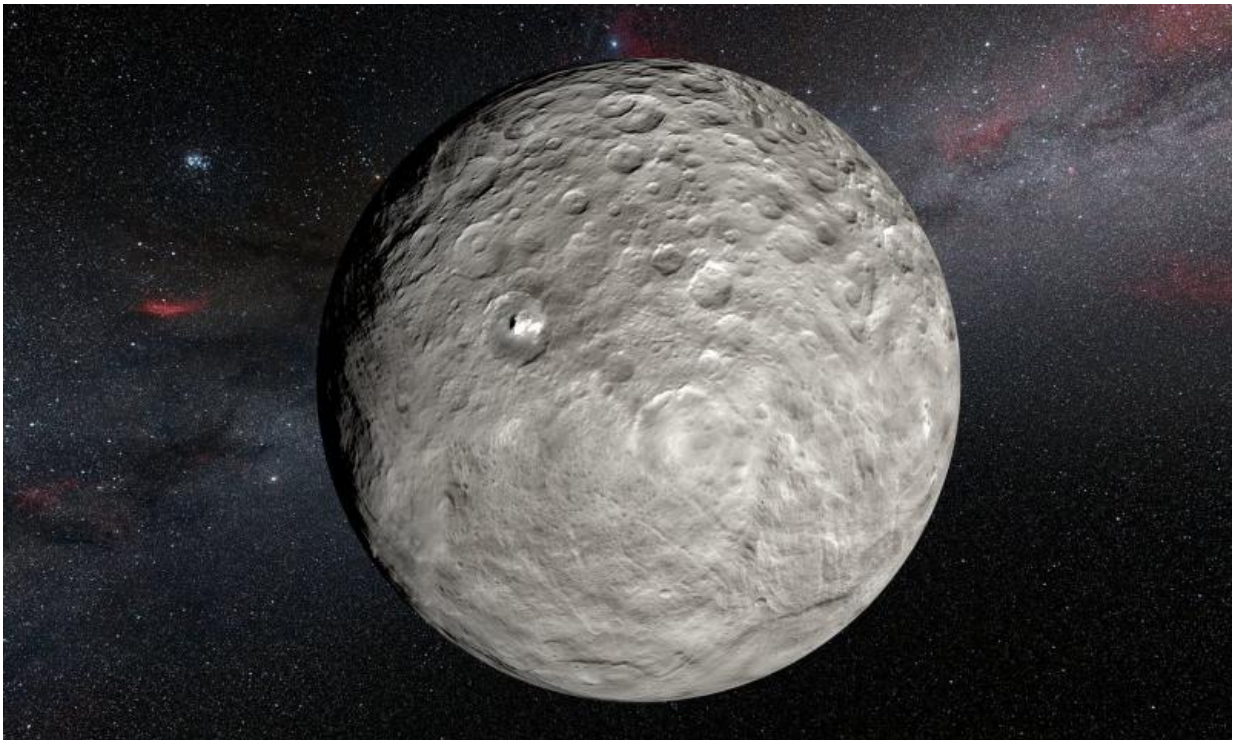


Astronomers discover unexpected changes of bright spots on Ceres

March 16 2016



This artist's impression is based on a detailed map of the surface compiled from images taken from NASA's Dawn spacecraft in orbit around the dwarf planet Ceres. It shows the very bright patches of material in the crater Occator and elsewhere. New observations using the HARPS spectrograph on the ESO 3.6-metre telescope at La Silla in Chile have revealed unexpected daily changes on these spots, suggesting that they change under the influence of sunlight as Ceres rotates. Credit: ESO/L. Calçada/NASA/JPL-Caltech/UCLA/MPS/DLR/IDA/Steve Albers/N. Risinger (skysurvey.org)

Ceres is the largest body in the asteroid belt between Mars and Jupiter and the only such object classed as a dwarf planet. NASA's Dawn spacecraft has been in orbit around Ceres for more than a year and has mapped its surface in great detail. One of the biggest surprises has been the discovery of very bright spots, which reflect far more light than their much darker surroundings. The most prominent of these spots lie inside the crater Occator and suggest that Ceres may be a much more active world than most of its asteroid neighbours.

New and very precise observations using the HARPS spectrograph at the ESO 3.6-metre telescope at La Silla, Chile, have now not only detected the motion of the spots due to the rotation of Ceres about its axis, but also found unexpected additional variations suggesting that the material of the spots is volatile and evaporates in sunlight.

The lead author of the new study, Paolo Molaro, at the INAF-Trieste Astronomical Observatory, takes up the story: "As soon as the Dawn spacecraft revealed the mysterious bright spots on the surface of Ceres, I immediately thought of the possible measurable effects from Earth. As Ceres rotates the spots approach the Earth and then recede again, which affects the spectrum of the reflected sunlight arriving at Earth."

Ceres spins every nine hours and calculations showed that the velocities of the spots towards and away from the Earth due to this rotation would be very small, of order 20 kilometres per hour. But this motion is big enough to be measurable via the Doppler effect with high-precision instruments such as HARPS.

The team observed Ceres with HARPS for a little over two nights in July and August 2015. "The result was a surprise," adds Antonino Lanza, at the INAF-Catania Astrophysical Observatory and co-author of the study. "We did find the expected changes to the spectrum from the rotation of Ceres, but with considerable other variations from night to night."

The team concluded that the observed changes could be due to the presence of volatile substances that evaporate under the action of solar radiation. When the spots inside the Occator crater are on the side illuminated by the Sun they form plumes that reflect sunlight very effectively. These plumes then evaporate quickly, lose reflectivity and produce the observed changes. This effect, however, changes from night to night, giving rise to additional random patterns, on both short and longer timescales.

If this interpretation is confirmed Ceres would seem to be very different from Vesta and the other main belt asteroids. Despite being relatively isolated, it seems to be internally active. Ceres is known to be rich in water, but it is unclear whether this is related to the bright spots. The energy source that drives this continual leakage of material from the surface is also unknown.

Dawn is continuing to study Ceres and the behaviour of its mysterious spots. Observations from the ground with HARPS and other facilities will be able to continue even after the end of the space mission.

More information: This research was presented in a [paper](#) entitled "Daily variability of Ceres' Albedo detected by means of radial velocities changes of the reflected sunlight", by P. Molaro et al., which appeared in the journal *Monthly Notices of the Royal Astronomical Society*.

Provided by ESO

Citation: Astronomers discover unexpected changes of bright spots on Ceres (2016, March 16) retrieved 26 April 2024 from <https://phys.org/news/2016-03-astronomers-unexpected-bright-ceres.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.