Success Assessment Metrics

Bologna, Italy

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NAASC
NORTH AMERICAN ALMA SCIENCE CENTER

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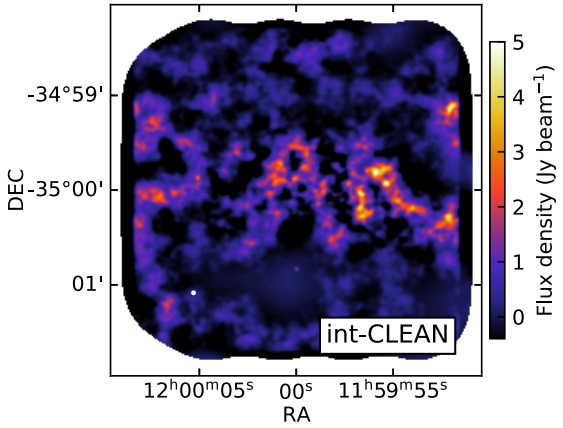
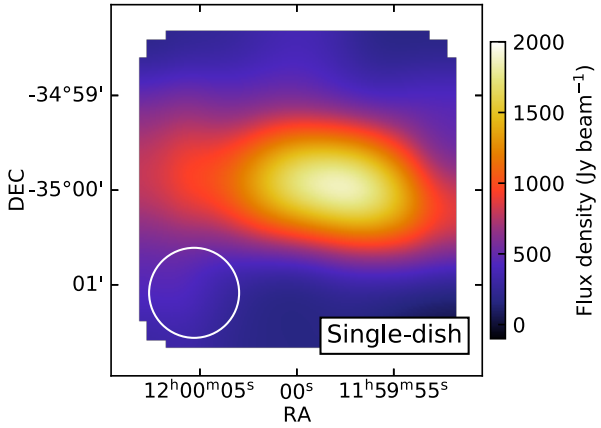
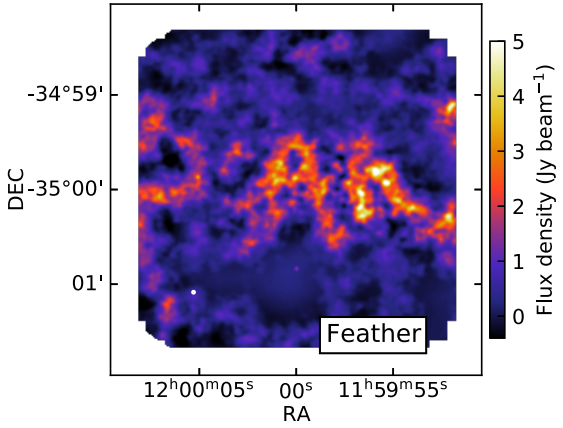
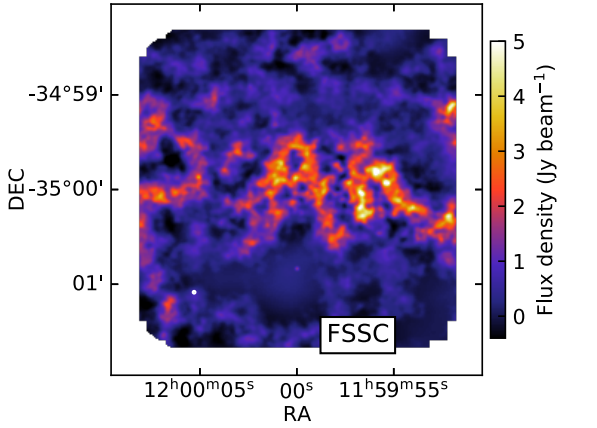
Inspecting results

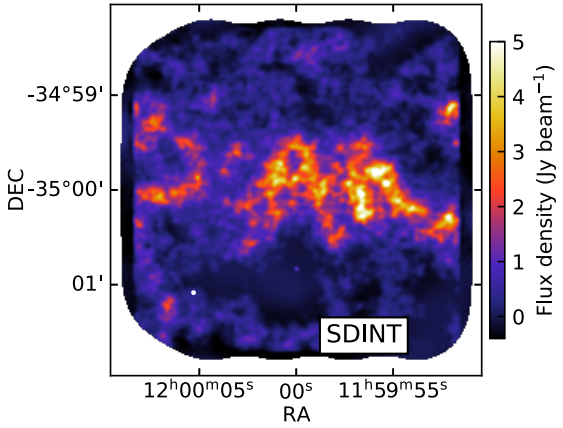
(qualitative)

