The Sun Does Not Have Two Periods; the Sign Was Thrown Away Before Counting

— Kept with its magnetic sign, the component at 22 years has amplitude 1.000000 and the one at 11 years is effectively zero, 1.226×10^{-16} — the separator is whether the sign was thrown away before counting — [Paper 684]

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— From thinking to syncing. —

Abstract

The solar cycle is given as 11 years and also as 22. There are not two periods; there are two ways of counting one.What a single operation, taking an absolute value, does to a spectrum is counted here.No new theorem or law is claimed. First, and this is the core. Throwing away the sign makes the 22-year component vanish——an amplitude of 1.000000 with the sign kept becomes 2.539×10^{-17}, that is exactly zero, once the absolute value is taken (Section 2). **Second, in its place appears a component that was not there——with the sign kept the 11-year amplitude is 1.226×10^{-16}, and after the absolute value it is 0.424413, which is $4/(3\pi)$** (Section 2). **Third, its size is fixed in closed form——the 11-year amplitude is 0.666667, that is $2/3$, of the mean, and follows without knowing anything about the Sun** (Section 2). **Fourth, put an asymmetry back and the 22-year component returns——a north-south bias of fraction ε gives the 22-year component amplitude exactly ε: at $\varepsilon = 0.05$ it is 0.050000, which is 0.117810 of the 11-year component** (Section 3). **Fifth, so whether 22 years is visible is a fact about the record, not about the Sun——the returning amplitude is exactly proportional to ε, and multiplying ε by twenty multiplies it by 20.0000** (Section 3). **Sixth, the separator is whether the sign was thrown away before counting——take an absolute value first and the same phenomenon shows a period half as long** (Section 4). **Keywords**: solar cycle, magnetic cycle, full-wave rectification, harmonics, Fourier component, sign information.

Scope of this paper (scope note): **No new theorem or law is claimed——that the magnetic cycle of the Sun is 22 years while the sunspot number cycles in 11, and that full-wave rectification produces only even harmonics, are both standard (Hale 1919, Stix 2002).Dynamo theory is not treated——why the period is 22 years, and how the field reverses, are not asked.Real time series are not treated——observed sunspot numbers, the Maunder minimum and the varying strength of successive cycles are not the subject; an idealised cosine is used throughout.The periods are not claimed——11 and 22 years are representative, and actual cycles run from about 9 to 14 years.Climate is not discussed——the relation between solar activity and terrestrial temperature is not treated.Relation to earlier papers**: **Paper 654 showed that choosing a window is choosing the answer, and that lowering the leakage loses the power to split close tones——there two tones appeared as one because the resolution was insufficient; here the resolution is ample and one period appears as two because of a step taken before counting. Measurement has two stages and either can change the answer.**What is added is **setting the signed and unsigned spectra side by side**, **showing numerically that the absolute value annihilates the 22-year component**, **showing the surviving 11-year amplitude to be $4/(3\pi)$ and $2/3$ of the mean**, **showing that an asymmetry returns the 22-year component in exact proportion to ε**, and **placing the separator on whether the sign was thrown away before counting**.

1. Notation and the Question

Setting: **write $s(t)$ for a quantity that carries the magnetic sign and $u(t)$ for one that keeps only the number. Idealise with a cosine of period $P = 22$ years.**

$$s(t) = \cos\frac{2\pi t}{P}, \qquad u(t) = \left|\cos\frac{2\pi t}{P}\right|, \qquad |\cos\theta| = \frac{2}{\pi} + \frac{4}{\pi}\sum_{k\geq 1}\frac{(-1)^{k+1}}{4k^2-1}\cos 2k\theta$$

That the expansion on the right contains no odd harmonic decides everything that follows.

Question: **are 11 and 22 years two periods, or two ways of counting one?**

2. The Absolute Value Annihilates 22 Years

Computation 2.1: **one period of 22 years was divided into 200000 points and the amplitudes at 22 and 11 years were derived, with the sign kept and with the sign thrown away.**

component	sign kept	sign thrown away
period 22 years	1.000000	2.539×10^{-17}
period 11 years	1.226×10^{-16}	0.424413
mean value	0	0.636620

The surviving 11-year amplitude agrees with the closed form $4/(3\pi) = 0.424413$ to six digits, and the mean with $2/\pi = 0.636620$.

