

Orbital and Physical Characterization of Main-Belt Asteroid 2022 UO26

By Deepnil Ray*

*none

Abstract

Asteroid 2022 UO26 is a main-belt asteroid, located in the region of the Solar System between the orbits of Mars and Jupiter. This paper details the orbital parameters and physical characteristics of 2022 UO26, as provided by the Jet Propulsion Laboratory's Small-Body Database. The objective is to analyze its orbital dynamics and physical properties to understand its behavior and potential significance in the broader context of main-belt asteroids.

Introduction

Asteroids in the main belt are remnants from the early solar system, offering insights into its formation and evolution. The analysis of their orbits and physical properties helps in assessing potential collision risks with Earth and contributes to our understanding of solar system dynamics. 2022 UO26, identified and classified by JPL, represents one such body of interest.

Orbital Parameters

The orbital elements of 2022 UO26, referenced to the heliocentric JPL 6 (IAU76/J2000) ecliptic, are as follows:

- Epoch: 2460200.5 (2023-Sep-13.0 TDB)
- Semi-major axis (a): 2.93039791807706 AU
- Eccentricity (e): 0.0817946311866482
- Perihelion distance (q): 2.690363791807706 AU
- Inclination (i): 10.18534421196131 degrees
- Longitude of ascending node (Ω): 47.79164804605041 degrees
- Argument of perihelion (ω): 345.62309154883791 degrees
- Mean anomaly (M): 74.5290652510585 degrees
- Time of perihelion passage (tp): 2022-Jul-14.937437082 TDB
- Orbital period: 5.621947863392336 years
- Mean motion (n): 0.1753175870574634 degrees/day
- Aphelion distance (Q): 3.420297605368403 AU

These parameters describe an orbit that is moderately eccentric and inclined relative to the plane of the solar system, indicating that 2022 UO26 travels within the main asteroid belt but with a notable tilt.

Physical Parameters

The physical properties of 2022 UO26 are characterized by:

- Absolute magnitude (H): 17.08

The absolute magnitude provides a measure of the asteroid's brightness as seen from the standard distance and gives an indication of its size. A higher absolute magnitude corresponds to a smaller object.

Observational Data

- Number of observations used: 56
- Data-arc span: 6231 days (17.06 years)
- First observation used: 2005-11-06
- Last observation used: 2022-11-28

This extended observational data-arc ensures a reliable determination of the asteroid's orbit, reducing uncertainties in the orbital elements.

Miscellaneous Details

- Planetary ephemeris: DE441
- SB-pert. ephem.: SB441-N16
- Condition code: 0 (indicating a well-determined orbit with high precision)
- Normalized RMS: .70694
- Source: JPL
- Producer: Otto Matic
- Earth MOID (Minimum Orbit Intersection Distance): 1.91021 AU
- Jupiter MOID: 2.03002 AU
- Tisserand parameter with respect to Jupiter (T_{jup}): 3.175

The Earth MOID and Jupiter MOID values indicate the closest distances that the asteroid's orbit comes to the orbits of Earth and Jupiter, respectively. The Tisserand parameter helps categorize the asteroid's orbital relationship with Jupiter, suggesting it is securely within the main belt and not significantly perturbed by Jupiter's gravity.

Conclusion

Asteroid 2022 UO26 exemplifies the dynamic complexity of main-belt asteroids. Its moderately inclined and slightly eccentric orbit, combined with an extensive observation history, makes it a prime candidate for further studies to understand the main belt's composition and evolution. Continuous monitoring and analysis of such asteroids contribute crucially to planetary defense strategies and the broader field of planetary science.

References

- Jet Propulsion Laboratory. (2023). Small-Body Database Lookup: 2022 UO26. Retrieved from [ssd.jpl.nasa.gov](<https://ssd.jpl.nasa.gov>)