StarbugII - JWST Photometry in Complex Dense and Dusty Fields

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Full photometry suite, optimised for crowded stellar fields embedded within highly structured dusty environments. Developed bespoke for JWST NIRCam and MIRI.

Source Detection:
Using an ensemble of background subtraction methods, we are able to out perform the JWST pipeline by an order of magnitude (figure right).

Photometry:
Includes aperture and PSF photometry, plus artificial star testing. Plus outlier and background galaxy contamination detection.
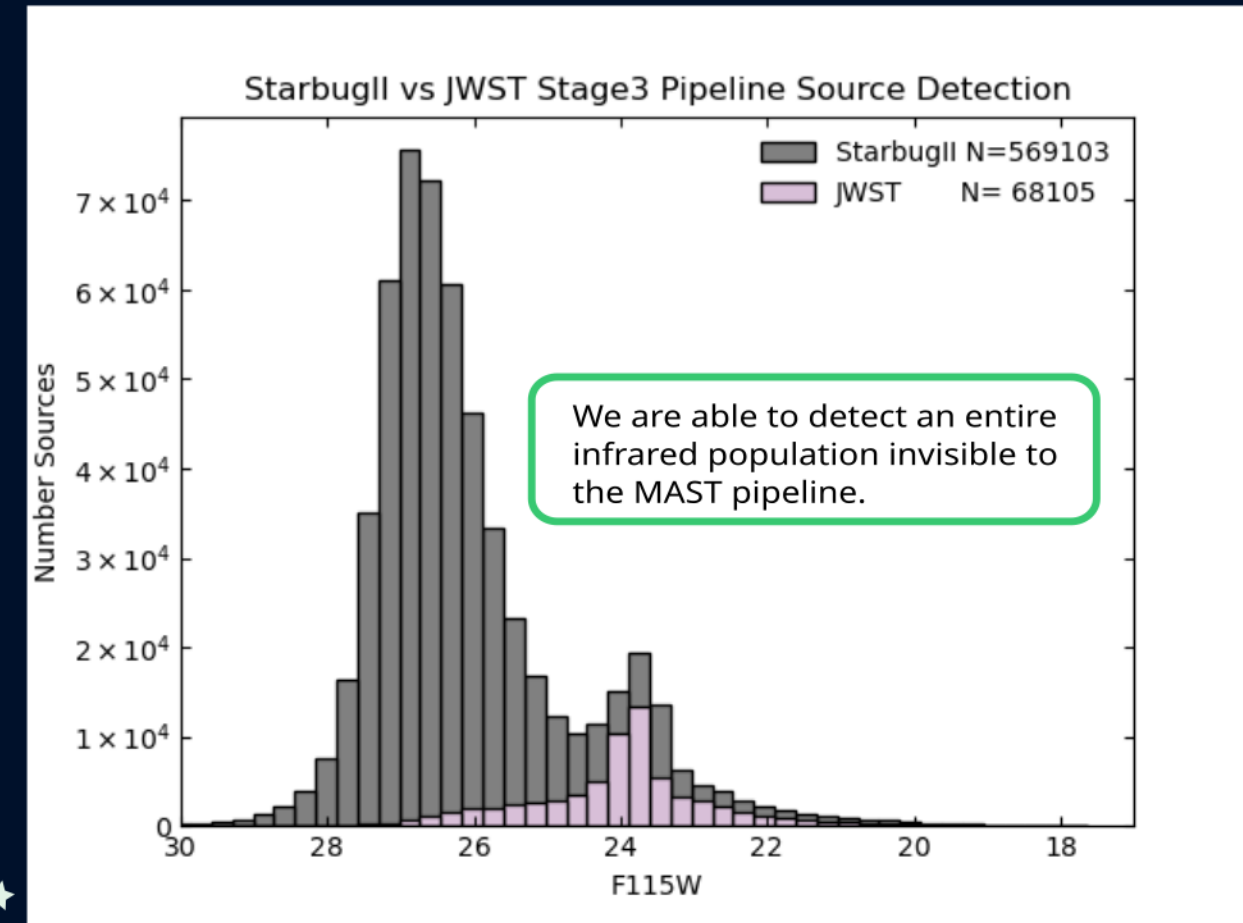
Background Estimation:
We can construct a realistic estimation of complex dusty backgrounds (figure below).

Catalogue Matching:
Match between exposures, observations, detectors, bands and between NIRCam and MIRI.

StarbugII vs JWST Stage3 Pipeline Source Detection

- StarbugII N=569103
- JWST N= 68105

We are able to detect an entire infrared population invisible to the MAST pipeline.

With a source list, we can estimate the shape and brightness of dusty regions and areas of compex PAH emission typical of regions of star-formation and galaxies within the Local Volume.

Simple command line tool, written in python and incorporating photutils. Works on both level 2 and level 3 data. Includes source matching between filters.
The tool is under constant development as we learn more about the intricacies of JWST.
This is a core part of the work presented in GTO PID 1234 and 1227.

Available on PYPI and Github:
$~ pip install starbug2
https://github.com/conornally/starbug2