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An explanation of the Titius-Bode law resulted by a Kant-Laplace type model of the solar system's forming

Abstract

In the paper is shows that the Titius-Bode relation of the distances Sun-planet may be explained by a Kant-Laplace type model of planetary system forming, considering a linear decreasing of the lenticular protoplanetary nebula's density and the constancy of its rotation speed. The resulted conclusions is that the protoplanetary material rings were formed by the successive halving of the nebular mass M_N and thereafter- of the remained part and may be generalized for the star clusters, for the galaxies forming but also for the expansion of the galaxies super-clusters and of the Universe.

Keywords: titius-bode relation, kant-laplace model, solar system, protoplanetary rings, galaxy rotation, star clusters

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Introduction

From the Kepler's Second Law, it is expected that the rotation velocities of the stars in a galaxy around the galactic center will decrease with the distance from the center, similar to the planets in the Solar System, but this effect was not observed,[1] the galaxy rotation curve remaining flat as the distance from the center increases. The conclusion was that there is a lot of non-luminous matter (dark matter) in the outskirts of the galaxy. Rubin and Ford showed in 1980 that most galaxies must contain about six times as much dark as visible mass. In a cold genesis theory,[2,3,4] which explain also the elementary astroparticles as quantified structures generated by quantum and sub-quantum (etherono-quantonic) vortexes, the main axiom postulates that the basic mechanism of material structures forming process is the cascade vortexes forming process, in accordance also with other theories (AN Kolmogorov, etc.). Relative to the Universe structure, a consequence of this axiom' generalization is the fact that the vortices cascade fractalic organization of the Universe is governed by the similitude' principle by which may be argued also the existence of a similitude between the Kant-Laplace genesis mechanism of a planetary system and a vortexial mechanism of the galaxies forming or also of the Universe' genesis. This similitude results from the generality of the vortexial movement also to the Universe' scale and may be better understood by the fact that the relation Titius-Bode referring to the distance between Sun and a planet:

$$d = 0,4 + 0,3x2n\,(u.a);\ (n = -\infty,\ 0,1,2,...7); \qquad (1)$$

(u.a. – astronomical unit), can be explained using the Kant-Laplace theory (1755 and 1796) about the genesis of the Solar system, theory which assumes that the planets arises in the vortex nuclei of some material "rings" separated successively from a rotating protoplanetary nebula, (Figure1). The Kant-Laplace's model of the Solar System forming seems to be confirmed by the discovery in 1992 of a proto-planetary system around the Beta Pictoris star (that appears surrounded by a disk of cosmic dust of 360 u.a.). The known explanation of the Titius-Bode relation assumes a specific distribution of the vortex centers which generated the planets. Is well known the theory of Karl Weizsäcker (1944) who proposes the empiric relation:

$$r_n = r^0\,(1,894)^M, with: r^0 = 0,3u.a \qquad (2)$$

which was amended by Chandrasekhar (1946), D der Haar (1950) and by V Vilcovici (1954)- which used the Kant-Laplace hypothesis completed by VG Fesenkan.

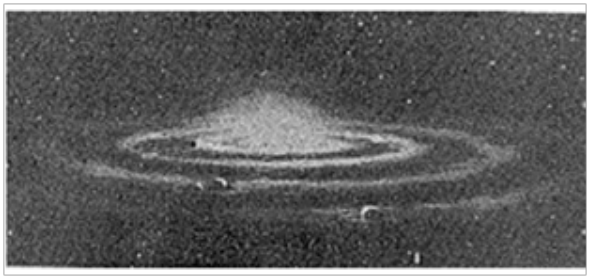

Figure 1 The Solar system forming.

Theoretical model of kant-laplace type

Based on the mentioned similitude, we may consider that- excepting a little central part M_0, the proto-solar nebula formed as a mass M_N of gas (H_2) and dust, which became lenticular, had a rotation speed $\omega \cdot r = v\omega -$ constant of the rest part $MN-0 = MN - M0$, this speed being kept after its dividing into proto-planetary material rings, by the kinetic energy, preserving for the nebular particles circulated on the quasi-tangential direction of the rotation, a constant kinetic energy: $E_T = m_p v^2_\omega/2$ = constant. A constant rotation speed: $v_\omega = \omega.r$ is specific to galaxies such as M33 or NGC5055, for example, and was observed also to some star clusters with expanding periphery. A possible explanation supposes by CGT the existence of a galactic sinergono-quantonic (pseudo)vortex of a central super-black hole and a 'dark matter' vortex or a local accumulation of galactic dust.

