A repeating fade that needs more data: TIC 328034764

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Tustin, California. Research note, 10 November 2026. The star is in the 2.10°–2.20° ring around V345 Lac. Nothing in this note has been submitted to VSX.

Abstract. TESS QLP aperture photometry of TIC 328034764 shows a repeating fade in sectors 56, 57, 76, 83, and 84. Sectors 16 and 17 stay at full light, including camera 3 CCD 1, which records the fade in sectors 57 and 84. Twelve times in one family give the ephemeris below. The O−C scatter of that family is 27 minutes, and the worst miss is 43 minutes. A second family, about as deep in a given season, follows 4.4 to 4.6 days later. That gap is not constant. The cause is open. The note is not a VSX submission.

The star

TIC 328034764 is TYC 3973-963-1, 2MASS J22052998+5533591, and Gaia DR3 2197919247114410240. The Gaia number stored on the TESS Input Catalog row is the DR2 source 2197919247110578432. The catalog place is 22h 05m 29.99s, +55° 33′ 58.8″ (J2000). V = 11.138 and the TESS magnitude is 10.541. The star is 2.109° from V345 Lac, 126.5 arcmin to the west-northwest, in the 2.10°–2.20° ring.

Gaia DR3 gives G = 11.025, BP − RP = 0.664, parallax 0.636 ± 0.485 mas, and RUWE 36.7. The DR3 place is 0.16 arcsec from the TIC place. With RUWE this large, the position is uncertain by about 0.4 arcsec, and the parallax is not a distance. The photometric variable flag is NOT_AVAILABLE. The non-single-star flag is 0. Gaia's astrophysical-parameter row for this source has no temperature, radius, gravity, metallicity, or distance. The variable-summary, variable-classifier, and two-body-orbit tables are empty for this source. SIMBAD types the object as a star, gives no spectral type, and lists no papers. The TESS catalog lists 8364 K, 2.15 solar radii, dwarf luminosity class, and 474 parsecs, and leaves surface gravity and mass blank. Those labels are not adopted.

How it was measured

The light curves are the TESS Quick-Look Pipeline. Sectors 16, 17, 56, 57, 76, 83, and 84 were read. TESSCut also lists sector 77. Both QLP versions of that sector return HTTP 404, so sector 77 is not in this note. The flux is the detrended column where the file has one, otherwise the KSPSAP column, otherwise SAP_FLUX, divided by the sector median. Only cadences with quality flag exactly zero are kept. In these files the SAP column is already near a median of 1. The timed minima below are measured on that SAP column. A known field sag near BTJD 3591.05 and another near BTJD 3604.35, and the sector-17 orbit edge near BTJD 1776, do not fall on these minima. Catalog values are from the TESS Input Catalog and Gaia DR3. No new observations were obtained.

One family has a clock

Twelve minima, called family A here, give

$$\text{Min} = \text{BTJD } 3369.91172 + 9.71001\ E$$

The O−C scatter is 26.9 minutes rms. The largest residual is 43 minutes. The hours column is the time spent below 0.975 of the sector median. In 2022 the floor is 0.960 to 0.965, about 0.04 mag, and the fade lasts about 2 to 3.5 hours. In sectors 76, 83, and 84 the floor is 0.946 to 0.955, about 0.05 to 0.06 mag, and the fade lasts about 5 to 6 hours. A short notch at BTJD 2874.599, 0.33 hours and flux 0.971, is left out of the table.

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)	Hours
56	-56	2826.180	2022-09-03 16:19	0.9649	+41.5	2.1
56	-55	2835.863	2022-09-13 08:42	0.9601	+2.6	3.5
56	-54	2845.562	2022-09-23 01:29	0.9634	-13.2	3.3
57	-53	2855.268	2022-10-02 18:25	0.9629	-19.0	2.7
76	0	3369.899	2024-02-29 09:34	0.9457	-18.3	5.1
76	1	3379.593	2024-03-10 02:13	0.9479	-41.4	5.7
76	2	3389.338	2024-03-19 20:06	0.9471	+9.0	5.6

Sector	Cycle	BTJD	UTC	Min. flux	O−C (min)	Hours
83	20	3564.132	2024-09-10 15:10	0.9489	+28.9	4.7
83	21	3573.852	2024-09-20 08:26	0.9523	+43.3	4.7
83	22	3583.527	2024-09-30 00:38	0.9509	-7.1	5.3
84	23	3593.250	2024-10-09 18:00	0.9554	+11.6	4.9
84	24	3602.926	2024-10-19 10:13	0.9518	-37.4	5.4

