

JWST Observations Show Interstellar Object 3I/ATLAS Has an Unusually CO₂-Rich Coma

NASA's James Webb Space Telescope was used to observe interstellar comet 3I/ATLAS on Aug. 6, with its Near-Infrared Spectrograph instrument.

An asymmetrically shaped coma rich with gas and dust was detected. Water ice (solid H₂O) and gas-phase H₂O, CO₂, and CO were identified from their infrared spectral features.

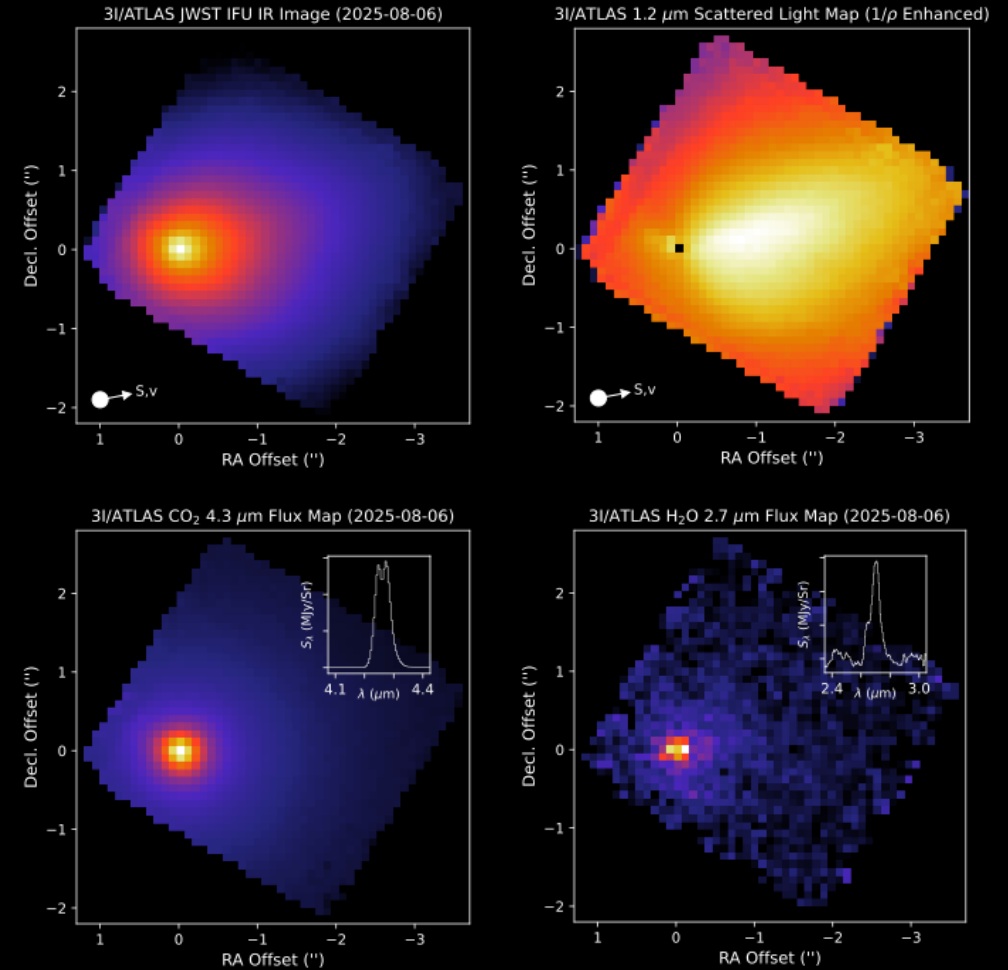
The ratio measured for the amount of CO₂ gas relative to H₂O is among the highest ever observed in a solar system comet, demonstrating that the coma of 3I/ATLAS is very CO₂-rich. This may indicate that 3I/ATLAS was exposed to higher levels of radiation than comets from inside the solar system or that it formed in a region of its original planetary disk where CO₂ ice naturally freezes out from the gas.

While the comet poses no threat to Earth, NASA's space telescopes help support the agency's ongoing mission to find, track, and better understand solar system objects. JWST was used to find out what it is made of and what is driving its apparent comet-like activity.

3I/ATLAS is only the third known interstellar object. It originates from outside our solar system and is traveling at high speed (58 km/s) through the orbital plane of the planets. Astronomers worldwide are using telescopes on the ground and in space to find out more about this object.

Article: M. Cordiner (691/CUA), N. Roth (691/AU), S. Charnley (691), S. Milam (691), et al. (2025). "JWST detection of a carbon dioxide dominated gas coma surrounding interstellar object 3I/ATLAS." *Astrophys. J. Letters*, accepted. <https://arxiv.org/abs/2508.18209>

Press release: <https://science.nasa.gov/blogs/3iatlas/2025/08/25/nasas-webb-space-telescope-observes-interstellar-comet/>



JWST NIRSpec images of interstellar object 3I/ATLAS showing (top-left) reflected sunlight from dust grains surrounding the nucleus, (top-right) a radially-enhanced dust image, (bottom-left) map of the CO₂ and (bottom-right) H₂O coma gases. Credit: NASA/CUA/M. Cordiner