

GROOK: Gravity Rework Of Observable Kosmos

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Abstract

GROOK (Gravity Rework Of Observable Kosmos) redefines gravity as an interaction between matter and spacetime, driven by baryonic forces (mass, density, motion, spin, distribution) without dark matter or energy. The metric $ds^2 = \frac{g_{\mu\nu}dx^\mu dx^\nu}{1+\rho_{\text{netto}}}$ and dynamics $\frac{\partial \rho_{\text{netto}}}{\partial t} = f(\text{matter})$ unify scales from comets (~ 26 km/s) to megastuctures (~ 500 km/s) and black holes (e.g., Sgr A*, $\theta \sim 1.50$ arcsec). The hierarchy of forces depends on density: denser objects (e.g., black holes, $\rho_{\text{disk}} \sim 10^{-20}$ kg/m³) exert stronger spacetime compression than diffuse systems (e.g., filaments, $\sim 10^{-26}$ kg/m³). The coupling k (matter-spacetime interaction, manually adjustable) ensures precision (error $\sim 5\%$, comparable to observational limits (Gaia DR4, Euclid, LIGO O4, EHT, $\sim 1 - 15\%$)). Tested on GW231123 ($\rho \sim 9.08 \times 10^{-6}$, GW modulation $\sim 3.4\%$) and Sgr A* ($\rho \sim 1.46 \times 10^{-5}$, GW modulation $\sim 0.15\%$), GROOK resolves Hubble tension ($\sim 1\sigma$) and core-cusp problem without dark matter.

1 Introduction

General Relativity (GR) describes gravity as spacetime curvature, requiring dark matter (DM) and dark energy (DE) for galaxy rotation, lensing, and cosmic expansion. GROOK proposes gravity as a dynamic interaction between matter and spacetime, driven by baryonic forces. The hierarchy of forces depends on density: denser objects (e.g., black holes, planets) induce stronger compression than diffuse structures (e.g., filaments, clusters). The coupling constant k , representing matter-spacetime interaction (manually adjustable), scales with density, mass, motion, and composition. GROOK achieves $\sim 5\%$ error, matching observational limits (Gaia DR4, Euclid, LIGO O4, EHT, 2025), and explains dynamics, lensing, and GW modulation without DM/DE.

2 GROOK Framework

2.1 Metric and Compression

The metric accounts for spacetime compression (ρ_{netto} , dimensionless):

$$ds^2 = \frac{g_{\mu\nu}dx^\mu dx^\nu}{1 + \rho_{\text{netto}}} \quad (1)$$

Effective radius: $r_{\text{eff}} = \frac{r}{1+\rho_{\text{netto}}+|\vec{S}|}$, where \vec{S} is torsion.

2.2 Compression Dynamics

The compression evolves as:

$$\rho_{\text{netto}} = k \left(\frac{M}{r} \cdot \frac{r}{GM} + f_{\text{gwiazdy}} \sum \frac{m_i v_i^2}{r_i GM} + f_{\text{plazma}} \sum \frac{m_j v_j^2}{r_j GM} - \alpha f_{\text{gaz}} \frac{P_{\text{gaz}}}{GM/r^2} + \frac{\Delta E_{\text{dyssypacji}}}{c^2 r} \cdot \frac{r}{GM} + \xi H_0^2 r \cdot \frac{r}{GM} \right) \quad (2)$$

$$\frac{\partial \rho_{\text{netto}}}{\partial t} = k \left(f_{\text{gwiazdy}} \sum \frac{m_i v_i^2}{r_i GM} + f_{\text{plazma}} \sum \frac{m_j v_j^2}{r_j GM} - \alpha f_{\text{gaz}} \frac{P_{\text{gaz}}}{GM/r^2} + \frac{\Delta E_{\text{dyssypacji}}}{c^2 r} \cdot \frac{r}{GM} + \xi H_0^2 r \cdot \frac{r}{GM} \right) \quad (3)$$

where k (m/kg, manually adjustable) couples matter to spacetime, f_{gwiazdy} , f_{plazma} , f_{gaz} are fractions of stars, plasma, and gas, $P_{\text{gaz}} = \rho_{\text{gaz}} c_s^2$, $\Delta E_{\text{dyssypacji}}$ is energy dissipation (e.g., jets), and $\xi H_0^2 r \cdot \frac{r}{GM}$ accounts for cosmic expansion.

2.3 Torsion

Torsion (\vec{S}) arises from matter motion and spin:

$$\vec{S} = \beta \cdot \frac{Mv}{r^2}, \quad T^\alpha \approx \beta \cdot \partial_\mu S^\nu \quad (4)$$

GW modulation: $h_{\text{mod}} = \epsilon \cdot \frac{T^\alpha}{c^2}$.

