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Research paper

The Mysterious Asteroid Apophis: Hazardous Asteroid, or Just a Passing Giant Space Rock?

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Abstract

Near-Earth asteroids (NEAs) are significant threat to Earth that have to be taken seriously. 99942 Apophis is a potentially hazardous NEA. The probability that Apophis would hit the Earth on April 13, 2029 is 2.7%. In this paper, a brief overview of the NEA Apophis is presented in order to highlight the risk of Apophis. In addition, this paper sounds the alarm to protect our planet from that threat or any other NEA.

Keywords: *Near-Earth Asteroids; NEA Apophis; Impact Risk.*

1. Introduction

Near Earth objects (NEOs) are serious threat to Earth (Khalil et al., 2019; Khalil et al., 2020; Khalil et al., 2021). The asteroid Apophis is one of these dangerous objects. Apophis has been detected on the evening of June 19, 2004, by astronomers working at Kitt Peak National Observatory in Tuscan, Arizona. The object was designated as 2004 MN4 (Hyland et al., 2010). It is named after the ancient Egyptian god of chaos and darkness. Due to technical problems and adverse weather, the crew could only examine the asteroid for two days, but subsequent observations immediately uncovered a lot of information about the asteroid. The asteroid was distinct from any other known asteroid. Apophis travels around the sun for less than one earth year, getting almost as close to the sun as Venus before veering off to a location just outside of Earth's orbit. Astronomers refer to Apophis as an Aten-class asteroid because of its orbit (Space.com, 2022). All eyes were on Apophis in early March 2013 when the asteroid passed quite close to Earth (Hyland et al., 2013). The Catalina Sky Survey in Arizona and the early warning system for asteroid collisions (ATLAS), which comprises telescopes in Chile, Hawaii, and South Africa, both picked up on the asteroid Apophis during testing. The NEOWISE satellite, which deployed its spectral vision to precisely determine the size and form of Apophis, made some of the most significant measurements. According to NASA, Apophis is a large asteroid. It is defined as an "S-Type" or Stoney-type asteroid and has a mixture of metals including nickel and iron (Earth Sky, 2022). Its form is said to be elongated with two lobes, similar to a rocky space peanut. Radar and optical tracking data obtained in late 2020 and early 2021 are used to create a precise course for Apophis. Researchers merged this freshly acquired data with years of intensive monitoring to create a clearer understanding of Apophis' path (NASA, 2021; NASA, 2022). We will be able to see this asteroid at its brightest if you live in southern Europe, southern Asia, Australia, or Africa. Eastern South America will be able to see the asteroid as it becomes brighter and further away from Earth. The asteroid will represent a magnificent object stationed in a spot in the sky around 15 degrees north of the Pleiades when dusk sets over the east coast of North America (NASA, 2021; NASA, 2022). Scientists at NASA's Ames Research Center in California reportedly estimated the energy that would be generated if Apophis collides with Earth based on NEOWISE data. The energy released would be equal thousands of megatons of TNT, or hundreds of nuclear weapons (Hyland et al., 2010).

2. Some features of apophis

Some researchers consider Apophis as a PHA (Potentially Hazardous Asteroid) due to the fact that it is the first asteroid of its size in decades to be very close to Earth (Lea, 2021). The diameter of Apophis is about 340 m. Its speed is up to 20 km/s. The closest approach of Apophis with the Earth will be on April 13, 2029, with distance of 38,000 km from the Earth. Its orbit intersects the orbit of the Earth. It makes a complete orbit around the Sun in a less than one Earth year. Also it is discovered that it has a 2.7% probability of hitting the earth on April 13, 2029 (Earth Sky, 2022).

3. Is Apophis a serious threat to Earth?

Apophis has been considered as a PHA that could pose a significant threat to Earth when it would come close in 2029. Scientists estimated a 2.7% chance that Apophis will hit Earth in 2029 but after additional researches, the exact path of Apophis depends on Earth's gravitational.

There was a probability that it may impact Earth in 2036 (Hyland et al., 2010). However, a small chance of impact in 2068 are considered (Earth Sky, 2022).

4. Conclusion

In this work, we present a brief overview of the mysterious asteroid 99942 Apophis to figure out its nature and to study if it could pose a serious threat to Earth or not. Although it is known that Apophis would not hit Earth in 2029, there are some uncertainties in its orbit which theoretically allow for a collision. The paper is a short message to researchers and astronomers to study the asteroid and any other similar asteroids that may come close to Earth in the future

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