The near giant planet in the Solar system.

Igor N. Krivosheev - observations, theory, calculations.
Mechanical engineer. Private Observatory. Chervishevo,
Tyumen region, Russia. 56,94586N, 65,42879E .
Equipment : MEADE LX200R 16", DSLR Nikon D700.
igorpel72@gmail.com

Abstract.

This theory does not disprove existing theories of motion of celestial bodies. Moreover, this theory is confirmed and is significant addition to current theories, since it is based on the basic principles of classical mechanics of Galileo and Newton. Statistical analysis method ”has been, is and will be” the foundation of the analytical work of any scientific study. The ultimate objective of the statistical analysis of the always becomes profiled laws concrete science. In this case the definition of statistical regularities are always ahead of the definition of the profiled laws. Example is simple enough:
$T_1^2/T_2^2 = a_1^3/a_2^3$ - this is statistical regularity.
$4\pi^2/G = T^2(M + m)/a^3$ - this is profiled mechanical laws with mechanical component.

Or another example. The theory of the Moon’s motion, which was developed by Ernest William Brown. In this theory, Brown used the 1400 coefficients. Currently, for the calculation of the Moon motion used the expression of tens thousands of coefficients. There is no limit to their number, if required even more high precision. But still it belongs to the category of statistic.

In Solar system all the prerequisites for the existence of a Near giant planet from the point of view of mechanics exist. It is necessary to develop these prerequisites from statistical theories to mechanics and explain the conditions of visibility.
Key words: Celestial mechanics, Solar system, Pioneer anomaly, Kirkwood gap, Lidov - Kozai mechanism, asteroid belt.

Introduction.

In this situation, the author was able to make a significant addition to the statistical component in the form of a mechanical component and complex approach in solution of this problem. The corroboration that can to solve this situation is the experimental part. The best method of search of near giant planet - the transit method. The near giant planet apparent motion on the celestial sphere passes over the disk of the Milky Way galaxy at this time. The main direction of search - search for a moving spot.

1.Kirkwood gaps. [3]

The explanation, that the Kirkwood gaps formed by the resonance with the orbital motion of Jupiter - is unconvincing. Reasonable to believe, that the Kirkwood gaps result of gravitational capture asteroids by massive body. Logically, the all Kirkwood gaps are considered nodes of the orbit of Near giant planet. The object must be synchronized orbit with orbital period Jupiter, Mars, Saturn, Thule (279).

Near giant planet is most likely a balancing factor, balancing the center of mass of the known planets. All Kirkwood gaps are the nodes of the Near giant planet orbit. The simulation showed the following results: the semi major axis of a=4.21±0.07 AU, eccentricity e=0.541±0.008, inclination i=20.9°± 0.12°.

Near giant planet orbit must to have precession of the nodes 18,23"/ day and increase of the perihelion argument 24.96 "/day. Accordingly we have anomalistic precession of perihelion 6.73 "/day.

2. The necessary and sufficient condition Lidov – Kozai mechanism. The particular solution of the ”Three body problem”. Reliable determination of the inclination of the orbital plane of Near giant planet.

Three-body problem of the vector equation:

$$a_r = \text{grad}U + n^2 \cdot r + 2[n \times v] \qquad (1)$$

The minimum angle of the plane of the asteroid’s orbit in the 39. 231 degrees (140.8 degrees for retrograde orbits) in which the precession of the perihelion argument goes to the libration in Lidov-Kozai mechanism. The precession of the perihelion argument has the following reason - the precession of the nodes of the asteroid’s orbit. Eliminate causes - equilibrium state of inertia forces in the nodes. We write the vector equation of equilibrium at the nodes.[4]

$$n^2 \cdot r + 2[n \times v] = 0 \qquad (2)$$

In scalar form this equation is:

$$n^2 \cdot r - 2 \cdot n \cdot v \cdot \text{Sin}(n; v) = 0 \qquad (3)$$

$$n^2 \cdot r = 2 \cdot n \cdot v \cdot \text{Sin}(n; v) \qquad (4)$$

where $v = n \cdot r$.

$$n^2 \cdot r = 2 \cdot n^2 \cdot r \cdot \text{Sin}(n; v) \qquad (5)$$

The final decision comes down to the definition of sinus between the vectors n and v.

$$\text{Sin}(n; v) = 0,5 \qquad (6)$$

Conclusion: the angle between the plane of motion of a massive body and the plane of the asteroid is 60 degrees. In such a situation is created in the equilibrium state of the nodes of the asteroid’s orbit, as angle between the vectors v and n is 30 degrees. Our task is to determine the orbital inclination of Near giant planet to the plane of the ecliptic. Thus the angle between the planes should be 60 degrees. Solve the problem of spherical triangles, taking into account the anomalistic precession of Near giant planet. For retrograde orbits: the forces of inertia are equal in direction and value.

$$n^2 \cdot r + 2 \cdot n \cdot v \cdot \mathrm{Sin}(n; v) = 0 \qquad (7)$$

$$n^2 \cdot r = -2 \cdot n \cdot v \cdot \mathrm{Sin}(n; v) \qquad (8)$$

where $v = n \cdot r$.

