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An Introduction to Studies of the Effect of Solar Wind and CNO Cycles on the Retrograde Rotation of Venus

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Abstract

In this work, we develop a special approach for finding the main reason for the retrograde and slow rotation of Venus based on observational data, and a scientific basis for the formation of planetary systems and dynamics of planets with consideration of their special characteristics. Generally, our work results in a new location for system characteristics of the CNO cycle-produced particles carried by the solar wind and its effects on the mode of rotation.

Keywords: (Heliosphere, Solar wind , Archimedean spiral ,gravity field)

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1. Introduction

The Venus, that wonderful world, is the brightest object in night sky after the moon, with the hottest atmosphere .

Our body contains large percent of water, amino acids and carbohydrates. Earth's atmosphere generally contains nitrogen and oxygen, and for our case study, Venus' wonderful atmosphere generally contains carbon dioxide .May these characteristics have a common source?

There are several scientific references explaining the characteristics of planets in the solar system, from their dynamical properties to physical factors, and also their chemical combination. We know that without absolutely identifying what is happening, and without scientific analysis of observational data, observational parameters, and statistical comparisons, there can be no scientific discussion in this field of study. Our prepared scenario attempts an approach to mechanical, physical, and especially mathematical calculations for the observed event.

First, in reviewing others works, I assume there are three hypothetical, but not measurable explanations for the opposite rotation of Venus, Uranus and Pluto:

1) The planet formed in a global condensing cloud which was rotating opposite to other planetary members (from the model of Whites Zacher planetary formation theory)

2) The north pole of the planet changed by a large degree (it is 23.5 degrees for earth)

3) A hypothetical event such as impact or crash caused the retrograde rotation.

The standard model, which I strongly believe is the mechanism of terrestrial planet formation, from a supernova state of exploded matter to solar cloud, says that planet embryos were born in a flattened rotating disk. But none of the models can clearly result in retrograde motion for planets. It may be that Venus was formed when conditions were different, or will change in the future. Careful research may show the correct reason.

I think if we find a general approach to the direction of rotation and period, then there may be found some exceptions for hypothetic events and properties of the system .It is a bit surprising to me that although the orbital dynamic of planets mechanism and gravity field have been worked out several times, no attention has been paid to the sidereal rotation. We will try to solve this problem step by step, by finding the best relation between the mass of a planet, its distance from sun, and its orbital period and speed:

The least time which any object with its own gravitational stability can rotate without exploding is:

$$T=\pi\sqrt{R^{3}/_{8MG}} \sim {}^{1}/_{\sqrt{\rho G}} \qquad 1\text{-}1$$

Orbital speed of planets comes from gravity field equations :

$$V=\sqrt{{}^{2}GM/_{d}} \qquad 2\text{-}1$$

For example, for earth we have: V = 30000m/s

The mechanism for the same orbital and sidereal rotation for a planet, still remains a mystery for us, maybe because no one worked on the subject to find a general formula as did

Kepler and Newton, for the gravity field and planetary dynamics. Look! the Mercury day and its year gives wonderful accurate number 1.50034, the day length of mars is very near to Earth's, and gas giants are rotating with gigantic speeds. I think terrestrial planets had exploded when they had such velocities. Can our calculations give a general universal model for this problem?

2. Retrograde rotation of a planet

We will show that the dense gas atmosphere of Venus, given the direction of the solar wind, carries particle currents that can change the direction of rotation. The geophysical historical events show that our earth's north pole has changed several times. The inner current of the magnetic field of earth, provides ideal conditions for life. Without the Van Allen belt, we could not survive because of the dangers of solar wind isotopes, particles and rays.

