

The Moho as G0/G1 Register Boundary

$R = 20,000/\pi \text{ km} \cdot \text{Seismic Velocities as Pure } \{2,3\} \text{ Lattice} \cdot \text{Sidereal Year} = \text{Moho Year} \times 730/729$

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P-MOHO-1 The Moho Discontinuity as a Tau-Register Transition

The Moho discontinuity — the boundary between Earth's crust and mantle at approximately 30-60 km depth beneath continents — is not merely a chemical transition from basaltic crust to peridotitic mantle. In the Force of Time framework, the Moho marks the boundary between two distinct Tau-registers: G0 (the high-density mantle/core regime) and G1 (the low-density crust, ocean, and atmosphere regime). The seismic velocity jump at the Moho — the empirical signature of the boundary — is the direct observational signature of the G0/G1 register transition.

P-MOHO-1

The Moho discontinuity is the G0/G1 Tau-register boundary. Below: dense Tau-lattice (mantle/core). Above: open Tau-lattice (crust/ocean/atmosphere). The seismic velocity discontinuity is the register transition signature.

The register concept in FOT replaces the notion of phase transitions driven by pressure and temperature with a single geometric principle: the Tau-field maintains distinct lattice spacings in different registers, and the boundary between them is a sharply defined surface, not a diffuse zone. This explains why the Moho appears as a near-discontinuity rather than a gradual gradient in most seismic surveys.

P-MOHO-2 Earth Radius as a Pure {2,3,pi} Value

The FOT Tau-lattice assigns Earth a canonical radius of exactly $20,000/\pi$ kilometres — the radius of a sphere whose circumference is precisely 40,000 km. This is not coincidental: the French Academie des Sciences defined the metre in 1791 as one ten-millionth of the meridian quadrant, encoding this exact value into the SI unit system. The conventional geodetic mean radius (6371.0 km) departs from this by 754 ppm — the scale-invariant Radian Veil effect operating at the planetary register.

$R_{\text{Earth}} (\text{FOT}) = 20,000 / \pi = 6366.197724 \text{ km}$ Circumference (FOT) = $2\pi \times R = 40,000.000 \text{ km}$ (exact) Conventional mean radius = 6371.000 km (754 ppm)

The 40,000 km circumference is a pure {2,3,5} value: $40,000 = 2^7 \times 5^4$. The factor of pi in the denominator of the radius is the Tau-sphere projection constant — the same pi that appears in every FOT wave-mechanics formula. Earth's size was not set by historical accident but by the Tau-field's requirement that the G1-register planetary node have a

circumference equal to $2^7 \times 5^4$ metres.

P-MOHO-3 Seismic Velocities as Pure {2,3} Lattice Values

At the Moho, compressional (P-wave) and shear (S-wave) velocities jump to values that lie on the {2,3} sub-lattice of the FOT prime lattice:

$$V_p \text{ (Moho)} = 2^3 = 8.0 \text{ km/s} \quad V_s \text{ (Moho)} = 3^2 / 2 = 4.5 \text{ km/s} \quad V_p / V_s = 16/9 = 1.77778$$

Observed values: $V_p = 7.6\text{--}8.1$ km/s (centre ~ 8.0), $V_s = 4.0\text{--}4.7$ km/s (centre ~ 4.5). The ratio $V_p/V_s = 16/9 = (4/3)^2$ is the square of the perfect-fourth musical interval — the same {2,3} fraction that governs the orbital period ratios in the inner solar system. That acoustic wave propagation at the planetary-scale register boundary encodes the same harmonic ratios as quantum and orbital systems is a core FOT prediction of scale invariance across all Tau-registers.

The Rader Veil for V_p at the Moho: observed range 7.6–8.1 km/s gives a centre value within 60 ppm of the exact lattice value 8.000 km/s. V_s centre within 220 ppm of 4.500 km/s. Both within the canonical 30–300 ppm Radian Veil band.

P-MOHO-4 The V_p/V_s Ratio as a Tau-Lattice Fraction

The ratio $V_p/V_s = 16/9$ is a fundamental Tau-lattice fraction. It appears throughout FOT:

Domain	V_p/V_s Equivalent	Value
Seismic (Moho)	$2^3 / (3^2/2) = 16/9$	1.7778
Musical	Perfect fourth squared $(4/3)^2$	1.7778
Orbital (Mars/Venus periods)	$687.0/224.7 \sim (3/2)^2 - \dots$	3.056 (distinct)
H-bond angle ratio	$\pi/2 / (18/\pi^2) \sim \dots$	approx. 1.78

The recurrence of 16/9 across acoustic, harmonic, and molecular domains confirms that this fraction is a primary Tau-coupling constant, not a geophysical coincidence.

P-MOHO-5 Sidereal Year = Moho Year x 730/729

The FOT derivation of the sidereal year proceeds through the Moho orbital period — the characteristic oscillation time of the G0/G1 register boundary. The exact identity is:

$$T_{\text{sidereal}} = T_{\text{Moho}} \times 730/729 \quad T_{\text{Moho}} = (3600 / \pi^2) \times (3^6 + 1) / 3^6$$

[days] T_{sidereal} (FOT) = 365.25661 days T_{sidereal} (IAU) = 365.25636 days (0.692 ppm)

The correction factor $730/729 = (3^6 + 1)/3^6$. Here $3^6 = 729$ is the sixth power of the foundational prime 3, and $730 = 2 \times 5 \times 73$ — the numerator that introduces the primes 2, 5, and 73 into the year length. The 0.692 ppm agreement between the FOT derivation and

the IAU measured value is within the canonical Radian Veil band, confirming that Earth's orbital period is set by the Tau-lattice through the G0/G1 register boundary frequency.

P-MOHO-6 The $1/(5\pi)$ Equalisation Factor

At the Moho boundary, two distinct wave families meet: the orbital (circumferential) Tau-wave and the linear (radial) seismic wave. For the G0/G1 register to be stable, these two wave families must equalise at the boundary surface. The coupling constant that achieves this equalisation is:

$$\text{Coupling constant} = 1 / (5\pi) T_{\text{orbital}} / T_{\text{seismic}} = 5\pi \text{ at the Moho surface}$$

The factor $5\pi = 5 \times \pi = 15.70796\dots$ combines the fifth prime-lattice member (5) with the sphere projection constant (π). This is the only $\{2,3,5,\pi\}$ value that equates the orbital Tau-wave period with the radial seismic wave period at $R = 20,000/\pi$ km. The $1/(5\pi)$ coupling constant connects Earth's rotation rate, the Moho depth, and the seismic wave speed in a single exact lattice identity — a prediction unique to Force of Time and absent from all conventional geophysical models.

The $1/(5\pi)$ coupling is not derived from gravity, pressure, or composition. It is a pure geometric requirement of the Tau-field: the same 5π that appears in quantum mechanics ($h = 2 \times 5 \times \pi^2 \times \dots$) appears at the planetary register boundary. Scale invariance is not an approximation in FOT — it is the mechanism.

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