The final decision comes down to the definition of sinus between the vectors n and v.

$$\mathrm{Sin}(n; v) = -0{,}5 \qquad (9)$$

Conclusion: for retrograde orbits the angle between the plane of a massive body and the plane of the asteroid is 120 degrees. In such a situation is created in the equilibrium state of the nodes of the asteroid's orbit, as angle between the vectors v and n is 150 degrees. The semi major axis of the orbit is always on perpendicular to the line of nodes. The dependence of the precession angle (*γ*) and inclination (*i*) may be expressed empirically:

$$i=i_{min}+\Delta i \cdot \mathrm{Sin}^{k} \gamma \qquad (10)$$

where i_{min} = 20. 768479515..°, i_{max} = 26. 0121564°, $\Delta i = i_{max} - i_{min}$ = 5. 24367688..°, k =9. 866 381 203..

For $\gamma > 180°$, view formula:

$$i=i_{min}-\Delta i \cdot \mathrm{Sin}^{k}(\gamma-180°) \qquad (11)$$

Note: the formula depending the angle of precession are determined from the solution of spherical triangles. The basic formula of the Kozai-Lidov resonance shows that the eccentricity can be exchanged for the inclination and vice versa. This formula has a statistical character.

$$[(1-e^2)\text{^}0{,}5]\cdot \mathrm{Cos}\, i=\mathrm{Const} \qquad (12)$$

Mechanical component Kozai-Lidov resonance in nodes looks like:

$$n^2\cdot r+2[n\times v]=0 \qquad (13)$$

3. The planes inclination of the asteroid orbits. Slowdown of the asteroids.

The orbit plane of giant planets have little inclination to the ecliptic plane: Jupiter i=1.31°, Saturn i=2.49°, Uranus i=0.77°, Neptune i=1.77°. With this in mind, the gravity of giant planets may withdraw any asteroid in orbit with inclination angle with respect to the ecliptic at the maximum inclination i=1.55° ± 0. 06°.The vector form of the perturbing acceleration can be applied the following expression:

$$a = a_x + a_y + a_z \quad (14)$$

In this situation $a_z = 0$. Draw the axis of this plane with the origin at the Sun. Relative to the Sun, projected on this axis of any asteroid will be at rest.

The principle of inertia say next: every isolated point in a state of rest or uniform motion until the applied force or the forces, which withdraw this state.

For example Ceres has inclination of the orbital plane to the ecliptic i=10.59°, Pallas has an inclination of the orbital plane to the ecliptic i=34.84 °. The question arises: what force could lead to such inclination planes of asteroids?

These dwarf planets were discovered at the beginning of the XIX century. The orbits of asteroids have perturbation , but inclination to the ecliptic plane remains relatively stable. In solving the ”Three-body problem” Sun-Asteroid-Jupiter (original inclination of the plane of the orbit of the asteroid comparable to the tilt of the orbit of Pallas), it requires a maximum of 100 years for the plane of the orbit of the asteroid had inclination, close to the ecliptic when used only the gravity perturbation of Jupiter. Subject to the use of all components, the inclination of the asteroid plane within 600 days close to ”zero” and the orbit becomes chaotic.
This situation is easily tested on the simulator.

Conclusion: need a stabilizing factor in the form of a massive body gravity.

Observations indicate deceleration of unknown character, which can be completely classified as additional gravitational perturbations from of the massive celestial body. Evaluation of the additional gravitational perturbations $6.36 \pm 0.95e-8$ m/s^2.Observed asteroids: A 170221, 42061, 11413, 08267, 20481, 06323, A 117927, 50059.

Note: the observations and calculations of asteroids slowdown were made in 2014.

4.Visibility.

The terms of visibility, or rather invisible in the context of ”Lambert -Beer law” can be explained by the presence of a massive satellite.

In consequence of the strong tidal acceleration, the dust does not settle on the surface of both the planet and its satellites and it is in suspension. In consequence of that it is possible that taking into account the effect of darkening the edge of this celestial body could well be identified by infrared sensors as an asteroid.

Real reducing the gloss on an additional +25m, dust concentration should be at least 320 000 particles per cubic meter in volume comparable to the volume of the object. (The minimum distance to Earth of about 1 AU). The efficiency of absorption layer thickness r depends the optical thickness.[1]

$$\tau = \sigma \cdot n \cdot r \quad (15)$$

$$\sigma = \pi \cdot \rho^2 \quad (16)$$

If $\rho = 1\ e - 5, 1e - 4$ cm, then $\sigma = (5 - 8)e - 9$ cm^2.

Lambert - Beer law say:

$$I(\nu)=Io(\nu)e^{-\tau(\nu)} \quad (17)$$

Star's brightness is reduced by:

$$\Delta m=-2,5lg(E/Eo)=lge^{-\tau(\nu)} \quad (18)$$

We can calculate the concentration of dust :

$$n=\Delta m/\sigma \cdot r \quad (19)$$

Note: in this situation we using the average value of the albedo of the giant planets equal to 0. 333.The magnitude of the brightness of the specified object in the opposition must be without of dust – 5.5m , -5.0m.

Celestial sphere repeatedly scanned by space observatories. However, by coincidentally scan was performed, when Near giant planet was at a remote distance from the Sun and Earth. During scanning Akari, Near giant planet was to Earth distance is not less than 3.85 AU and had scanning object with a magnitude of brightness in the +22.1m. For IRAS: the distance to the Earth is not less 5.26 AU. Magnitude: +22.8 m .For ISO, WISE, Herschel: the distance to the Earth is not less 6.27 AU. Magnitude:+ 23.2m.Maximum permeability WISE + 22.0 m .

