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The Universe Collapses or Remains Inert If G Is Not Constant

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Abstract : *The purpose of this article is to show that the universe either remains inert or collapses if G, the "gravitational constant", is not constant in space. And even if G is constant in space but not a constant in time this can have an effect on the climate change of the earth and the universe can collapse.*
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I. Introduction

The **gravitational constant** (also known as the "universal gravitational constant", the "Newtonian constant of gravitation", or the "Cavendish gravitational constant"[5]), denoted by the letter *G*, is an empirical physical constant involved in the calculation of gravitational effects in Sir Isaac Newton's law of universal gravitation and in Albert Einstein's general theory of relativity.

The purpose of this article is to show that universe either remains inert or collapses if G, the "gravitational constant", is not constant in space. And even if G is constant in space but not a constant in time, the universe can collapse.

The law of universal gravitation envisioned by Isaac Newton in 1687 is based on the force of gravitation which is “proportional to the product of the masses m_1 and m_2 of the two interacting bodies, and varies as the inverse square of the distance r between the two bodies, and it’s an attractive force.” the force is given by :

$$F_G = G\frac{m_1 m_2}{r^2} \tag{1}$$

Where, m_1 is the first mass, m_2 the second mass, r is the distance between the two masses, the gravitational constant $G = 6.67408\times 10^{-11} \quad m^3.kg^{-1}(N.m^2/kg^2)$ [5]

The Centripetal Force F_C , is a well tested and known force, it's a force that makes a body follow a curved path, its direction is always orthogonal to the motion of the body and towards the fixed point of the instantaneous center of curvature of the path [6].

$$F_C = \frac{m_p v_0^2}{r} \tag{2}$$

Where, m_p is mass of the planet, v_0 is the orbital velocity of the planet and r is the radial distance to the center of the sun.

In the article [1] Mahmoud E. yousif asked what is the mechanism that can produce an attractive force from merely the existence of two bodies in space ? Comparing both the gravitational and centripetal forces as a percentage as given in NASA data [2], he realized that both forces are not equal by 100%, and it varies by up to ±3% for some planets; hence he supposed both to be equal without giving proof, so for Mahmoud E. yousif [1]:

$$F_G = G\frac{m_p m_s}{r^2} = F_C = \frac{m_p v_0^2}{r} \quad (3)$$

This is **wrong** in general but We will see that is true in the case where the planet m_p is in a **stationary** orbit. So, from Eq (3), the Gravitation constant (G) is derived :

$$G = \frac{r v_o^2}{m_s} \quad (4)$$

And :

$$F_G = \frac{m_p v_0^2}{r} \quad (5)$$

But Mahmoud E. yousif [1] do not admit that G, the "constant of gravitation", is constant, he even doubt of the existence of the gravity and considers that it is only a simple representation of F_C . And as a result, we have these two anomalies :

1- First anomalie :

From the equation (5) if $v_0 = 0$, then $F_G = 0$. Which is strange. Because when the speed of the planet is 0, the planet is not attracted by the sun (The **universe remains inert) !!!.**

2- Second anomalie :

From the equation (5) if the speed v_o of the planet is big the planet will be absorbed by the sun. (**The universe will collapses).**

The purpose of this article is to show that the cause of this anomaly is the fact that G was not considered constant **in space**.

If Mahmoud E. yousif [1] doubts on the existence of the **gravitation force**, and that other consider that the **coriolis force** is only a virtual force, here it is shown that these forces exist with the **Centripetal Force** [6] and that they are three different forces.

II. The proof that universe either remains inert or collapses if G, the "gravitational constant", is not constant in space.

Lemma 1 : Let $F = -F_G - F_C + F_{co}$ where F_{co} is the **Coriolis force.** F is the resultant of the forces acting on m_p and :

$$F = -G\frac{m_p m_s}{r^2} - \frac{m_p v_0^2}{r} + 2\frac{m_p v_0^2}{r} \quad (6)$$

So :

$$F = -G\frac{m_p m_s}{r^2} + \frac{m_p v_0^2}{r} \quad (7)$$

Corollary 1 :

i- $F = 0 \Leftrightarrow v_0 = \sqrt{\frac{G m_s}{r}}$. In other words, in this case, a planet m_p is in a **stationary orbit** .

ii- $F \geq 0 \Leftrightarrow v_0 \geq \sqrt{\frac{Gm_s}{r}}$. In this case, the planet will escape to the attraction of the planet m_s **and we avoid the second anomaly.**

iii- $F \leq 0 \Leftrightarrow v_0 \leq \sqrt{\frac{Gm_s}{r}}$. In this case, the planet m_p will be absorbed by the planet m_s .

