A Transit of Venus Turns the Sun's Parallax, Too Small as an Angle, into Seconds of Time Through Venus's Parallax

— misreading the time by **1** second shifts the parallax by **0.292107** percent, a fineness that would require **0.025688** arcseconds if read as an angle — the separator is whether the parallax is read as an angle or as a time —

— [Paper 806]

Yuuki YAMAGISHI (山岸 勇輝)
Yamagishi Complexity Torus Lab, Japan
September 2026

— *From thinking to syncing.* —

Abstract

The astronomical unit is fixed by the solar parallax, an angle of less than 9 arcseconds.Using the geometry of circular orbits, it is counted how a transit of Venus across the Sun magnifies that small angle and turns it into a time difference.No new theorem or law is claimed. First, the solar parallax is small, and slight differences move the astronomical unit——149597884.970 km at 8.794143 arcseconds, and +0.047133 percent at 8.79 arcseconds (Section 2). **Second, the difference from Venus's parallax magnifies the angle——with Venus at 0.723332 astronomical units, the magnification is 2.614440** (Section 3). **Third, Venus moves slowly across the solar disk——241.777812 arcseconds per hour relative to the Sun, the same value from differences of positions on circular orbits** (Section 3). **Fourth, and this is the core. An angular shift becomes a time difference in seconds——at two places an Earth radius apart, a shift of 22.991763 arcseconds becomes a time difference of 342.340538 seconds** (Section 3). **Fifth, one second of time is a very fine angle——a 1-second misreading is 0.292107 percent of the parallax, a fineness that would need 0.025688 arcseconds if read as an angle** (Section 4). **Sixth, the separator is whether the parallax is read as an angle or as a time——"the solar parallax is too small to measure" is not decided true or false until one says whether it is read as an angle or as a time** (Section 5). **Keywords**: transit of Venus, solar parallax, astronomical unit, Venus, time difference, angular speed.

Scope of this paper (scope note): **No new theorem or law is claimed——the relation between solar parallax and the astronomical unit, the method of finding the solar parallax from the times of a transit of Venus, and Venus's orbital elements are all known.The setting is idealized——the orbits of Earth and Venus are circles in the same plane. The two places are an Earth radius apart, and only the case where they lie along Venus's motion is considered.Observing difficulties are not treated——the blurring of the moment of contact (the black drop), atmospheric seeing, clock calibration and errors in the observers' positions are left out.The definition of the astronomical unit is not discussed ——the present astronomical unit is fixed as a length, and the parallax of 8.794143 arcseconds here is a representative value for comparison.History is not treated——past expeditions and their resulting values are not given.Relation to earlier papers**: **Paper 297 showed that cosmic distance is a ladder of seven rungs and only the first (trigonometric parallax) is measured directly——this paper stands beside that seat: the first rung's parallax has the astronomical unit as its baseline, and here the mechanism for measuring that baseline's length by time rather than angle is counted.Paper 499 showed that not one of the four classical measurements of the speed of light measures one way, and counted Rømer's delay——turning that delay into a speed needs the length of the astronomical unit. This paper takes the same line in using idealized values and stands beside that seat.**What is added is **deriving how slight differences in solar parallax move the astronomical unit**, **deriving the magnification 2.614440 from the difference with Venus's parallax and the angular speed relative to the Sun, 241.777812 arcseconds per hour, by formula and by differences of positions**, **showing that a shift of 22.991763 arcseconds becomes a time difference of 342.340538 seconds**, **converting a 1-second misreading into an angular fineness of 0.025688 arcseconds**, and **placing the separator on reading as an angle or as a time**.

1. Notation and the Question

Setting: **the relation between the Earth's equatorial radius $R_\oplus$, the astronomical unit AU and the solar parallax $\pi_\odot$, and for Venus (orbital radius a astronomical units, period P_V) the shift Δ on the solar disk, the angular speed ω relative to the Sun, and the time difference Δt, are set as follows.**

$$\sin\pi_\odot = \frac{R_\oplus}{\mathrm{AU}}, \qquad \Delta = \pi_\odot\left(\frac{1}{1-a}-1\right), \qquad \omega = \frac{a}{1-a}\cdot 2\pi\left(\frac{1}{P_\mathrm{V}}-\frac{1}{P_\oplus}\right), \qquad \Delta t = \frac{\Delta}{\omega}$$

Δ is the difference in Venus's position seen from two places an Earth radius apart, minus the difference in the Sun's position seen from the same two places.

Question: **how is the solar parallax, less than 9 arcseconds, magnified in a transit of Venus, and into what is it mapped?**

2. Solar Parallax and the Astronomical Unit

Computation 2.1: **with $R_\oplus = 6378.137$ km, the astronomical unit was derived from the parallax.**

solar parallax	astronomical unit	against 8.794143 arcsec
8.794143 arcsec	**149597884.970** km	
8.79 arcsec	**1.496684×10^{8}** km	**$+0.047133$** percent
8.80 arcsec	**1.494983×10^{8}** km	**-0.066557** percent

> **Observation 2.2**
>
> **the solar parallax is small, and slight differences move the astronomical unit.The 0.01-arcsecond difference between 8.79 and 8.80 arcseconds splits the astronomical unit into $+0.047133$ and -0.066557 percent—— fixing the astronomical unit finely requires telling apart differences of 0.01 arcseconds in an angle under 9 arcseconds.**

3. Magnifying Through Venus

Computation 3.1: **derived with Venus's orbital radius $a = 0.723332$ astronomical units, period $P_{\mathrm{V}} = 224.701$ days, and Earth's period $P_{\oplus} = 365.256$ days.**

quantity	value
Earth--Venus distance (astronomical units)	**0.276668**
parallax magnification $1/(1-a)-1$	**2.614440**
Venus's angular speed relative to the Sun (formula)	**241.777812** arcsec/hour (**4.029630** arcmin/hour)
the same from differences of positions on circular orbits	**241.777812** arcsec/hour (difference **6.405×10^{-8}**)
shift at two places an Earth radius apart	**22.991763** arcsec
time difference for a shift along the motion	**342.340538** s

Observation 3.2

the difference from Venus's parallax magnifies the angle.Venus is only 0.276668 astronomical units from Earth, so the difference in its position seen from two places is 2.614440 times the solar parallax——a near ruler in front of the Sun spreads the Sun's small angle.