In addition, the object K15P00T was discovered in August 2015. [5]

Note: the main task - identifying the object K15P00T as a giant planet.

5. Pioneer anomaly . Yarkovsky effect.

The slowdown in 8.74±1.33 e-10 m/s^2 is directed toward the Sun. We calculate on 01/01/1990 Pioneer 10crossed the point of Pluto's aphelion, that was from the Sun 49.3 AU .[8]

Slowdown Cassini-Huygens mission is estimated at (26.7±1.1) e-10 m/s^2 [10]and can not confirm or deny the existence of anomalies. However, this result allows us to estimate the mass of the object in 9.28±0.38 Earth masses. Assuming that the Pioneer anomaly is caused by gravity some massive object, try to determine more accurately the mass of the object causing, which the slowdown. Believe that a large deceleration is typical for a closer distance, respectively, lower value - for a long distance. Accordingly, we calculating the heliocentric distance based on the measurement date.

Accordingly:

1. On the January 5, 1987, the slowdown will be 1.007 e-9 m/s^2, distance from the

Sun is 41.2132 AU. Calculated weight 96.058 Earth masses.
2. On the November 17, 1988, the slowdown will be 8.74 e-10 m/s^2, distance from the Sun is 46.2656 AU. Calculated weight 105.0653 Earth masses.
3. On the October 1, 1990, the slowdown will be 7.41 e-10 m/s^2, distance from the Sun is 51.3314 AU. Calculated weight 109.6518 Earth masses.

The average mass of the Near giant planet 103.5917±5.6466 Earth masses or 6.1871±0.0545e +26 kg. Effect of a sinusoidal movement of the Sun to slow the spacecraft considerably, if the line Sun-the Solar system center mass (with considering mass of Near giant planet)parallel to the line the Sun-Spacecraft. In this case, the line is almost perpendicular (according to estimates), and hence the error of calculating the mass of the Near giant planet, is negligible. If these lines are parallel, then the error in determining the mass, would be ranged from 27 % to 42 %.

Note: These characteristics are estimated. Real physical characteristics may be determined by actual observations. The orbits of Earth and Venus are almost circular. For Earth orbit eccentricity is e = 0.0167 for Venus orbit eccentricity is e = 0.0068. To save these values eccentricities requires additional gravitational perturbation of approximately 2 (± 0.2) e-7 m / s^2, which can give a massive body.

There are several mutually exclusive for the ”Pioneer anomaly” hypotheses. Therefore, the phenomenon of ”Pioneer anomaly” is related to unsolved problems in physics.

The Yarkovsky effect - is a force acting on a rotating body in space caused by the anisotropic emission of thermal photons, which carry momentum. Acceleration relative Sun equal:

$$a = GM / R^2 \tag{20}$$

Amount of energy emitted per unit area per second.

$$\varepsilon = L / 4\pi R^2 \tag{21}$$

Where possible to deduce acceleration dependence caused by pulse jet from the amount of energy:

$$a_1 / a_2 = \varepsilon_1 / \varepsilon_2 \tag{22}$$

On the basis of this effect Golevka(6489) [9] asteroid in 12 years it has strayed from the path of only 15 km. From these data we can to calculate slowdown of asteroid equal 2.09 e -13 m/s^2. Average solar flux value is 218. 72 W/m^2 or 0. 31344 $cal/cm^2 \cdot min$. Anomaly Pioneer has a value of 8.74±1.33 e-10 m/s^2. If we assume that this anomaly is due to temperature phenomena, taking into account the proportions, the Pioneer anomaly, the emitter must establish the amount of energy emitted by a unit surface per second and equal in magnitude:

$$\varepsilon = [8.74e{-}10/2.09e{-}13]\cdot 218.72 = 914\,647.27\ W/m^2 \text{ or } 1310.75\ cal/cm^2\cdot min.$$

$$T = (\varepsilon/\sigma)\text{^}0{,}25 \tag{23}$$

T=2004 K, where ε = 914 647. 27 W/m^2− energy, $\sigma = 5.67e - 8\ W/m^2\cdot K^4$ Boltzmann constant.

Note: Yarkovsky effect evaluated in the following range from 1 e-15 m/s^2 to 1e-12 m/s^2. With such data, taking into account the proportion of Pioneer anomaly and Yarkovsky effect, the emitter temperature should be at least 1335 K.

Conclusion: On the basis of the elementary calculations, found that to generate momentum caused by anisotropic radiation, which have result of a slowdown in 8.74±1.33 e-10 m/s^2, is required emitter, which heated to T=2004 K for approximated values (but not less than 1335 K).

The probe NEAR experienced further acceleration. NEAR probe speed with the distance from the Earth was 13.5 millimeters per second more than expected (the accuracy of measurements was 0,1 millimeters per second). This speed increment value indicates on value acceleration of $a = 3.626 \pm 0.4\, e-5$ m/s^2.[7]

$$v + \Delta v = [(g+\Delta a)R]^{0.5} \qquad (24)$$

Most likely acceleration can be caused by the removal of 397 345.15 km or on 0. 57089R⊙ common center of mass of the Sun from the physical center of the Sun. This deviation gives grounds to speak about the correct evaluation of mass of Near giant planet approximately in 110 Earth masses.

