

Scientists model destruction of an Earth-bound asteroid

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Tatiana Galushina is an employee of the Department of Celestial Mechanics and Astrometry, Tomsk State University. Credit: ©TSU

Researchers at Tomsk State University (Russia) and colleagues are developing measures to protect the Earth from potentially dangerous

celestial bodies. With the help of the supercomputer SKIF Cyberia, the scientists simulated the nuclear explosion of an asteroid 200 meters in diameter in such a way that its irradiated fragments do not fall to the Earth.

"The way we propose to eliminate the threat from space is reasonable to use in case of the impossibility of the soft disposal of an object from a collision in orbit and for the elimination of an object that is constantly returning to Earth," says Tatiana Galushina, an employee of the Department of Celestial Mechanics and Astrometry. Previously, as a [preventive measure](#), scientists proposed to destroy the [asteroid](#) on its approach to Earth, but this could result in a catastrophic shower of highly radioactive fragments.

TSU scientists and colleagues from other research centres propose another solution to the problem. It is known that the majority of dangerous objects make several Earth passes before collision. Therefore, there is window of time during which the asteroid can be destroyed further away from the planet. This would be much safer and more effective.

The researchers modeled a [celestial body](#) with a diameter of 200 meters, similar to the asteroid Apophis, which in 2029 will approach Earth at a distance of 38,000 kilometers. Calculations have shown that destroying Apophis would require the impact of a nuclear device with the equivalent energy of one megaton of TNT. This impact would render part of the asteroid into gas and liquid droplets, while much of the object would break into pieces no larger than 10 meters. This is the minimum requirement to assure safety for the Earth.

"Because the rocket detonates behind the asteroid, almost all the pieces after the destruction will fly forward," says Galushina. "In this case, the orbit of the fragments will be significantly different from the asteroid's

orbit. For 10 years after the explosion, an insignificant number of fragments will fall to Earth. Their radioactivity during this time will be reduced considerably, and after a few years, they will not pose a danger. It is worth adding that nuclear explosions in space are prohibited by international treaty, but in the case of a real threat to humanity, perhaps there will be an exception to this rule."

Experts in [celestial mechanics](#) and ballistics contributed to the project. The scientists note that the theoretical calculations are only the beginning of developing preventive measures for the Earth.

More information: A. G. Aleksandrova et al, The preventive destruction of a hazardous asteroid, *Astronomy Reports* (2016). [DOI: 10.1134/S1063772916040016](#)

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