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Time Equivalence of the Tropical Year and the Sidereal Year

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"We scientists would claim that in the absence of precession, the tropical year and the sidereal year would be equal." Prof. Douglas P. Hube, Dept. of Physics University of Alberta[1]

ABSTRACT

The sidereal year is said to be the truest measure for a complete period of revolution of the Earth around the sun. By 1952 physicists had measured the precise time interval of the sidereal year in order to establish a definition for the unit 'second'. However, astronomers argued that the length of the sidereal year depends upon the adopted value of the precession. According to the theory of "the precession of Earth", Earth's axis of rotation gradually changes its orientation in space over a period of about 25800 years. This phenomenon causes a continuous displacement of the equinoctial points with respect to inertial space and with respect to the position of the sun. As a result, the sidereal year is supposed to be about 1223 seconds longer than the tropical year. Such a yearly time difference must be scientifically substantiated. This paper will prove that the time intervals of a tropical year and a sidereal year are, in fact, equal. Hence, the theory of "the precession of Earth" will be refuted.

KEYWORDS: sidereal year, tropical year, rotation of Earth.

DEFINITIONS

Sidereal year: the period during which Earth makes a complete 360° revolution in its orbit around the sun, as measured with respect to the position of the fixed stars or inertial space.

Tropical year: the period during which Earth makes a complete 360° revolution in its orbit around the sun with respect to the position of the vernal equinox. The defined time interval of the tropical year for 1900.0 is 31,556,925.97474 seconds.

Mean sidereal day: the period during which Earth makes a complete rotation on its axis (absolute rotation). The time interval of the mean sidereal day is 86164.0905382 seconds.

MATHEMATICAL PROOF

The orientation of Earth's axis of rotation in space has no influence on Earth's complete period of revolution or on its absolute rotation. In one complete orbit, Earth makes exactly one less complete rotation of 1296000 arc-seconds on its axis with respect to the position of the sun than with respect to an outer fixed frame of reference.

Mean solar time is based on the motion of a hypothetical sun traveling at an even rate throughout the year, and it is obtained in practice from observations of stars. The difference between the mean solar day of 86400 seconds (s) and the mean sidereal day is exactly 235.9094618 s. The rigorous mathematical relationship that exists between the mean solar day and the mean sidereal day is expressed by the equation:

$$365.24219878 \times 86400 \text{ s} = 366.24219878 \times 86164.0905382 \text{ s} = 31{,}556{,}925.9747 \text{ s}$$

This equation describes Earth's complete 360° period of revolution of 31,556,925.9747 s relative to a fixed frame of reference, implying that the position of the vernal equinox remains fixed with respect to the orientation of Earth's axis in space. The total number of rotations of Earth in such a complete orbit is expressed by the equations:

$$1 \div (1 - (86164.0905382 \text{ s} \div 86400 \text{ s})) = 366.24219878$$

$$86400 \text{ s} \div 235.9094618 \text{ s} = 366.24219878$$

The time period of the Gregorian, or civil, calendar of 365.2425 mean solar days is about 26.03 seconds longer than the tropical year. In other words, the civil calendar deviates by only one day in almost 3320 tropical years.

Since the reference frame of inertial space moves relative to the orientation of Earth's axis in space, Earth's period of rotation* with respect to a fixed direction in space is said to be about 9.12 milliseconds (0.1368") longer than the mean sidereal day (absolute rotation).

If the difference of 9.12 milliseconds (ms) per rotation were due to a precession of the axis, the same value must apply to the mean solar day. This is not the case, according to Newcomb's tables.[3] For more than a century the mean solar day has essentially remained a constant, implying a non-precessing or fixed axis of rotation with respect to the position of the sun and the equinoctial points.

Based on the theory of "the precession of Earth", the equinoctial points retrograde around the sun by about 3.34 s per rotation of the Earth. In other words, due to precession the mean solar day would have to be 9.12 ms longer and also 3.34 s shorter. However, a difference of 3.34 s per rotation - between the *moving origin* and the *non-moving frame of reference* - is not being measured in practice.

Supposedly, the length of the sidereal year - i.e. the actual number of rotations of the Earth in one complete 360° orbit period - depends upon the adopted value of the precession. Hence, the following equation is said to represent the accumulating daily difference of 3.34 s over a period of one year:

$$365.256361 \times 86400 \text{ s} = 366.256361 \times (86164.0905382 + 0.00912) \text{ s} = 31{,}558{,}149.59 \text{ s}$$

In reality this equation describes a slightly larger, but *non-existing* 360° orbit period for the Earth, implying in fact a *non-precessing* or fixed axis of rotation.

* "No special name has been given to this kind of day, and although of theoretical interest, it is not used in practice."[2]

DOCUMENTED PROOF

In its 1955 Transaction Report,[4] the International Astronomical Union (IAU) passed the resolution to substitute the time interval of the *tropical year for 1900.0* for the *sidereal year for 1900.0* to define the unit 'second', as it had already been proposed in 1952:

"The General Assembly in Rome in 1952 adopted the recommendation that 'dans tous les cas où l' on juge que la variabilité de la seconde de temps solaire moyen s'oppose à son emploie comme unité de temps, l' année sidérale pour 1900.0 soit adoptée comme unité de temps'.

It was subsequently pointed out [...] that the tropical year is more fundamental than the sidereal year. The length of the tropical year is derived from Newcomb's tables of the Sun, whereas the length of the sidereal year depends upon the adopted value of the precession. The tropical year should therefore be substituted for the sidereal year in the resolution above."

Furthermore, the report states:

"The second is the fraction 1:31556925.975 of the tropical year for 1900.0. [...] The proposed unit had, in effect, been agreed at the Rome meeting of the I.A.U. and all that was needed now was a minor correction by the substitution of 'tropical year' for 'sidereal year'."

CONCLUSIONS

A) The time interval of the *sidereal year for 1900.0* is NOT about 1223 seconds longer than the time interval of the *tropical year for 1900.0*.

B) The civil calendar is NOT being corrected for an additional time discrepancy of about 1223 seconds per complete orbit period of Earth.

C) The complete orbit period of Earth is NOT about 1223 seconds longer than the fundamental time interval of the *tropical year for 1900*.

DISCUSSION

The scientific arguments presented here have conclusively proven that the time intervals of the tropical year and the sidereal year are indeed equivalent. It is has been mathematically verified that the mean time interval of 31,556,925.97474 s is Earth's true 360° orbit period, implying that the equinoctial points do NOT retrograde around the sun. Hence, we can no longer subscribe to the erroneous conclusion that the 'precession of Earth' is a scientific fact.

However, the gradual displacement of the equinoctial points relative to inertial space does require a scientific explanation. The observations and the research done by Karl-Heinz Homann[5] suggest that our entire solar system is orbiting the Sirius system.

REFERENCES

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