Gravity assist inter planetary spacecraft Galileo, NEAR, Rosetta, Cassini, Messenger. Almost all spacecraft were accelerated different from calculate. The exception was the Messenger. During gravity assist Galileo, NEAR, Rosetta, Cassini trajectory was perpendicular to the line center of mass of the Solar system-the Sun(Vector-radius Solar system center mass - Sun and vector-radius of the Sun - spacecraft are collinear). While trajectory of Messenger was almost parallel to this line(vector-radius Solar system center mass-Sun and vector-radius of the Sun-spacecraft are perpendicular) or Messenger was on the reverse side of the convex portion of the Sun. Therefore Messenger overall change its speed was very low.[7]

Accordingly:
- on March 4, 2005 for Rosetta λ ⊕=163.36°;
- on September 2, 2005 for Messenger λ ⊕=339.51° .

Conclusion: the exaggerated role of anisotropic emission in the phenomenon Pioneer Anomaly.[6]

6.Stability condition.

This Near giant planet is one of balance factor of Solar system. Estimated maximum deviation of the common center of mass of the Solar System from the physical center of the Sun at gravity assist:

- on December 8, 1992 for Galileo – 0. 55666 R⊙ or 387 440.7 km, λ ⊕=75.85°;
- on January 23, 1998 for NEAR - 0.5553 R⊙ or 386 495.9 km, λ⊕=122.93°;
- on March 4, 2005 for Rosetta – 0.56768 R⊙ or 395 108.1 km, λ ⊕=163.36°;
- on August 18, 1998 for Cassini – 0.60392 R⊙ or 420 334.6 km, λ ⊕=325.04°.

The center of mass of the Solar System is always in the Sun. Let me remind the stability condition of the rotating system. The rotating system is stable if the center of gravity, the center of mass and the center of rotation are at the same point. In our situation, it added to the central body-the Sun. In conjunction these provisions we say about a First Generalized Kepler's law.

The stability condition is defined in the "base" or unmoving coordinate system. The displacement of the center of mass of the Sun from its physical center has a value which does not exceed the radius of the Sun. As can be seen from the result, the common center of mass, center of gravity, the center of rotation is always in the Sun.

Note: the stability condition should not be confused with the "2-body problem".
The two-body problem is a special case of the stability condition. For a system of rotating bodies, a common point is defined, with respect to which all bodies rotate without exception. In the case of the solar system, a point is determined, with respect to which all bodies, including the Sun, are rotated in accordance with all Kepler's Three General Law. In our situation, it added to the central body-the Sun. The stability condition is defined in the "basic" (unmoving) coordinate system.

To understand this situation, we give an example of solving the problem: direct and reverse.

6.1. Direct problem.

D'Alembert's principle. Viewed in this case the reaction. At the moment of the im pact of external forces on the daily solar rotation axis (offset of this axis on the radius of the Sun) there is a change in momentum.

$$\Delta M = dL/dt \qquad (25)$$

$$L = m \cdot v \cdot r \qquad (26)$$

$$v = n \cdot r \qquad (27)$$

Value m and r are constant. The momentum change is due to changes in angular velocity n. The angular velocity of rotation of the sun rises. At the equator of the sun the linear velocity equal of the first cosmic velocity. The star begins to collapse. Example: Vega (Alpha Lyr). $V=0.93V_1$. Where V_1 is the first cosmic velocity.
Another example - the spinning top. When exposed to the axis of rotation, for save of the stability, the spinning top must to increase the angular velocity of rotation.

6.2.Reverse problem.

Two massive bodies rotating relative a common center of mass. The weight of each component is equal to 1/2 the Sun's mass. The density of each component material is equal to the density of solar matter ($\rho 1 = \rho 2 = \rho\odot$) . The radius of each component equal $R=0.7937R\odot$.

Upon reaching the Roche limit, begining the mutual absorption of bodies to form one total body mass. For these bodies the Roche limit is: $d = 1.2599R (\rho 1/\rho 2)^{1/3}$, where $\rho 1/\rho 2 = 1$ and $R=0.7937R\odot$, we have total $d = R\odot$.

Conclusion: the maximum bias of daily Sun's rotation axis relative to common center mass of system is equal to the radius of the Sun.

Note: at a considerable distance between components of the binary system, orbital velocity and the linear velocity of daily rotation is much smaller than the first cosmic speed.

The linear velocity of the daily rotation of the Sun at the equator is 2027.5 ± 2.5 m/sec. This situation suggests shifting the axis of daily rotation of the Sun relative of the center of mass of the solar system at 3233.4 ± 2.6 km.

A defined above the center of mass of the solar system abnormalities may indicate the following: sinusoidal motion of the Sun; especially the Sun structure; about two factors combined.

6.3. Heliosphere.

The Voyager 1 spacecraft passed the termination shock in December 2004, when it was about 94 AU from the Sun, by virtue of the change in magnetic readings taken from the craft. In contrast, Voyager 2 began detecting returning particles when it was only 76 AU from the Sun, in May 2006. This implies that the heliosphere may be irregularly shaped, bulging outwards in the Sun's northern hemisphere and pushed inward in the south. [10]

Given the asymmetry of the heliosphere , can be said about the displacement of the center of mass of the Sun from its physical center at 0. 65423 $R\odot$. This value is quite comparable to the values obtained through the gravity assist of spacecraft: Galileo, NEAR, Cassini, Rosetta. Said displacement has a movement, and has to influence on the stability of the solar system. The approximate calculated angular velocity is equal to 399 ±0. 7 "/ day. This situation is reflected in the movement of the Moon.