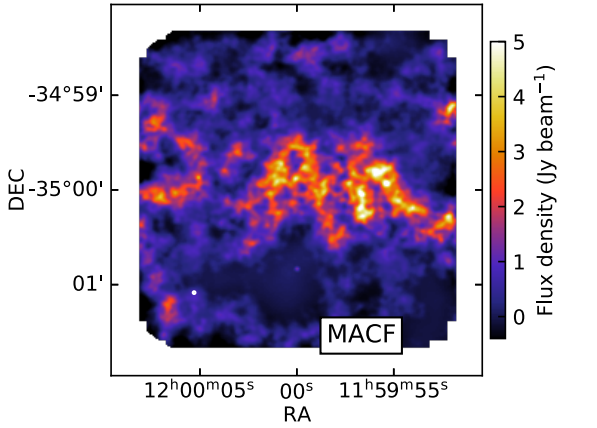








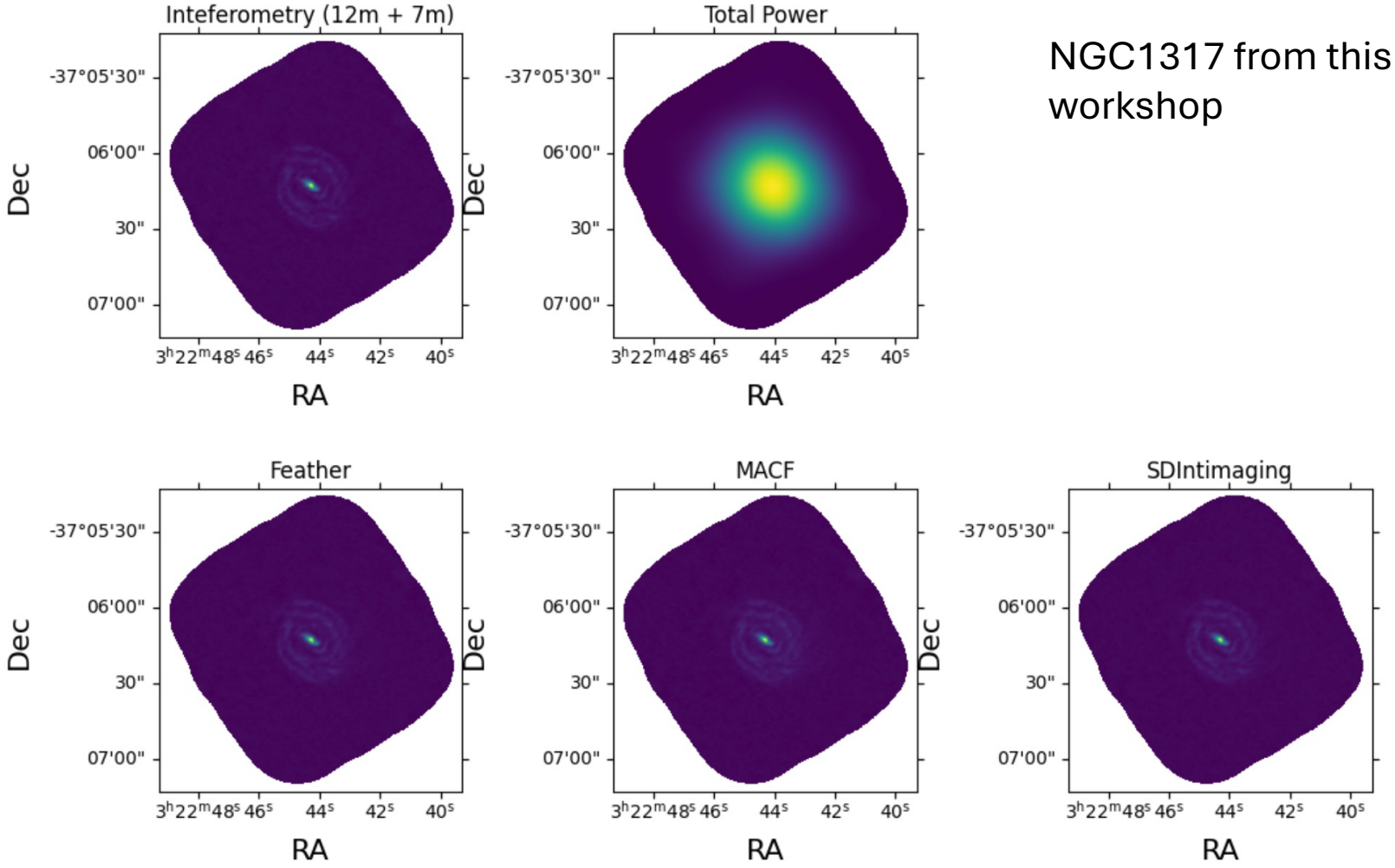




Example of simulated observations from Plunkett et al. (2023)

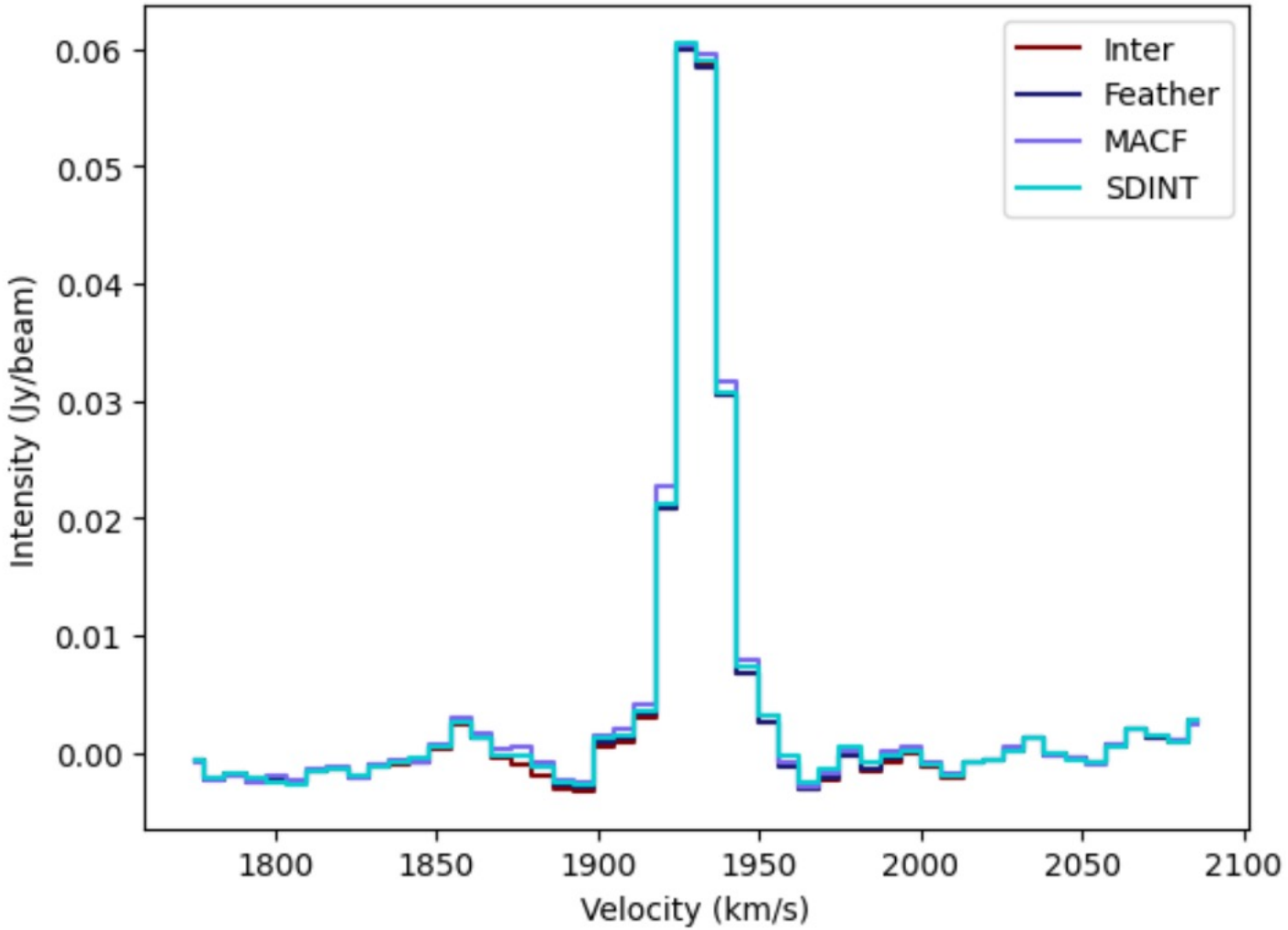
Inspecting results

(qualitative)



