Four deep eclipses and no adopted period: TIC 330136776

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

Abstract. TESS QLP aperture photometry of TIC 330136776 shows four eclipses, each to about half the light, at BTJD 1771.951, 2850.821, 3390.260, and 3592.549. The shapes match. The gaps are 1078.87, 539.44, and 202.29 days. A period of 67.430 days and a period of 33.715 days both still hide the eclipses that would decide between them, so neither is adopted. A neighbor 29 arcsec away has about a quarter of the combined light, which is less than the dip, so the target fades. The note is not a VSX submission.

The star

TIC 330136776 is Gaia DR3 2198379736322859648. It has no Tycho match in the TESS Input Catalog. The catalog place is 22h 13m 37.00s, +56° 44′ 42.9″ (J2000). V = 11.773 and the TESS magnitude is 11.226. The star is 2.197° from V345 Lac, 132 arcmin to the north-northwest, in the 2.10°–2.20° ring. Gaia DR3 gives G = 11.63, BP − RP = 0.80, parallax 1.512 ± 0.012 mas, and RUWE 0.86. That parallax is about 660 parsecs. The absolute G magnitude, with no dust correction, is about 2.5. The TESS catalog lists 7140 K, log g 3.86, mass 1.59 solar masses, and radius 2.46 solar radii. The contamination ratio is 0.342.

How it was found

The search is the same 414-star pass through the 2.10°–2.20° ring. Sectors 16, 17, 56, 57, 76, 77, 83, and 84 were read. Sector 76 was not in the first ring list, and it holds the third eclipse. The curves are SAP_FLUX divided by the sector median, quality flag exactly zero. The detrended column reaches the same four floors. The raw aperture column also shows notches of about 35 percent, near BTJD 1754.4, 1788.1, 2833.3, 3372.7, 3406.4, 3575.0, and 3608.7. Several of those notches repeat 33.7 days apart. The detrended column stays at full light through every one of them, so they are not used. The four eclipses are the events where both columns fall to half the light. Catalog values are from the TESS Input Catalog and Gaia DR3. No new observations were obtained.

The four eclipses

The timed minima are BTJD 1771.951 in sector 17 (flux 0.502), BTJD 2850.821 in sector 56 (flux 0.475), BTJD 3390.260 in sector 76 (flux 0.498), and BTJD 3592.549 in sector 84 (flux 0.486). Each falls to about half the light, 0.75 to 0.81 mag. The light stays under 98 percent for 5.6 to 6.5 hours, and under 80 percent for 3.2 to 3.5 hours. Ingress is steep and egress is a little slower, and the four curves lie on top of each other when each is aligned on its own middle. The eclipse at BTJD 3592.549 falls 1.5 days after a known field sag at BTJD 3591.05. That sag is a 1.5 percent wiggle on other stars in this field. A drop to half the light is a different event. The centroid shifts by 0.08 pixel.

Sector	BTJD	UTC	Min. flux	Below 98% / 80%
17	1771.951	2019-10-15 10:49	0.502	6.5 h / 3.5 h
56	2850.821	2022-09-28 07:42	0.475	5.8 h / 3.4 h
76	3390.260	2024-03-20 18:13	0.498	5.6 h / 3.2 h
84	3592.549	2024-10-09 01:09	0.486	5.8 h / 3.3 h

No period is adopted

The gaps between the four minima are 1078.87 days, 539.44 days, and 202.29 days. The first gap is twice the second. The third is three eighths of the second. Those ratios are exact at the level of a minute, so the times sit on a 67.430-day period, and they also sit on half of that, 33.715 days. Both of those periods place an eclipse in each sector that has one, and they place the extra eclipses of the half period in the gaps between sectors. A shorter trial, 22.48 days, predicts minima inside sectors 16, 56, 57, and 83 where the light stays at full. That period is rejected. The two survivors cannot be separated with the sectors in hand. This note adopts neither, and it does not predict the next eclipse. Another

sector, or a ground night that lands on one period and misses the other, is what decides.

Gaia DR3 2198379663295581440 lies 29 arcsec away at G = 12.86, 1.2 mag fainter. It has about a quarter of the combined light. The dip removes about half of the light in the aperture, which is more than that neighbor can supply, so the target fades. The catalog contamination ratio is 0.342. That ratio is not turned into an intrinsic depth. On the catalog radius of 2.46 solar radii, half the light is a companion of about 1.7 solar radii. A Jupiter-sized body removes a fraction of a percent. The nearest VSX object is Gaia DR3 2198379942481282944, a rotator, 69 arcsec away. It is a different star.

