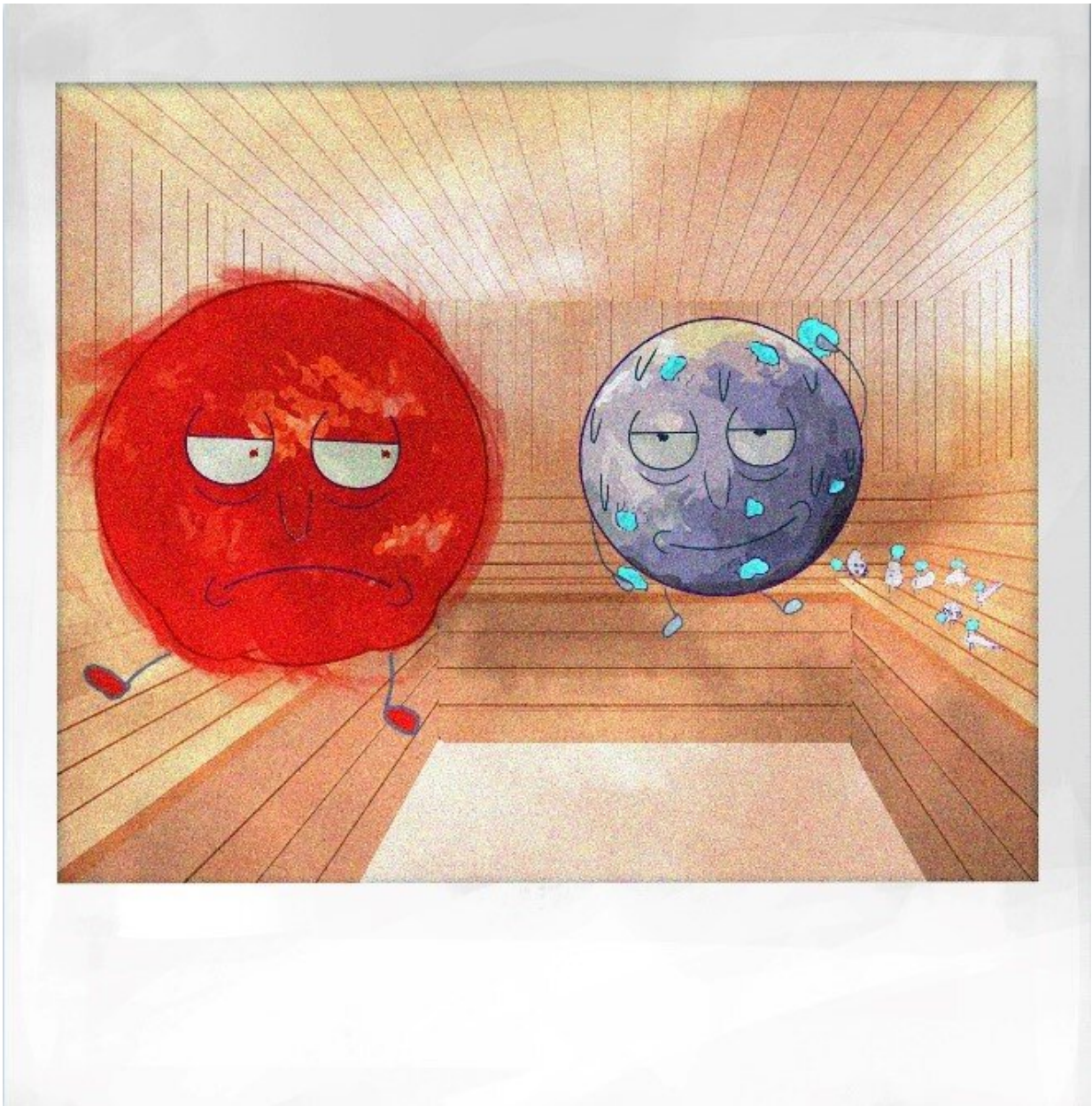


# Space dust, asteroids and comets can account for all water on Mercury

April 19 2022



Credit: Anastasiia Kriuchevska

Mercury harbors water ice in the shadows of the steepest craters around its poles. But it is unclear how those water molecules ended up on Mercury. Now a new simulation shows that incoming minor bodies such as asteroids, comets and dust particles carry enough water to account for all the ice sheets present. The study could form the basis for new research on water in exoplanetary systems. The work was published in *Icarus* on April 19.

We have known for a few decades that Mercury harbors water. You might expect that this can only be in the form of water vapor. After all, the planet has no atmosphere so we can rule out a liquid due to a lack of pressure. And Mercury is almost three times closer to the sun than the Earth is, so water ice doesn't seem likely either. But then there are the craters. Steep craters at high latitudes contain troughs that are forever captured in darkness, only illuminated by the dimly glowing band of the Milky Way against the backdrop of an eternal black sky. These eerie places are home to ice sheets many meters thick, on the closest planet to the sun. Now the question remains: how did those water molecules end up on Mercury?

First author Kateryna Frantseva (SRON Netherlands Institute for Space Research / Groningen University) has developed an algorithm that simulates [meteorite](#) impacts in the form of asteroids, comets and interplanetary dust particles (IDPs). It turns out that over the course of a billion years, these bodies bring enough water to Mercury's surface to explain the amount that we currently see.



Credit: Anastasiia Kriuchevska

Frantseva said, "We cannot rule out endogenous sources of water such as volcanic activity and outgassing from the crust and mantle, but this shows that we don't need anything other than impacts from minor bodies

to explain the water we see on Mercury." The simulation shows that IDPs carry by far the heaviest load, with over ten thousand kilograms per year. In comparison, asteroids and comets deliver yearly each about a thousand kilograms.

The simulation provides a basis for new theoretical models for water delivery to [exoplanets](#)—planets outside our solar system. These can be compared to future observations, for example from the recently launched James Webb telescope, through which astronomers might be able to spot water signatures in the spectrum of light that asteroid belts in exoplanetary systems emit while re-radiating light from their host star.

**More information:** Kateryna Frantseva et al, Exogenous delivery of water to Mercury, *Icarus* (2022). [DOI: 10.1016/j.icarus.2022.114980](https://doi.org/10.1016/j.icarus.2022.114980)

Provided by SRON Netherlands Institute for Space Research

Citation: Space dust, asteroids and comets can account for all water on Mercury (2022, April 19) retrieved 25 April 2024 from <https://phys.org/news/2022-04-space-asteroids-comets-account-mercury.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.