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Resonant Cosmos

(Oscillatory motion and forming of the inclination of the planets' rotation plane)

Resume

A mechanism of originating and forming of the inclination of the rotation plane of the planets (bodies) in the space systems of planetary type is considered. The inclination of the rotation plane is formed by resonant oscillations of planets (bodies) along the direction of motion of planetary systems. The resonant oscillations are a natural condition of all cosmic formations of planetary type.

Contents:

Introduction

The paper [1], [2], devoted to the law of the motion of the bodies in the systems of planetary type, shows that the observed motion of planets is determined by oscillatory motions of a planet in two planes:

– planet's rotation around a central body (star) in the plane of celestial equator and

– oscillatory motion along the direction of motion of a planetary system, Fig. 1.

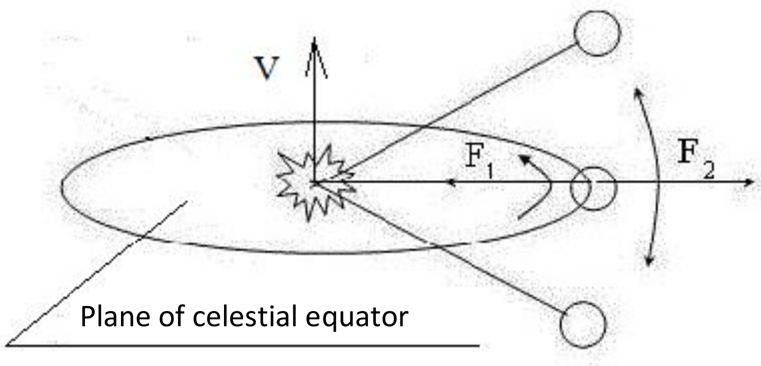


Fig. 1. Planets' motion occurs in the form of oscillations in two planes.

It was shown that the oscillatory motions along the direction of motion of a planetary system are caused by the component of gravitational attraction of a star when the planet is shifting relative to the plane of celestial equator.

It was shown also that the oscillatory motion along the direction of motion of the planetary system determines the inclination of the planet's plane of rotation and the dynamics of the inclination observed.

However, the question of what forces cause the planet's shift relative to the plane of celestial equator, and what determines the amplitude of the oscillatory motion of the planet along the direction of motion of the planetary system, remained unconsidered.

Physical model of forming of the inclination of the rotation plane

Let us imagine a planetary system consisting of a star and a planet (with the parameters of the Sun and the Earth) revolving around the Galaxy's center.

Suppose that while forming simultaneously from a dust cloud, and acquiring an angular velocity of the motion around the Galaxy's center equal to that of the star, the planet is revolving around the star in the plane of celestial equator, which is perpendicular to the Galaxy's plane, Fig. 2.

During its moving around the Galaxy's center as a part of the planetary system, the planet sometimes approaches to the Galaxy's center and sometimes moves away from it by the radius of its orbit around the star.

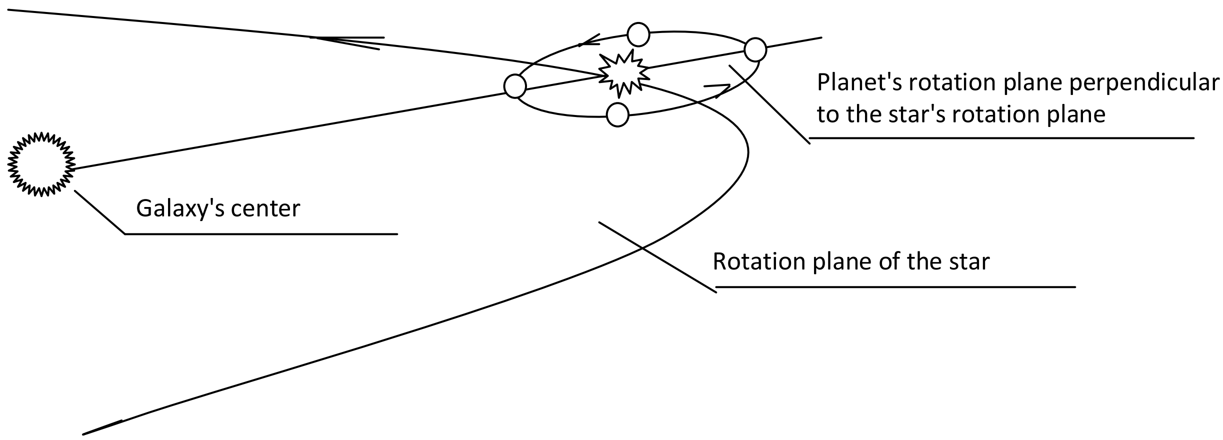


Fig. 2. In its motion around the star, the planet periodically approaches to and moves away from the Galaxy's center.