The other fade does not keep one separation

Fourteen more minima, family B, have about the same depth as family A in the same season. The floors run from 0.943 to 0.965. In sectors 56 and 57 the gap from family A to the next family-B minimum is 4.43 to 4.47 days. In sectors 76, 83, and 84 that gap is 4.54 to 4.60 days, except the last one. BTJD 3607.618 falls 4.69 days after the family-A minimum at BTJD 3602.926. Against a single phase of 0.467 the family-B residuals run from −168 minutes to +186 minutes, and that last minimum is the +186 minute end. A separation is not adopted. For planning, the next family-A window after 10 November 2026 is about 20:00 UTC on 15 November 2026, give or take an hour. The next family-B window is about 09:00 UTC on 20 November 2026, and that one is a couple of hours wide. The light-time correction used on the web page moves a raw BTJD by a few minutes. No drift rate is extrapolated.

The 2019 sectors stay at full light

The same ephemeris predicts nine times inside sectors 16 and 17. Two land in data gaps, family A at BTJD 1748.341 and family A at BTJD 1777.471. The other seven have a minimum SAP flux of 0.995 to 0.997 inside ±0.2 day, which is full light. The cameras are sector 16 on camera 1 CCD 1, sector 17 on camera 3 CCD 1, sector 56 on camera 3 CCD 2, sector 57 on camera 3 CCD 1, sector 76 on camera 4 CCD 1, sector 83 on camera 3 CCD 2, and sector 84 on camera 3 CCD 1. Camera 3 CCD 1 is flat in sector 17 and dips in sectors 57 and 84. Camera 3 CCD 2 dips in sector 56 and in sector 83.

Centroid and the two neighbors

The centroid shift is the median position while the SAP flux is below 0.97, minus the median while it is above 0.995. Sectors 16 and 17 have no faint points. The shifts are 0.0019 pixel in sector 56, 0.047 pixel in sector 57, 0.0015 pixel in sector 76, 0.0075 pixel in sector 83, and 0.0045 pixel in sector 84. A 5 percent loss sitting entirely on a star 32 arcsec away, 1.5 pixels, would move the centroid by about 0.08 pixel. The same loss on a star 14 arcsec away would move it by about 0.03 pixel. The deep sectors are too still for the 32 arcsec star to be the whole dip. Sector 57 by itself is about the size of the 14 arcsec shift. The note does not claim that either neighbor fades.

TIC 328034754 is 14 arcsec away, G = 13.08, T = 12.714, V = 13.29. In the TESS band it has about 0.14 of the target’s flux. TIC 328034781 is 32 arcsec away, G = 12.28, T = 11.169, V = 13.18, about 0.56 of the target’s flux. Those two ratios add to about 0.70. The catalog contamination ratio is 0.685, so contaminants are about 41 percent of the aperture. The catalog’s contaminant count is 1378. That count is not 1378 bright stars. The ratio is not turned into an intrinsic depth. On the catalog radius of 2.15 solar radii, which is not adopted, an undiluted 5 percent dip is a body about 0.48 solar radii across, and dilution at that contamination ratio raises the scale to about 0.62 solar radii. A Jupiter-sized body removes about 0.2 percent on that radius. A star of G = 18.71 lies 4.6 arcsec away and is too faint to matter.

Catalogs

VSX has no row for this star, under the TIC name, the Tycho name, or either Gaia source. Inside 2 arcmin the catalogued variables are other stars. The closest period coincidence is ZTF J220540.33+553400.3, 88 arcsec away, type RS, period 9.6604726 days, r about 18.4. It is about 7 magnitudes fainter. Even if it vanished it would remove about 0.1 percent of the light, which is less than the dip. That period does not phase the late minima: from BTJD 2830 to BTJD 3607 it slips by about 4 days. The ASAS-SN input catalog contains the star, and the ASAS-SN discovery list has no entry within 2.4 arcmin. This note does not include an ASAS-SN light curve. ZTF saturates near this magnitude, so a missing ZTF curve of the target is not a test of the fade.

