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Gravity Model of Black Holes and Solar Planets

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Author's contribution

The sole author designed, analyzed, interpreted and prepared the manuscript.

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ABSTRACT

By considering that gravity changes at increased elevation contribute to change in velocity we can obtain timescale variation related gravity as alternative to time dilation related space-time curvature. Gravity changes around planets and black holes are revisited by introducing a gravitosphere model where gravity works inside and around planets. Resulting gravitospheres related to planets and black holes radius shows evidence for a critical Radius of a star to develop black hole structure. Internal structure based gravity and velocity variations of black holes is suggested by including captured asteroids input which results in phase transformations and release of kinetic energy. These processes may explain vibrations related radiations, an adapted volcanic style with possible escape of particles and gravitational waves from horizon zone. By assuming that gravity control velocity changes and related structures it will provide the first elements of a universal gravity model.

Keywords: Gravity; velocity of light; black hole; horizon; solar planets.

1. INTRODUCTION

Time dilation has been investigated from varying experiments and was related to space time curvature [1]. Further experiments using lasers optimized errors of atomic optical clocks to deal with relativistic time dilation [2,3,4]. Atmospheric perturbations may constraints gravitational redshift estimates which led to focus on high precision of gravity measurements using geodesic approaches [5]. As we go far into space the variations of time dilation are due mainly to gravitational redshift. However, there is an elevation at which gravity is absent and the

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velocity of light reaches its maximum value of vacuum without gravity [6]. This leads to constraint models of spatial gravity potential around planets. In black hole setting, these speed and gravity variations and associated time variation (or dilation) are not well investigated since the absence of observations relating both observables at varying elevation. Recent observations indicated strong pulse X-ray output from black hole [7] and highly radio jets are expected around the horizon [8] caused by unknown process. Dynamic processes around and inside black holes may be the cause of these events which are investigated from the internal structure in varying black hole radius based on gravity variations and related velocity models.

2. METHODOLOGY

By considering that gravity is included in any vacuum due to the presence of gravity field during electromagnetic signal propagation, it is possible to investigate the time variations versus elevation. Time variation of 1m horizontal distance at varying elevation is therefore indicative to estimate the time variation due to gravity. Since light velocity is also gravity dependant [6] and gravity changes at varying elevation it allows to estimate the time delay in horizontal distance versus the elevation. Data include values of gravity at surface 0 m (g_s) of a radius planet R and at the elevation h, g_h is estimated by

$$g_{\mathrm{s}} = \mathrm{G}\,.\,\mathrm{M} / \mathrm{R}^2$$
$$g_{\mathrm{h}} = \mathrm{G}\,.\,\mathrm{M} / (\mathrm{R}+\mathrm{h})^2$$
$$g_{\mathrm{h}} = g_{\mathrm{s}}\,.\,(\mathrm{R}^2 / (\mathrm{R}+\mathrm{h})^2) \qquad (1)$$

As laser horizontal velocity propagation by varying elevation h in a vacuum with gravity is given by [6]

$$V_{\mathrm{h}} = -50.446.\,g_{\mathrm{h}} + V_0 \qquad (2)$$

Where V_0= 299792953, 5 m/s is the velocity of light in vacuum without gravity.

Time variation (dilation) in a distance D (1m) of horizontal propagation at h elevation from the surface (s) is then given by

$$\mathrm{dT} = T_{\mathrm{s}} - T_{\mathrm{h}} \qquad (3)$$

Where $T_{\mathrm{h}} = \mathrm{D}/V_{\mathrm{h}}$; $T_{\mathrm{s}} = \mathrm{D}/V_{\mathrm{s}}$

It is assumed that within the 1m horizontal distance there is no change in gravity values. At varying elevation, the maximum boundary of the gravity field potential due to the planet mass is considered when the values of gravity is about 10^{-8} m/s² , and related velocity of light reached the velocity of speed without gravity. This boundary is assumed to be the gravitophere Gs.

This method can be apply on gravity of planets in solar system and to a black hole where velocity inside Schwarzschild radius is given from equation (2) and where velocity V_{h} is cancelled at the horizon layer while gravity reaches its maximum value g_{BH}

$$g_{BH} = 5943218{,}401\ \mathrm{m/s^2} \qquad (4)$$

Beneath surface planets and black holes, the variation of gravity is done by the relationship

$$g_d = g_s\ (1 - \mathrm{d/R}) \qquad (5)$$

Where g_d is gravity at depth d and g_s the gravity at the surface horizon s, R the Schwarzschild radius.