> **Observation 2.2**
>
> **this is the core: the two columns have exchanged places.What was present at 22 years is gone, and what was absent at 11 years has appeared——there are not two periods; one period is being seen in two ways according to what is counted.**

Computation 2.3: the surviving 11-year amplitude is 0.666667 of the mean, agreeing to six digits with the closed form $(4/(3\pi))/(2/\pi) = 2/3$.

> **Observation 2.4**
>
> **the Sun does not enter this ratio.The value $2/3$ follows from the act of taking an absolute value alone, and depends neither on the strength of the field nor on the length of the period——"a variation about two thirds of the mean" is a signature of the counting, not of the phenomenon.**

3. An Asymmetry Brings 22 Years Back

Computation 3.1: a slight excess in one hemisphere was added as a signed component of fraction ε, and the 22-year amplitude was derived for each ε.

ε	amplitude at 22 years	against 11 years
0.01	0.010000	0.023562
0.05	0.050000	0.117810
0.10	0.100000	0.235619
0.20	0.200000	0.471239

Observation 3.2

the return is exactly proportional.Multiplying ε by twenty multiplies the amplitude by 20.0000——the size of the 22-year component is a direct gauge of how much sign information survived into the record.

Observation 3.3

so “22 years is not visible” is not a claim about the Sun.If the record discards the sign completely the component is zero, and if any of it survives the component appears in proportion——what decides visibility is the record, not the object.

4. The Separator

Observation 4.1

the separator is whether the sign was thrown away before counting.Thrown away, the period looks halved; kept, the original period is seen——“the period is 11 years” and “the period is 22 years” are both true of the same phenomenon because two people are counting two different quantities.

Observation 4.2

beside Paper 654.Paper 654 showed that choosing a window is choosing the answer, and that lowering the leakage loses the power to split close tones——there two appeared as one for want of resolution; here resolution is ample and one appears as two because of a step taken before counting. Measurement has two stages, and either changes the answer.

Observation 4.3

what is not said.Neither dynamo theory nor any real time series is treated, and only an idealised cosine was used——what is shown is what taking an absolute value does to a spectrum.

5. Roll Call and Closing

1. **signed 22 years is $\mathbf{1.000000}$** (Computation 2.1): **the original period.**
2. **unsigned, 22 years vanishes** (Computation 2.1): **the core.**
3. **11 years appears at $\mathbf{0.424413}$** (Computation 2.1): **equal to $4/(3\pi)$.**
4. **the mean is 0.636620** (Computation 2.1): **equal to $2/\pi$.**
5. **their ratio $\mathbf{0.666667}$** (Computation 2.3): **$2/3$; no Sun in it.**
6. **$\mathbf{0.050000}$ at $\varepsilon = 0.05$** (Computation 3.1): **22 years returns.**
7. **that is $\mathbf{0.117810}$** (Computation 3.1): **against 11 years.**
8. **$\mathbf{0.471239}$ at $\varepsilon = 0.20$** (Computation 3.1): **plainly visible.**
9. **a factor of $\mathbf{20.0000}$** (Observation 3.2): **exact proportion.**
10. **sign kept or thrown away** (Observation 4.1): **the separator; Paper 654.**

Closing: **The Sun does not have two periods.Kept with its sign, the 22-year component has amplitude 1.000000 and 11 years is absent; thrown away, 22 years vanishes and 11 years appears at 0.424413——the two columns have exchanged places.The surviving amplitude is 0.666667 of the mean, and that ratio follows from the act of taking an absolute value alone——the Sun does not enter it.A north-south asymmetry of fraction ε returns the 22-year component with amplitude exactly ε: at $\varepsilon = 0.05$ it is 0.050000, which is 0.117810 of the 11-year component.So "22 years is not visible" is a claim about the record, not about the Sun.The separator is whether the sign was thrown away before counting.Placed among the earlier papers——in Paper 654 two appeared as one for want of resolution;**

here one appears as two because of a step taken before counting.To be honest——neither dynamo theory nor any real time series is treated, and only an idealised cosine was used.

References

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