Note: Given the condition of stability Near giant planet has a mass of 142.42±3.37 Earth masses or 8.506 ±0.201 e+26 kg.

The following data were used for calculations:

- the common center of mass of the known planets, its ecliptic longitude and heliocentric distance;

- the displacement of the center of mass of the Sun from its physical center at

0. 65423 R⨀, in the projection onto the plane of the ecliptic;

-object X, its ecliptic longitude and heliocentric distance.

7. Observations. Astro photo. Orbital characteristics.

The main search method of the Near giant planet - the transit method. A non-standard approach is required in the production of astro photos.

Decrease magnitude brightness of star and eclipse of the star + 15.15 m.[11]

Taking into account the angular velocity of motion along the celestial sphere in 18.2 arc sec per hour and the distance to Earth in 4.11 AU preliminary result is the following. Reducing the gloss lasted 30 minutes. This means dust above 27 000 km above the planet, an eclipse lasted 3 minutes, meaning an object of at least 2 700 km (asteroid with such characteristics is not in nature, and therefore the object must have a larger size to retain by gravity such a quantity of dust).

Astro photo session from March 11, 2017.

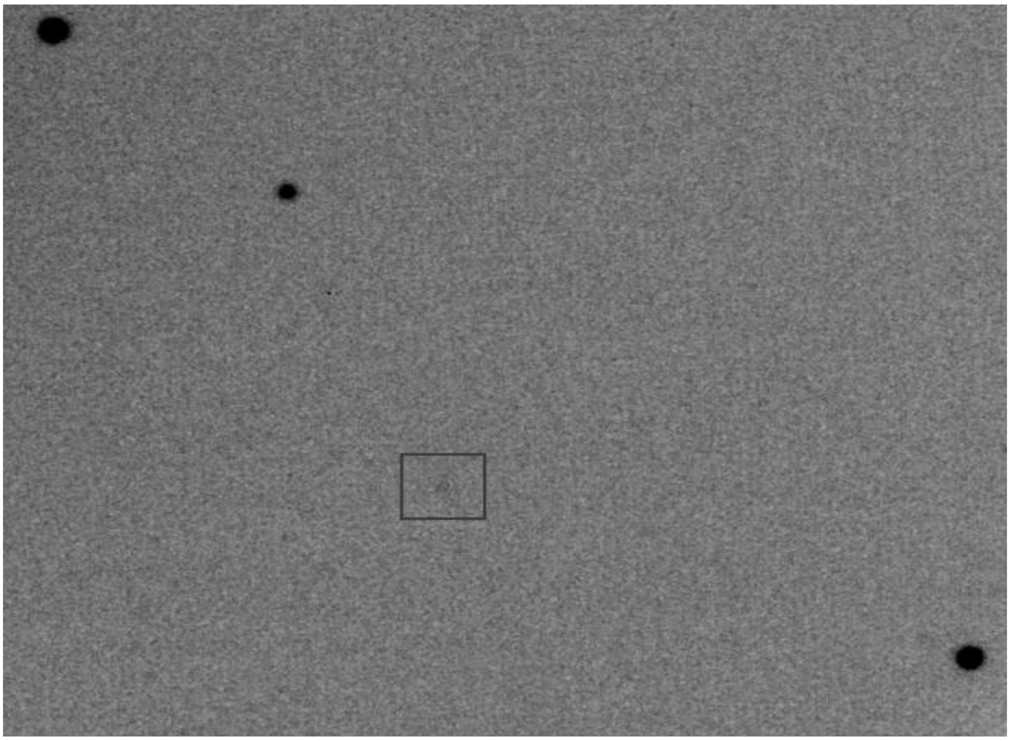

Fig 1. 2017-03-11. 17-59-57 UTC . R.A. 5:54:00.1 DEC +1:18:18.1 (Ori) Object name: USNOA2 0900-0900-02054154. Decrease magnitude brightness to +18m. Time from the onset of a decrease in brightness to eclipse - 30 min.