3. RESULTS

Resulting values of time variation of laser propagation at varying elevation on Earth gravity field is shown in Fig. 1a. It indicates that time vary from surface to an elevation limit where time variation remains constant as gravity field is less than 0,00001 m/s². Time variation or dilation based on velocities less than Laser as those used by satellites at GPS elevation are shown in Fig. 1b. By using equation (2) and fixing the velocity 3800 m/s at elevation 202000 km it is deduced that time variations at varying elevations seem small until 1000 km and increases to 37 µs. At more increased elevation this time shift gravity related remains stable to about 37 µs due to the low gravity field that is in these elevation ranges of 0.57 m/s². For light speed, the time variation on Earth increases at1m elevation from surface from about 1.7 10^{-21} sec to 6.10^{-16} sec at 400 km, and stabilizes at higher altitude to 5.10^{-15} sec (Fig. 2). Variation of gravity, velocity and time at varying elevation applied to 2 black holes of varying Radius are shown in (Fig. 3). Table 1 shows at which elevation the gravity is reduced to 10^{-8} m/s² where the velocity is of vacuum without gravity in varying planet gravity potentials. This elevation is considered to be the external limit of gravity G_s. It is therefore useful to investigate the gravitosphere G_s for a planet of radius R. In Fig. 4, the gravitosphere G_s is plotted versus their radius using both solar planets and 5 black holes of extremely radius variations spanning from 3 km to 10^{10} km. It appears clearly that black holes and solar planets are not set in the same linear fit. However, both fitting meet at a critical radius of 10^{13} m. At this level of radius a planet or star may develop into black hole.

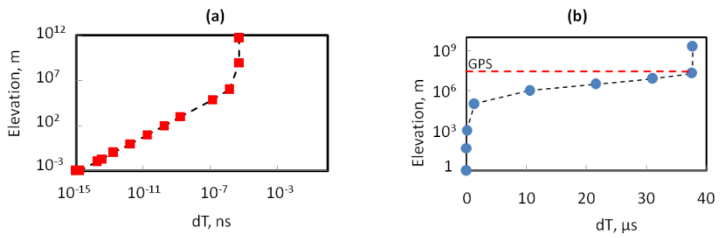

Fig. 1. Time variations at increased elevation based on gravity changes and related velocity of photons (a), and satellites based GPS (b)

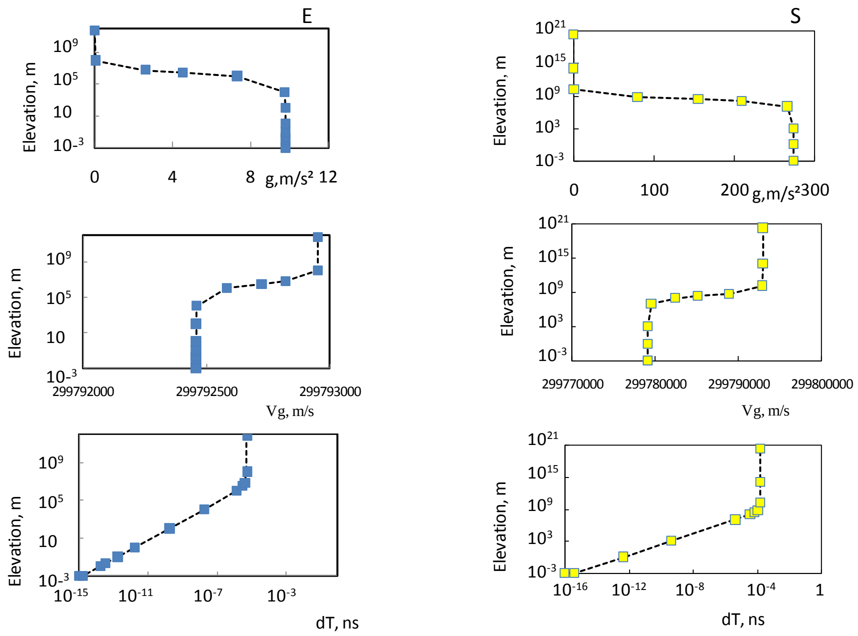

Fig. 2. Variation of gravity, velocity and time at varying elevation versus their log elevation values (m) on Earth (E) and Sun (S)

Table 1. Results obtained of time variations of photons at the boundary of gravitosphere where gravity potential is strongly reduced around planets and black holes of varying radius