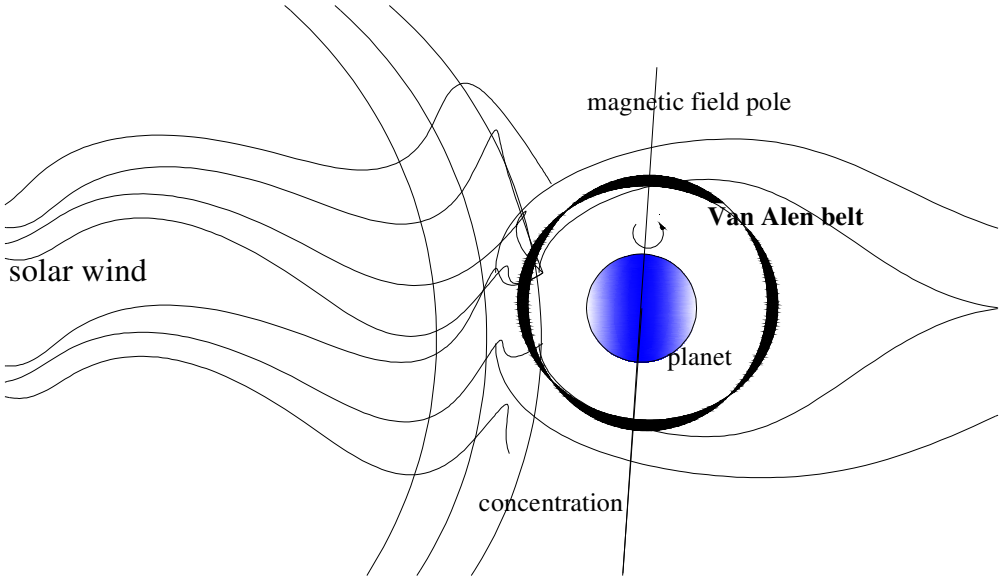

Figure 1. planet magnetic field against solar wind and supposed concentration of wind round planet

The particles carried by wind continually is entering planet atmosphere as we see all in earth poles specially in sun storms ,this current surrounds planet and obey from escape velocity of planets gravity field against V_{rms} ,although the temperature in surface of Venus is very hot ,but the magnetic field of planet is very poor and ionized particles entering its atmosphere will increase the temperature ,Therefore, comparing V_{rms} (some gases for example) escaping from our atmosphere and from Venus' environment shown in Table 1. ,occurs in two different conditions (It is wonderful place.)

Table1. V_{rms} of some particles in our atmosphere : $V_{rms}=\sqrt{3kT/m}$

complex		V_{rms} on earth(m/s)	V_{rms} on Venus(m/s)
CO_2	Carbon dioxide	407 m/s	1750
O_2	Oxygen	477 m/s	2054
N_2	Nitrogen	510 m/s	2200
He	Helium	1350 m/s	5805
H_2	hydrogen	1908m/s	8204

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Do we see in any historical time of Venus where its poles changed or was there a period of reducing the planet's sidereal rotation, causing it to be stable, then opposite. If so, we have to find planet's dynamical condition of zero point rotation:

For the gravity field properties, any object with mass greater than Phobos' (mars moon) will have a spherical shape with its own gravity. As we solve the gravity field equations for stability of any hill on the planet's surface, it seems to be very simple dynamical problem which will allow us to find the main reason for the rotation of any planet, star or galaxy.

Rotation period of planets vary irregularly for solar system members ,from synchronies for the moon and small objects in which their day equals their year, to fast rotating massive planets such as Jupiter and Saturn, and spins of pulsars (neutron stars) of less than a one second period.

In fact we can consider these conditions:

1) Any object is formed from an early gas nebula, or for example plasma or liquid matter in empty space.

2) Any solid or plasma-type matter such as a planet or star is entering another gravity field.

The second event happens when we send any rotating module to planets or the moon, or as earth satellites. The Roche limit, the distance within which a celestial body, held together only by its own gravity, will disintegrate due to a second celestial body's tidal forces exceeding the first body's gravitational self-attraction[1], and have various amounts of solid or liquid mass. Rigid satellites and rotating objects such as meteorites and many sidereal-rotating comets can exceed this limit safely. Jupiter's moon, Metis and Saturn's moon Pan, are examples of such satellites, which hold together because of their tensile strength (that is, they are solid and not easily pulled apart). In extreme cases, objects resting on the surface of such a satellite could actually be lifted away by tidal forces. A weaker satellite, such as a comet, could be broken up when it passes its Roche limit[2].

