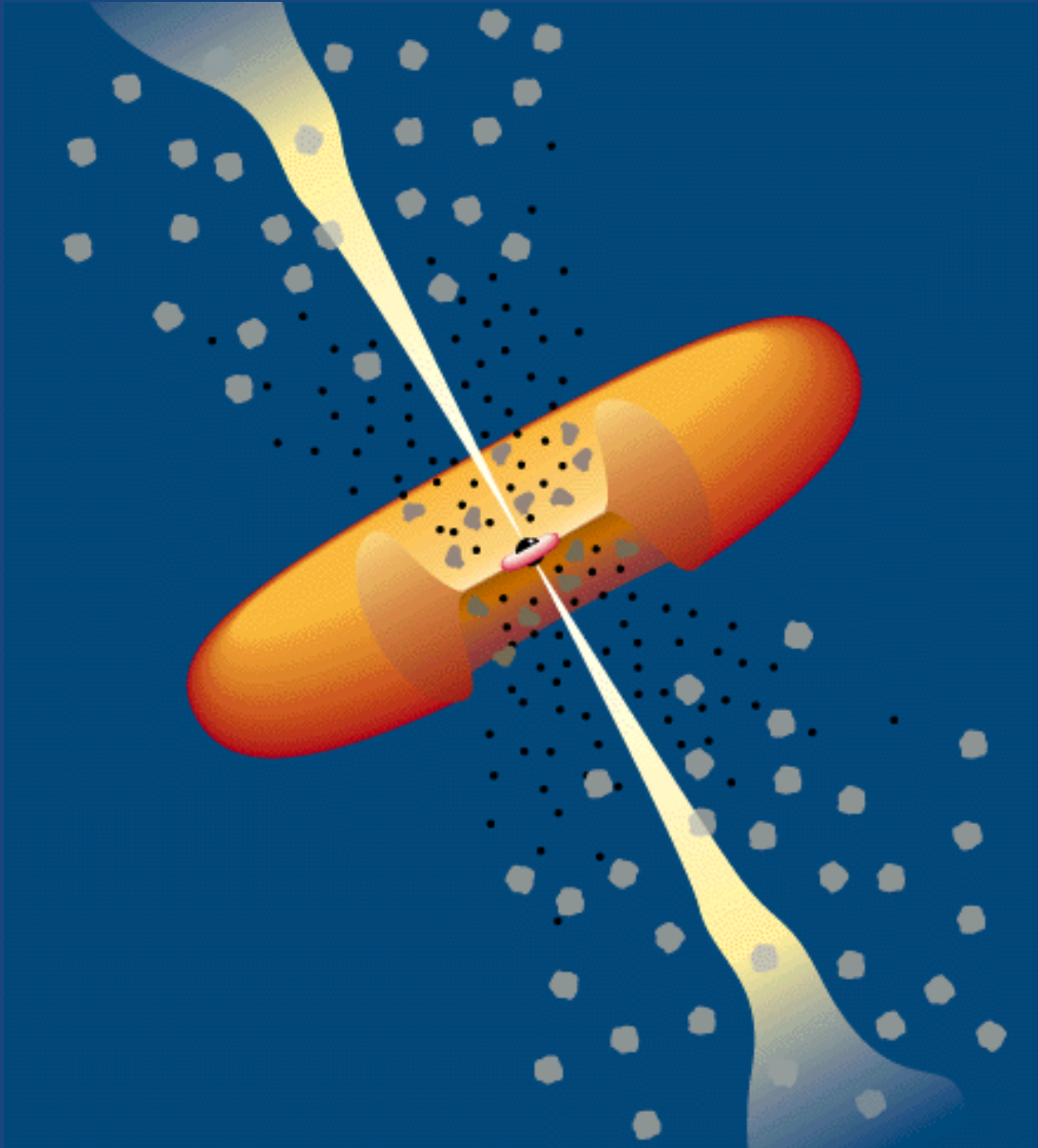


Extragalactic Science with SPICE, the Space Interferometer for Cosmic Exploration