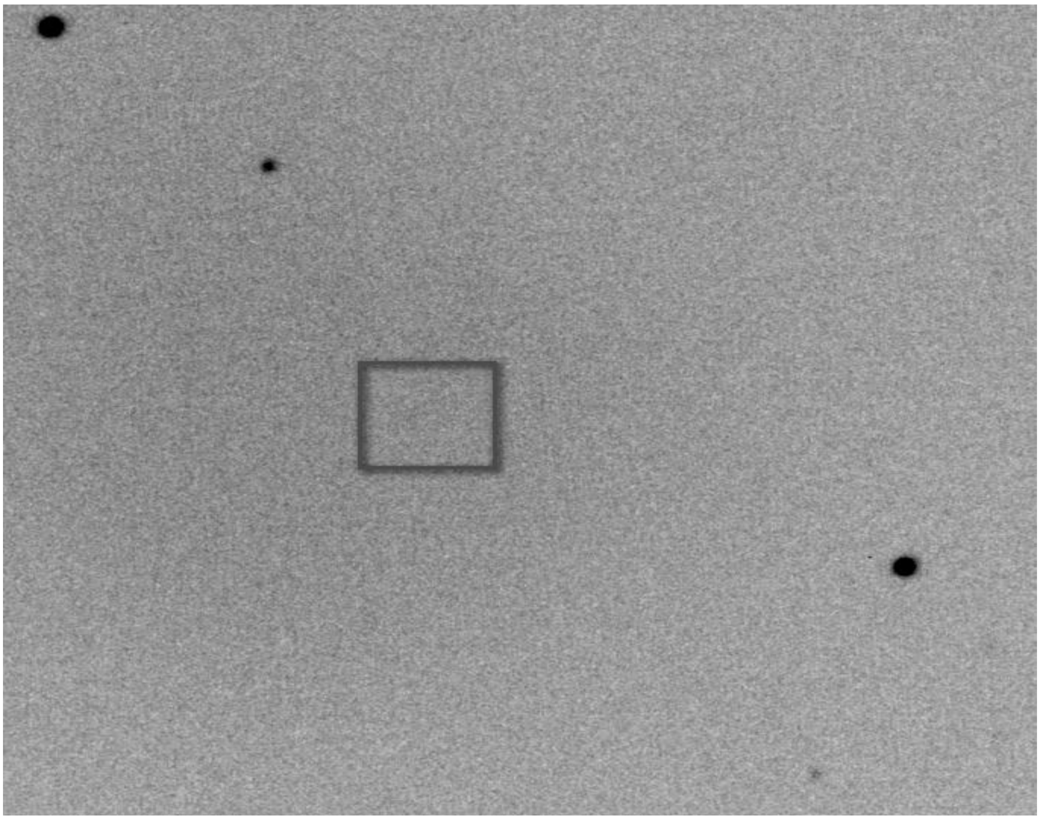

Fig 2. 2017-03-11. 18-25-29 UTC . R.A. 5:54:00.1 DEC +1:18:18.1 (Ori) USNOA2 0900-0900-02054154 Time eclipse -3 min.

Astro photo methodic.Refusal of continuous summation of frames.

Differential summation of frames by event:
- summation frames of normal state ;
- summation frames of decrease magnitude brightness of star;
- summation frames of star eclipse.
- adjust the focus to the distance to the object. At the moment, the distance to Object X and to Jupiter is approximately the same.
- possible creation of animation.
-guiding object.

Orbital element:
Epoch 2017.0 March 11.0 = 2 457 823.5 JDT
(2000.0)
n 0.11498545, a 4.1883291, e 0.5383032, Node 189.70983, Peri 146.63978, Incl 20.93993, P 8.57.

8. General conclusions.

8.1. Solved a few unsolved problems in physics.

1. Pioneer anomaly is caused by the gravity of a massive body.

2. Solved the problem of stability of the Solar system. The condition of stability of the solar system as a rotating system is closed.

All three balancing factors of the Solar system are calculated:

- Near giant planet . Determined the mass of Near giant planet. According to the Pioneer anomaly the mass of the Near giant planet is 103.5917 ± 5.6466 Earth masses or 6.1871 ± 0.0545e +26 kg. According to the condition of stability Near giant planet has a mass of 142.42±3.37 Earth masses or 8.506 ±0.201 e+26 kg;

- Value of the displacement of the center of mass of the Sun from its physical center equal 0. 65423 R⨀(data of spacecraft Voyagers);

- Center of mass of known planets.

Search one more additional massive celestial body is doomed to failure.

3. The shown are the real reasons Kozai - Lidov resonance. The minimum angle of the plane of the asteroid's orbit in the 39. 231 degrees (140.769 degrees for retrograde orbits) in which the precession of the perihelion argument goes to the libration in Lidov - Kozai mechanism.

The precession of the perihelion argument has the following reason - the precession of the nodes of the asteroid's orbit. Eliminate causes - equilibrium state of inertia forces in the nodes.

4. The displacement of the center of mass of the Sun has a period of movement and has additional effect to:
- the gravity assist of interplanetary spacecraft;
- the asteroids trajectory;
- gravitational perturbation on planetary orbits.

This phenomenon requires additional research.

Near giant planet has additional effect to the asteroids trajectory.

These phenomena should be used in calculating the trajectories of spacecraft and for calculating the MOID in NEO program, PHO program.

5. Discovered new physical phenomena influence the trajectory of TNO. As a consequence it is necessary to model the trajectory of TNO with considering discovered new phenomena (in TNO trajectories possible anomalous precession of perihelion and precession of nodes). The truncated Gaussian method for determining orbital parameters for TNO requires to testing in the form of long time observations.

6. Most likely we are dealing with the legendary planet Phaethon, which was searched by Olbers. And the legend of Phaeton and Kyknos has a cosmogonic character.

8.2. Additional conclusions and hypothesis.

1. The anomalous perihelion precession of Mercury - discovered in 1859 feature motion of the planet Mercury. This feature of Mercury's motion is completely subject to the law of universal gravitation of Newton. And can to be explain by the feature of the structure of the Sun - the displacement of the center of mass of the Sun from its physical center and the presence of Near giant planet. The results obtained with the use of GTR is an accidental coincidence.

2. The asteroid belt is the result of a cosmic catastrophe. Most likely clashes satellite of Near giant planet and Venus. Base: daily retrograde rotation of Venus. In other words, Venus was initially at a heliocentric distance of 3 AU. All Kirkwood gaps are nodes of Near giant planet orbit with the presence of anomalous precession of the perihelion and precession of the orbit nodes.