3. **Angular rotation for planets and moons**

When any one falls to the ground or jumps in a pool, it seems that he feels at rest while in motion.

First we start from synchronous spin: For Kepler and Newton's laws, the angular velocity of a planet in its orbit is [3]:

$$V_p = 2\pi d/y \qquad 3\text{-}1$$

y is the planet's period or its year and V_p is the velocity of the planet in its orbital. For entering elliptical orbital properties, we have:

$$V_{per} = 2\pi d\ (\sqrt{[(1+e)/(1-e)]}\ )/y \qquad 3\text{-}2$$

$$V_{ap} = 2\pi d\ (\sqrt{[(1-e)/(1+e)]}\ )/y \qquad 3\text{-}3$$

Where the V_{per} is the velocity at perihelion and V_{ap} is the velocity at aphelion. The sidereal rotational velocity of a planet with radius r is:

$$V_s = 2\pi r/p \qquad 3\text{-}4$$

Where P is the planet's day.

For synchronies, we have: p=y; then for an elliptical orbital, we must enter the effect of an eccentric factor to our equations because of Kepler third law and for the reason that the length of

earth's day doesn't vary in duration over the whole year (24 hours), we can solve our equations for a circular orbital:

$$2\pi d/ V_p = 2\pi r/ V_s \quad ==> V_s = r V_p/d \qquad 3\text{-}5$$

For example, for the moon we will have $V_s = 2\pi * 1.74exp^6/2.36exp^6 = 4.6$ m/s .

This factor is 465m/s for earth and 12600 m/s for Jupiter, and 9800 m/s for Saturn: the spin of the two giant planets are for the reason we have shown in formula 1-1. The earth could not have such a rotation period.

4. Analytical mechanics analysis of event

Synchronous orbit is used for satellites placed in the same geographical position of the sky. If mercury was the same distance from sun, it would have a 27 days's length of its year and one rotation per year.

The general relativity principle – (algebraic mass equals gravitational mass) says that the planet is similar to a hanging ball or a space man, on its orbit around the sun. It is weightless, so any considerable event or great impact can change a planet's rotation period or its angular momentum. Moment of inertia for a spherical planet:

$$I = \frac{2}{5}Mr2 \qquad 4\text{-}1$$

$$\omega = \frac{2\pi}{T} \qquad 4\text{-}2$$

$$I\omega = Mrdv \qquad 4\text{-}3$$

And we have planet rotation effect on atmosphere, too reaction of Coriolis force on planet for the reason of Newton third low.

5.Gravity Force of a Spherical Shell

The Newtonian solution of a shell gravity field for its inner part and outer part will be considered here for Venus' dense atmosphere. This can show itself in the Coriolis effect, wind circulation and weather turbulences. In addition, we want to add this effect for the first time to the dynamics of a planet as is done with the liquid magma of the inner part of the earth. It rotates at one cycle per 400 years. We will use this for finding similar signs in Venus. Atmosphere of planet is such as any shell:

The gravitational field outside a uniform spherical shell is GM/r 2 towards the center. [4]

Coriolis effect formula is:

$$\boldsymbol{F}_C = -2m\boldsymbol{\Omega} \times \boldsymbol{v} \qquad 5\text{-}1$$

Coriolis affect the effect of the Earth's rotation on the atmosphere, oceans, and theoretically all objects moving over the Earth's surface. In the northern hemisphere it causes moving objects and currents to be deflected to the right; in the southern hemisphere it causes deflection to the left. The effect is named after its discoverer, French mathematician Gaspard de Coriolis (1792–1843)[11]

The equation may be multiplied by the mass of the relevant object to produce the Coriolis force: [11].

