Proof of Kepler's Third Law

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Abstract: The motion trajectories of planets are divided into static trajectories and dynamic trajectories. It was proposed that planets revolve around the center of mass of stars and other planets. It suggests that the center of mass of a planet, or the center of mass of an entire galaxy, is not a closed curve in the plane of the galaxy, but a solid spiral curve around that closed curve. It was proposed that the planet and its orbiting moons were a whole. It was proposed that the orbit of the planets around the star is a closed, irregular spiral curve around the center of mass of the planets and moons, around the center of mass of the stars and other planets. Similarly, the orbit of the satellite around the planet is also a circle of irregular spiral curves. The curve in the closed irregular galactic plane is static, and is the projection of the threaded center of the dynamic spiral curve onto the galactic plane. The closed irregular spiral curve is dynamic. It was proposed that the trajectory of the planets around the star was not an elliptic curve in the galactic plane, but a three-dimensional spiral curve around this irregular flat curve that resembled an ellipse. It turns out that Kepler's third law describes the dynamics of planets. In other words, Kepler's second law, which is a static description of planets, follows the area law. Kepler's third law, which describes the dynamics of planets, also follows the area law and is in perfect agreement with Newton's law of gravitation.

Key Words: Static motion trajectory; Dynamic motion path; The center of mass; Spiral curve

1.Introduction

As we know, Kepler's three laws describe the basic laws of all galaxies and planets orbiting stars in the universe:

(1)The first law (orbital law) : The orbit of a planet around a star is a closed ellipse, and the star is located at a focal point of the ellipse.

(2)The second law (the law of area) : the line between the planet and the sun sweeps an equal area in an equal amount of time.

(3)The third law (period law) : The square of the time it takes the planets to orbit the Sun (called the orbital period) is proportional to the cube of their average distance from the Sun.

The authors believe that this is just a static description of the motion of the planets. Because the only data that people can observe is the distance of the planet from the star and the period of the planet's orbit. In this way, all the laws that describe the motion of the planets are related to the trajectories of the planets in the plane of the galaxy. That is, the pattern that the planets show in the galactic plane after one cycle is a static description. And we know that the trajectories of planets around stars are, in fact, not in the galactic plane at all, that is, in the dynamic case, but in the three-dimensional spiral curve above and below the galactic plane. So, what's the difference between a planet's dynamic trajectory around a star and its static trajectory over the galactic plane? The following is a detailed introduction one by one.

2. Distribution of Galaxies

2.1. Basic Knowledge and Concepts

(1)The Mass of the Planet

Planets and moons are a whole, so in our astronomical calculations, the mass of a planet includes the mass of all its moons.

(2) The Center of Mass of the Planet

The center of mass of the planet, not the center of the planet; It's the center of mass of the planets and all the moons.

(3) The Center of Mass of the Planet Around the Star

The planets do not move around the center of the star, but around the center of mass of the star and other planets, including their moons. Because the other planets, including their moons, are always moving in spiral curves around the star. Therefore, the planet orbits the center of mass of the star in a closed, irregular spiral curve.

(4) The Arrangement of the Closed Irregular Spiral Curve of the Center of Mass of the Planet Around the Star

Each planet has its own closed, irregular spiral curve around the center of mass of the star. The order in which they are arranged is just the opposite of the order in which the orbits of the planets are arranged: the inside is on the outside, and the outside is on the inside.

(5) The Behavior of the Planet in the Closed Irregular Spiral Curve of the Center of Mass of the Star

Because the other planets are always moving. Therefore, the closed irregular spiral curve of the center of mass of each planet around the star, each circle is different from the adjacent spiral curve. That is, in fact, the irregular spiral curve of the center of mass of each planet around the star is not closed, but separated and connected by similar spiral curves. In this way, the movement of each planet around the star is not the same, is different. That's why planets precess. That is, every planet precesses. However, the outer planets have long periods, and the precession is not obvious. The planets inside, they have short periods, they precession is very obvious. The precession of Mercury is a good illustration.

(6) Sparse Star Region and Dense Star Region

A planet orbiting a star has a long, slow outer period. The cycles inside are short and the speed is fast. So, the distribution of planets, almost all of the time, almost all of the planets are concentrated in the region of the outer planets, called the dense region of the galaxy. Opposite the dense star region, it is called the sparse star region.