NGC1317 from this workshop

0. Compare fluxes

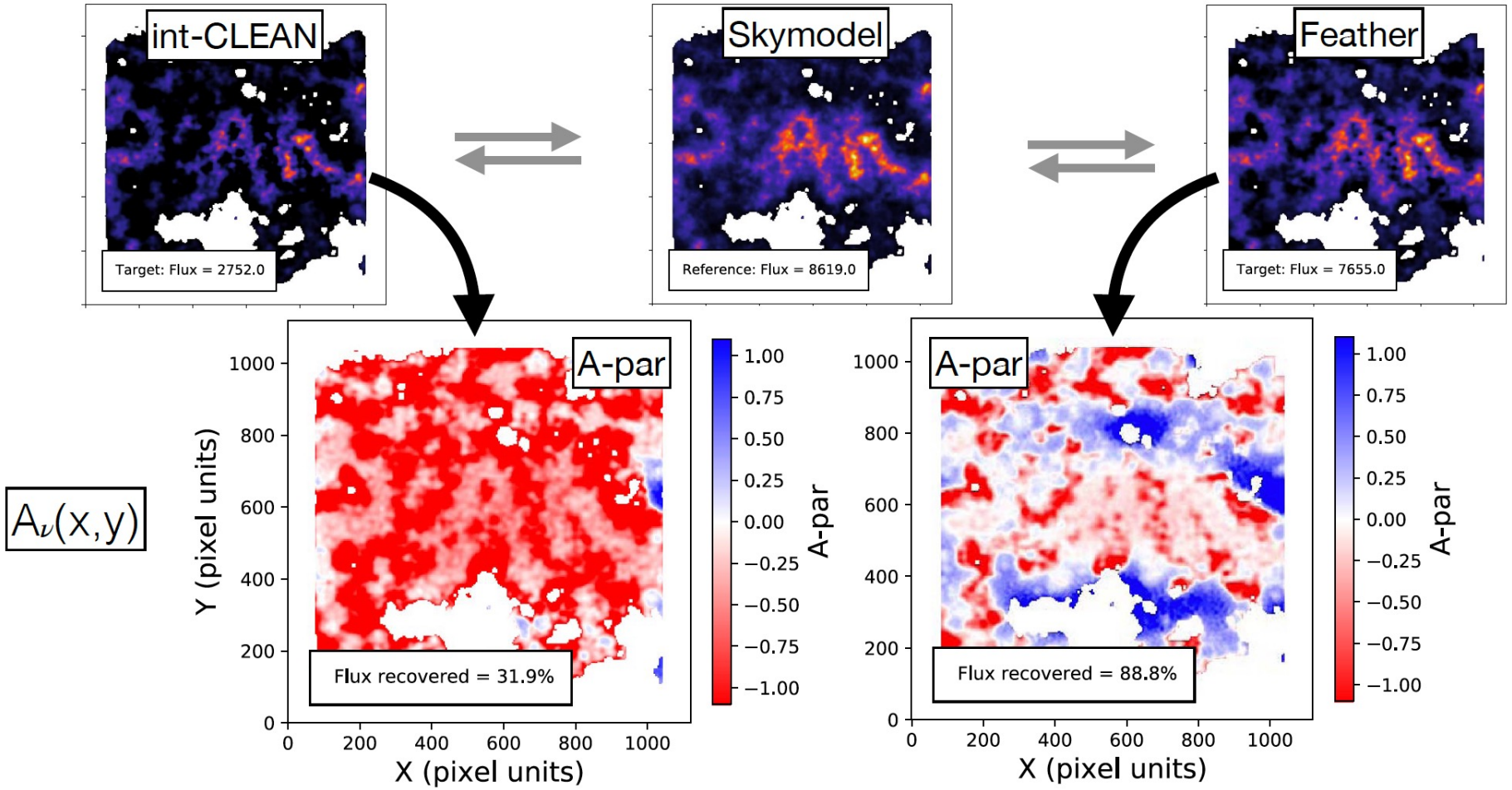


Assessing results [[some definitions]]

	Formula:	*Ideal:*
A-par	$$A_\nu(x, y) = \frac{I_\nu(x, y) - R_\nu(x, y)}{|R_\nu(x, y)|}, \quad -\infty < A_\nu(x, y) < \infty.$$	A~0
Fidelity	$$F_\nu(x, y) = \left| \frac{R_\nu(x, y)}{I_\nu(x, y) - R_\nu(x, y)} \right|, \quad 0 < F_\nu(x, y) < \infty.$$	F~∞

See Plunkett et al. (2023), *Sec. 5.2: Accuracy Parameter and Fidelity: Assessing Flux Recovery*

1. Map of A-par

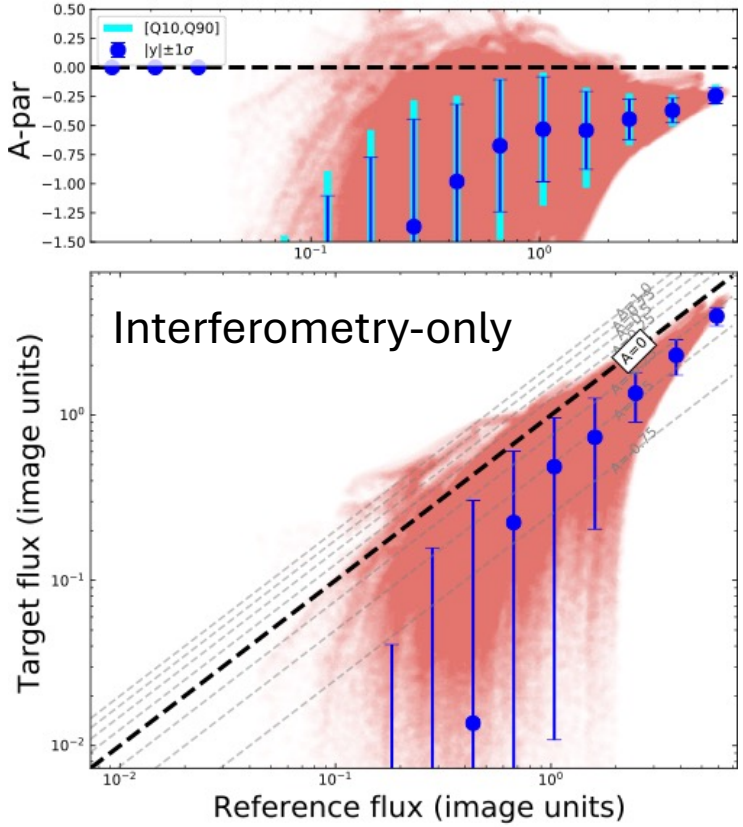


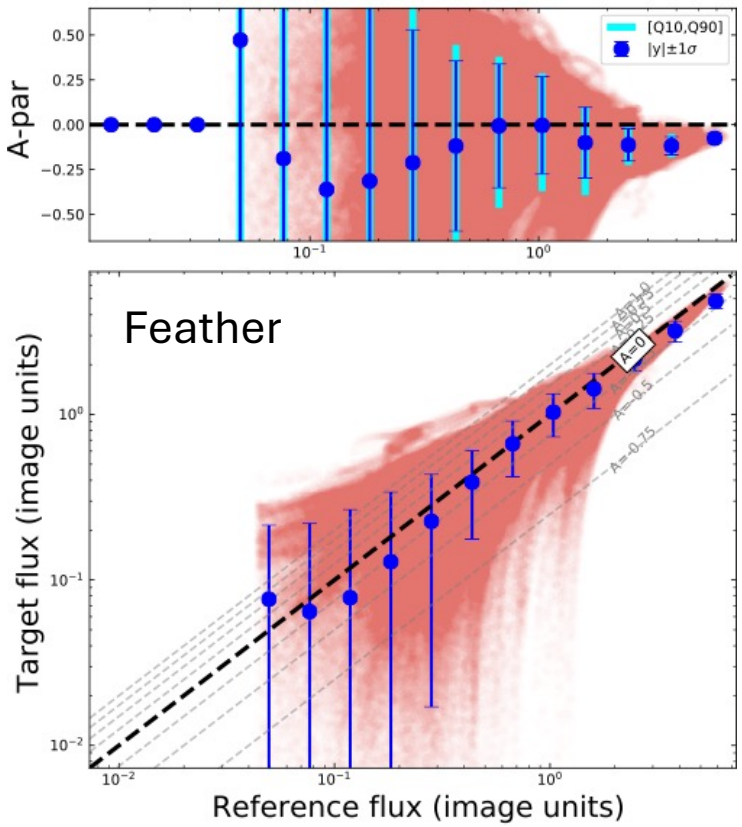
$A_\nu(x,y)$

Example of simulated observations from Plunkett et al. (2023)