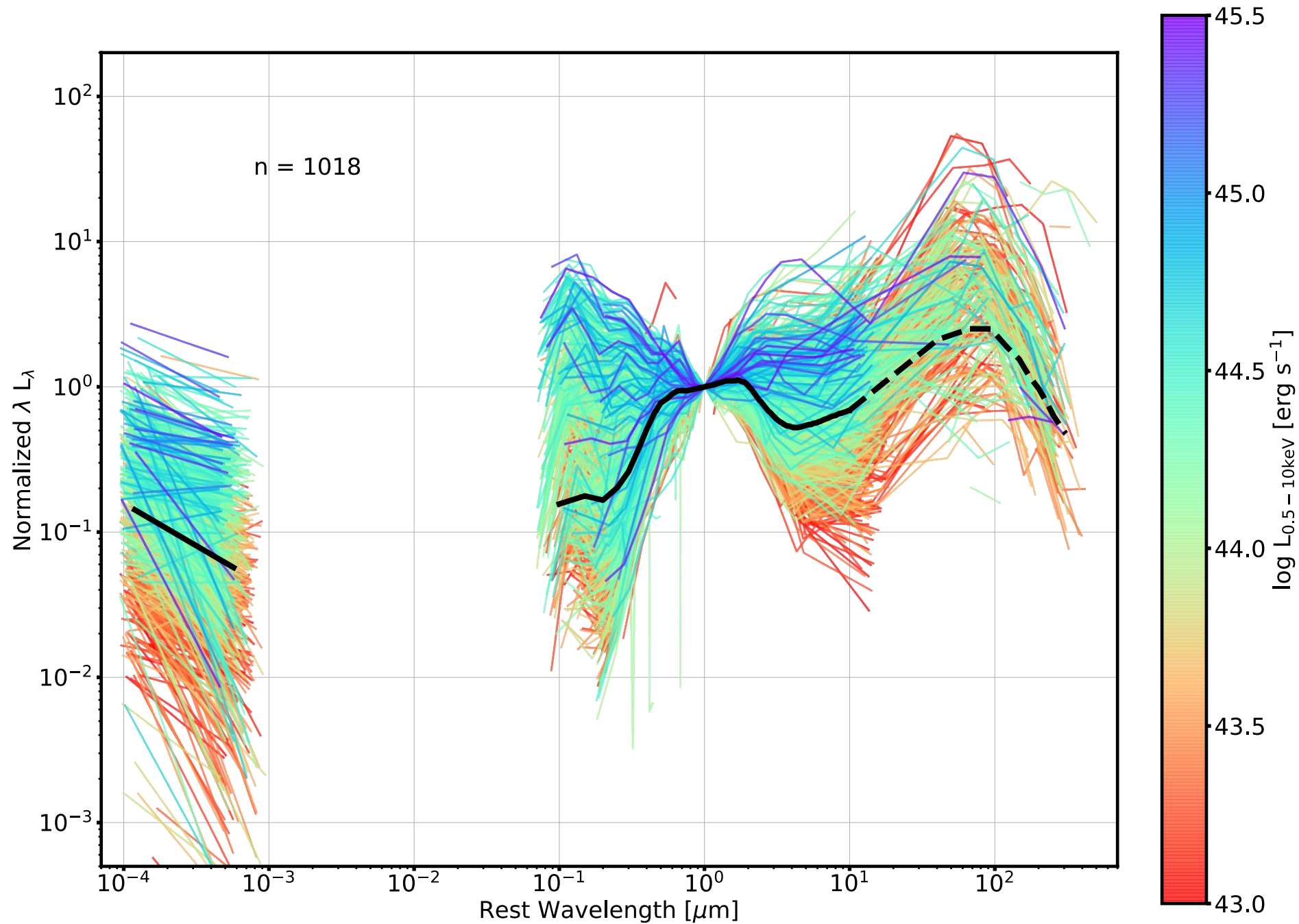
Meg Urry, Matteo Bonato, David Leisawitz, Gianfranco De Zotti,
Laura Sommovigo, Irene Shivaei, Duncan Farrah, Locke Spencer,
Berke V. Ricketti, Hannah Rana, Susanne Aalto,
David B. Sanders, Lee G. Mundy

Bonato+ 2024



BH growth in AGN

- Most supermassive black hole growth obscured by gas and dust
- UV reprocessed into IR
- Still need to find obscured AGN at high luminosity, high redshift



AGN SEDs

Connor Auge+ 2023

Accretion History of AGN

Far-infrared data essential for BHs, galaxies

- FIR can dominate spectral energy distribution (SED)
- FIR needed to assess contributions from stars v AGN
- FIR needed to determine bolometric luminosity $\rightarrow L/L_{\text{Edd}}$