Four comparison stars passed the usual cuts: Gaia G within 1 mag, similar color, no companion within 4 arcsec brighter than G + 3, and no VSX entry within 10 arcsec. C1 is Gaia DR3 2197919311522173312, G = 11.69, 56 arcsec away. C2 is 2197925156985580928, G = 11.64, 98 arcsec. C3 is 2197924847751769984, G = 11.23, 109 arcsec. C4 is 2197918147598977024, G = 11.71, 191 arcsec. A ground night should keep the 14 arcsec star and the 32 arcsec star in their own apertures. If the signal has continued, the fade is a few hundredths of a magnitude.

Figures

ΓIC 328034764. Red lines are family A. Dashed blue lines are family B. In 2019 those times sit at full light.

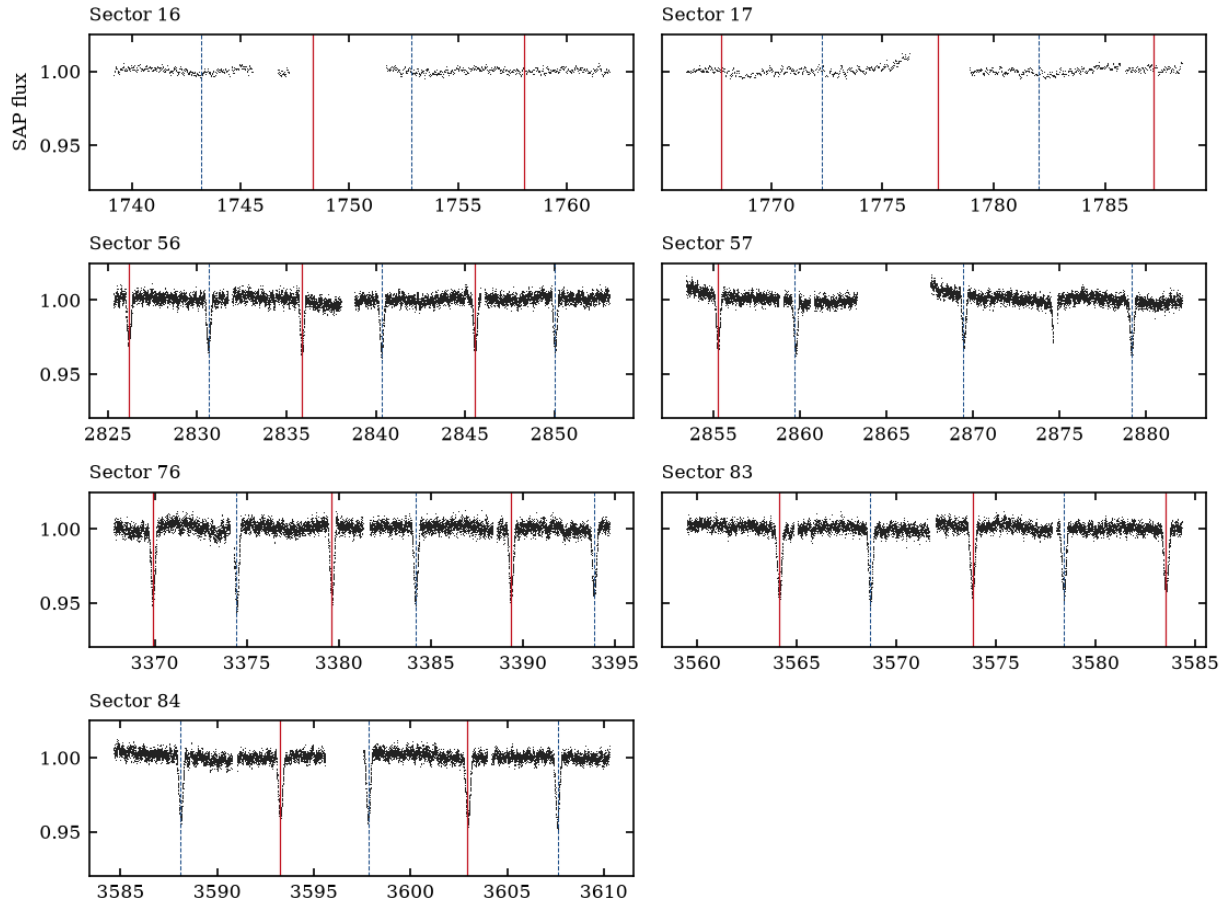


Figure 1. Seven TESS sectors. Red lines are family A. Dashed blue lines are family B. In 2019 those times sit at full light.

Family A in 2022 and family B in sector 76. The later season is deeper.