2. Flux and A-par relative to “model” flux

Pixel-by-pixel comparison of flux and A-par show global improvement at all flux levels after combination.

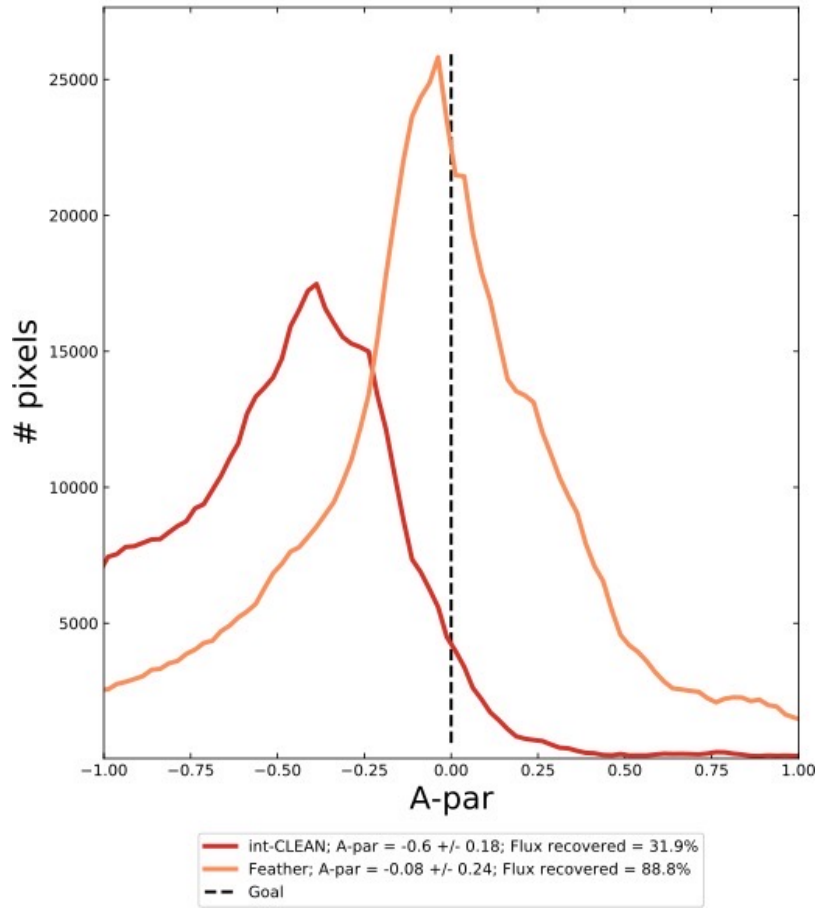


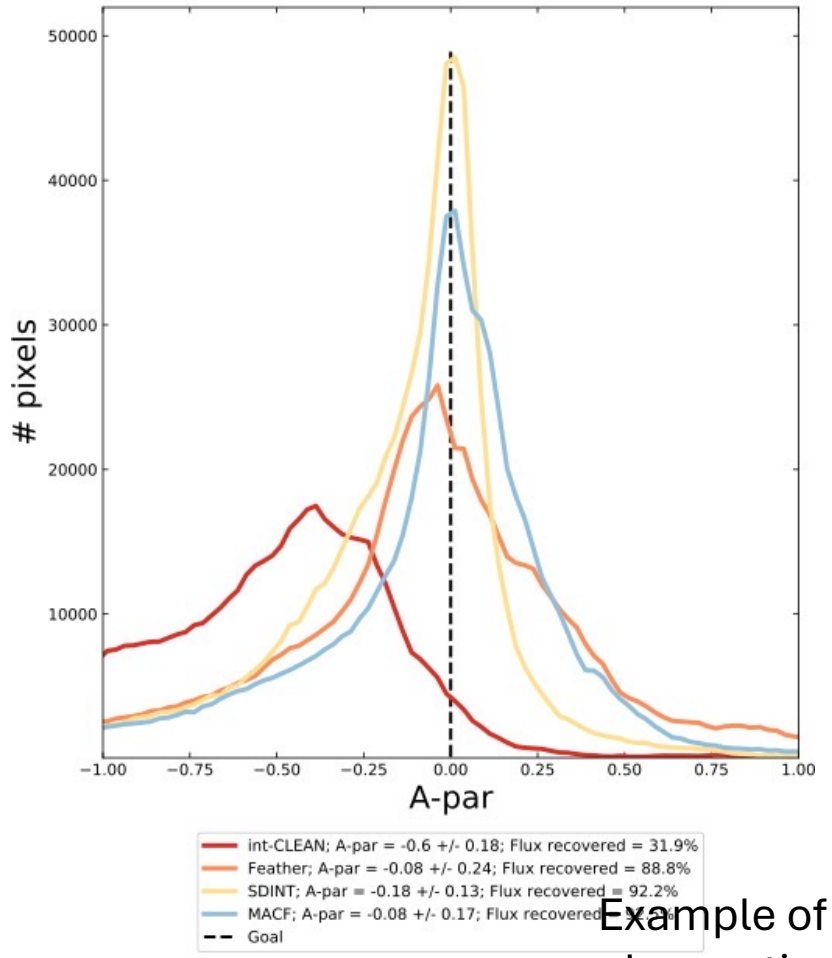


Example of simulated observations from Plunkett et al. (2023)

3. Histogram of A-par values

Any combination is better than no combination; SDINT and MACF (model-assisted) result in best A-par.

