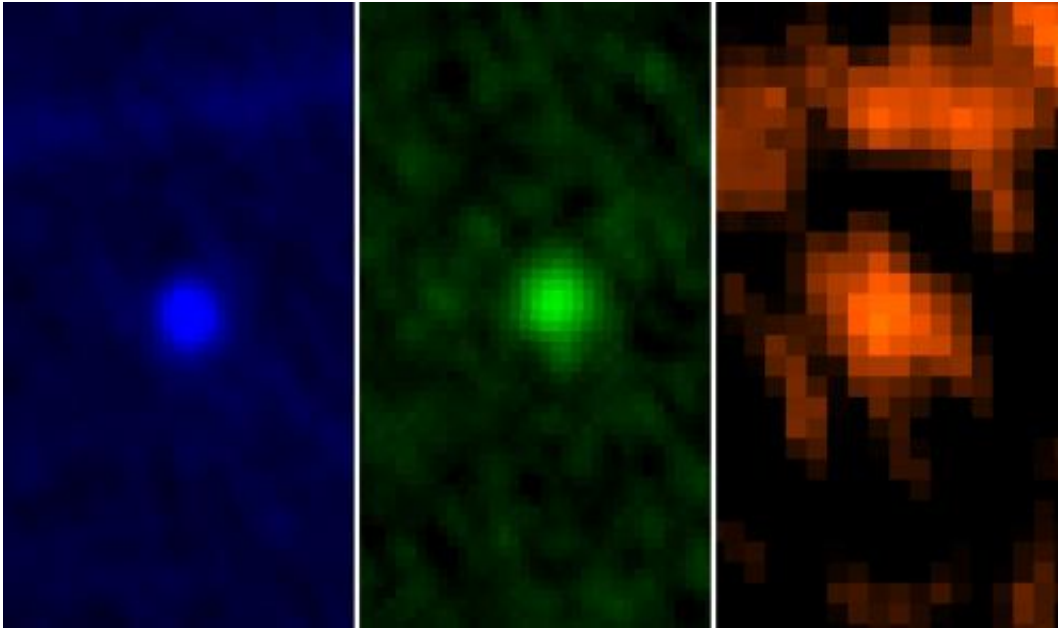


Herschel intercepts asteroid Apophis

January 9 2013



ESA's Herschel Space Observatory captured asteroid Apophis in its field of view during the approach to Earth on 5/6 January 2013. This image shows the asteroid in Herschel's three PACS wavelengths: 70, 100 and 160 microns, respectively. Its closest pass, on 9 January 2013, brings it to 14.45 million km from Earth, 35-40 times that of the distance of the Moon. In 2029, it will approach even closer than the geostationary orbit of many satellites, which are positioned at an altitude of 36 000 km. During the latest pass, Herschel collected important information about the physical properties of the asteroid, which will help astronomers make refined predictions for the future trajectory of the asteroid. Credit: ESA/Herschel/PACS/MACH-11/MPE/B.Altieri (ESAC) and C. Kiss (Konkoly Observatory)

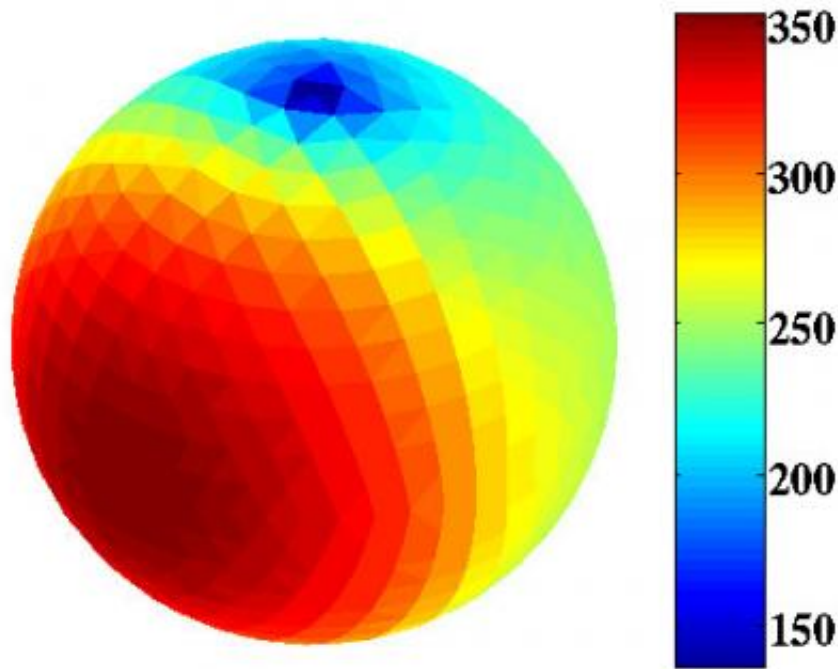
(Phys.org)—ESA's Herschel space observatory made new observations of asteroid Apophis as it approached Earth this weekend. The data shows the asteroid to be bigger than first estimated, and less reflective.