3. Should pay attention to the inclination of the axis of daily rotation of the giant planets. For Saturn it is 26.7°, Uranus 97.8° ,for Neptune 28.3°. While under the current model of the Solar system calculated values are as follows: for Saturn 3.9°±0.2°, Uranus 2.3° ± 0.15°, for Neptune 2.1° ± 0. 15°. This situation can to speak about the gravitational perturbation of Near Giant Planet with an unstable orbit, which creates an additional Coriolis acceleration for axis of the daily rotation of the famous giant planets. The simulation showed that the orbit can have the following characteristics: semi-major axis 11. 67879 AU, e = 0.85404, perihelion q=1. 70464 AU, aphelion Q=21. 65294 AU, i=20.796 °, P=39. 9 year. It is also a challenge in the context of the Solar system evolution.

4. Possible dual-core structure of the Sun. Base: The displacement of the center of mass of the Sun from its physical center and dual magnetic field. (One magnetic core - one magnetic field, two magnetic core - two magnetic fields.)

8.3. Explanatory Notes.

1.The final result of positional measurements gives a minimum error close to "0". Because The calculation takes the acceleration directed to the physical center of the Sun. It seems like it turns out there is no perturbations of the asteroids orbit. However, this vector is the sum of the vectors $a = a_1 + a_2$.

a - is the acceleration directed toward the physical center of the Sun(2). It is the vector sum of the acceleration a1,a_1 - acceleration directed to the center of mass of the Sun (1) and a_2- the perturbing acceleration from the Object X (Near Giant Planet).

The main reason for the existence of the Near Giant Planet is the inclinations of the asteroid planes, and not the absence of error in the positional dimension.

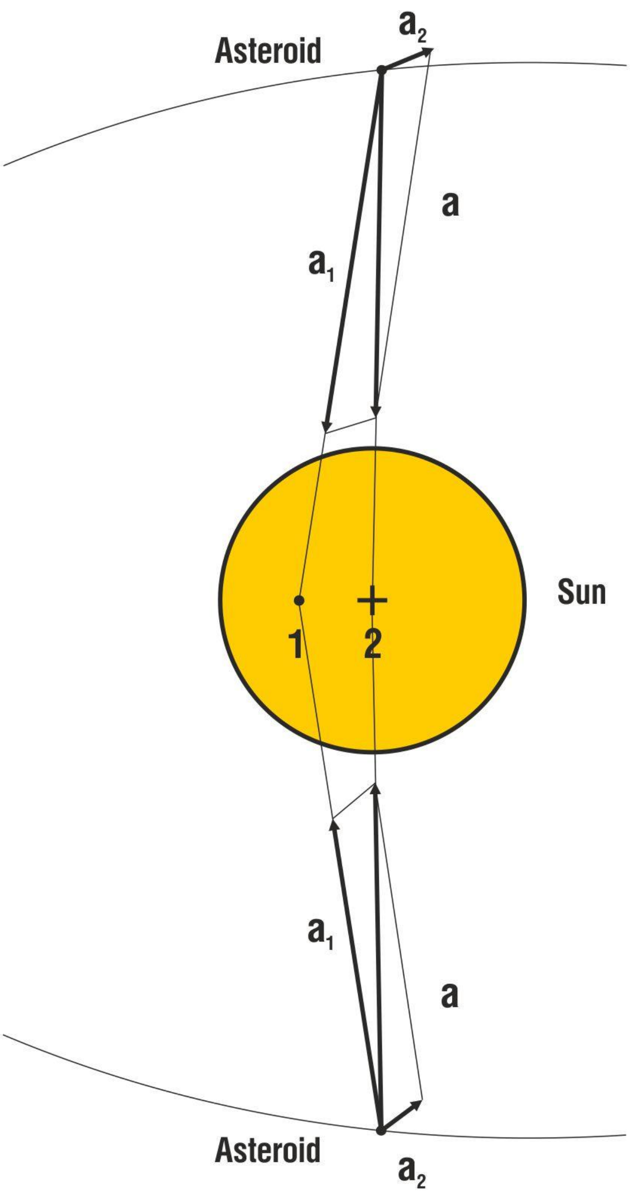

Fig 3. 1- The center of mass of the Sun. 2- The physical center of the Sun.

Next, consider the motion of the Moon in several cases, in particular the eccentricity of the Moon orbit, the position of perigee and apogee. When:

a. Earth in opposition to Jupiter.

b. Earth in the maximum elongation relative to Jupiter.

c. Earth in conjunction with Jupiter.

In the opposition of the Earth with Jupiter, the apogee of the Moon orbit is in the direction of Jupiter, the eccentricity of the Moon orbit is 0.068-0.07. In elongations relative to Jupiter, the Moon's orbit has an eccentricity of 0.045-0.048. It is fair to assume that in the conjunction of the Earth and Jupiter, considering that the distance in the conjunction is approximately 1.5 times greater than in the opposition, the eccentricity of the Moon orbit will be in the region of 0.027-0.028. However, it increases in comparison with elongations and reaches the maximum values of 0.068-0.07 and, again, the apogee has a direction to Jupiter. This can speak of some peculiarity of the structure of the Sun, in particular, the displacement of the center of mass of the Sun itself relative to its physical center.

