Gravitational Pressure waves in PPC law of Gravity and Equation of Gravitational Pressure waves

🪐 PPC LAW OF GRAVITY

(Pawan Upadhyay's Pressure–Curvature Law of Gravity)

Pressure Waves in the PPC Law of Gravity

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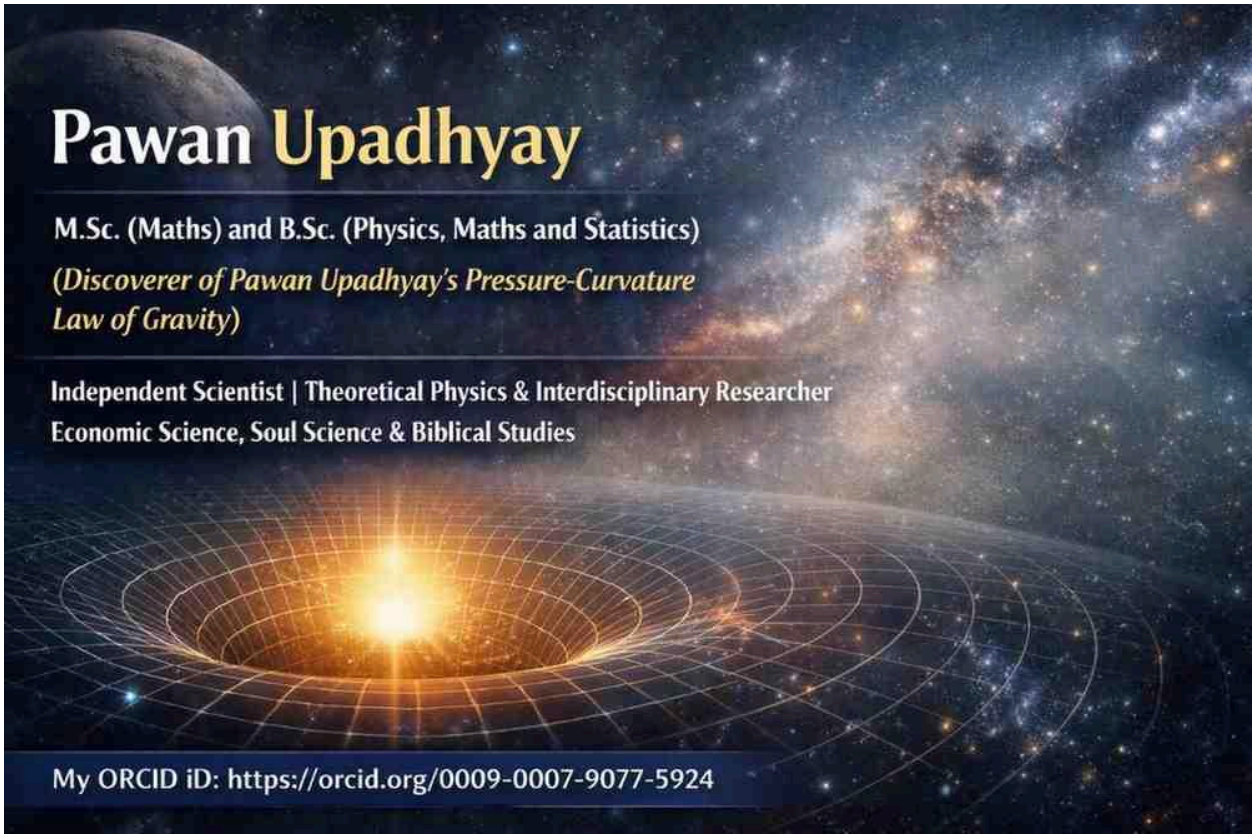
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1. Introduction

In the framework of the **Pressure–Curvature Law of Gravity (PPC Law)**, gravity is interpreted as a manifestation of **pressure-induced curvature** within spacetime.
Mass not only bends spacetime through its energy density but also applies a **pressure field** upon it.
When this pressure varies dynamically, **Pressure Waves** arise — oscillations that propagate through the universal pressure field at the speed of light.