Planets	Radius (m)	Gravitosphere Boundary Gs, (m)	Time variations (ns) at Gs	$g.10^{-8}$ (m/s²) at Gs
Earth	6371000	$1,994.\ 10^{11}$	$5,5006\ .\ 10^{-6}$	1,00038
Sun	694340000	$1,148.\ 10^{14}$	$1,5380.\ 10^{-4}$	1,00232
Mars	3389500	$4,70.\ 10^{10}$	$2,0885.\ 10^{-6}$	1,93496
Pluto	1188300	$5,70.\ 10^{10}$	$3,929.\ 10^{-7}$	1,00391
Venus	6051800	$2,905.\ 10^{11}$	$4,9954.\ 10^{-6}$	1,00247
Saturn	58232000	$2,795.\ 10^{12}$	$5,0516.\ 10^{-6}$	1,00266
Jupiter	69911000	$3,36.\ 10^{12}$	$1,2966.\ 10^{-5}$	1,00001
Moon	1737400	$8,34.\ 10^{10}$	$8,9806.\ 10^{-7}$	1,00245
Black Hole A	73000	$1,776.\ 10^{12}$	$1,2175.\ 10^{8}$	1,00405
Black Hole B	8.10^{9}	$1,95.\ 10^{17}$	$1,3343.\ 10^{10}$	1,00024

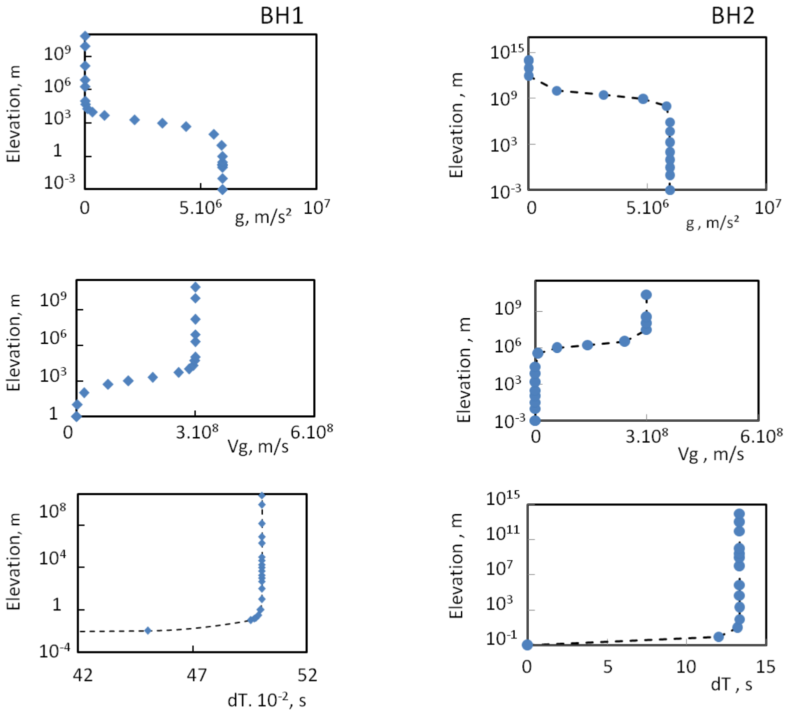

Fig. 3. Variations of gravity, velocity and time variations versus elevation (in log) are determined for Black holes of 3km (BH1) and 8 10^6 km (BH2) radius

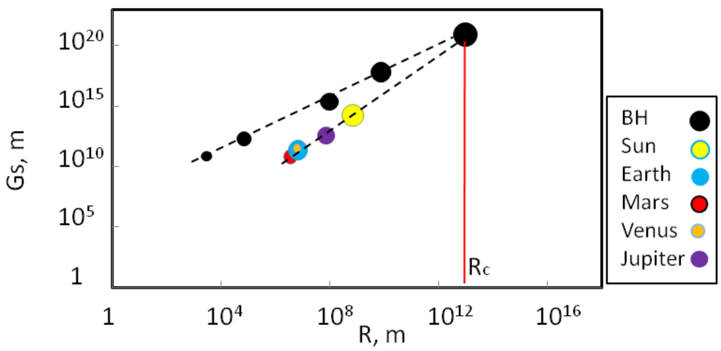

Fig. 4. Gravitosphere G_s and radius plotted in bi-log show linear trend fitting by solar planets while black holes (BH) of varying radius follow further linear fit. Both linear fitting meet at radius Rc of 10^{13} m