Catalogued as [asteroid](#) (99942) Apophis (previously 2004 MN4), it is often nicknamed 'the doomsday asteroid' in popular media, after initial observations made after its discovery in 2004 gave it a 2.7% chance of striking Earth in April 2029.

With additional data, however, an impact in 2029 was soon ruled out, although the asteroid will pass within 36 000 km of Earth's surface, closer even than the orbits of geostationary satellites.

The asteroid will return to Earth's neighbourhood again in 2036, but quite how close it will come then is uncertain, as the 2029 approach is predicted to alter its orbit substantially. Obtaining improved physical parameters for Apophis and its orbit is thus of great importance in being able to make better predictions of its future trajectory.

Herschel had a good opportunity at the weekend, observing the asteroid for about two hours on its approach to Earth, ahead of today's closest encounter at a little less than one tenth of the distance from Earth to the Sun: about 14.5 million km. The observations were made as part of Herschel's Guaranteed Time Programme MACH-11.



Temperature coded (in Kelvin) spherical shape model used for the thermal analysis of Apophis, based on data from the new Herschel observations. Note that this is a model; indications from previous lightcurve observations in 2005/06 suggest that Apophis could be elongated, which will be confirmed by ground-based observations (including lightcurves and radar images) obtained in the coming month. Credit: ESA/Herschel/MACH-11/T.Müller MPE (Germany)

"As well as the data being scientifically important in their own right, understanding key properties of asteroids will provide vital details for missions that might eventually visit potentially hazardous objects," says Laurence O'Rourke, Principal Investigator of the MACH-11 observing programme, from the European Space Astronomy Centre (ESAC), near Madrid, Spain.

"Apophis is only the second near-Earth asteroid observed by Herschel,

and these were the fastest tracked observations by the [space telescope](#) – the asteroid moved at a rate of 205 arcseconds per hour as seen from Herschel's viewpoint."

Herschel provided the first thermal infrared observations of Apophis at different wavelengths, which together with optical measurements helped refine estimates of the asteroid's properties. Previous estimates bracketed the asteroid's average diameter at 270 ± 60 m; the new Herschel observations returned a more precise diameter of 325 ± 15 m.

"The 20% increase in diameter, from 270 to 325 m, translates into a 75% increase in our estimates of the asteroid's volume or mass," says Thomas Müller of the Max Planck Institute for Extraterrestrial Physics in Garching, Germany, who is leading the analysis of the new data.

By analysing the heat emitted by Apophis, Herschel also provided a new estimate of the asteroid's albedo – a measure of its reflectivity – of 0.23. This value means that 23% of the sunlight falling onto the asteroid is reflected; the rest is absorbed and heats up the asteroid. The previous albedo estimate for Apophis was 0.33.

Knowing the thermal properties of an asteroid indicates how its orbit might be altered due to subtle heating by the Sun. Known as the Yarkovsky effect, the heating and cooling cycle of a small body as it rotates and as its distance from the Sun changes can instigate long-term changes to the asteroid's orbit.

"These numbers are first estimates based on the Herschel measurements alone, and other ongoing ground-based campaigns might produce additional pieces of information which will allow us to improve our results," adds Müller.

"Although Apophis initially caught public interest as a possible Earth

impactor, which is now considered highly improbable for the foreseeable future, it is of considerable interest in its own right, and as an example of the class of Near Earth Objects," says Göran Pilbratt, ESA's Herschel Project Scientist.

"Our unique Herschel measurements play a key role for the physical characterisation of Apophis, and will improve the long-term prediction of its [orbit](#)."

Provided by European Space Agency

Citation: Herschel intercepts asteroid Apophis (2013, January 9) retrieved 25 April 2024 from <https://phys.org/news/2013-01-herschel-intercepts-asteroid-apophis.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.