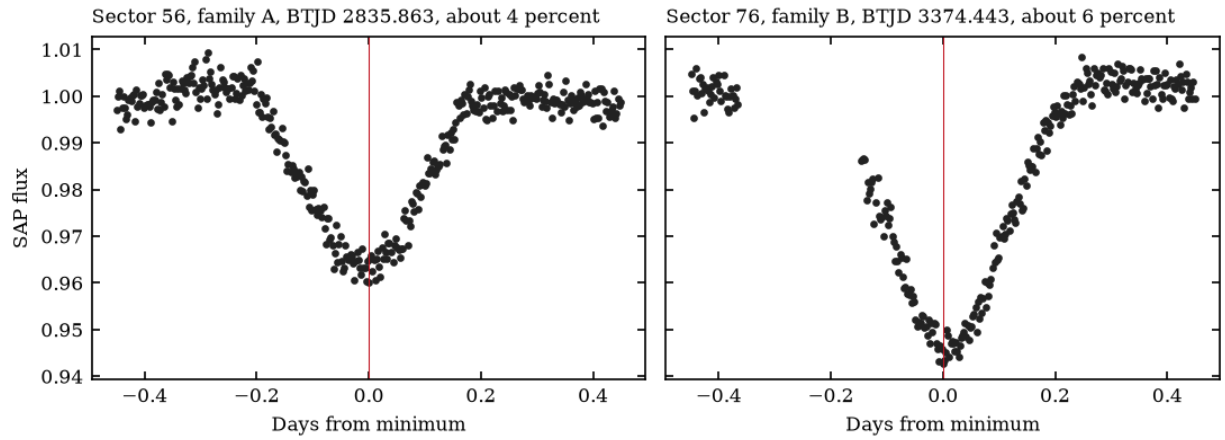


Figure 2. Family A in sector 56, about 4 percent, and family B in sector 76, about 6 percent. The later season is deeper. The two families have about the same depth within one season.

Folded on the 9.71001-day clock. The blue line marks family B. The 2019 sectors stay at full light.

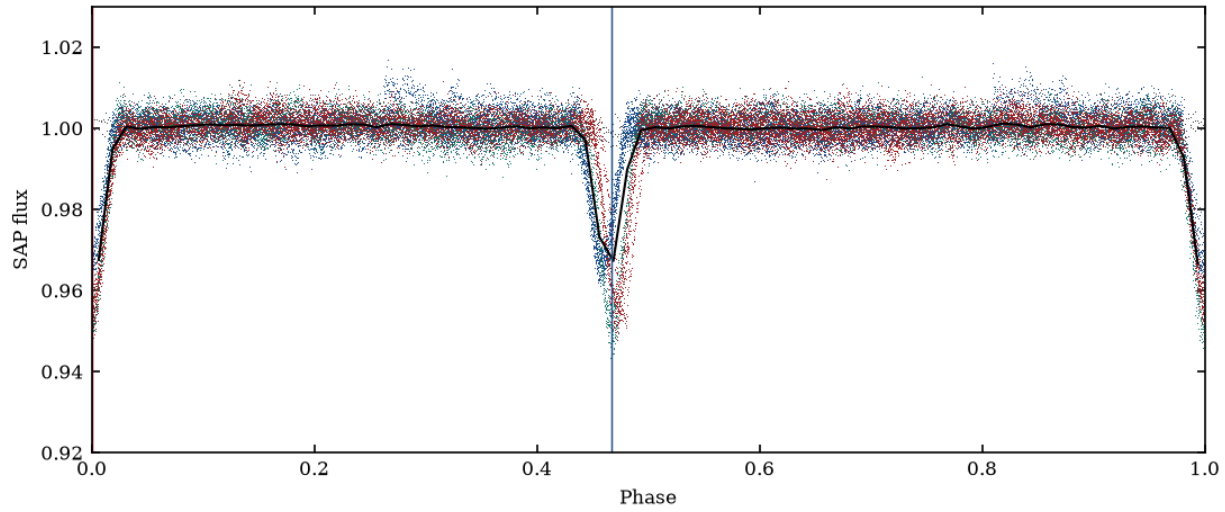


Figure 3. Folded on the 9.71001-day period. Family A is at phase 0. The blue line marks family B, near phase 0.47, and that clump is wider because the gap is not constant. Points are colored by sector. Sectors 16 and 17 stay at full light.

Nothing in this note has been submitted to VSX. TIC 330739083 is still the one New submission on this account, so this star stays unfiled.

References

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