

THE NEW UNKNOWN FIELD CAUSED BY VARYING IN TIME GRAVITATIONAL FIELD

H.F. ABBASOV

“OilGasScientificResearchProject” Institute, SOCAR  
 AZ1012, H.Zardabi 88a, Baku, Azerbaijan  
[abbasovhakim@gmail.com](mailto:abbasovhakim@gmail.com)

By using an analogy between the gravitational field and electric field (Coulomb’s law and Newton’s law of gravity), it has been proposed that the change of gravitational field over time should lead to the emergence of a new vortex field similar vortex magnetic field due to the Maxwell's bias current. The gravitational field and the new vortex field create one another and spread in space, always remaining perpendicular to one another and to the spreading direction, similarly to the electric and magnetic fields in electromagnetic wave. The occurrence of black holes, dark energy and dark matter can be explained by existence of new vortex field.

**Key words:** new vortex field, gravitational field, electric field, magnetic field.

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INTRODUCTION

According to the Gauss's law [1] the flux of the gravitational field, created by a single particle of mass  $m$  through the closed surface equals to:

$$\int \vec{g} d\vec{S} = 4\pi Gm \tag{1}$$

where  $\vec{g}$  is the gravitational field,  $d\vec{S}$  is the surface element,  $G$  is the gravitational constant. Formula (1) can be rewritten in differential form by using Gauss's theorem as,

$$\int \vec{g} d\vec{S} = \int \text{div} \vec{g} dV = 4\pi G \int \rho dV$$

or

$$\text{div} \vec{g} = 4\pi G\rho \tag{2}$$

where  $\rho$  is the density of the particle of mass  $m$  and of volume  $V$ .

BASIC EQUATIONS

By using an analogy between the gravitational field and electric field (Coulomb’s law and Newton’s law of gravity), we can conclude that the change of  $\vec{g}$  over time should lead to the emergence of a new vortex field  $\vec{X}$  (similar Maxwell's equation for bias current [2, 3]):

$$\int X_l dl = -\frac{d}{dt} \int \vec{g} d\vec{S} = -4\pi G \frac{dm}{dt}$$

$$= -4\pi G V \frac{d\rho}{dt} - 4\pi G\rho \frac{dV}{dt} \tag{3}$$

or by using the Stokes’s theorem we obtain,

$$\text{rot} \vec{X} = -\frac{\partial \vec{g}}{\partial t} \tag{4}$$

Besides, the change of  $\vec{X}$  over time should lead to the emergence of a new vortex gravitational field  $\vec{g}$  (similarly, Faraday's law of induction [4]):

$$\int g_l dl = -\frac{1}{v^2} \frac{d}{dt} \int \vec{X} d\vec{S} \tag{5}$$

where  $v$  is some parameter.

By using the Stokes’ theorem formula (5) can be rewritten in differential form as,

$$\text{rot} \vec{g} = -\frac{1}{v^2} \frac{\partial \vec{X}}{\partial t} \tag{6}$$

Producing operation  $\text{rot}$  in both parts of equation (6) and substituting the expression of  $\text{rot} \vec{X}$  from equation (4) we obtain:

$$\text{rot} \text{rot} \vec{g} = -\frac{1}{v^2} \frac{\partial}{\partial t} \text{rot} \vec{X} \tag{7}$$

or

$$\text{rot} \text{rot} \vec{g} = -\frac{1}{v^2} \frac{\partial^2 \vec{g}}{\partial t^2} \tag{8}$$

It is the wave equation for gravitational field, that spreads in space with the speed  $v$ . In case  $\vec{g}(0,0,g_z)$  and  $g_z(x)$  after some simplifications we obtain

$$\frac{\partial^2 g_z}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 g_z}{\partial t^2} \tag{9}$$

that we can solve as,

$$g_z = g_{z0} e^{i(\omega t - kx)} \tag{10}$$

Actually, by substituting this function to the (9) we obtain the wave vector:

$$k = \frac{\omega}{v} = \frac{2\pi\nu}{v} = \frac{2\pi}{\lambda} \tag{11}$$

Analogically, producing operation  $\text{rot}$  in both parts of equation (4) and substituting the expression of  $\text{rot} \vec{g}$  from equation (6) we obtain:

$$\text{rotrot}\vec{X} = -\frac{1}{v^2} \frac{\partial}{\partial t} \text{rot}\vec{g} \quad (12)$$

or

$$\text{rotrot}\vec{X} = -\frac{1}{v^2} \frac{\partial^2 \vec{X}}{\partial t^2} \quad (13)$$

It is the wave equation for vortex field  $\vec{X}$ , that also spreads in space with the speed  $v$ . In case  $\vec{X}(0, X_y, 0)$  and  $X_y(x)$  we obtain

$$\frac{\partial^2 X_y}{\partial x^2} = \frac{1}{v^2} \frac{\partial^2 X_y}{\partial t^2} \quad (14)$$

that we can solve as,

$$X_y = X_{y0} e^{i(\omega t - kx)} \quad (15)$$

## CONCLUSION

As seen from expressions (10) and (15) these two fields: the gravitational field  $\vec{g}$  and the vortex field  $\vec{X}$  create one other and spread in space by the velocity  $v$ , always remaining perpendicular to one another and to the spreading direction, similarly to the electric and magnetic fields in electromagnetic wave.

On the base of this model it is possible to explain the existence of black holes, dark energy and dark matter. Really, the destruction and a birth of stars always happen in space that is accompanied in changing of mass of these stars, in other words in changing of their gravitational fields. It was found that the universe is expanding (Hubble's law) at an increasing rate [5]. This means that in the considered constant volume of space the density of the universe decreases, what leads to the emergence of a new vortex field according to the formula (4). This field possesses a certain energy that can be evaluated approximately by Einstein's formula  $\Delta W = c^2 \Delta m$  [6].

The existence of this new field could be tested by the following simple experiment (Fig.1). Let us consider the interaction between two pellets: small of mass  $m$  and big of mass  $M(t)$ . The big pellet was filled by the water and this water begins to flow through the valve during a certain time. In equilibrium state we can write:

$$T \sin \alpha = G \frac{mM}{r^2} \quad (16)$$

$$T \cos \alpha = mg \quad (17)$$

As seen from figure 1 the mass of big pellet in the given time  $t$  can be written as:

$$M = M_0 - \rho \pi R^2 y \quad (18)$$

and  $r = a - ltg\alpha$ . By dividing equations (16) to the equation (17) we can found:

$$tg\alpha = \frac{GM}{g(a-ltg\alpha)^2} \quad (19)$$

or

$$g(a-ltg\alpha)^2 tg\alpha = G(M_0 - \rho \pi R^2 y) \quad (20)$$

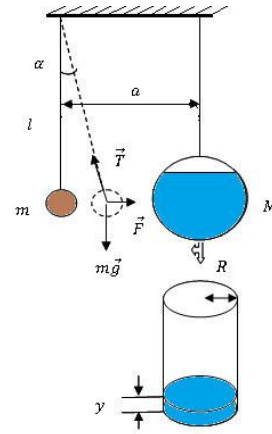


Fig. 1.

By measuring  $\alpha(t)$  and  $y(t)$  it is possible to test the validity of the equation (20). The deviation from expression (20) will mean the existence of a new vortex field.

In fact for exact estimation we must take into account a little shift of mass center of big pellet, that is negligible in the case, when  $M \gg m$  and if the test is carried out in a short period of time.

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