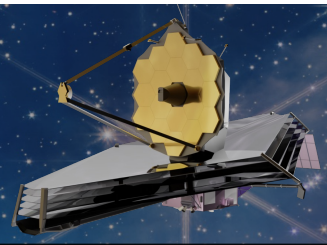
A Webb of Possibilities:

An Open Source Hunt for Interstellar life

Evan Ortiz, Taylor Ranson - Texas State University, Department of Biology

STScI | SPACE TELESCOPE SCIENCE INSTITUTE

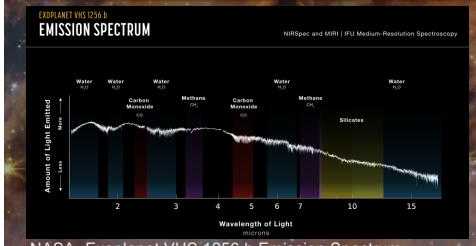


TXST 1ST INAUGURAL DATATHON 2024

NASA

James Webb Space Telescope

The James Webb Space Telescope (JWST) is equipped with advanced infrared capabilities, allowing it to see the universe up to 13.5 billion years ago. Its Near-Infrared Camera (NIRCam) is designed to capture light in the near-infrared spectrum, facilitating the study of star formation, galaxy evolution, and the detection of exoplanets. Additionally, the Mid-Infrared Instrument (MIRI) extends JWST's reach into the mid-infrared range, which is key for analyzing cooler objects in space like planetary atmospheres and distant galaxies. All data collected by the James Webb Space Telescope are stored and made publicly accessible through the open-source Mikulski Archive for Space Telescopes (MAST) database.

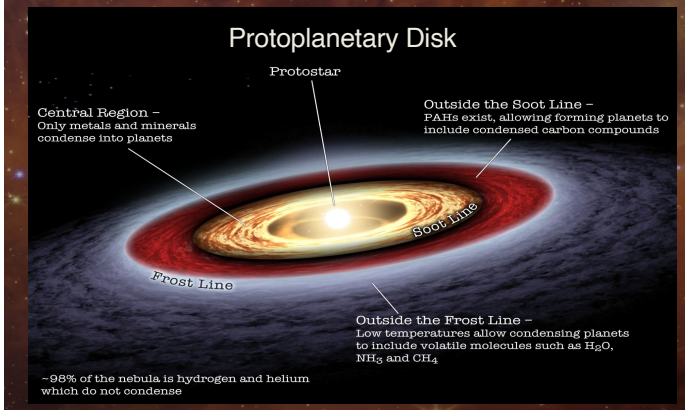


NASA- Exoplanet VHS 1256 b Emission Spectrum

Caltech: First IR Image of IRAS-04385 (2009)

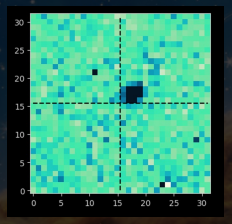
Searching for Life

Protoplanetary disks are dense, gas and dust-filled structures around young stars, from which planetary systems form, and they frequently harbor water—key for life-supporting planets. A study led by Dr. Andrea Banzatti at Texas State University focuses on a particular disk, IRAS-04385, located 456 light-years away, to explore these life-sustaining properties. The data from IRAS-04385 that was used in this study was obtained from the MAST database and was over 200 GB in size.



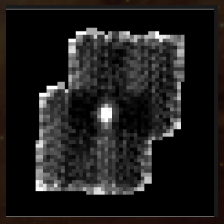
NASA/JPL-Caltech edited by Invader Xan

IRAS-04385 First Images and Pipeline

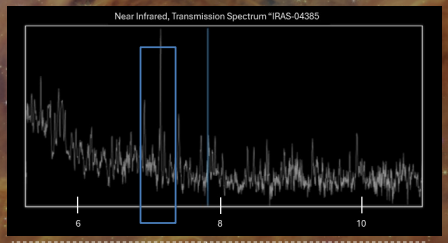


Raw Uncalibrated Image

Pull Data through MAST API or website → **Stage 0:** Uncalibrated Exposures → **Stage 1:** Fix bad Pixels, jumps from cosmic rays → **Stage 2:** Pixel alignment to sky coordinates → **Stage 3:** Calibrated Combined Files → **Science Ready Data**



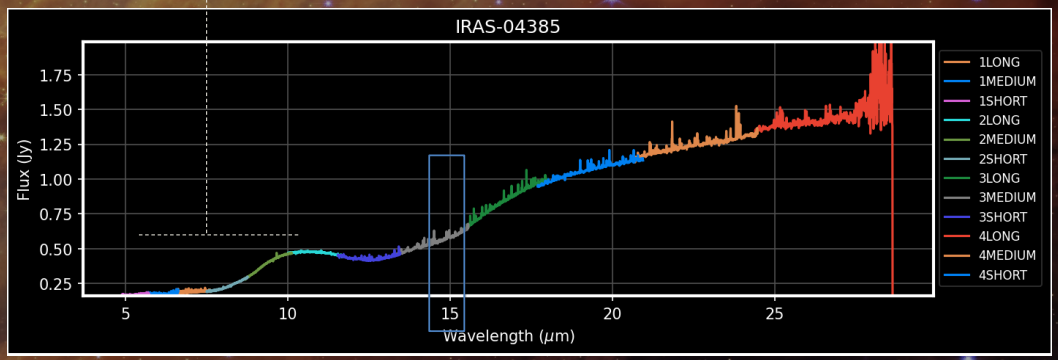
3-Dimensional Data Cube



Results:

The spectroscopy data for IRAS-04385 shows peaks at the 7 nm (left) and 15 nm (below) wavelengths that are highly associated with water.

This shows that IRAS-04345 potentially could be an exoplanet that has life, due to its water composition.



Impact:

Despite the fact that our cosmic portrait currently comprises only about 5 percent of the universe, the sheer volume of data we've captured remains immense and largely unexplored. By adopting an open-source model, we can harness the collective intellect of humanity to unravel the mysteries of the cosmos.

Our investigations reveal that IRAS-04385 is a promising candidate in the search for life, potentially joining the ranks of over 5,500 exoplanets we've already discovered.

Future Ideas:

- Creating a 3D model of the universe using the relationship of distance with the infrared intensity as the Z-axis.
- Creating a Computer Vision automation that will sift through the data at scale to find the oldest parts of our universe.