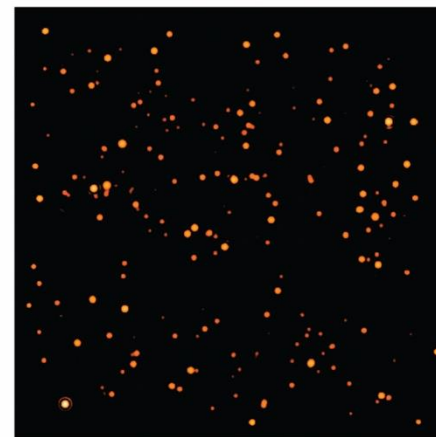
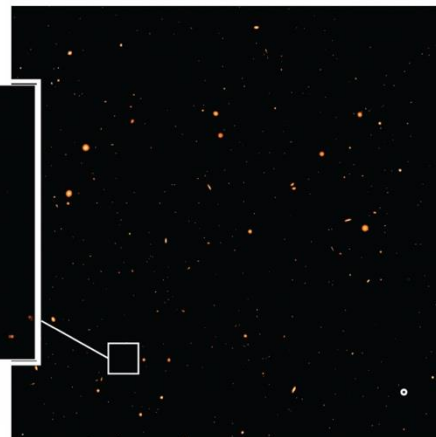
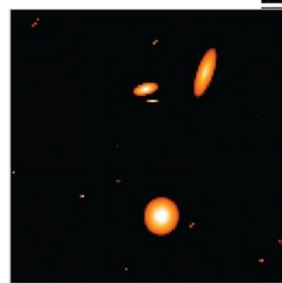
Full resolution

Convolved (2 m)

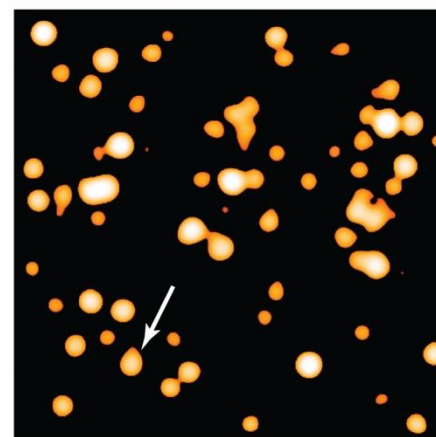
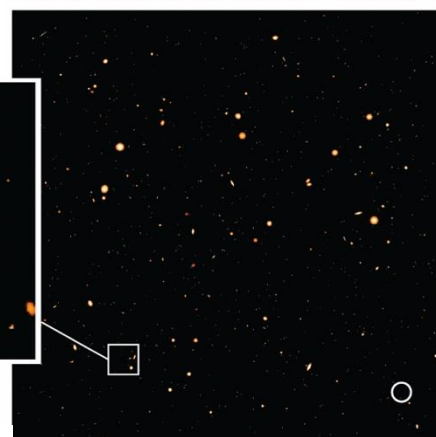
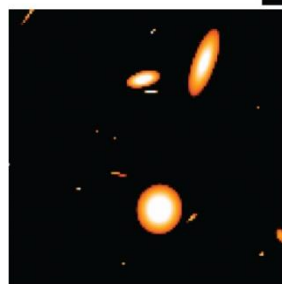
Left: simulated SPICE

Right: convolved to 2m resolution

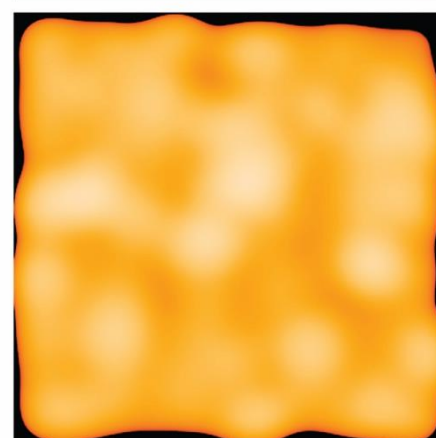
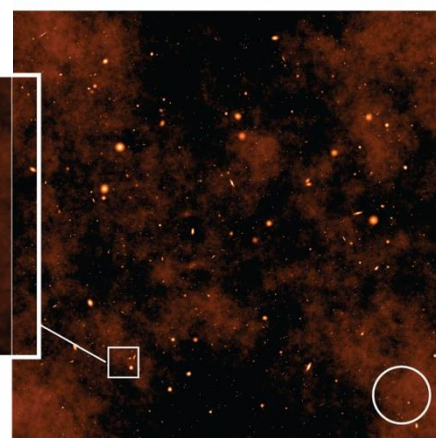
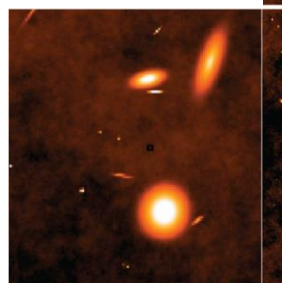
25 μm