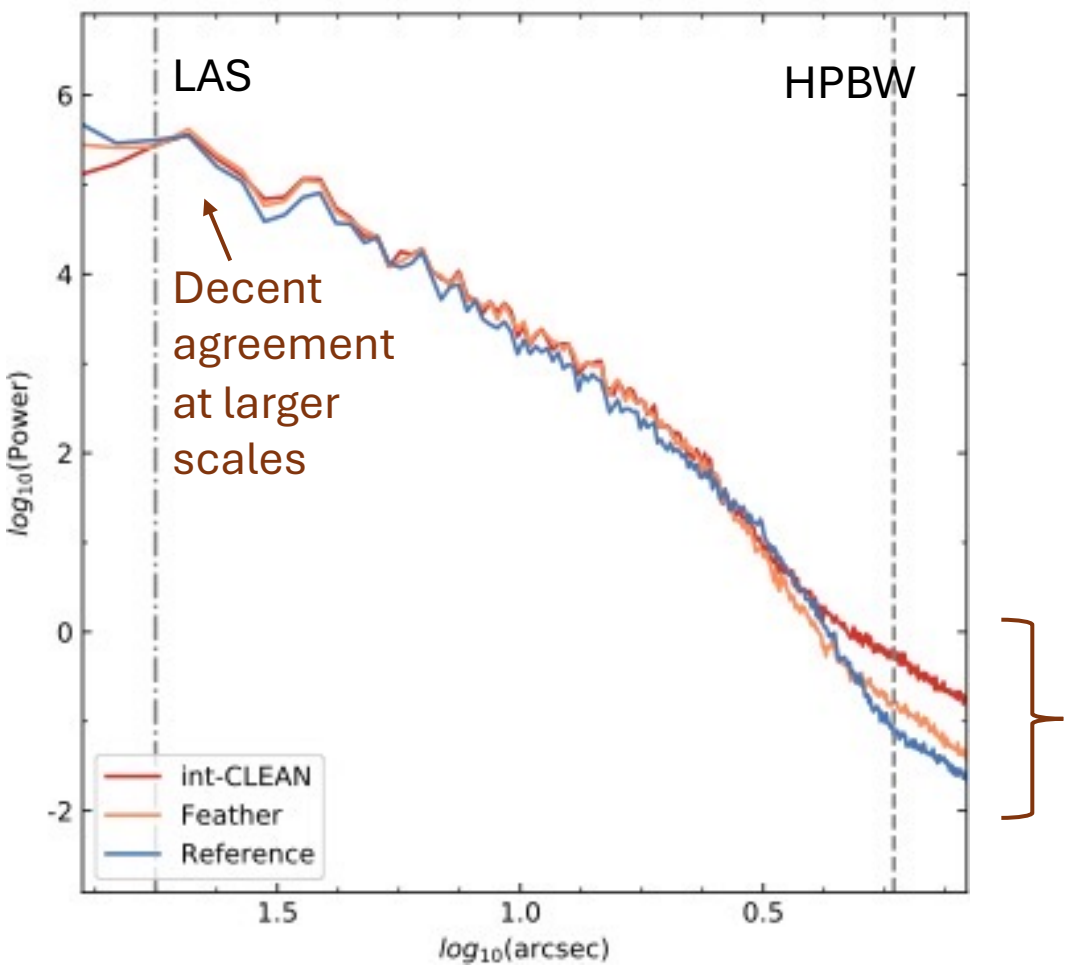




Example of simulated observations from Plunkett et al. (2023)

4. Power spectrum of flux

Spatial power-spectra show scale-dependence of image combinations.



"The variation in power at small scales highlights subtle deficiencies that may not be immediately and clearly visible in the images."

Example of simulated observations from Plunkett et al. (2023)

4. Power spectrum of flux

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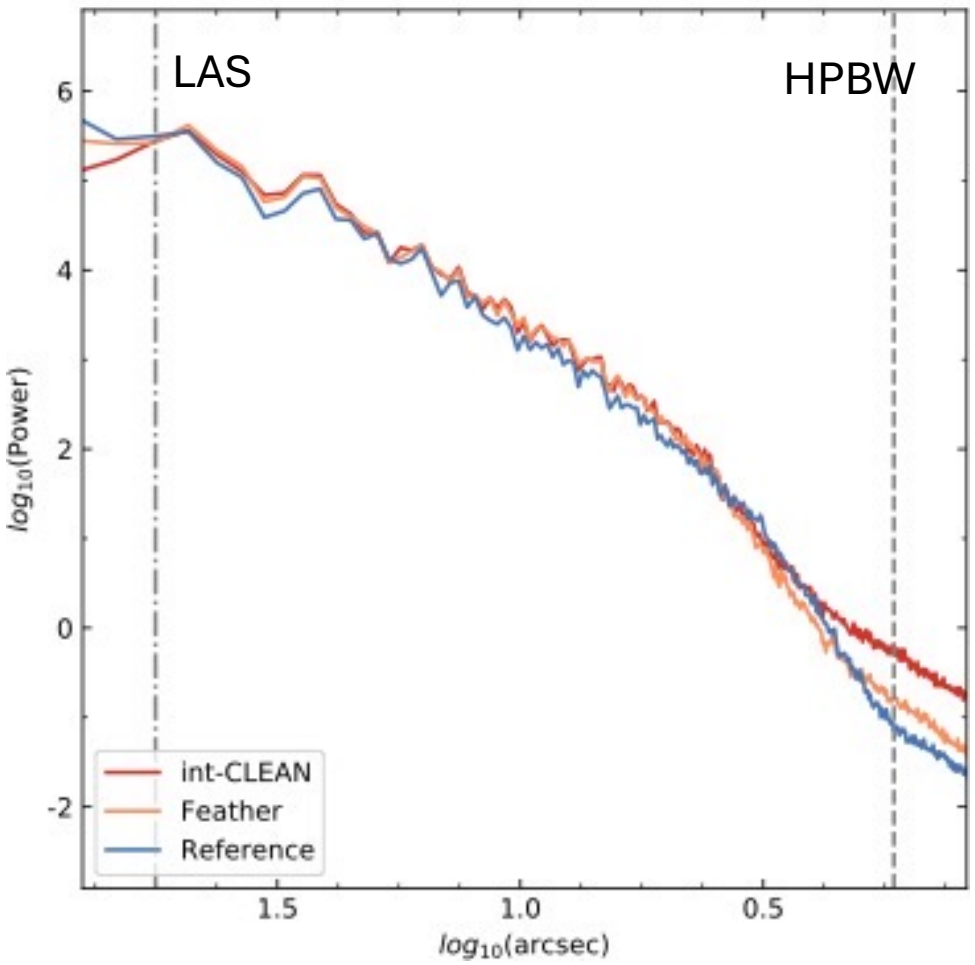

