. Not. R. Astron. Soc., 503, 200 (ASAS-SN II)
Kunimoto M. et al., 2021, Research Notes of the AAS, 5, 234
Stassun K. G. et al., 2019, Astron. J., 158, 138 (TIC)
Watson C., Henden A., Price A., 2006–, AAVSO International Variable Star Index (VSX)