100 μm



300 μm



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4.74 x 4.74 arcmin cutouts

← 4.74 arcmin →

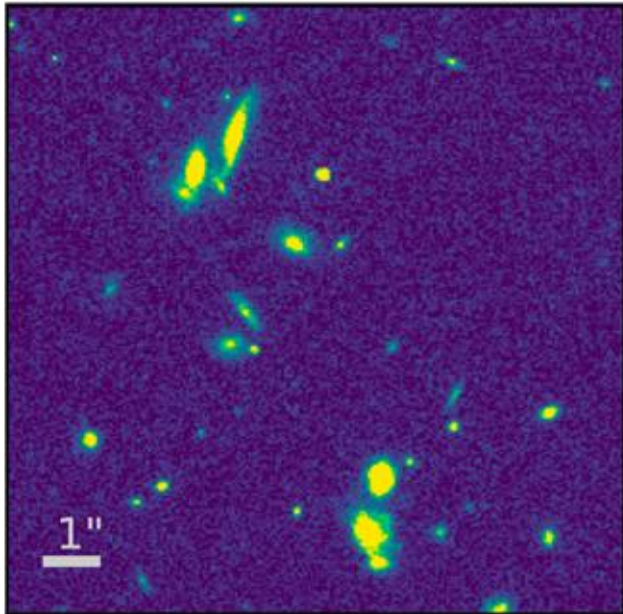
FIR interferometer res at 100 μm like JWST NIRCam 1.6 μm

Current status of optical/near-IR

Single dish (3.5 m) FIR

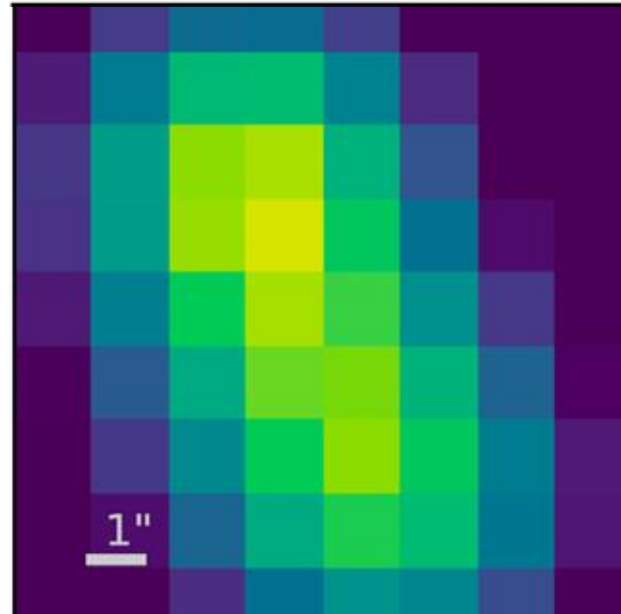
High resolution FIR

JWST 0.06" at 1.6 μm



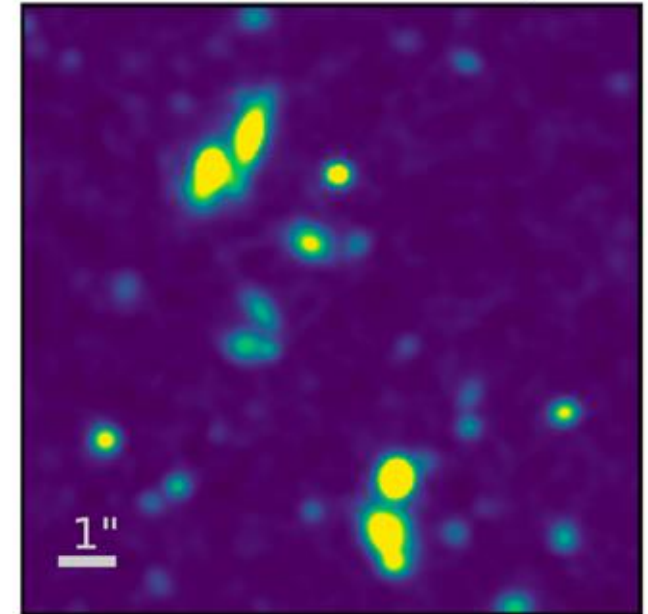
Simulated sky as seen by
JWST/NIRCam at 1.6 μm