Opposition of the Earth and Jupiter	Apogee of the Moon	Perigee of the Moon
3 Dec 2012	28 Nov 2012 – 406361.2 km	12 Dec 2012-357072.6 km
6 Jan 2014	16 Jan 2014 - 406532.8 km	1 Jan 2014-356922.9 km

Conjunction of the Earth and Jupiter	Apogee of the Moon	Perigee of the Moon
14 May 2012	19 May 2012 – 406446.6 km	6 May 2012 – 356954.0 km
24 Jul 2014	28 Jul 2014- 406564.3 km	10Aug2014 - 356897.9 km

The theory of Ernest William Brown is statistical in nature with the use of a large number of coefficients and does not explain in this situation the motion of the Moon in the context of Galileo-Newtonian mechanics.

2. To assert 100% that object K15P00T/2015PT is a Near Giant Planet can not be. It is possible that this object is a satellite of the Near Giant Planet and can be used as an indicator-object. In connection with which the brightness of the Near Giant Planet may be less than indicated in the article. As a consequence, the concentration of dust in the near-planetary space can be higher than specified.

3. The accuracy of the orbital elements can be established by long-term observations. The main possible cause of a minor error is the sinusoidal motion of the Near Giant Planet and its satellite, relative to the common center of mass. The maximum error in the calculation of coordinates and the astro photo sessions was 4.8 arc minutes, the minimum error was 2.1 arc minutes.

4.Given the asymmetry of the heliosphere , can be said about the displacement of the center of mass of the Sun from its physical center at 0. 65423 $R_{\odot}$. (Date of Voyager1 and Voyager2). However, this balancing factor is mobile and two measurements are not sufficient for final output. According to the preliminary calculations, the displacement of the center of mass of the Sun from its physical center should be close to 0.704$R_{\odot}$.

5. With regard to the thermodynamic calculation in the context of the Pioneer Anomaly, the author consciously placed himself in unfavorable conditions. When analyzing the Pioneer Anomaly, a number of positive factors affecting the trajectory of Pioneer-10 and Pioneer 11 were not taken into account, albeit insignificantly, but nevertheless this is an acceleration, not a slowdown. Namely:

a. The same Yarkovsky effect, creating an additional reactive moment and acceleration directed from the Sun;

b. The influence of the solar wind on the spacecraft, also creating an additional reactive moment and acceleration directed from the Sun.

6. Observations should be made on more powerful equipment than the one that was provided to me. It is necessary to stay border for experimenters from thoughtless testing of ephemerides. On the calculated trajectory for a successful astro photo session, there should be control objects that are eclipsed or lost brightness by the transit of the Near Giant Planet. In the absence of such control objects a session would be useless. The program of summing up the pictures is "oaky", therefore it is required to directly observe the event (eclipse or decrease magnitude brightness) in real time. The average expectation of the event in my case is about 2 hours. In addition, improvement of astrophotography methodic is required.

7. Proceeding from the received model of the Solar system, the orbits of TNO will have the form of a sinusoid with respect to an ellipse. With a heliocentric distance of 77-80 AE, the average daily movement will be 4.5-5 arc seconds. The precession of the nodes of the orbit will be 2.1-2.7 arc seconds per day, the increment of the perihelion argument will be 3.1-3.7 arc seconds per day, respectively, the anomalous precession of perihelion will be 0.4-1.7 arc seconds per day.

These calculations are very rough, but they allow us to conclude that TNO will not leave the limits of the heliosphere. The maximum perturbation of the orbit of TNO will be approximately every 240 ° of the Saturn's angular path at the time of the oppositions of Saturn and Jupiter. Accordingly, every 120 ° there will be a "pseudo clusterization" of TNO.

Real TNO trajectories and their orbital parameters can be confirmed only on the basis of long-term observations using radar scanning.

8. The existing Lidov-Kozai resonance formula is of a statistical nature, as was repeatedly pointed out by Lidov and Kozai. The problem is solved in the article to determine the mechanical causes of this resonance. The motion of the balancing factors of the Solar system must be synchronized.

References

[1] Astronomy: a manual for teacher training institutions / MM Dagaev [and others]. - M.:Education, 1983. - 384. - ISBN 1-11-1

[2] John D. Anderson, Philip A. Laing, Eunice L. Lau, Anthony S. Liu, Michael Martin Nieto, Slava G. Turyshev. Study of the anomalous acceleration of Pioneer 10 and 11.

http://arxiv.org/abs/gr-qc/0104064

[3] http://scienceworld.wolfram.com/astronomy/KirkwoodGaps.html

[4] Igor N.Krivosheev .The necessary and sufficient condition Lidov- Kozai mechanism. The particular solution of the ”Three-body problem”. Reliable determination of the inclination of the orbital plane of Planet X.

http://www.membrana.ru/particle/18387

[5] http://www.minorplanetcenter.net/mpec/K15/K15P20.html

[6] Support for the Thermal Origin of the Pioneer Anomaly

http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.108.241101

[7] Anomalous Orbital-Energy Changes Observed during Spacecraft Flybys of Earth

http://www.physics.usyd.edu.au/~laszlo/kepek/anderson2008.pdf

[8] http://space.jpl.nasa.gov

[9] Direct Detection of the Yarkovsky Effect by Radar Ranging to Asteroid 6489 Golevka

http://science.sciencemag.org/content/302/5651/1739

[10] http://edition.cnn.com/2006/TECH/space/05/23/voyager.2/index.html

[11] Special thanks to Vitaliy Ugreninov for help and processing in astro photo.