Figures

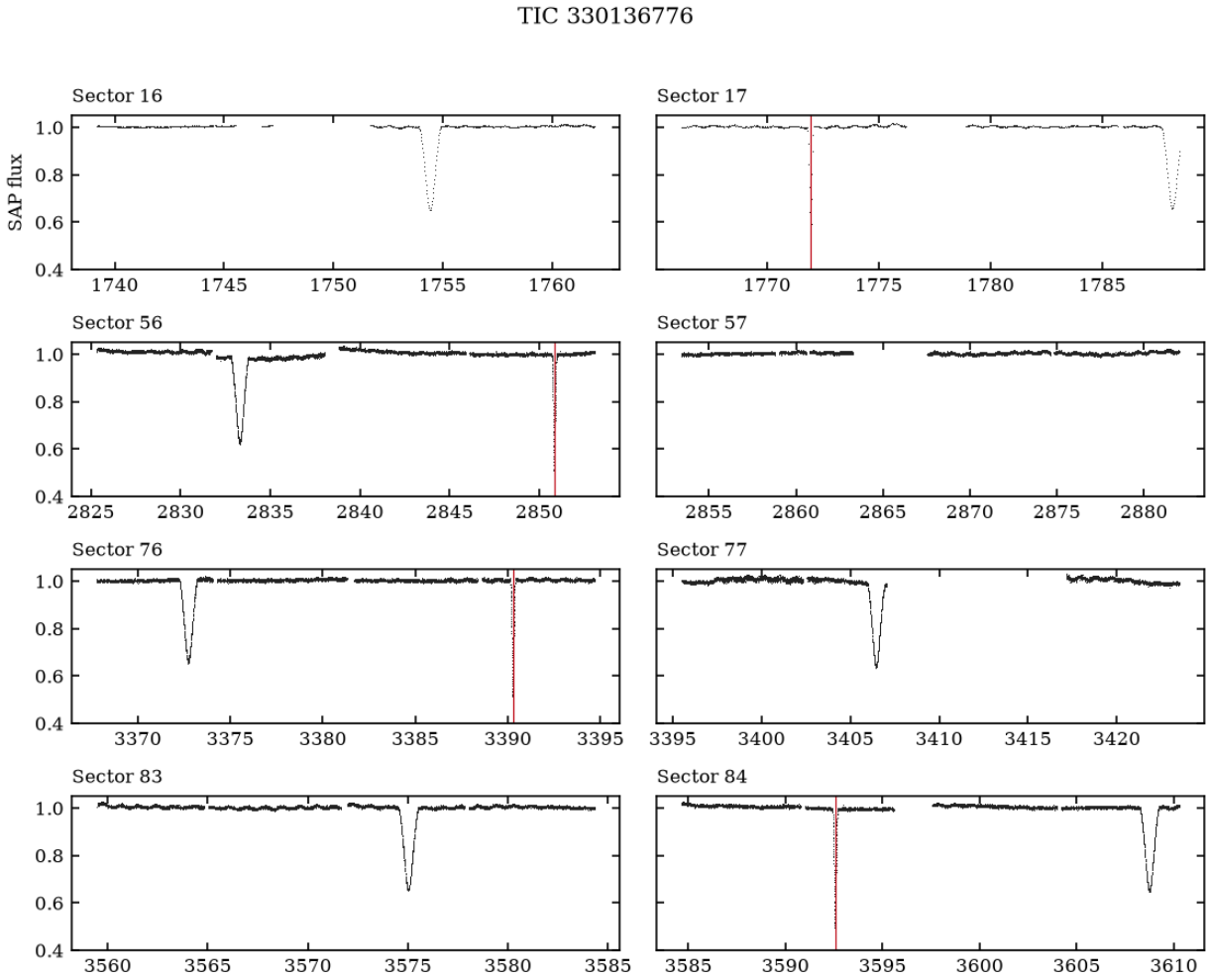


Figure 1. Eight TESS sectors. Red lines mark the four eclipses. No period is drawn through the gaps. Notches with no red line are in the raw aperture column only. The detrended column removes them.

TIC 330136776. No period is adopted.