From the equations (2) , (5) and (7)we deduce :

Corollary 2 :

$F_G = F_C \Leftrightarrow F = 0$. In other words, $F_G = F_C$ if and only if the planet m_p is in a stationary orbit.

From the equation (4) we deduce :

Lemma 2 : $G = constant \neq 0 \Leftrightarrow r\, v_0^2 = constant \neq 0$.

And from the equation (5) we deduce :

Lemma 3 : $G = constant \neq 0 \Leftrightarrow F_G = \frac{m_p K}{r^2} (K\, constant \neq 0)$

Lemma 4 : If $G = constant \neq 0$, then $F_G = 0 \Leftrightarrow r = \infty$ Which is completely normal, **and we avoid the first anomaly.**

Corollary 3 :
i-By fixing $G = constant \neq 0$, two planets will attract each other unless the distance between them is infinite and **we avoid the first anomaly.**

ii- By fixing $G = constant \neq 0$, for every couple m_s and m_p of planets, m_p animated with a speed v_0 there exists a distance R such that m_p remains in a stationary orbit around m_s . And beyond R, the planet m_p escapes the attraction. If not, m_p will be swallowed by m_s .

iii- W**e avoid the second anomaly** as soon as $v_0 \geq \sqrt{\frac{Gm_s}{r}}$

iv- If $G = constant \neq 0$, both anomalies are avoided. And this corresponds to what happens in our universe.

vi- We therefore conclude that G is constant in space : If G = G (t, x) where t is the time
and x is a point in space, then G only depends on time.

III. Theoretical proof that G is constant in space:

In my articles [4] and [5] G is constant: The idea was simple: as I considered that the gravitational force is due to a force f which comes from outside, then in a sphere of radius R around the particle of mass m, we must have $p(x) 4 \pi R^2 = f$, where $p(x)$ is the pressure at point x of the sphere. This shows that the gravitational force is proportional to m/R^2 and explains why the gravitational force F between two bodies m and M is of the form: $F = GmM/R^2$ where G is a scalar which depends on the place where the force is exerted (the "vacuum" in our case) . Which shows that the law of gravitation of Newton is **not wrong** contrary to what was said in [1] by Mahmoud E. Yousif.

IV. Dependence of the gravitational constant with time and the climate change, resemblance to the law of the perfect gases, and the risk of the collapse of the universe.

As in **III**, f may depend on time. In writing $p(x,t)4\pi r^2 = mf(t)$, we have $p(x,t) = \frac{mf(t)}{4\pi r^2}$. And we deduce that in a small volume V around the point x, we have: $p(x,t)V = nf(t)$. where n is the quantity of matter in V.

If in a small interval of time we have: $f(t) = Rt$, then we deduce that we have : $p(x,t)V = nRt$: which resembles to the equation of perfect gases $PV = nRT$.

As $p(x,t) = G\frac{mM}{4\pi r^2}$, then we deduce that $G(x,t) = \frac{mg(t)}{4\pi r^2}$, and that in a small volume V around the point x, we have: $G(x,t)V = ng(t)$. where n is the quantity of matter in V. G can therefore depend on t.

If in a small interval of time we have: $g(t) = St$, then we deduce that we have : $G(x,t)V = nSt$: which resembles to the equation of perfect gases $PV = nST$

In this case G increases with t, and the universe will eventually collapse. Similarly, we can see that at the moment $t = 0$, $G(x,0) = 0$. In other words, the universe at time $t = 0$ was inert, and can collapse in the future when t or G becomes big enough !

From the equation (4) we deduce that if $G = \frac{rv_o^2}{m_s}$ changes with time t, the product rv_0^2 changes and consequently the earth-sun distance changes or it is the velocity speed v_0 that changes. which will have an effect on **climate change** of the earth.

V. Conclusion :

So we have proved theoretically and experimentally that the gravitational constant G is indeed constant in space because the **universe either remains inert or collapses if G is not constant in space. We have also seen that even if G is constant in space but not a constant in time this can have an effect on the climate change of the earth and that the universe can collapse.** Fortunately the G is at least **almost** constant in our universe and without a doubt, for this reason, the All-powerful said about gravitation : ***"Verily God holds the heavens and the earth in position lest they deviate; and if they deviated there will be none to hold them in place, apart from Him He is sagacious and forgiving. Quran, Fatir (41)".***

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