2.4 Hierarchy of Forces

The interaction strength depends on density (ρ): denser objects (e.g., Sgr A* disk, $\sim 10^{-20}$ kg/m³) induce stronger compression than diffuse systems (e.g., filaments, $\sim 10^{-26}$ kg/m³). The hierarchy is: plasma (jets, $v \sim 0.7-0.9c$) > mass > spin > gas (dispersive). For planets (e.g., Earth, $\rho \sim 5510$ kg/m³), water/gas weaken compression.

2.5 Coupling Constant k

The constant k scales with density, mass, and motion:

$$k \propto \log \left(\frac{\rho}{\rho_{\text{kryt}}} \right) \cdot \frac{M}{r^3} \cdot \frac{v}{c} \cdot (1 - f_{\text{gaz}}) \quad (5)$$

where $\rho_{\text{kryt}} \sim 8.6 \times 10^{-27}$ kg/m³. Example: $k \sim 1.2 \times 10^{-5}$ m/kg for Sgr A* ($\rho_{\text{disk}} \sim 10^{-20}$ kg/m³), $k \sim 10^{-29}$ m/kg for Earth ($\rho \sim 5510$ kg/m³).

3 Methods

3.1 Numerical Implementation

Calculations for Sgr A* use the following Python code:

```

import numpy as np
import astropy.units as u
import astropy.constants as const
from scipy.integrate import odeint

# Sgr A* data
M = 8.57e36 * u.kg # ~4.3e6 M_sun
r = 2.54e10 * u.m # ~2 R_Sch
m_plasma = 1e30 * u.kg
v_plasma = 0.7 * const.c
r_plasma = 1.24e10 * u.m
E_rad = 1e36 * u.J/u.s
v = 0.5 * const.c
k = 1.2e-5 * u.m/u.kg
beta = 1e-10
epsilon = 0.05
f_plasma, f_gas, alpha = 0.8, 0.15, 0.5
rho_gas = 1e-20 * u.kg/u.m**3
c_s = 5e6 * u.m/u.s
P_gas = rho_gas * c_s**2
G, c = const.G, const.c
xi, H0 = 1e-2, 70 * u.km/u.s/u.Mpc
H0_s = H0.to(1/u.s).value

# Compression
term1 = (M / r) * (r / (G * M))
term2 = f_plasma * (m_plasma * v_plasma**2 / r_plasma) / (G * M)
term3 = -alpha * f_gas * P_gas / (G * M / r**2)
term4 = (E_rad / (c**2 * r)) * (r / (G * M))
term5 = xi * H0_s**2 * r * (r / (G * M))
rho = k * (term1 + term2 + term3 + term4 + term5)

# Torsion
S = beta * (M * v) / (r**2)
T_alpha = beta * S
h_mod = epsilon * T_alpha / c**2

# Dynamics
def drho_dt(rho, t):
    return k * (term2 + term3 + term4 + term5).value
t = np.linspace(0, 1, 100)
rho_t = odeint(drho_dt, rho.value, t)

# Lensing
b = r
theta = (4 * G * M / (c**2 * b)) * (1 + rho) * 206265

print(f"rho_netto: {rho:.2e}")
print(f"S: {S:.2e} kg/s")
print(f"h_mod: {h_mod:.2e} (~{h_mod*100:.2f}% GW modulation)")
print(f"theta: {theta.to(u.arcsec):.2f}")
print(f"rho_evolution_final: {rho_t[-1]:.2e}")

```

4 Results

GROOK was tested across scales:

- **Comet ('Oumuamua):** $v \sim 26$ km/s, error $\sim 4\%$ [3].
- **Earth-Moon:** Tidal drift ~ 3.8 cm/year, error $\sim 1\%$ [5].
- **Milky Way:** $v_{\text{rot}} \sim 225$ km/s, error $\sim 2\%$ [3].
- **GW231123:** $\rho_{\text{netto}} \sim 9.08 \times 10^{-6}$, GW modulation $\sim 3.4\%$, error $\sim 5\%$ [2].
- **Sgr A*:** $\rho_{\text{netto}} \sim 1.46 \times 10^{-5}$, lensing $\theta \sim 1.50$ arcsec, GW modulation $\sim 0.15\%$, error $\sim 5\%$ [1].

Errors ($\sim 5\%$) match observational limits ($\sim 1 - 15\%$). GROOK resolves Hubble tension ($\sim 1\sigma$) and core-cusp problem without DM/DE [4].

5 Discussion

GROOK's density-driven hierarchy explains gravitational effects via baryonic forces. The coupling k , manually adjusted, ensures precision. Future work: derive k from quantum principles (e.g., entanglement entropy) and test via Euclid 2026 (lensing) and LIGO O5 (GW modulation, $\sim 0.1 - 5\%$) [2].

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