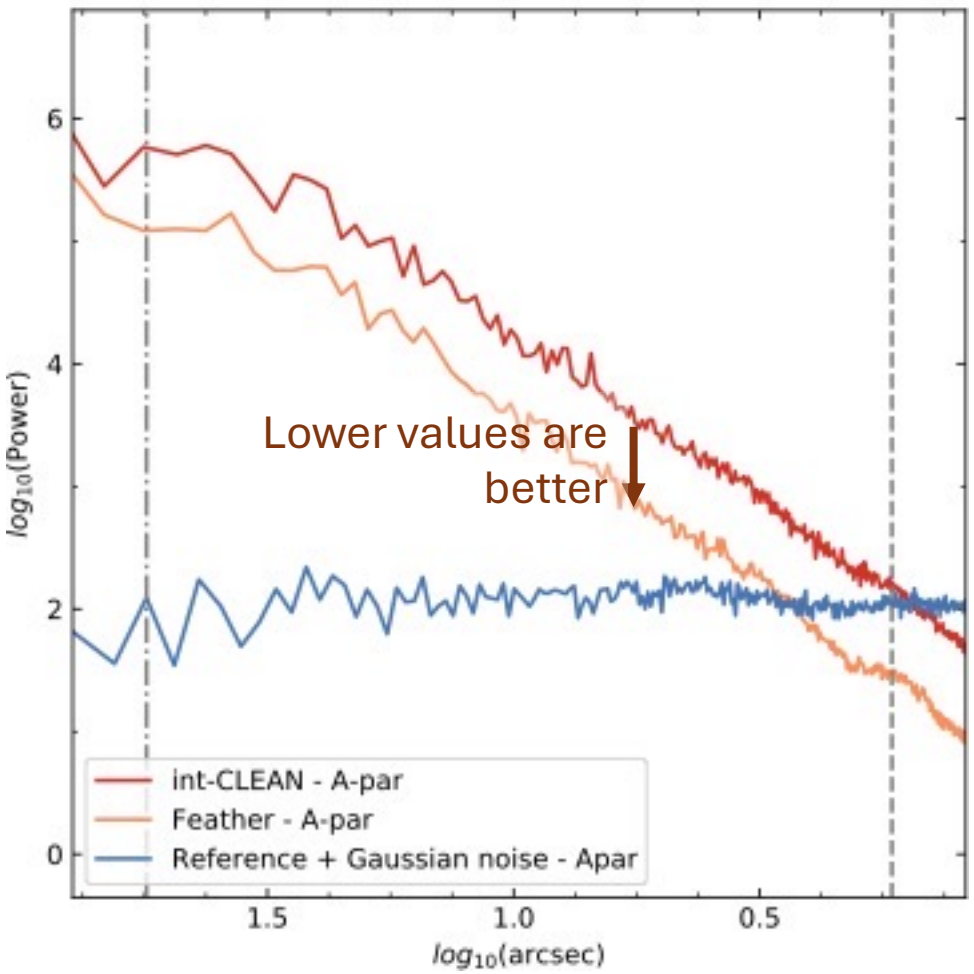

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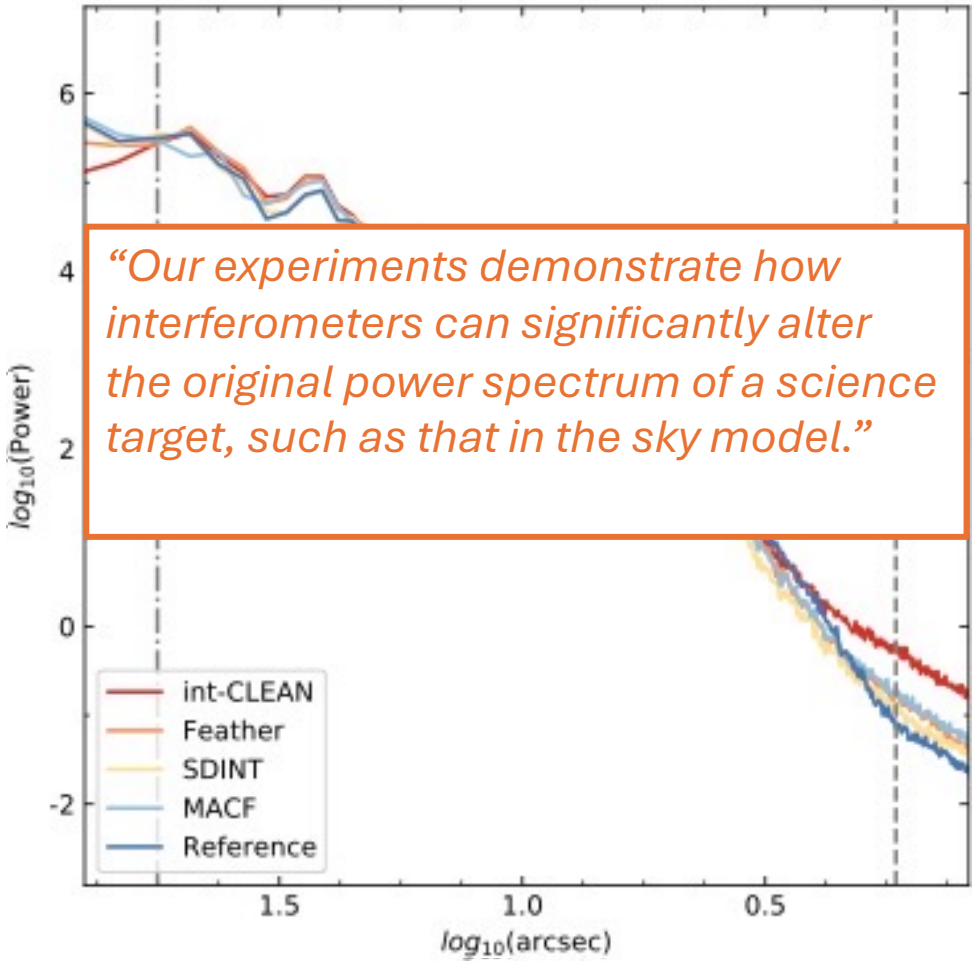
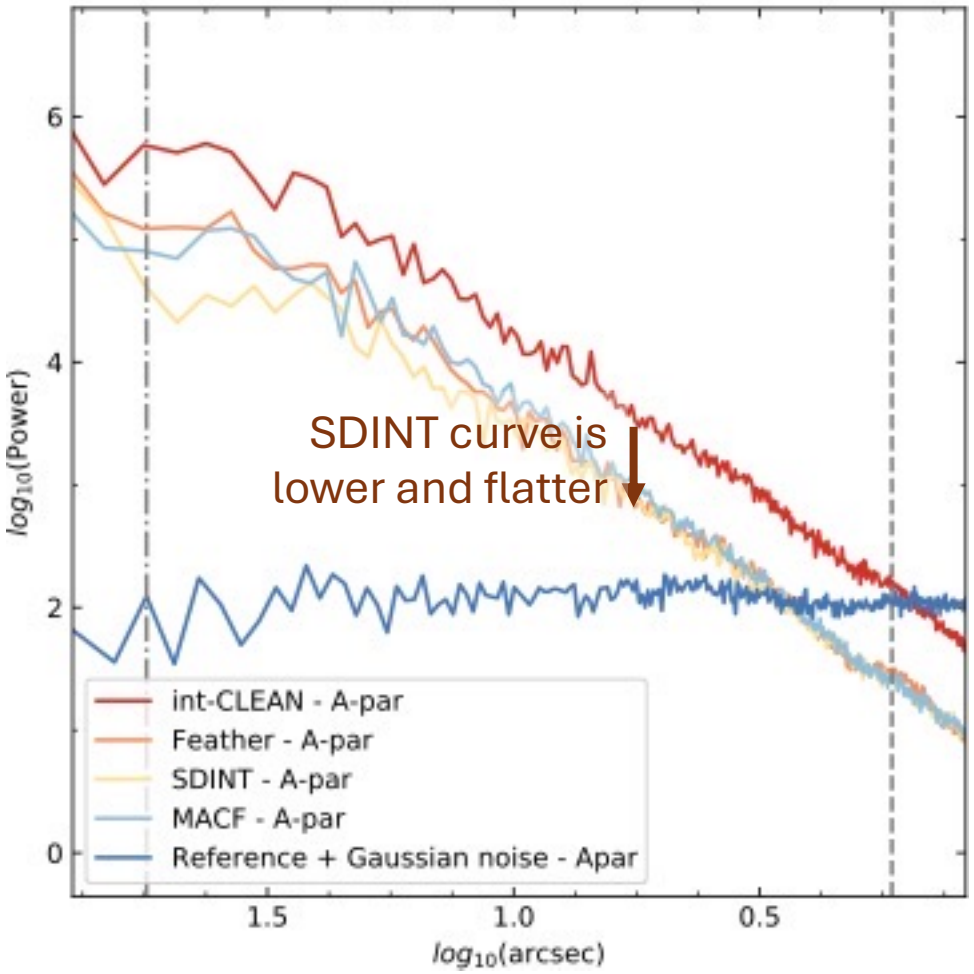
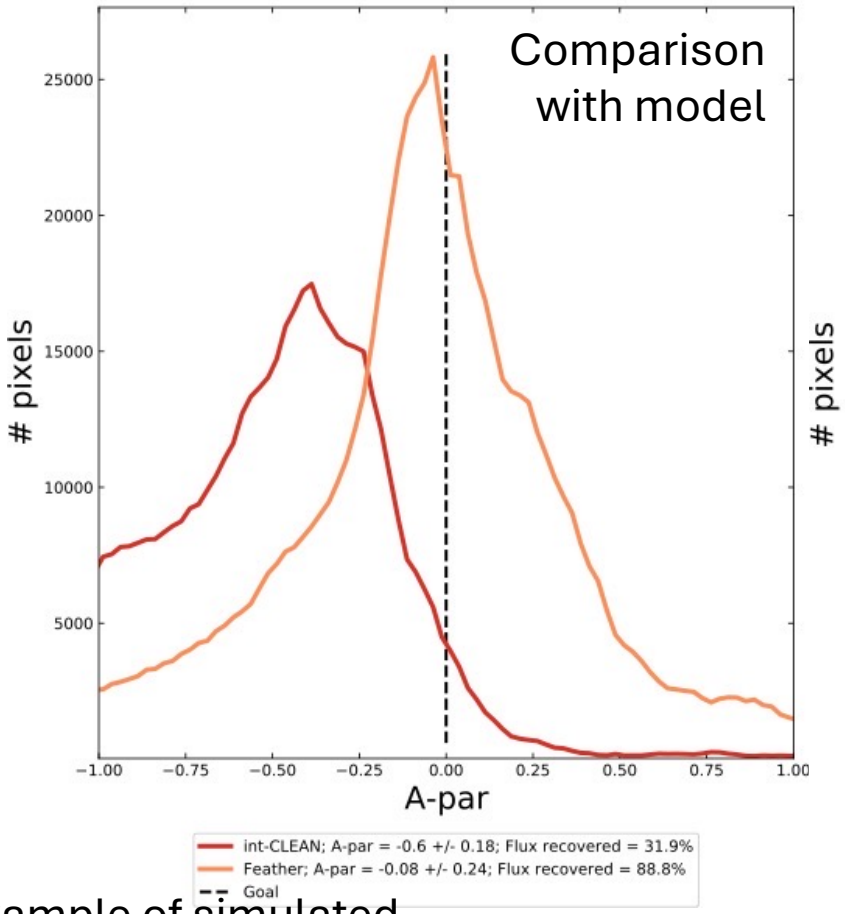


