Irrefutable proof of the non-existence of a gravitational singularity at the centre of a black hole

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Abstract

Astronomical observations confirm that gravitational force decreases with the square of the distance. If the gravitational force in the centre of Sagittarius A* were close to infinity and would decrease with the square of the distance, our Milky Way could not exist as we observe it. This fact is irrefutable proof that there is no gravitational singularity in the centre of Sagittarius A* and in general, there is no gravitational singularity in the centre of a black hole.

Keywords: gravity, black holes, gravitational singularity.

1. Introduction

On the surface of a given stellar object, we measure gravitational force by the gravitational acceleration a.

$$a = \frac{mG}{r^2} \qquad (1)$$

Above the stellar object, as distance r increases a diminishes accordingly to Eq. (1). Going below the surface of the stellar object, as distance r diminishes mass m diminishes in accordance with the Newton shell theorem and gravitational acceleration a diminishes accordingly. Penrose's proposal of gravitational singularity in the centre of a black hole suggests that inside the black hole Newton's theorem is not valid. This has never been proven by astronomical observations. In Penrose's model gravity increases with decreasing r and is infinite in the centre of a black hole [1].

Let us imagine that gravitational force is infinite in the centre of Sagittarius A* and is decreasing with the square of the distance. If this were the case the gravity of Sagittarius A* would act on the stars in the Milky Way with enormous strength and the Milky Way would be totally different than we observe it to be. This is irrefutable proof that Penrose's idea of infinite gravity inside black holes is incorrect. Also, from a mathematical point ($\infty - X = \infty$), Penrose's idea seems wrong, infinite gravity minus Δ gravity is still infinite gravity: $Fg_{\infty} - \Delta Fg = Fg_{\infty}$. If only one point of space in the observable universe would have infinite gravity, it would mean that the entire observable universal space would have infinite gravity.

2. Gravity inside the event horizon

Black holes obey Newton's law of gravity. Going toward the centre of a black hole gravitational force decreases according to the Newton shell theorem. Gravitational acceleration a at given point T a distance r above the centre of the black hole can be calculated as follows:

$$a = \frac{m_1 G}{r^2} \qquad (2)$$

where m_1 is the mass of the part of the black hole that is below the point T and therefore within distance r from the centre. In the centre of the black hole, gravity is zero as it is for all stellar objects [2].

Penrose's model does not tell us how gravity decreases with distance from the centre of the black hole. The rate of decrease in gravity should be much higher than by the square of the distance in order to reach the correct gravitational acceleration a on the event horizon, according to Eq. (1). This problem does not seem solvable, suggesting that the geometrisation of gravity inside stellar objects has led to the development of inaccurate models.

3. Curvature of space can be replaced by the variable energy density of space

Measurements carried out by NASA in 2014 show that the space of the universe has a Euclidean shape (NASA https://map.gsfc.nasa.gov/universe/uni_shape.html). This discovery requires the development of gravity in Euclidean space. Gravitational acceleration a at the given point T in Euclidean space is the actual value of the strength of gravity. Gravitational acceleration can be seen as the gravitational vector, so we can write $a = \vec{g}$ [3]. This model works perfectly at every given point of universal space and defines $\vec{g}$ in terms of the variable energy density of space. In intergalactic space energy density of space is constant so $\vec{g}$ tends to zero. At a given distance R from the centre of a given stellar object (R ≥ r), where r is the radius of the stellar object with a mass m, we calculate the gravity vector $\vec{g}$ as follows:

$$\vec{g} = \frac{(\rho_{PE} - \rho_{cE}) V G}{R^2 c^2} \qquad (3),$$

where ρ_{PE} is the Planck energy density of space for the intergalactic space, ρ_{cE} is the energy density of space in the centre of the stellar object, V is the volume of the stellar object, r is the radius of the stellar object, and G is the gravitational constant [3].

Another weak point of the gravitational singularity model is that it cannot explain the source of the jets. The Schwarzschild radius r_s is the radius at which a stellar object of a given mass becomes unstable and starts eating itself because the energy density of space in the centre of the black hole become so low that atoms become unstable and fall apart into elementary particles that form stellar and galactic jets [2,3,4,5]. This process is wrongly called "gravitational collapse". A black hole is transforming its own matter back into elementary particles not because of infinite gravity in the centre but because of the extremely low energy density of space.

Infinite curvature and gravitational singularity are in contradiction with the extension of the mass-energy equivalence principle on the superfluid quantum space, where a given black hole diminishes the energy density of space in its centre exactly for the amount of its energy [2]:

$$E = mc^2 = (\rho_{PE} - \rho_{cE})V \qquad (4).$$

The mass of every black hole is finite and, therefore, also the gravity at its surface is finite and decreases toward the centre where gravity is zero. The idea that a stellar object with finite mass could produce infinite gravity force is flawed.

In principle, only a black hole with infinite mass could produce the infinite gravitational acceleration and consequently infinite gravity force on its surface:

$$a_\infty = \frac{m_\infty G}{r^2} \qquad (5).$$

In physics, gravity is directly defined by the amount of mass of a given stellar object, not by the curvature of space. The curvature of space is only a mathematical description that describes gravity. A mathematical description cannot be a cause of infinite gravity. The idea that gravity is not a force but rather the effect of space curvature is false. Gravity is a force that has its origin in the variable energy density of space. An area of space where the energy density is higher is pushing towards the area of space where the energy density of space is lower. Gravity force is embedded in the variable energy density of space [3]. Imagine a point in space one meter above Earth's surface. Gravity force is there, but if no object is there, it will not act. Once you place a physical object at a point, gravity acts on the area of the lower energy density of space caused by the object and pushes it towards the Earth's centre. An object that is inside the area of the lower energy density of space also moves.

The curvature of space is a mathematical model, and the variable energy density of space is a physical model. In both models, mass is not directly related to gravity:

mass → curvature of space → gravity
mass → variable energy density of space → gravity.

The variable energy density of space is superior in the way that explains the physical origin of gravity force and is correct about gravity inside the Schwarzschild radius, where the curvature of space has given wrong assumptions.

4. Conclusions

Geometrisation of gravity has led to the misunderstanding of gravity inside black holes. Newton's shell theorem is applicable inside black holes as well as in the rest of space. The hypothesis of a gravitational singularity in a centre of a black hole is an error, there is no single astronomical observation that would prove its existence.

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