Having: k- the proto-planet's number in the sense of its distance from the Sun, the material ring of the rank k is stabilized- according

to the hypothesis, at a distance R_K given by the dynamic equilibrium between the gravitational attracting force exerted by the nebular rest M_{N-K} (remained after the detaching of the material ring of rank k) considered formally with the mass concentrated in its center and the centrifugal inertia force:

$$G\frac{m\cdot M_{N-k}}{R_k^2} = \frac{m.v_\omega^2}{Rk}, \tag{3}$$

(M_N –the initial nebulary mass). The value R_K results according to the relation:

$$R_k = \frac{G}{v_\omega^2}M(N-k) = \lambda\cdot M(N-k); \qquad \lambda = \frac{G}{v_\omega^2} \tag{4}$$

Having k=9, it results $R_9 = \lambda\cdot M_{N-9}$, but: $M_{N-9} = M_0+M_1+M_2+...+M_8$, (the remained mass), so generally:

$$R_K = \lambda.M_{N-K} = \lambda.(M_o+M_1+M_2+...+M_{K-1})[a.u.] \tag{5}$$

On the other side, according to the Titius-Bode relation, we may write:

$$R_K = 0.4+ 0,3x\ 2^{K-2} = 0,1+ 0,3x\ 2^{K-1}[a.u.]\ ;\ k\geq 1 \tag{6}$$

From the relations (4) and (5) it results in consequence that:

$$R_1 = 0.4 = \lambda.M_0[a.u.] \qquad R_2 = 0.4 + 0.3 = 0.4 + 0.3x2^0 = \lambda.(M_0+M_1) \tag{7}$$

$$R_3 = 0.4 + 0.3 + 0.3 = 0.4 + 0.3x2^1 = 0.4 + 0.3x\left(2^0+2^0\right) = \lambda.(M_0+M_1+M_2)$$

$$R_4 = 0.4+0.3+0.3+0.6 = 0.4 + 0.3x(2^0+2^0+2^1) = \lambda.(M_0+M_1+M_2+M_3)$$

$$R_5 = 0.4 + 0.3 + 0.3 + 0.6 + 1.2 = 0.4 + 0.3x(2^0+2^0+2^1+2^2) = \lambda.(M_0+M_1+M_2+M_3+M_4)$$

$$R_K = 0,4+0,3\left(2^0+2^0+2^1+2^2+...+2^{K-3}\right) = \lambda.\Sigma M_{K-1}[a.u.]$$

$$R_9 = 0,4+0,3\left(1+2+2^2+...+2^6\right)[a.u.] \text{ i.e.:}$$

$$M_o = \frac{0,4\ [a.u.]}{\lambda};\ M_1 = \frac{0,3\ [a.u.]}{\lambda};\ M_2 = \frac{0,3\ [a.u.]}{\lambda};\ M_3 = \frac{0,6\ [a.u.]}{\lambda};\ .....\ M_9 = \frac{0,3\ [a.u.]}{\lambda}x2^7; \tag{8a}$$

or - generally:

$$M_k = \frac{0,3\ [a.u.]}{\lambda}x2^{k-2}\ ;\quad k\geq 2 \tag{8b}$$

It is understood that over the material parts m_k of a M_k -ring acts gravitationally also the mass of the previous $M_{k'}$ material rings (k'>k), but the higher distance from the material parts $m_{k'}$ to the m_k –parts permits to consider as negligible the attraction of the previous $M_{k'}$ material rings.

The interpretation of the eqn. (8) is that the protoplanetary material rings were formed by the successive halving of the rest part $M_{N-0} = M_N - M_0$ of nebular mass M_N and of the remained part having a rotation speed $\omega\cdot r = v_\omega$ – constant, etc , the remained part M_0 (the nebular nucleus) forming the Sun. It may be presumed also that from the proto-planetary material ring were formed more proto-planets or pseudo-planets, but after the dissipation of the non-confined matter, only the planet(s) with dynamic equilibrium to the radial direction remained to stable orbit. In this case, the natural satellites (Moon, Titan etc.) of the planets, might represent independently formed planets, which, meeting the bigger planet (found on an orbit of a stable dynamic equilibrium) have been attracted and kept around it on a stable orbit.