It should be noted that any galaxy, including those containing stars, has a similar distribution, with the outer regions in the dense star region. Opposite the dense region is the sparse region.

The Milky Way is similar, only it contains many satellite galaxies. Each satellite galaxy has its own sparse star region and dense star region. What we see are the sparse and dense regions of the satellite galaxies inside. The sparse regions of the outer satellite galaxies are invisible to us because of the massive stars at the center of the Milky Way. The dense regions of the outer satellite galaxies, due to the vast scope of the Milky Way, we only see the tip of its iceberg. That's why people have a partial view of the galaxy that's not entirely correct.

(7) The Role of Sparse and Dense Star Regions

Due to the gravitational pull of the many planets in the dense region, the closed irregular spiral curve of the center of mass of all the planets around the star is stretched for the first time, forming a shape similar to an elliptical ring. Imagine the planets moving at the same distance and at the same speed along a closed spiral curve inside the star. The trajectory of the planets is similar to the spiral curve of the center of mass, scaled up, closed, irregular spiral curve. The screw center of this spiral curve, the static curve projected in the corresponding galactic rotation plane, is a closed irregular ellipsoid curve. This is Kepler's first law, the so-called orbital law.

Because the spiral curve is irregular. The part with smaller threads, and the part with longer pitch, corresponds to a faster static curve in the galaxy's rotation plane. Conversely, the parts with larger threads, and the parts with shorter pitches, correspond to a slower static curve in the galaxy's rotation plane. This is Kepler's second law, the so-called area law. It's actually the motion of the static curve of the planet in the rotation plane of the galaxy.

(8) The Center of Mass of the Satellite Around the Planet

The satellite does not move around the center of the planet, but around the center of mass of the planet and all the other satellites. Because the other moons have been orbiting the planet in a spiral curve. Thus, all the moons of the planet itself encircle the center of mass of the planet in a closed, irregular spiral. Together with the pull of other planets and their moons, including stars, the closed irregular spiral curve of the moons around the planet's center of mass is stretched a second time, forming a shape similar to an elliptical ring.

(9) The Correlation Between the Centroid Curve of the Planet Itself and the Centroid Curve of the Planet Around the Star

There is a one-to-one relationship between the centroid curve of the planet itself and the centroid curve of the planet around the star, in the period of the planet around the star.

(10) The Motion of Planets Around Stars

The motion of the planet around the star, not the center of the planet, the motion around the center of the star. Instead, the curve of the center of mass of the planet itself, along the curve of the center of mass of the planet around the star, is an irregular spiral curve that is periodically closed. Due to the first stretching of the centroid curve of the planet around the star, and the second stretching of the centroid curve of the planet itself, the closed irregular spiral curve of the planet around the star takes on a flatter elliptical ring shape. This is a dynamic description of a planet orbiting a star. The screw center of this spiral curve, the static curve projected in the corresponding galactic rotation plane, is a closed irregular ellipsoid with a flatter curve. This is a static description of a planet orbiting a star.

(11) The Cause of Planetary Rotation

The rotation of the star, under the action of the moment around the center of mass, causes the planet to orbit the star.

(12) The Causes of Planetary Rotation

The rotation of the satellite around the planet, under the action of the moment around the center of mass, causes the planet to spin.

(13) Causes of Satellite Orbit

The rotation of the planet, under the action of the moment around the center of mass, causes the satellite to orbit the planet.

3. How Galaxies Work: Kepler's Law

All galaxies, all planets or moons orbiting a star or planet at the center of a galaxy, all planets or moons moving in a closed, irregular spiral curve, all planets or moons with the same area swept by the line of stars or planets at the same time.

This is because human beings can never determine the speed of a celestial body in a dynamic situation, that is, the real speed. The only physical quantities that can be measured are the period of the movement of the celestial body and the radius of the fixed center of the pointing force of the celestial body. As a result, people's understanding of celestial bodies is almost limited to static descriptions of their motions. In other words, people have been exploring the law of the movement of celestial bodies in the plane of the galaxy, that is, the same plane of immobility. And this is the roughest of understandings. Kepler's second Law is one such example.

