

Webb Finds Water, and a New Mystery, in Rare Main Belt Comet

A team of astronomers, including Goddard scientists Villanueva (690) and Milam (691), used Webb's Near-Infrared Spectrograph instrument (NIRSpec) to confirm the presence of water vapor around a comet in the main asteroid belt for the first time, indicating that water ice from the primordial solar system can be preserved in that region.

Sublimation of ice is what distinguishes comets from asteroids, creating their distinctive tails and hazy halos, or comas. It is especially significant for Comet 238P/Read, as it is one of 16 identified main-belt comets found in the asteroid belt, as opposed to the colder Kuiper Belt or Oort Cloud, more distant from the Sun, where most comets reside.

Strangely, carbon dioxide (CO₂), which is commonly seen in comets, was not detected in the sublimating material. This is a mystery requiring further investigation in order to get a better understanding of the role main-belt comets like 238P/Read play in the history of the Solar System.

The James Webb Space Telescope's detection of water vapor at Comet Read is a major benchmark in the study of main-belt comets and in the broader investigation of the origin of Earth's abundant water.

M. Kelley, G. Villanueva (690), S. Milam (691), et al., 2023, *Nature*, <https://doi.org/10.1038/s41586-023-06152-y>
Press release: <https://webbtelescope.org/contents/news-releases/2023/news-2023-123>



Artist's illustration of Comet 238P/Read sublimating its water ice as it approaches the Sun. Credits: NASA, ESA.