According to the law of conservation of momentum (L = mvr), the planet's velocity along the direction of motion of the planetary system shall change — increase with the planet's approaching to the Galaxy's center, and decrease with the planet's moving away from it.

When getting closer to the Galaxy's center, and having greater velocity along the direction of motion of the planetary system, the planet shall outrun the star. When moving away from the Galaxy's center, the planet slows down along the direction of motion of the planetary system and shall lag behind the star, Fig. 3.

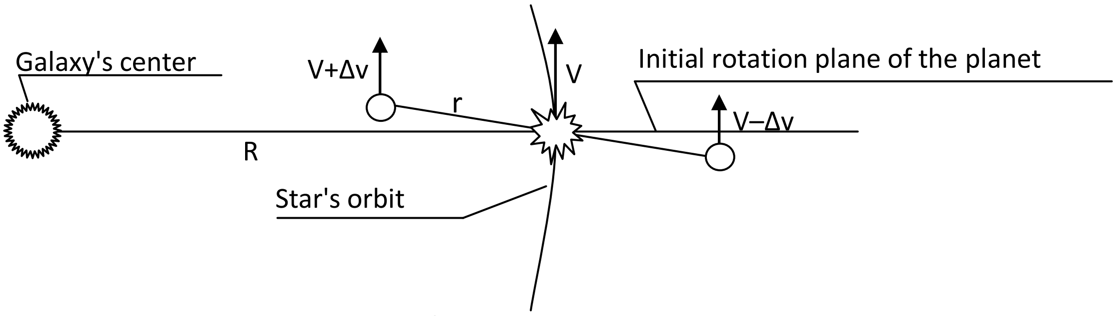


Fig. 3. When getting closer to the Galaxy's center, the planet outruns the star, and when moving away from the Galaxy's center, it lags behind the star.

Relative change of the distance from the Galaxy's center (the distance of the Earth in this case) is approximately $\delta = \pm 5.5E{-}10$, which leads to a negligibly small change of the planet's motion along the direction of motion of the planetary system, and therefore to a negligibly small, practically unobservable shift of the planet relative to its rotation plane (plane of celestial equator). This parameter increases for the outer planets of the Solar System. For the inner ones it decreases.

As it was shown in [1], when the planet shifts from the plane of celestial equator, the gravitational force component F of the star's attraction arises, which acts in the direction of the motion of the planetary system, opposite to the shift.

During the planet's shifting from the point farthest from the Galaxy's center to the star's orbit, action of this gravitational component and direction of change of the planet's velocity, determined by the law of conservation of angular momentum, coincide and are directed to increase the planet's velocity in the direction of the planetary system's motion, Fig. 4.

