The Meaning of the Coefficient c

Definition:

The coefficient c emerges when we relate surface gravity (g) to the product of planetary density (ρ) and diameter (D). In its simplest form, the relationship can be written as:

$g \approx c \cdot \rho \cdot D$

where:

- g = surface gravity (m/s^2)

- ρ = mean density (kg/m^3)

- D = planetary diameter (m)

- c = balancing coefficient

Physical Meaning:

The term ρD represents the inward pressure of weight — the compactness of matter extended across the planetary scale. But this inward pressure is not fully realized as gravity at the surface, because atomic structures resist compression. Atoms spin and generate thermal expansion, pushing outward.

The coefficient c represents the balance point between these two competing effects:

- Inward pull of weight (density × diameter)

- Outward resistance from atomic spin and heat expansion

Thus, c is the conversion factor between "raw weight-pressure potential" and actual gravitational field strength.

Interpretation:

c can be thought of as a "density resistance coefficient":

- A measure of how much density-driven weight is resisted by atomic spin and heat

- Encodes the relationship between macroscopic planetary gravity and microscopic thermal behavior

This gives c a meaning similar to the gravitational constant G, but with a different interpretation. While G is a universal coupling constant of attraction, c is a universal resistance constant of matter.

Units:

From the equation $g \approx c \cdot \rho \cdot D$:

$c = g / (\rho D)$

Therefore, the units of c are:

$(m/s^2) / (kg/m^3 \cdot m) = m^3 / (kg \cdot s^2)$

These are the same as the units of the gravitational constant G, emphasizing that c plays an analogous regulating role.

Simplified Statement:

The coefficient c represents the resistance of matter to compression, balancing weight-pressure against atomic spin and thermal expansion. It determines how density and diameter scale into the gravitational field strength we observe at the surface.