Pressure–Curvature Wave Binding and the Emergence of Separate Universes in Pawan Upadhyay's Pressure–Curvature Law of Gravity

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Abstract

Pawan Upadhyay's Pressure–Curvature Law of Gravity (PPC Law) interprets gravity as a physical phenomenon arising from pressure generated by mass–energy, with spacetime curvature emerging as its geometric response. In this paper, gravitational binding and cosmic separation are explained through the concept of pressure–curvature waves. Large astronomical bodies generate strong pressure–curvature waves that bind smaller bodies within a single universe. When these waves weaken over vast cosmic scales, pressure becomes extremely low, curvature approaches flatness, and large-scale binding fails. This process naturally leads to causal disconnection and the formation of separate universes. The Moon–Earth–Sun system is presented as a concrete example of low-curvature objects remaining bound due to external pressure–curvature waves. This framework provides a physically intuitive explanation for structure formation, gravitational binding, and multiverse emergence without invoking exotic fields or extra dimensions.

1. Introduction

Gravitational binding is traditionally described either as a force acting at a distance or as motion along curved spacetime geometry. While mathematically successful, such descriptions do not explicitly identify a physical carrier responsible for binding across space.

Pawan Upadhyay's Pressure–Curvature Law of Gravity (PPC Law) proposes that gravity arises from pressure generated by mass–energy, and that curvature is the geometric manifestation of this pressure. This paper extends the PPC framework by introducing pressure–curvature waves as the mechanism responsible for binding structures within a universe and explains how weakening of these waves leads to the formation of separate universes.

2. Fundamental Principle of the PPC Law

The PPC Law is expressed as:

$$P_g = \omega E_d$$

where

- P_g is gravitational pressure,
- E_d is energy density,
- ω is the equation-of-state parameter.

The core causal chain is:

$$\text{Mass–Energy} \rightarrow \text{Pressure} \rightarrow \text{Curvature} \rightarrow \text{Motion}$$

In this framework, curvature is a consequence of pressure, not an independent primary entity.

Pressure variations propagate through spacetime as curvature disturbances, here referred to as pressure–curvature waves.

3. Pressure–Curvature Waves

Pressure–curvature waves are dynamic manifestations of gravitational pressure gradients. Large concentrations of mass–energy generate strong pressure fields, and changes in these fields propagate outward through spacetime curvature.

Key properties of Pressure-Curvature waves :

- Generated by massive bodies (stars, planets, galaxies)
- Extend far beyond the source
- Provide long-range gravitational binding
- Govern the motion of smaller bodies embedded within them

4. Binding of Small Bodies in a Single Universe

Within a single universe:

- Large stars and massive planets generate strong pressure–curvature waves.
- These waves create a structured curvature environment.
- Smaller bodies remain gravitationally bound because they exist within this wave field.

Thus:

Gravitational binding of small planets and moons arises primarily from the pressure–curvature waves of larger bodies, rather than from their own intrinsic pressure or curvature.

This explains why even low-mass objects remain stable within planetary systems.

5. The Moon as a PPC Case Study

The Moon provides a clear illustration of pressure–curvature wave binding:

- The Moon has very low intrinsic gravitational pressure.
- Its local spacetime curvature is weak.
- By itself, the Moon cannot generate strong binding effects.

However:

- The Moon exists within the combined pressure–curvature wave fields of the Earth and the Sun.
- These external waves dominate the local curvature environment.

Therefore:

Despite having low pressure and low curvature, the Moon remains bound due to the pressure–curvature waves generated by the Earth and the Sun within the same universe.

6. Weakening of Pressure–Curvature Waves at Cosmic Scales

As distance increases across cosmic scales:

- Energy density decreases.
- Pressure gradients weaken.
- Pressure–curvature waves lose strength.
- Spacetime curvature becomes increasingly flat.

At sufficiently large scales, pressure–curvature waves can no longer maintain binding between distant regions.

7. Formation of Separate Universes

In the PPC framework, a separate universe forms when:

Pressure becomes extremely low.

Curvature approaches near-flatness.

Pressure–curvature waves fail to propagate effectively.

Large-scale gravitational binding is lost.

This leads to:

Causal disconnection of spacetime regions, resulting in independent pressure–curvature domains, each constituting a separate universe.

The process is gradual and driven by pressure dilution rather than sudden creation events.

8. Internal Structure of a Separate Universe

Even after separation:

Each universe contains high-pressure regions (stars, galaxies, compact objects).

Each universe contains low-pressure regions (voids).

Pressure gradients continue to generate local curvature.

The PPC Law remains valid within each universe independently.

Thus, separation localizes gravity rather than eliminating it.

9. Implications for Cosmology and Multiverse Physics

This framework implies:

- A physical mechanism for cosmic separation
- No need for exotic dimensions or speculative fields
- A unified explanation for binding, expansion, and multiverse emergence
- A natural hierarchy from planetary systems to universes

10. Clarification on the Force of Pressure–Curvature Waves

In Pawan Upadhyay's Pressure–Curvature Law of Gravity (PPC Law), gravitational interaction is mediated by pressure–curvature waves generated by mass–energy. The term force of pressure–curvature waves refers to the effective force experienced by matter due to gradients in gravitational pressure encoded in spacetime curvature.

Within this framework, pressure–curvature waves transmit gravitational influence through space, and the resulting pressure gradients produce forces that govern motion and binding. Strong pressure–curvature waves generated by massive bodies such as stars and planets create significant pressure gradients, leading to binding forces that hold smaller bodies—such as planets and moons—within a single universe. Conversely, when pressure–curvature waves weaken over vast cosmic scales, pressure gradients diminish, the associated forces approach zero, spacetime curvature becomes nearly flat, and large-scale gravitational binding fails. This loss of binding force leads to causal disconnection and the emergence of separate universes.

Thus, in the PPC framework, gravitational binding and cosmic separation are understood as direct consequences of the presence or absence of forces transmitted by pressure–curvature waves.

In the PPC Law, gravitational binding arises from forces produced by pressure gradients carried by pressure–curvature waves, while the weakening of these forces at cosmic scales leads to flat curvature and universe separation.

11. Limitations and Future Work

This work is conceptual in nature. Future developments should:

- Quantify pressure–curvature wave strength mathematically
- Define critical thresholds for cosmic separation
- Explore observational consequences
- Compare predictions with cosmological data

12. Conclusion

In Pawan Upadhyay's Pressure–Curvature Law of Gravity, gravitational binding is mediated by pressure–curvature waves generated by mass–energy. Large bodies bind smaller ones within a universe through these waves, while weakening of pressure–curvature waves at cosmic scales

leads to flat curvature, loss of binding, and the emergence of separate universes. The Moon–Earth–Sun system illustrates how low-curvature objects remain bound within stronger external pressure–curvature environments. This framework provides a physically intuitive and unified explanation of structure formation and multiverse emergence grounded in gravitational pressure.

Final PPC Statement

Strong pressure–curvature waves bind structures within a universe, while their weakening at cosmic scales leads naturally to flat curvature, causal disconnection, and the formation of separate universes.

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