Kepler's second law, also known as the area law, states that the radius of the stationary center of the pointing force of an object in circular motion passes over an area in the same stationary plane, and the same area is swept over at the same time.

$$\forall t \in [0, T], \exists m < n$$

$$R_m \bar{V}_m \equiv R_n \bar{V}_n$$

$$\bar{V}_m = \frac{R_n}{R_m} \bar{V}_n$$

$$R_m \neq R_n \wedge \frac{R_n}{R_m} \neq C \wedge \frac{R_n}{R_m} \neq 1$$

That is to say, the static velocity of the celestial body, that is, the average velocity of the dynamic velocity over the plane of the celestial body, is not linear. It can be seen that the relationship between dynamic speed and time is a curve of some kind. Because the dynamic velocity is bounded over the period and is continuous almost everywhere, it is differentiable. Now, let's calculate the dynamic velocity after the first stretch of the spiral curve. According to Lagrange's mean value theorem

$$m < \xi < n$$

$$0 \leqslant t_m < t_\xi < t_n \leqslant T$$

$$\frac{d\tilde{V}}{dt}\Big|_{t=\xi} = \frac{\tilde{V}_n - \tilde{V}_m}{t_n - t_m} = \bar{V}_{m \to n}$$

$$\tilde{V}_\xi = \int_{t_m}^{t_n} \bar{V}_{m \to n} dt = \frac{1}{2} \bar{V}^2_{m \to n} (t_n - t_m)$$

$$t_n - t_m = 1 \Rightarrow \tilde{V} = \frac{1}{2} \bar{V}^2$$

Now, let's calculate the dynamic velocity of the spiral curve after it's been stretched a second time. Because the stretching of the satellite is perpendicular to the plane of the planet, in the vertical plane, the upper part of a thread of the stretching part is taken. Think of it as an identical triangle with the base being the dynamic velocity of a stretch. The dynamic velocity of the second stretch, then, is the sum of the other two sides. So, the dynamic velocity after the second stretch

$$\hat{V} \equiv 2\tilde{V} \equiv \bar{V}^2$$

Under dynamic conditions, objects moving in an irregular spiral curve that is closed around the center of a galaxy also obey Kepler's area law

$$R_m \hat{V}_m \equiv R_n \hat{V}_n \equiv C$$

$$R\hat{V} \equiv R\bar{V}^2 \equiv R \cdot \left(\frac{2\pi R}{T}\right)^2 \equiv 4\pi^2 \cdot \frac{R^3}{T^2} \equiv C$$

$$\frac{R^3}{T^2} \equiv \frac{R\hat{V}}{4\pi^2} \equiv \frac{C}{4\pi^2} \equiv D$$

According to Newton's formula for gravitation

$$F = G\frac{Mm}{R^2} = ma = m\frac{\bar{V}^2}{R} \Rightarrow R\bar{V}^2 = GM$$

$$R\hat{V} \equiv R\bar{V}^2 \equiv GM \equiv 4\pi^2 \cdot \frac{R^3}{T^2}$$

$$\frac{R^3}{T^2} \equiv \frac{GM}{4\pi^2}$$

4. Conclusion

(1) The dynamic description of the movement of celestial bodies is the real situation of the movement of celestial bodies.

(2) The static description of the movement of celestial bodies is the dynamic trajectory of the movement of celestial bodies, and the projection curve on the plane of the galaxy is not the real trajectory of the movement of celestial bodies, which is a crude and simple description.

(3) The law of the movement of celestial bodies is actually only the law of area, which applies to all planets around the central body. Because, in fact, there is no way to measure and describe it, but instead use Kepler's third law, the law of periods.

(4) Kepler's second law is actually a static description of Kepler's third law, not a real situation. Therefore, it can only be applied to a single planet orbiting a central body.

(5) A stretch occurs in the plane of the galaxy, corresponding to the static velocity of the static curve, the average velocity. The dynamic velocity varies greatly and is determined by differential.

(6) The secondary stretching occurs in the vertical plane of the galaxy's operating plane, corresponding to the dynamic velocity after a single stretching, the change is not too large, and is calculated by the length of the curve.

It is impossible for a new theory to be completely correct, and it needs to be modified and perfected constantly. It is unrealistic to put forward a new theory and let people accept it in a short time, which requires us to constantly think and repeatedly consider. Therefore, the mistakes of this article are inevitable, and teachers are welcome to criticize and correct.

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