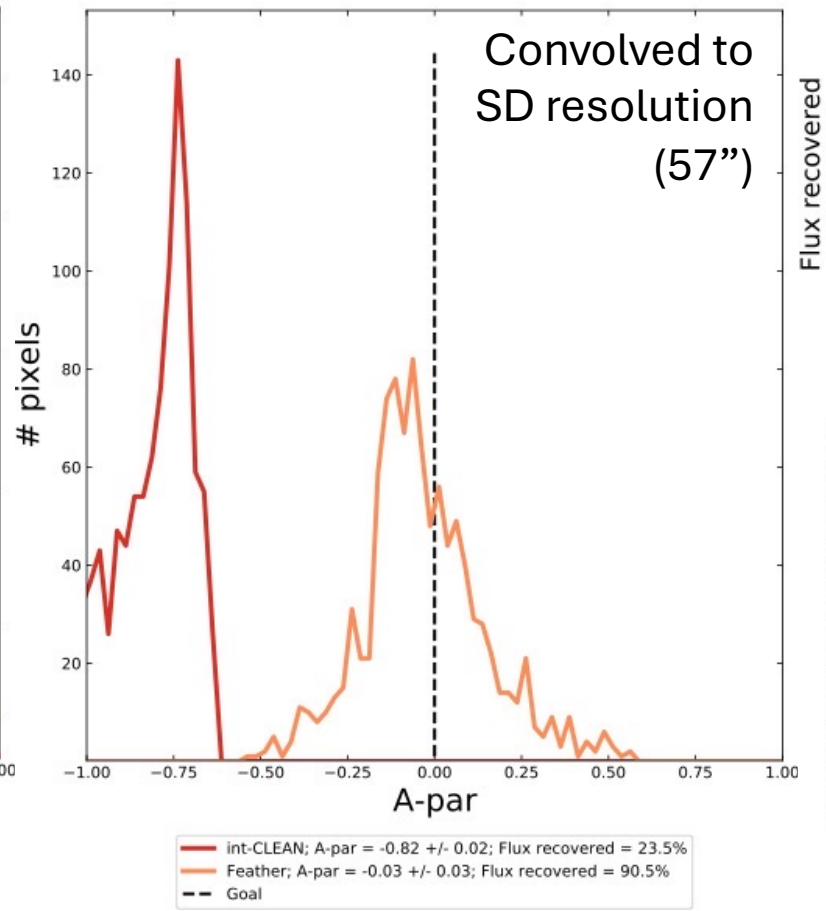
"Our experiments demonstrate how interferometers can significantly alter the original power spectrum of a science target, such as that in the sky model."