6. Solar CNO cycle and its role in solar system

When we do study solar wind , we have a continuous current of alpha and beta rays with proton and some heavy elements, especially solar CNO cycle-produced elements and isotopes with a carbon catholic method for nucleic reactions in core of sun with temperatures of$15.7*10^6$ degrees centigrade. Like carbon, nitrogen, and oxygen involved in the main branch, florine produced in the minor branch is merely catalytic and at steady state, does not accumulate in the star. While the total number of "catalytic" CNO nuclei is conserved in the cycle, in stellar evolution, active proportions of the nuclei are altered .When the cycle progresses to equilibrium, the ratio of the carbon-12/carbon-13 nuclei is driven to 3.5, and nitrogen-14 becomes the most numerous nucleus, regardless of initial composition. During a star's evolution, convective mixing episodes bring material in which the CNO cycle has operated from the star's interior to the surface, altering the observed composition of the star. Red giant stars are observed to have lower carbon-12/carbon-13 and carbon-12/nitrogen-14 ratios than main sequence stars, which is considered to be convincing evidence for the operation of the CNO cycle.[5]

7. The solar wind

The solar wind is the supersonic outflow into interplanetary space of plasma, which forms the sun's corona, the region of the solar atmosphere beginning about 4000km above the sun's visible surface and extending several solar radii into space. .It is composed of approximately equal numbers of electrons. The ion component consists predominantly of protons (95%),with a small amount of doubly ionized Helium and trace amounts of heavier ions. The interplanetary magnetic field (IMF) is the known solar wind weak magnetic field. The solar wind varies in density, velocity, temperature and magnetic field properties, with solar cycle, heliospheric latitude, heliocentric distance and rotational period. It also varies in response to shocks, waves, and turbulence that perturb the interplanetary flow. Average values for solar wind density per second is 8.7 protons per cubic centimeter, 6.6 nT, respectively. During the declining and minimum phase of the solar cycle, the wind is dominated by high speed (500-800 km per second) flow emanating from coronal holes –the region of low coronal density and temperature where the magnetic field is weak and the field lines are open to interplanetary space. The streams in the solar wind flow moves outward into interplanetary space in an Archimedean spiral (because of the sun's rotation). As the streams travel away from the sun, the high speed streams eventually overtake the slow speed flows and create regions of enhanced density and magnetic field known as Co-rotating Interaction Regions (CIR).These compressed inter stream regions play and important role in solar–terrestrial relations: when CIRs encounter the earth ,they trigger geomagnetic storms that recur with 27-day periods, corresponding to the sun's rotational period .[6,7]

8. Archimedean spiral and solar wind motion

An Archimedean spiral is a curve defined as a polar equation of the form $r=\theta^a$,with special names being given for certain values of a. For example if a=1, then $r=\theta$. It is called Archimedes' spiral, and is hyperbolic when a=-1. Fermat and Lituus' spirals are created with equations $r=\sqrt{\theta}$ and the second is $r=1/\sqrt{\theta}$. The hyperbolic spiral is also called the reciprocal spiral because it is the inverse of Archimedes' spiral with the inversion center at origin[9].

As we last said, the streams in the solar wind flow, move outward into interplanetary space in an Archimedean spiral. in fact, the sun's rotation vector gives radial velocity to plasma which is expanding outward into interplanetary space. When we draw the geometric curvature (figure 2.), it makes an angle with straight line between sun and planets as known two points, for example it makes a 45^0 angle in earth's orbit [8,9].