Observation 3.3

this is the core: an angular shift becomes a time difference in seconds.Venus moves only 241.777812 arcseconds per hour relative to the Sun, so passing a shift of 22.991763 arcseconds takes 342.340538 seconds ——slow motion stretches a small angle into a long time.

4. The Error in Time

Computation 4.1: **shifts in parallax and astronomical unit from misreading the time of contact were derived.**

misreading of time	parallax shift	astronomical-unit shift
1 s	**0.292107** percent	**4.369856** $\times$ 10^{5} km
5 s	**1.460534** percent	**2.184928** $\times$ 10^{6} km
10 s	**2.921068** percent	**4.369856** $\times$ 10^{6} km
20 s	**5.842136** percent	**8.739712** $\times$ 10^{6} km

Observation 4.2

one second of time is a very fine angle.A 1-second misreading is 0.292107 percent of the parallax; reading the parallax angle directly to the same fineness would need 0.025688 arcseconds——seconds can be counted, but angles that fine cannot be read. A transit of Venus exchanges an unreadable angle for countable seconds.

5. The Separator

Observation 5.1

the separator is whether the parallax is read as an angle or as a time.Read as an angle, 8.794143 arcseconds must be read to a fineness of 0.025688 arcseconds; read as a time, reading 342.340538 seconds to 1 second does the same——“the solar parallax is too small to measure” is not decided true or false until one says whether it is read as an angle or as a time.

Observation 5.2

beside Papers 297 and 499.Paper 297 showed that only the first rung of the distance ladder is measured directly, and 499 what the classical measurements of the speed of light measure; the length of the astronomical unit enters both——here it was counted that the angle fixing that length is mapped into time by Venus’s nearness and slowness.

Observation 5.3

what is not said.The black drop, the atmosphere, clock calibration, the placement of observing stations, orbital inclination and ellipticity, values from past observations, and the present definition of the astronomical unit are not treated——what is shown is the mechanism and the factors by which an angle maps into time.

6. Roll Call and Closing

1. **parallax 8.794143 arcsec gives 149597884.970 km** (Computation 2.1): **the astronomical unit.**
2. **+0.047133 percent at 8.79 arcsec** (Observation 2.2): **slight differences matter.**
3. **Earth--Venus distance 0.276668** (Computation 3.1): **a near ruler.**
4. **magnification 2.614440** (Observation 3.2): **the difference of parallaxes.**
5. **angular speed 241.777812 arcsec/hour** (Computation 3.1): **slow motion.**
6. **shift 22.991763 arcsec** (Computation 3.1): **the magnified angle.**
7. **time difference 342.340538 s** (Observation 3.3): **the core.**

8. **0.292107 percent per second** (Computation 4.1): **the fineness of a second.**
9. **0.025688 arcsec as an angle** (Observation 4.2): **an unreadable fineness.**
10. **as an angle or as a time** (Observation 5.1): **the separator; Papers 297, 499.**

Closing: **A transit of Venus turns the Sun's parallax, too small to measure as an angle, into a time difference measurable in seconds by magnifying it through Venus's parallax.From a solar parallax of 8.794143 arcseconds the astronomical unit is 149597884.970 km, and at 8.79 arcseconds it moves by +0.047133 percent——differences of 0.01 arcseconds must be told apart in an angle under 9 arcseconds.Venus, only 0.276668 astronomical units from Earth, spreads the parallax difference 2.614440 times, and moving only 241.777812 arcseconds per hour relative to the Sun, it turns a 22.991763-arcsecond shift between places an Earth radius apart into a 342.340538-second time difference. A 1-second misreading is 0.292107 percent of the parallax, which as an angle would be a fineness of 0.025688 arcseconds——nearness spreads the angle, and slowness stretches it into time.The separator is whether the parallax is read as an angle or as a time.Placed among the earlier papers——standing beside the seats of Paper 297's first rung and Paper 499's Rømer delay, the length of the astronomical unit that enters both was counted from the side of measuring by time.To be honest——the orbits were set as circles in one plane, and neither the black drop, the atmosphere, nor clock calibration is treated.**

References

1. Yamagishi, Y. (2026). *Cosmic Distance Is a Ladder of Seven Rungs, and Only the First Is Measured Directly* [Paper 297]. Zenodo. 10.5281/zenodo.22171788
2. Yamagishi, Y. (2026). *Not One of the Four Classical Measurements of the Speed of Light Measures One Way* [Paper 499]. Zenodo. 10.5281/zenodo.22760231

— *From thinking to syncing.* —

Yuuki YAMAGISHI (山岸 勇輝)

© 2026 Yamagishi Complexity Torus Lab, Japan · Licensed under Creative Commons Attribution 4.0 International (CC BY 4.0)