Supplemented Newtonian Gravitational Equation

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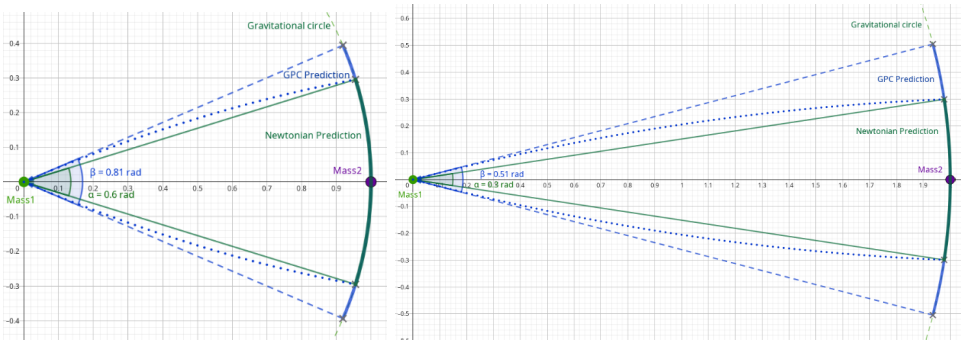
Abstract
Gravitational equation $F = G_N \frac{m_1 m_2}{r^2} + G_p \frac{m_1 m_2}{r}$, and new theory based on the effect of gravitational fields to each other.
The calculated attractive force F eliminates the need for dark matter.

Introduction

According to Newton's law of universal gravitation[1], the magnitude of the attractive force is evenly distributed around a point-like mass in the form of a sphere. But according to this theory, this is only true if we do not count on the effect of gravitational fields to each other. If the attractive forces are represented by vectors, then the path of vectors are curved by the gravitational fields in the direction of each other. And the effect of this increases with distance. In other words, the curvature of space-time has a different effect on the path of light than the path of gravity, because the path of light depends on time (gravitation) and always follows the fastest way.



(a) r = 1 (b) r = 2

Figure 1: The distance between straight and curved path on the gravitational circle increases the Newtonian gravitational force. The dot line of curved path follows Einstein's curvature of space-time $\frac{1}{r^2}$.

$$\frac{\beta}{\alpha} = \frac{F_N + F_p}{F_N}$$

$$F_p = G_p \frac{m_1 m_2 r}{r^2}$$

$$F = F_N + F_p$$

$$F = G_N \frac{m_1 m_2}{r^2} + G_p \frac{m_1 m_2}{r}$$

- F_N [N] is the Newtonian force;
- F_p [N] is the force of path curvature effect;
- F [N] is the force between the masses;
- m_1 [kg] is the first mass;
- m_2 [kg] is the second mass;
- r [m] is the distance between the centers of masses;
- $G_N = 6.67430 \times 10^{-11}$ $[N(\frac{m}{kg})^2]$ is the Newtonian gravitational constant[2, 3];
- $G_p = \frac{8\pi G_N}{c^4} \times 10^{11} \approx 2.07665 \times 10^{-31}$ $[N(\frac{m}{kg^2})]$ is the constant of gravitational path curvature effect. Value is calculated based on Einstein's gravitational constant[4] and the rotational velocity[5, 6] of an average disc-shaped galaxy;

The F_p and G_p value requires empirical and observable evidence. The current standard uncertainty of G_N is U = 0.00015×10^{-11} $[N(\frac{m}{kg})^2]$[3], so the value of F_p cannot be measured within $\frac{U}{G_p} \approx 0.75$[ly] by known methods. The calculated attractive force F eliminates the need for dark matter[7, 8].

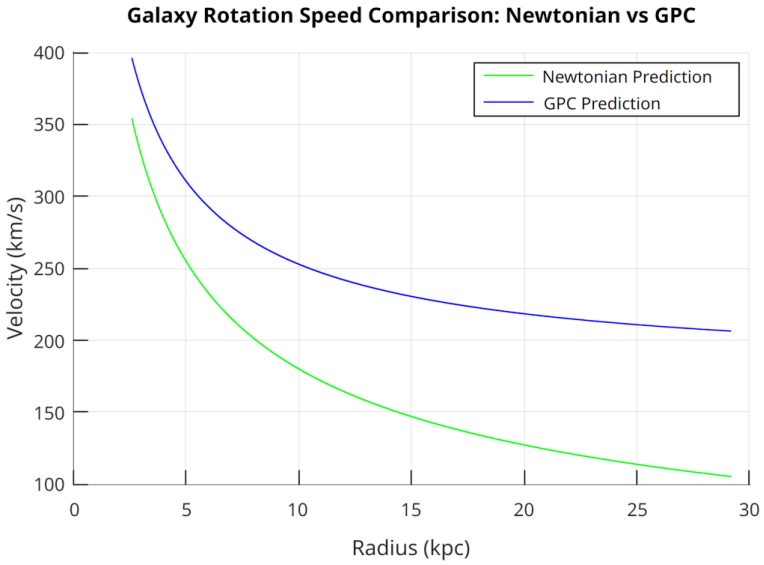


Figure 2: Simplified galaxy rotation speed comparison: Newtonian vs Gravitational Path Curvature. Mass = 1.5×10^{41} kg.

References

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