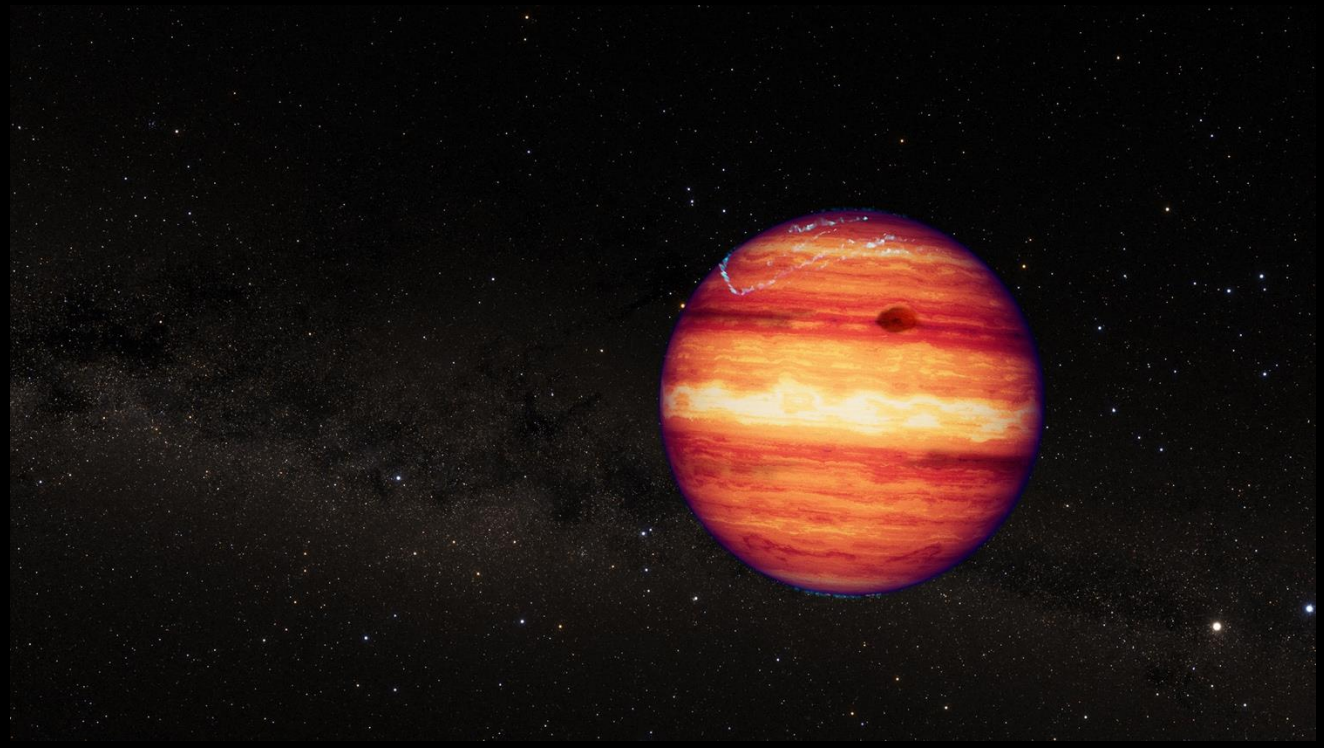
Webb Exposes Complex Atmosphere of Starless Super-Jupiter

An international team of researchers has discovered that previously observed variations in brightness of a free-floating planetary-mass object known as SIMP 0136 must be the result of a complex combination of atmospheric factors and cannot be explained by clouds alone.

Using NASA's James Webb Space Telescope to monitor a broad spectrum of infrared light emitted over two full rotation periods by SIMP 0136, the team was able to detect variations in cloud layers, temperature, and carbon chemistry that were previously hidden from view.

The results provide crucial insight into the three-dimensional complexity of gas giant atmospheres within and beyond our solar system. Detailed characterization of objects like these is essential preparation for direct imaging of exoplanets, planets outside our solar system, with NASA's Nancy Grace Roman Space Telescope, which is scheduled to begin operations in 2027.



This artist's concept shows what the isolated planetary-mass object SIMP 0136 could look like based on recent observations from NASA's James Webb Space Telescope and previous observations from Hubble, Spitzer, and numerous ground-based telescopes. Credit: NASA, ESA, CSA, and Joseph Olmsted (STScI)

Paper: https://iopscience.iop.org/article/10.3847/2041-8213/ad9eaf
News article: https://science.nasa.gov/missions/webb/nasas-webb-exposes-complex-atmosphere-of-starless-super-jupiter/#h-downloads