Herschel 6.8" at 100 μm



Same field simulated for the
3.5m single dish Herschel

SPICE 0.3" at 100 μm

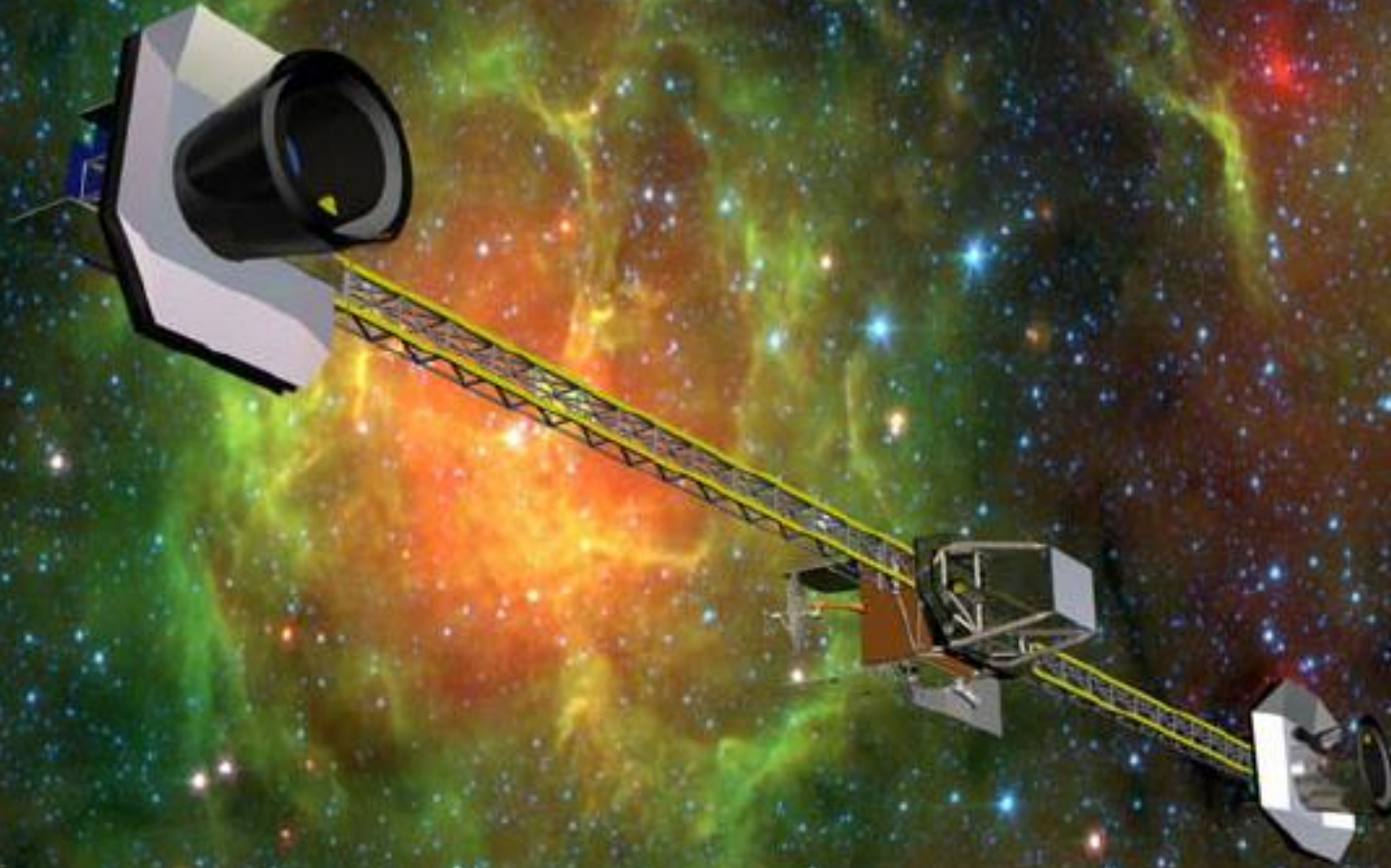


Same field simulated for the
SPICE interferometer

Census at high-redshift requires:

- Sensitivity to detect faint sources
- Arcsec resolution, to avoid confusion limit
- Arcsec resolution, to identify correct $\lambda\lambda\lambda$ counterpart

Understanding black hole-galaxy evolution requires:



*See Lee Mundy's talk
tomorrow afternoon*

1000-hr, 0.5 sq deg survey (e.g., COSMOS)

Bonato+ 2024

- ~65,000 star-forming galaxies and AGNs detected (5σ)
- Detections up to $z \sim 6-8$
- AGN ~10-30% of detections (peaks at 100 μm ; incr w flux)
- Depth well matched to Chandra COSMOS *Civano+ 2016*
- 100s-1000s of detections in Ne, O, Si lines

SPICE is complementary to JWST and ALMA

UV to FIR emission of a typical galaxy across cosmic time:

With sub-arcsecond resolution, SPICE is complementary to JWST and ALMA capabilities and wavelength coverage