These waves are the physical expression of what General Relativity describes as gravitational waves.
Thus, *Pressure Waves* form the **dynamic extension** of the PPC Law of Gravity.

My Symbol for Energy density is E_d and for gravitational pressure is P_g.
Where $P_g=\omega E_d$, if $\omega=1$ then $P_g=E_d$.

2. Theoretical Foundation

The PPC Law establishes that:

$$P_g = \rho c^2$$

The **pressure gradient** gives rise to a gravitational force:

$$F = \nabla P_g$$

In Einstein's formulation:

$$G_{\mu\nu} = \frac{8\pi G}{c^4} T_{\mu\nu}$$

$$T_{\mu\nu} = \left(\rho + \frac{p}{c^2}\right) u_\mu u_\nu + p g_{\mu\nu}$$

In the weak-field limit:

$$\nabla^2 \Phi = 4\pi G(\rho + 3p/c^2)$$

3. Linearized Gravitational Pressure Wave Equation

In weak-field approximation:

$$g_{\mu\nu} = \eta_{\mu\nu} + h_{\mu\nu}, \quad |h_{\mu\nu}| \ll 1$$

Define the trace-reversed perturbation:

$$\bar{h}_{\mu\nu} = h_{\mu\nu} - \tfrac{1}{2}\eta_{\mu\nu} h$$

Impose the harmonic (Lorenz) gauge condition:

$$\partial^{\mu} \bar{h}_{\mu\nu} = 0$$

In vacuum, Einstein's equations reduce to:

$$\boxed{\Box \bar{h}_{\mu\nu} = 0}$$

Where the d'Alembert operator is:

$$\Box = \frac{1}{c^2}\frac{\partial^2}{\partial t^2} - \nabla^2$$

Expanded form:

$$\boxed{\frac{\partial^2 \bar{h}_{\mu\nu}}{\partial t^2} = c^2 \nabla^2 \bar{h}_{\mu\nu}}$$

This is the gravitational wave equation.

In PPC interpretation:

Dynamic gravitational pressure
→ Dynamic curvature
→ Pressure–curvature wave propagation

Gravitational Pressure waves and Mechanical Pressure waves are two different waves.

Formation of Mechanical Pressure Waves :-

3. Formation of Pressure Waves

If the pressure or density field varies with time:

$$p = p(x,t), \quad \rho = \rho(x,t)$$

These are described by the classical wave equation:

$$\frac{\partial^2 \Phi}{\partial t^2} = c^2 \nabla^2 \Phi$$

4. Flow of PPC Law

Mass → Pressure → Force → Curvature → Pressure Waves in Spacetime

Figure 1 — Propagation of Pressure Waves according to the PPC Law
Pawan Upadhyay — Discoverer of the PPC Law of Gravity (2025)

5. Physical Interpretation

Pressure Waves are **vibrations of the spacetime pressure field** created by mass-energy variations.
They carry curvature energy through the universe and manifest as detectable gravitational waves.

Under this interpretation:

- Gravity arises from **pressure-induced curvature**.
- Gravitational waves are **pressure waves** in spacetime.
- The PPC Law unifies mass, pressure, and curvature in a single causal chain.

6. Summary

> “Gravitational waves are pressure waves in spacetime — vibrations of the universal pressure field created by mass.”
> — *Pawan Upadhyay, 2025*

7. References

1. Einstein, A. (1915). *The Field Equations of Gravitation. Sitzungsberichte der Preussischen Akademie der Wissenschaften.*

2. Abbott, B. P. *et al.* (LIGO Scientific Collaboration) (2016). *Observation of Gravitational Waves from a Binary Black Hole Merger. Physical Review Letters*, 116, 061102.

3. Upadhyay, P. (2025). *PPC Law of Gravity — Independent Discovery.* GitHub Repository: https://github.com/pawanupadhyay2025/PPC-law-of-gravity-

✔️ Paper Summary

This paper presents a new interpretation of gravitational waves as *Pressure Waves* — dynamic oscillations in spacetime's pressure field.
It extends Einstein's General Relativity by identifying pressure as the **physical mechanism** behind curvature formation, completing the causal sequence:
Mass → Pressure → Force → Curvature → Pressure Waves → Motion.