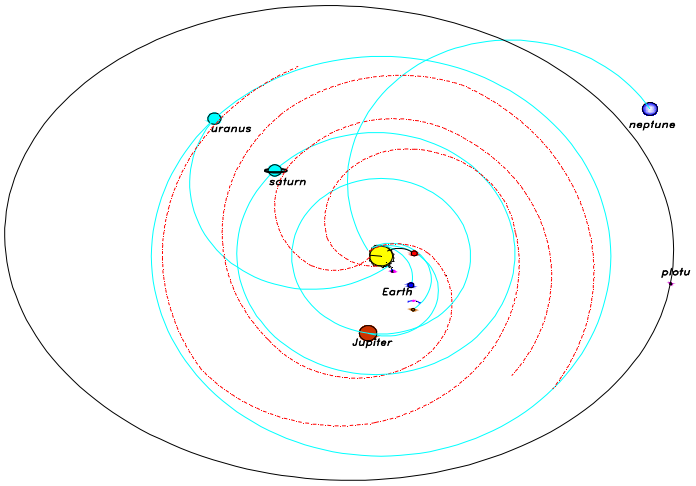

Figure 2. Forecasting movement and direction of solar wind

The streams in the solar wind flow outward into interplanetary space in an Archimedean spiral (because of sun's rotation). Durational solar wind current has its special effects in near distances and may be different in farther parts, as the wind's motion a spiral. We obtained that the solar wind particles are normally rotating the planetary disk. For example, for π/4 radian angles of solar wind direction and a straight line with Earth and sun in the earth's orbit we found that near 5 π/4 for Jupiter's orbit and a whole 2 π radian rotation of the spiral at Saturn's orbit (10AU). So the solar wind particles never leave the solar system. There are some signs of fouling of solar wind particles at the outer part of the solar system:

1) Any comet which rotates round the sun loses some part of its mass near the sun. We obtained that it will return with its early mass, because of the existence of a large amount of water, ice and other ions in the Kuiper belt to recharge it. The main source of those particles and chemical complexes is solar wind-carried particles.

2) The Kuiper belt contains a bit of density of vapors or ices or gases, as the Pioneer 10&11 act there.

3) The mass increase of Jovian planets, (the scenario which I had discuss in last my article) is due to the gigantic speed of sidereal rotation of Jovian planets and their durational mass increasing.

Planet	distance from sun AU	angle of solar wind Radian
Mercury	0.4	π/10
Venues	0.7	π/6
Earth	1	π/4
Mars	1.56	2 π/ 5
Jupiter	5	5π/4
Saturn	10	2.5π
Uranus	19	5π
Neptune	30	7.5π

9. **Venus Orbit , rotation and environment**

Verna, the Russian space craft, measured the planet's surface temperature of 740 kelvin and its pressure of 95 bar. It equals a 95 meter water height. The mean height of planetary atmosphere is 60km. When it is 95 bar pressure on the surface then it will be about 95 times denser than earth's atmosphere.

Venus' retrograde rotation remained a mystery since it was found, and it has been inferred as due to impacts which supposed that first, it caused a slowing down of period and second, caused opposite rotation from its normal mode. But hypotheses are not scientific reasons, therefore, based on whole observational data, system facts, and considering the effect of solar wind on the rotational period of planets as it will be discussed, we must continue such studies to solve this mystery. Table 2. These diagrams are prepared for comparisons:

Table2. rotation velocity and Escape velocity (V_e) from planets gravity field.

Planet	mass(Me)	radius (km)	sidereal rotation (hour)	sidereal velocity m/s	V_e (km/s)
Mercury	0.055	2451	1351.2	3.2	4.3
Venues	0.815	6080	5832	1.8	10.3
Earth	1	6400	23.95	456	11.2
Mars	0.107	3405	24.01	241	5.0
Jupiter	317.8	70208	9.57	12600	59.5
Saturn	95.15	58496	10.15	9800	35.6
Uranus	14.53	25472	15.84	2590	21.2
Neptune	17.15	24704	17.16	2680	23.6