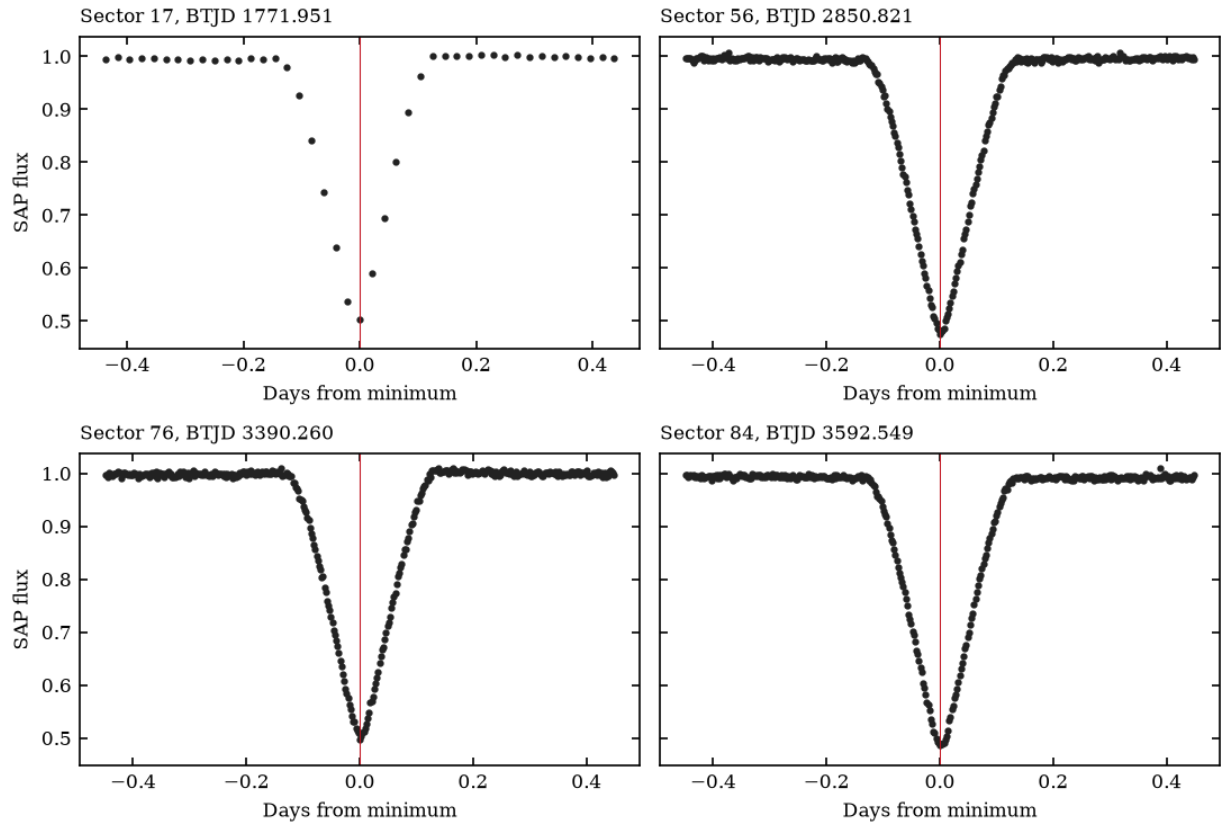


Figure 2. The four eclipses. Each is about half the light and about six hours below 98 percent.

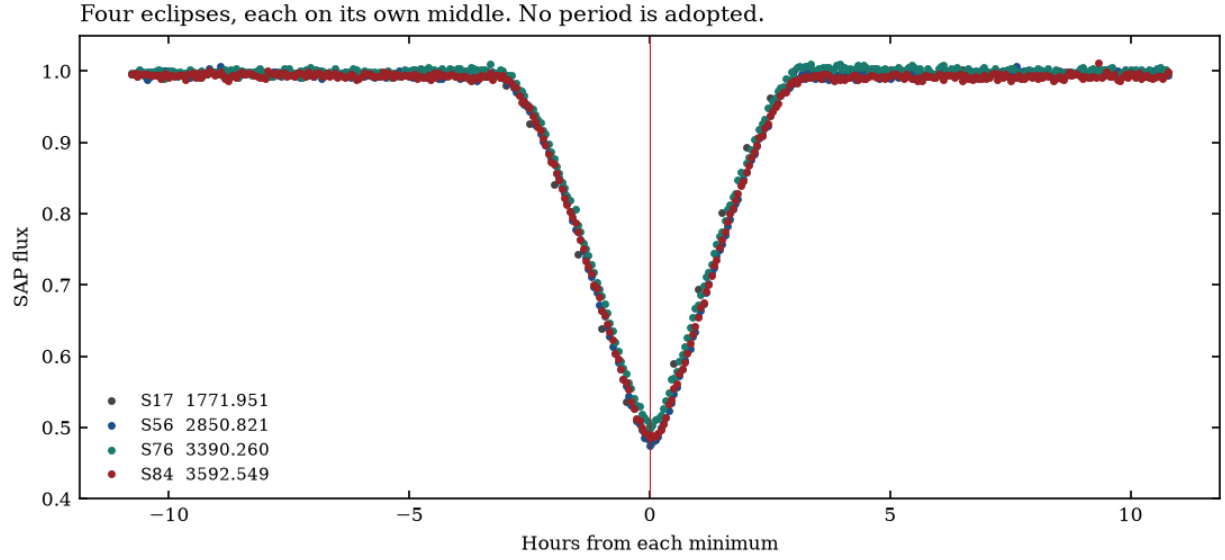


Figure 3. The four eclipses shifted onto their own middles. This is not a phase fold, and no period is adopted.

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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