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Planetary Defence: not another source of fear for the public and rather an opportunity

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Abstract

The asteroid hazard is the least likely source of natural disaster on a human lifetime, and yet, it can have extremely big consequences when it turns into reality. However, this is the only risk that we have the possibility to predict and drastically minimize by reasonable and feasible means that just need to be implemented. Moreover, the study of threatening asteroids has a high science return as these small bodies are part of the leftover planetesimals that formed both the terrestrial planets and the cores of the giant planets. The most primitive ones contain a record of the original composition of the solar nebula in which the planets formed. The organic matter and properties of water that some contain provide us with critical clues about how life started on Earth. This is the reason why two sample return missions, the JAXA Hayabusa2 and the NASA OSIRIS-REX missions, have each a near-Earth asteroid as a target and send us fascinating images of these little worlds, which turn our understanding of these bodies on its head.

Predicting a potential impact needs that the inventory (orbit and size) of asteroids is performed down to a given size, which can be done from the ground on the long run and from space within a few years. The project NEOCam under study at NASA is designed to accomplish this task. Preventing an impact needs at least the validation of a deflection techniques. The AIDA project, which includes ESA Hera [1] and NASA DART [2], aims at validating the kinetic impactor techniques. DART is now scheduled for launch in July 2021 for an impact on the moon of the binary asteroid Didymos in October 2022. The change in the orbital period of the moon will be measured by ground-based observations. Hera will observe in detail the outcome of DART impact a few years afterwards. It will measure the actual momentum transferred to the target by DART and the crater dimensions and morphology, which are necessary measurements to validate impact numerical codes and extrapolate to other scenarios. Hera has passed the Phase B1 at ESA and waits its approval at the ESA Ministerial Council of November 2019 for launch in 2023 and arrival at Didymos in 2026. Both missions within AIDA will thus demonstrate that planetary defence is an international problem, for which at least two big agencies need to work together to face it.

Asteroids are both fascinating and can represent a hazard. There is no reason to be afraid, no asteroid is identified to be on a collision course with the Earth in a close future. But we have the opportunity to be prepared and to tell the public that we are ready in case a collision is predicted, noting that all actions necessary to be ready also provide fundamental scientific knowledge and involve space missions that fire the imagination of the public and can be great sources of inspiration for the young generations.

References

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