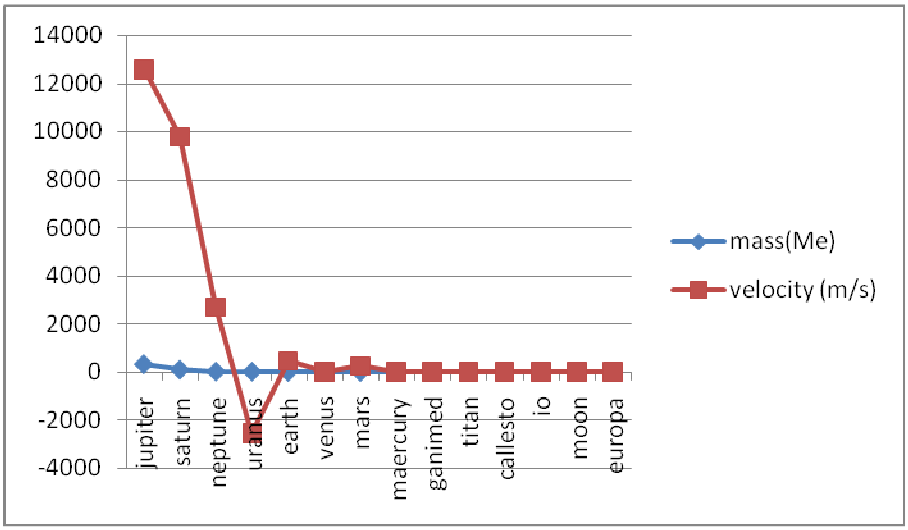

Figure 3. mass variation and sidereal rotation velocity of objects in solar system

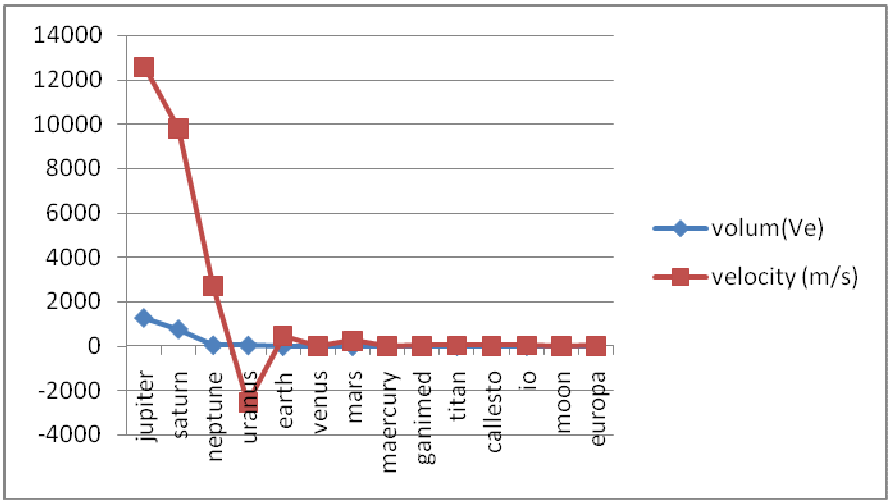

Figure 4. volume variation and sidereal rotation velocity of objects in solar system