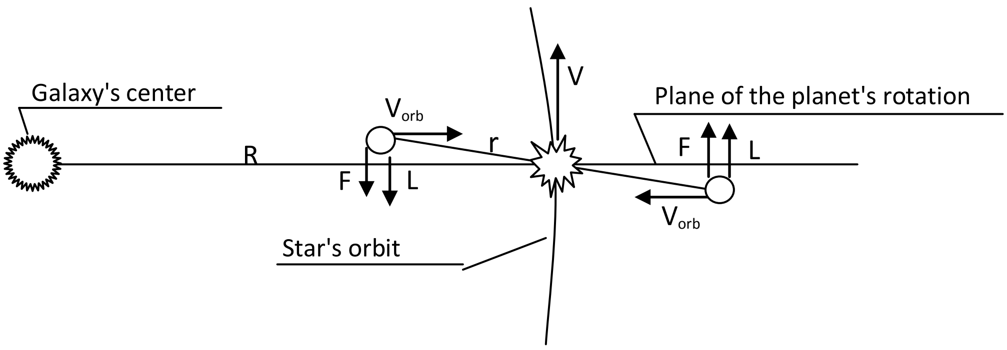


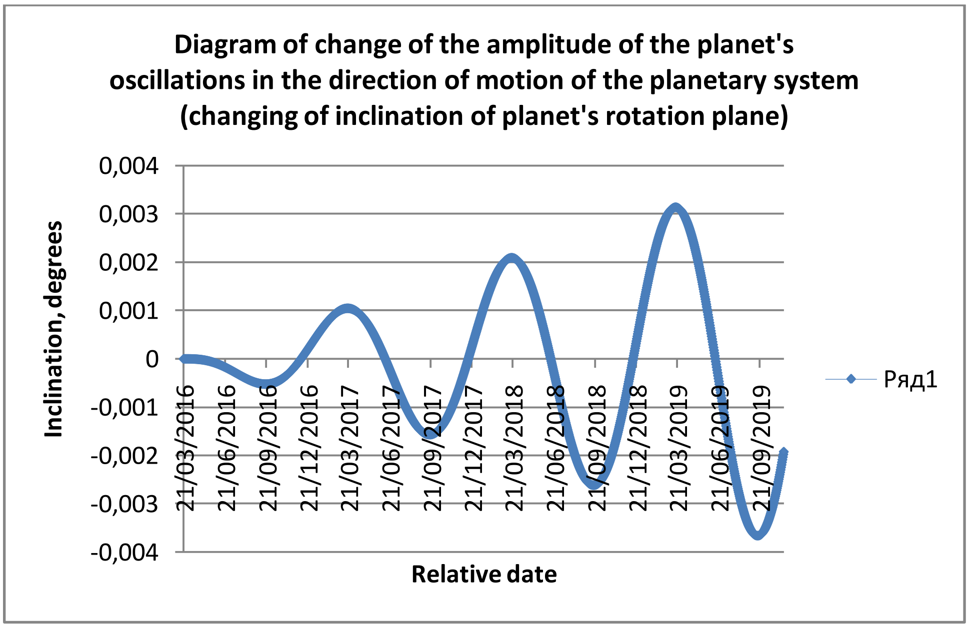
Fig.4. Action of the gravitational component and direction of change of the planet's velocity, determined by the law of conservation of angular momentum, coincide.
F – Gravitational attraction of the star.
L – Change of velocity in conformity with the law of conservation of angular momentum.

During the planet's moving from the point closest to the Galaxy's center to the star's orbit, action of the gravitational component and direction of change of the planet's velocity, determined by the law of conservation of angular momentum, coincide too, but now they are directed so that to decrease the planet's velocity in the direction of motion of the planetary system (star).

As a result of the resonance arisen, an amplitude of the planet's oscillations in the direction of motion of the planetary system and therefore the inclination of the plane of rotation will be constantly increasing.

In the diagram, a fragment of calculations is represented, which shows how the amplitude of oscillations of the Earth in the direction of motion of the planetary system would change if it started its rotation around the Sun in the plane of celestial equator, that is, orbiting the Galaxy's center with the same angular velocity as the Sun.

(A paper and a table with the calculations can be found at: https://neizvestniezakoniastronomii.blogspot.com).



The diagram shows that after some tens of thousands years have passed (which is a negligibly short time in the cosmic scale) the amplitude of the planet's oscillations in the direction of motion of the planetary system (or an angle of inclination of the planet's rotation plane) can reach some tens of degrees.

Conclusions

The considered mechanism of arising and generation of the oscillatory motion of a planet in the direction of motion of the planetary system is a Law relevant for any planetary systems.

Oscillations of cosmic bodies in two planes (rotation in the plane of celestial equator and cyclic oscillations in the direction of motion of the planetary system) are the natural condition of cosmic bodies within planetary systems.

An exclusion could be planetary systems which are moving uniformly or are stationary in space. However, existence of such systems are unlikely, as any formations in space have their centers to orbit.

Movement of all objects in space within planetary type systems occurs in form of cyclic oscillations — orbiting around a central body in the plane of celestial equator, and resonant oscillations in the direction of motion of the planetary system.

References

1. V. Krasnov, “The Papers of Independent Authors:, ISSN 2225-6717, Ludu Inc., publ. “DNA”, volume 37, 2016, ID 19203260, ISBN 978-1-365-32094-1.
2. **viXra:1701.0643** ; **viXra:1701.0641**