4. BLACK HOLE GRAVITY STRUCTURE

Since gravity limit is obtained in the horizon where photon velocity is reduced to 0, the internal structure of the black hole will determine the continuity of the photon motion. The usual model applied to planets including Sun is that the maximum gravity is reached at the surface of any planet. In Black hole, this surface is horizon event where gravity is given from equations (2) and (4). A this surface, photons have no more electromagnetic energy and will experience phase change into graviton as the gravity is in this environment the dominant energy controlling particle motions. At depth inside black hole, the gravity will change as we go to deeper layers, the velocity will increase as gravity decreases and gravitons will gain more velocity as the motions cross the varying layers underlying the horizon (Fig. 5). When the graviton reached the central zone of the black hole, the singularity zone, the gravity is cancelled and the velocity will reach the value obtained in a vacuum without gravity, they are then reflected by this high velocity and can reach again the horizon crossing intermediate layers. The back way of the graviton has strong kinetic energy but a strong attenuation is due to gravity high in the horizon. Only small parts may be transmitted outside from horizon and may be recorded as gravitational waves. In the same approach, spatial matters failed into a black hole due to gravity high. Arriving at horizon layer where temperature is low due to high gravity they are forced to pull deeper due to their density. During the way to deeper layers the temperature environment increases as the gravity decrease until approaching the singularity center. High temperature and pressure singularity environment lead these failed bodies to experience metastable phase transformations. By analogy, this process investigated by experiments using cold crustal matter when failed into lower mantle high temperature and pressure environment on Earth [9,10]. Most phase transformations are accompanied by release of kinetic energy that on Earth are recorded by high magnitude earthquakes. Beneath Horizon surface, cold matter pulled deeply into Black hole by gravity will experienced phase transformations, and kinetic energy released from these chemical reactions is responsible for vibrations observed in the horizon. The magnitude of the horizon vibrations is proportional to the amount of matter captured by black hole gravity. In this regard, the horizon vibrations express the black hole internal seismicity. Seismic waves which propagate in all directions provide a source of energy in forcing gravitons confined between Singularity and surface horizon to escape from horizon elevation. In addition, when black hole is rotating centrifuge forces may help to escape efforts. While temperature and pressure environment change outside horizon graviton re- found their initial phase as photons which appears visible around black holes.

5. DISCUSSION

Gravitosphere (G_s) model based both on variation of gravity and velocity of light at increasing elevation until the gravity is being extremely reduced. This will provide alternative explanation of time dilation that is here simply due to variation in velocity which is intimately related to gravity field variation that decreases at increasing elevation. The optimization of time variation estimates is however constrained by the precision of gravity values used. However, the most universal model which correlates for all planets is due to S/R which means that the radius is a fundamental parameter when related to Gs, and it provides a global relationship that may be used for more far away planets. By including gravity field in the propagation of electromagnetic signals in a vacuum with gravity the Maxwell equation may assumed by using

$$V_g{}^2 = 1/\varepsilon_g\, \mu_{\mathrm{g}}$$

Where ε_g and μ_{g} are permittivity and permeability in a vacuum with gravity

The Universal gravity model we can apply both on calm or eruptive planets and black holes may explain many observations. By considering that all particles motions with or without mass is dependant on gravity field, it is possible to characterize a gravitosphere where the gravity field works. By the way, the vacuum is represented by zones where gravity trends to zero values. In this regard, the gravity changes at increasing or decreasing elevation is well established on Earth and can be used to draw up the boundaries of the gravitosphere. Black hole structures seem not to be an exception as the nature cannot be exclusive for a particular planet. The only differentiation we can set up is the gravity high that appears varying in the evolution of any planet. As shown in Fig. 3 the radius of a planet is an important parameter in the planet evolution. By comparing several black hole radius and solar planets a critical radius Rc is obtained when considering black holes and planet gravitospheres. This critical radius is interpreted by a radius limit of a planet to develop a black hole structure. The high gravity of surface horizon stops photon to move and captures asteroids to the underlying layers. The strong gradient of temperature and pressure in the lower layers of black holes provoke metastable phase transformations that release kinetic energy analogous to seismic waves. The kinetic energy released is fundamental in the wave propagations able to counteract gravity and may reach horizon which explains surface radiations. By similarity, Earth Tsunamis are recorded by gravity waves at orbital elevations [11] and recorded acoustic energy from Venus seismic events [12]. While gravitons may use seismic waves to escape from horizon boundary this may be a signature of gravitational waves. All these escape attempts are controlled by the magnitude of seismic activity which is related to the series of matters captured. However, when reflected gravitons from singularity reached horizon their velocity is again cancelled, but if black hole is rotating centrifuge forces applied to gravitons will facilitate a slow passage outside horizon as illustrated in Fig. 6. This slow escape leads to circular motions of gravitons as results of horizon gravity and centrifuge forces. As gravitons escape from horizons they may partially re-found their initial phase of photons. This explains the observed light zones around horizons. Others particles inside horizon may be due to eruptives mechanism that can happen during strong fail of large body into black hole. By analogy, the strong collapse of an asteroid of about 6 km radius on Earth provoked for about 66 My large release of multiform gas around Earth which changed the climate around the planet with dramatic consequences. If we consider that total volume of black hole remains stable then the input of new bodies by gravity will replace an output of matter as it is usually observed during the mechanism of subduction dragged by gravity. This may be assumed by a volcanic style adapted to black hole P and T boundary conditions. Additional processes may be observed is due to magnetic storm that usually is related to eruptive mechanisms at atomic scale. The strong gravity in the horizon led to reduce their wave propagations which constraint their possible detections.