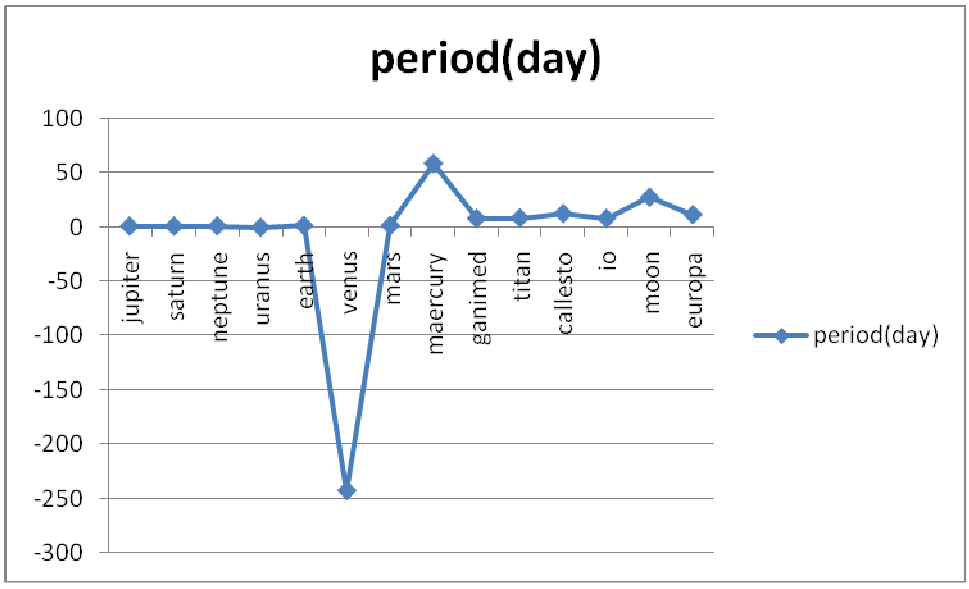

Figure 5. sidereal rotation period of objects in solar system

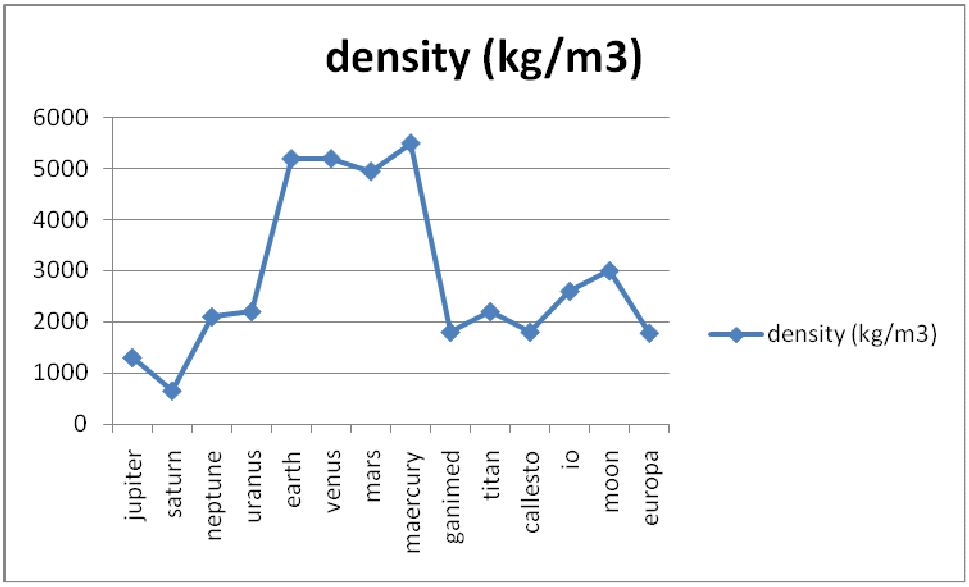

Figure 6. Density of objects in solar system

10. Break effect of dense atmosphere

As we said the planet which is free falling in its orbital round sun is such as a hanging ball or space man and weightless, only its momentum of inertia The high density of Venus' atmosphere is because of its weak resistance to the solar wind. Wind-carried particles can absolutely be hunted by a planet. The Coriolis effect of dense atmosphere, reduces a planets rotation period and changes it to its opposite.

This discussion and break effect will be result any forecasting that absolutely the planet either decreases its velocity of rotation ,or increase. When the rotation period of planet be considerably stable it results that the planet may have any inertia of early impact effect which has been cased such velocity and direction of rotation ,or main gravity of field cases such rotation , (analytical mechanics doesn't show so)"non impact cannot slow down angular rotation by duration of time".

For any useful conclusion I ask astronomers to compare rotation velocity of venus in duration of time carefully , may be it increase or decrease , the rate of increase or decrease will give us best number for our next dynamic analysis ,. From such rate I can give several factors existing at the planet.

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