Galaxy source counts at 7.7 μm, 10 μm and 15 μm with the James Webb Space Telescope

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1st JWST paper in Taiwan
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Introduction

It is straightforward to investigate the evolution of galaxies for observers: we ask how many galaxies in the Universe there are and how bright they are. This information - **source count** - allows us to infer the galaxy luminosity function and to interpret the cosmic star formation history (CSFH).

Mid-IR galaxies are crucial to the CSFH due to their active star-forming features (AGN, starburst). Thus, for the first time, we utilize the superb sensitive of JWST Mid-Infrared Instrument (MIRI) to explore and extend the faint end of MIR galaxy counts.

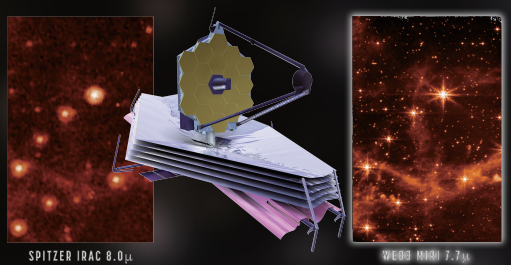


Fig 1: MIR images from Spitzer (left) and JWST (right)

Data & Analysis

We use 3 MIR band images (7.7, 10 and 15 μm) of **Stephan's quintet**, an early release observation of JWST. Foreground sources are masked out, which gives a sky coverage of ~4.6 arcmin^2. We extract sources with Source-Extractor.

To ensure our extractions are reliable, we estimate the completeness of source detection as a function of flux density (fig 2). This is done by checking how many implanted artificial sources can be recovered with our extraction.

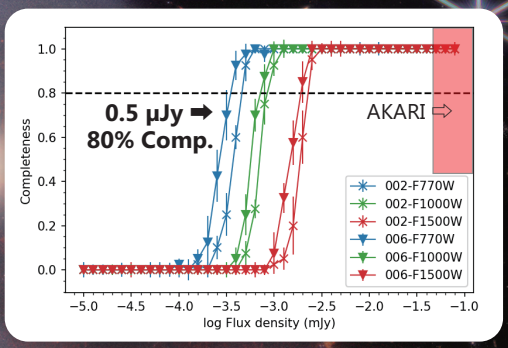
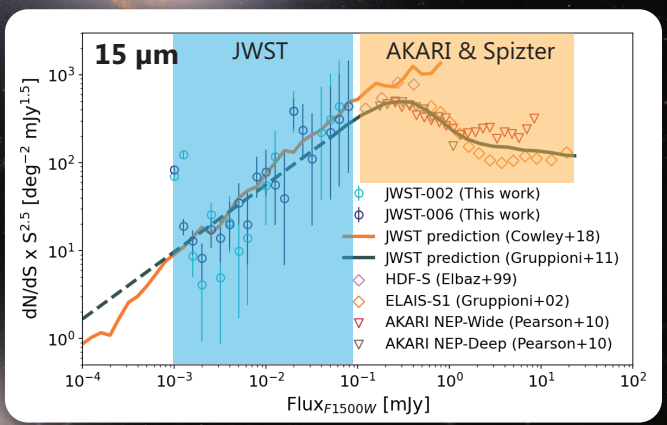


Fig 2: Completeness of our extraction in each band.

What we achieve

The first MIR galaxy source count from JWST

- Agree with both model and previous observations
- Extend our understanding of galaxy ≥100x deeper
- First step to establish luminosity function and its evolution



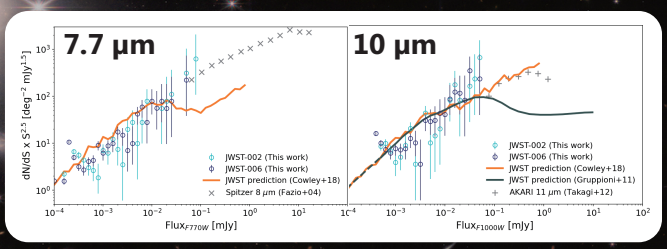


Fig 3: Differential source counts in 7.7, 10 and 15 μm, normalized to Euclidean space. Model predictions plot in solid lines.