The explaining of the law v_ω = constant

By returning to the case of a galaxy rotation, we may observe that - if we suppose the existence of a proto-galactic vortex of visible matter and of "dark" matter around a central quasar of radius R_0 with massive black hole, with a total density variation given by the law of the material ring's mass constancy:

$$dM(R) = 2\pi HRdR\cdot\rho_m(R) = 2\pi HR_0d\rho\cdot r_m^0 = const.\ ;$$

$$(\rho_m = \rho M + \rho_{DM})\sim R^{-1}, \tag{9}$$

(H = $2R_0$ - the thick of the proto-galactic vortex, considered quasi-cylindrical), we may explain also the galaxy rotation law: $v\omega = ct.$, by the eqns:

$$M_{(R)} \cong \int 2R_0\cdot 2\pi R\cdot\rho_m(R)dR \approx 4\pi R_0^2\rho_m^0\cdot R\ ;\quad \Rightarrow \tag{10}$$

$$(\rho_m(R) = \rho_m^0\cdot(R_0/R);\quad R>>R_0)$$

$$G\frac{m\cdot M(R)}{R^2} \approx 4\pi GR_0^2\rho_m^0\cdot\frac{m}{R} = m\frac{v^2}{R}; \qquad \Rightarrow \qquad v_\omega = R_0\cdot\sqrt{4\pi G\rho_m^0} = cons\tan t$$

$$(\rho_m(R) = \rho_m^0\cdot(R_0/R);\ R>>R_0)\ ; \qquad \rho_m^0 = \rho_m(R_0) \tag{11}$$

It results from eqn. (11) that –like in the case of the solar system's forming, the rotation speed v_ω of the proto-galactic mass M_G was maintained constant during its expanding.

This result: $v\omega$ = constant, is given –according to eqn. (11), by the fact that over a particle with mass m found at the distance R from the proto-galactic center, the proto-galactic vortex acts gravitationally with all its mass $M_{(R)}$ contained by the volume, $V(R)\approx 2R_0\cdot\pi R^2$ considered quasi-cylindrical. After the stars forming by rotated nebulae of molecular hydrogen, in more parts of a material ring of R-radius, the gravitational attraction between adjacent stars in correlation with the total remained mass M'(R) determined the forming of the galactic spiral arms, in the case of the spiral galaxies. In the case of the star clusters with expanding periphery, to which was observed also the law $v_\omega = \omega\cdot r$ = constant, this law may be explained similarly, by eqns. (10), (11), by equivalenting a quasi-cylindrical mass distribution M(R) with a spherical mass distribution according to the equation:

$$M_{fR} \cong \int 2R^0\cdot 2\pi R\cdot\rho_m(R)dR \cong \int 4\pi R^2\cdot\rho_m'(R)dR = M_{sR} = 4\pi\cdot R_0^2R; \tag{12}$$

$$\Leftrightarrow \rho_m(R) = \rho_m^0\cdot(R^0/R);\ \rho_m'(R) = \rho_m^0\cdot(R^0/R)^2$$

Conclusion

By the paper it results that the Titius-Bode relation of the R_k distances Sun-planet may be explained by a Kant-Laplace type model of planetary system forming, considering a linear decreasing of the lenticular protoplanetary nebula's density and the constancy of its rotation speed, by the conclusion that the protoplanetary material rings were formed by the successive halving of the rest part $M_{N-0} = M_N - M_0$

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of the nebular mass M_N and of the remained part having a constant rotation speed, $v_{\omega(R)}$, the remained part M_0 (the nebular nucleus) forming the Sun. This phenomenon seems to be specific also to the Saturn's rings system, in the sense that the A- ring and B-ring, separated by the Cassini division, seems to have approximately equal quantities of particles and they are fragmented into many ringlets separated by small gaps, according to astrophysical observations, as consequence of the basic ring's instability (demonstrated by Cassini, Laplace and Maxwell).

It results also that the previously presented conclusions regarding the planetary system forming by a Kant-Laplace type model, may be generalized for the star clusters, for the galaxies forming but also for the expansion of the galaxies super-clusters and of the Universe, by considering an initially rotated proto-supercluster of galaxies which was split in annular meta-layers of galaxies assemblies according to eqn. (8), forming structures of cosmic ‚bubbles' inside our Universe, with galaxies expanded by the antigravitic charge of a central (super) quasar. Relative to the Universe structure, a consequence of the of a similitude between the Kant-Laplace genesis mechanism of a planetary system and a vortexial mechanism of the Universe genesis, presuming the formation in a similar way, at a critical vortexial speed of the atomic matter, of material rings forming further planets and respective -of meta-haloes („layers") formed from galaxies assemblies, discovered in the form of a quasi-regular three-dimensional network of super-clusters of galaxies and voids,[5] with regions of high density separated by a distance of 120Mpc. on a distance of $7 \cdot 10^9$ l.y.. This generalization is in accordance with the 'Fractal cosmology' and with the fact that the polarization of the cosmic microwave background radiation suggests an inflationary model for the early Universe.

Acknowledgments

None.

Conflicts of interest

The author declares there is no conflict of interest.

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