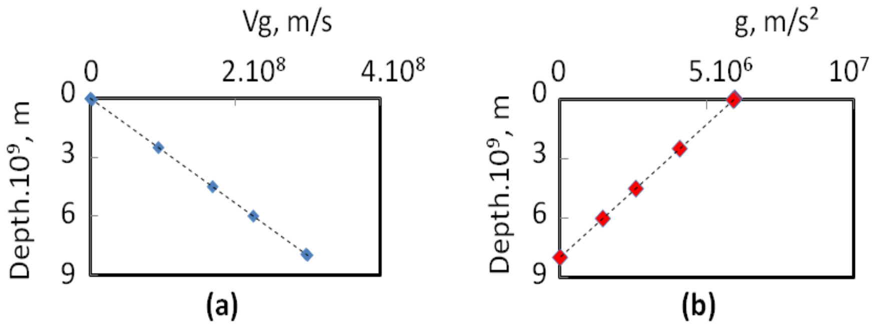

Fig. 5. Black hole internal structure is shown in term of velocity V_g (a) and gravity g (b) from surface horizon to the center (singularity) at depth 8.10^9 m.

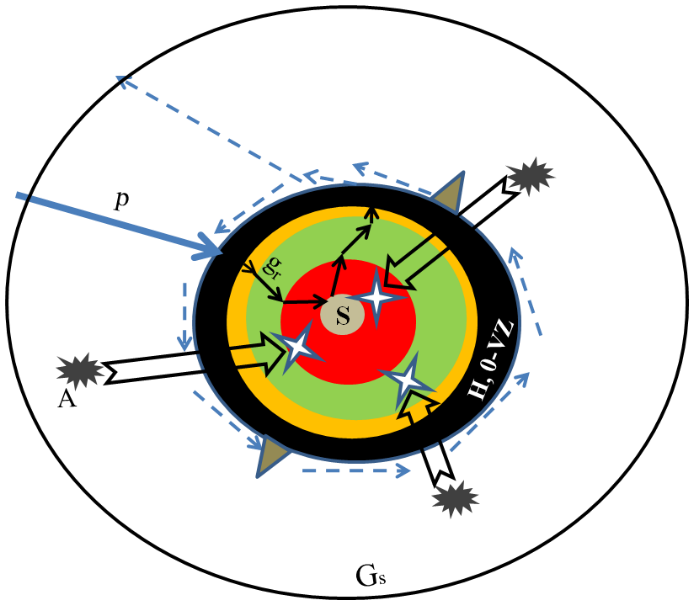

Fig. 6. Schematic structure of black hole shows decreasing gravity layers until singularity center (S). Captured photon input (p) are transmitted as graviton (g_r) inside black hole until singularity, and reflected to reach horizon (H, 0-velocity zone). Asteroide (A) failing into black hole provoked phase transformations (blue stars), resulting in kinetic energy and related volcanic eruptions (grey triangles). Energy released and rotation allow possible phase particle changes and propagation around and outside the gravitosphere (G_s) (dashed arrows)

6. CONCLUSION

By using the impact of gravity in the velocity variations at varying elevation we can obtain the same time variation of GPS as found from time dilation theory. Gravity associated with radius may determine the nature of planets that may develop black hole structure. Gravity model and phase transformations applied to the internal dynamic of black hole suggest explanation of observations around the horizon including radiations and gravitational waves.

COMPETING INTERESTS

Author has declared that no competing interests exist.

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