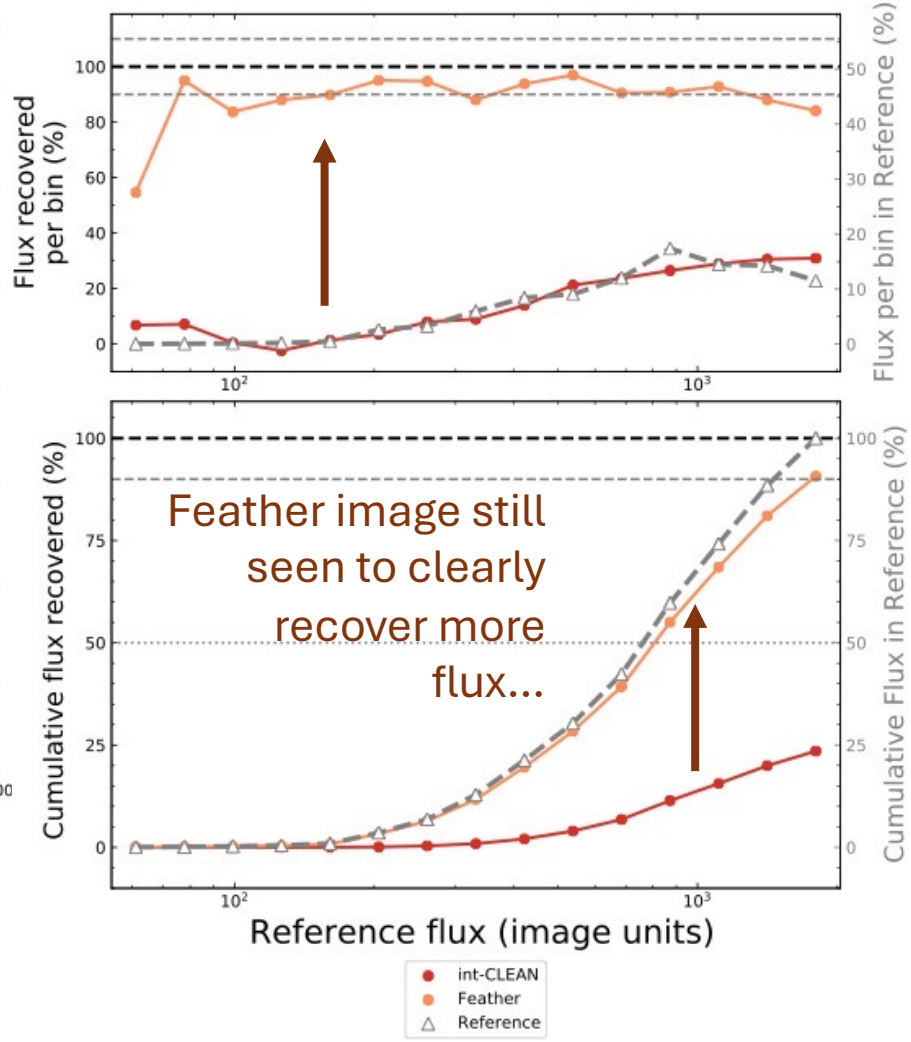


See Plunkett et al. (2023), *Sec. 6.4: Flux and A-Par Power Spectra*

Note: *SD is a "good" proxy for the reference image (smoothed, fewer data points, but best we have)*



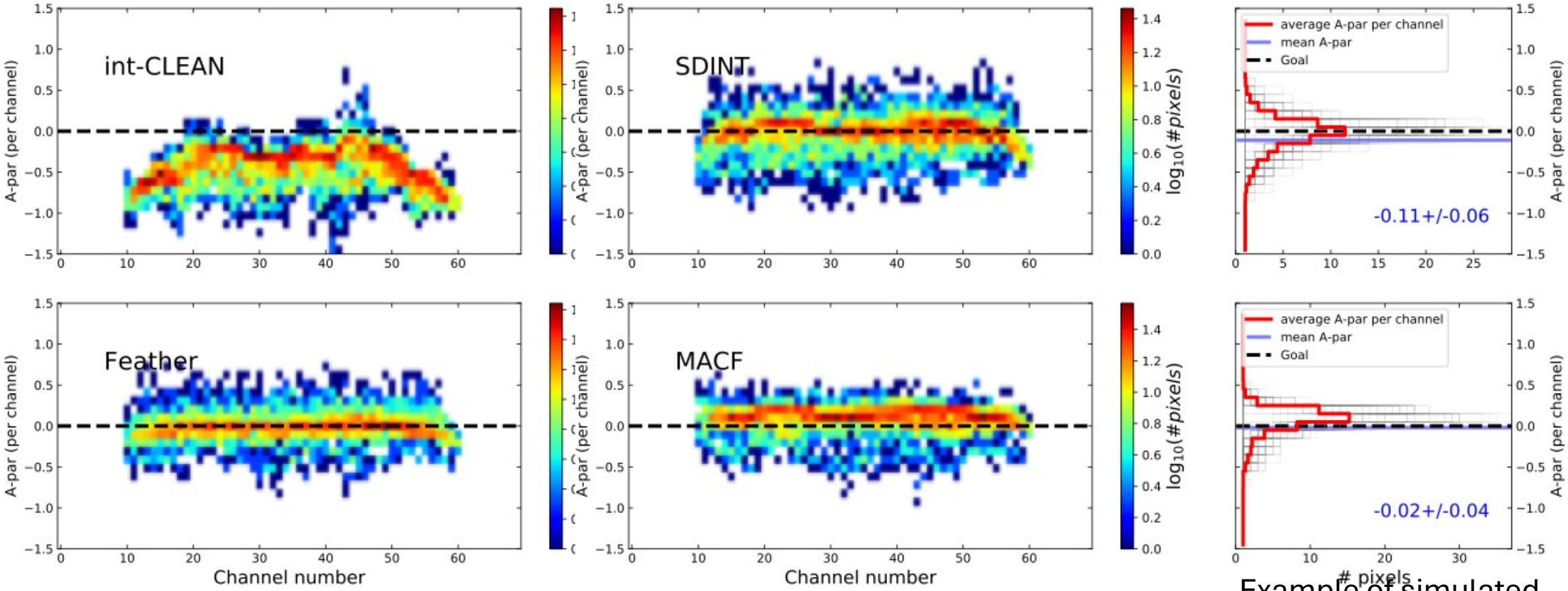




Example of simulated observations from Plunkett et al. (2023)

5. A-par distribution as function of chan.

”Spectrograms” make it possible (critical) to assess data cubes (example here: M100)



Example of simulated observations from Plunkett et al. (2023)

In practice...

DataCombAssess_20241014.ipynb

Data Combination Tutorial

THIS VERSION TO BE USED FOR WORKSHOP

By: Adele Plunkett

Updated: 2024-10-14

Aims:

- Inspect the data cubes
- Assess the outcomes

Prior steps:

- Image 12m and 7m data
- Feather
- Model assisted CLEAN then Feather (MACF)
- SDIntimaging
- Smooth to TP beamsize

Datasets to use here:

- NGC1317_sdint_sdgain1.joint.cube.image.sm.fits
- NGC1317_sdint_sdgain1.joint.cube.image.fits
- NGC1317_Feather_CO.image.sm.fits
- NGC1317_Feather_CO.image.fits
- NGC1317_MACF_CO.image.sm.fits
- NGC1317_MACF_CO.image.fits
- NGC1317_12m7m_CO.image.sm.fits
- NGC1317_12m7m_CO.image.fits
- NGC1317_TP_CO.regrid.imt.depb.fits