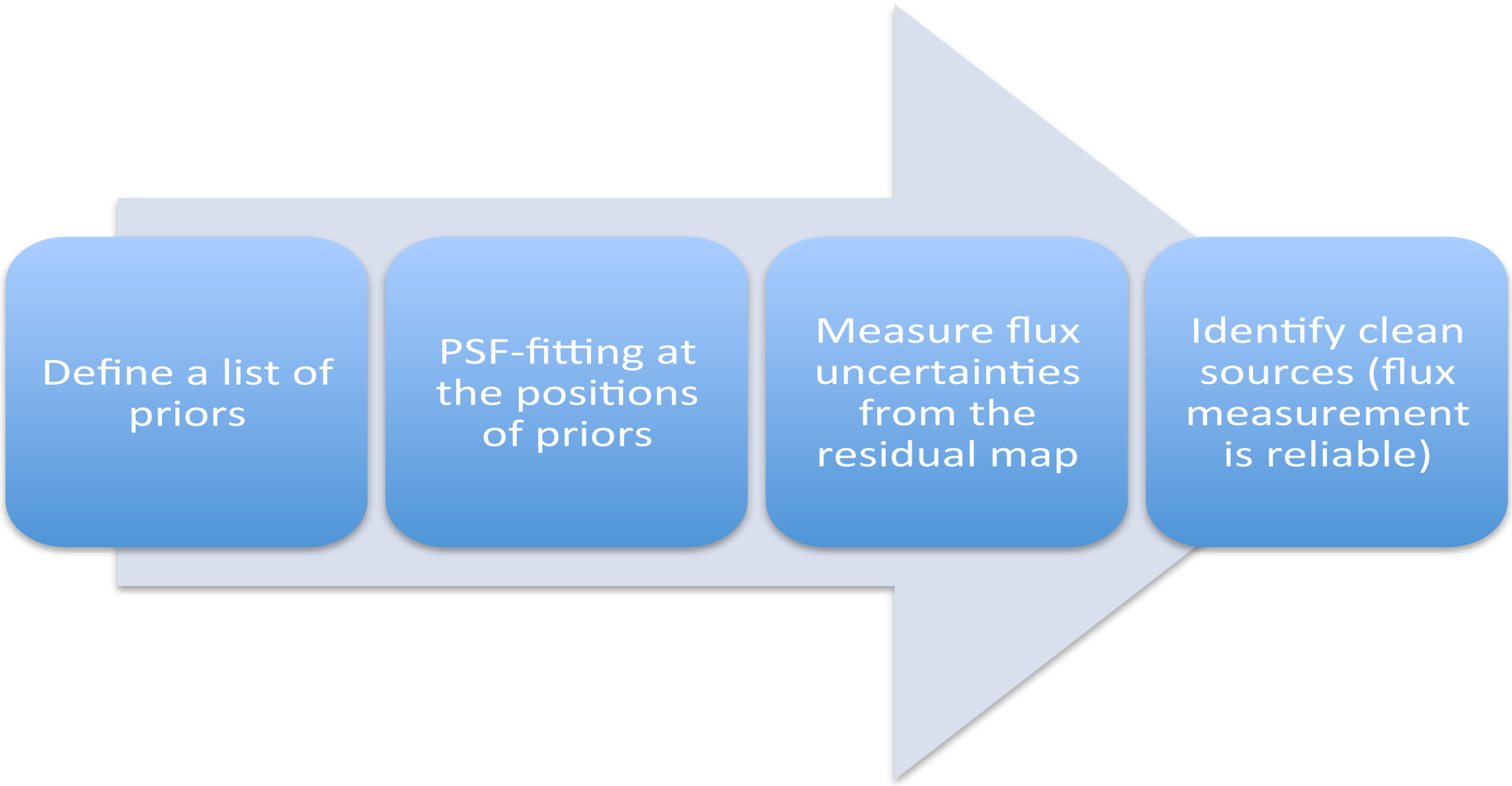
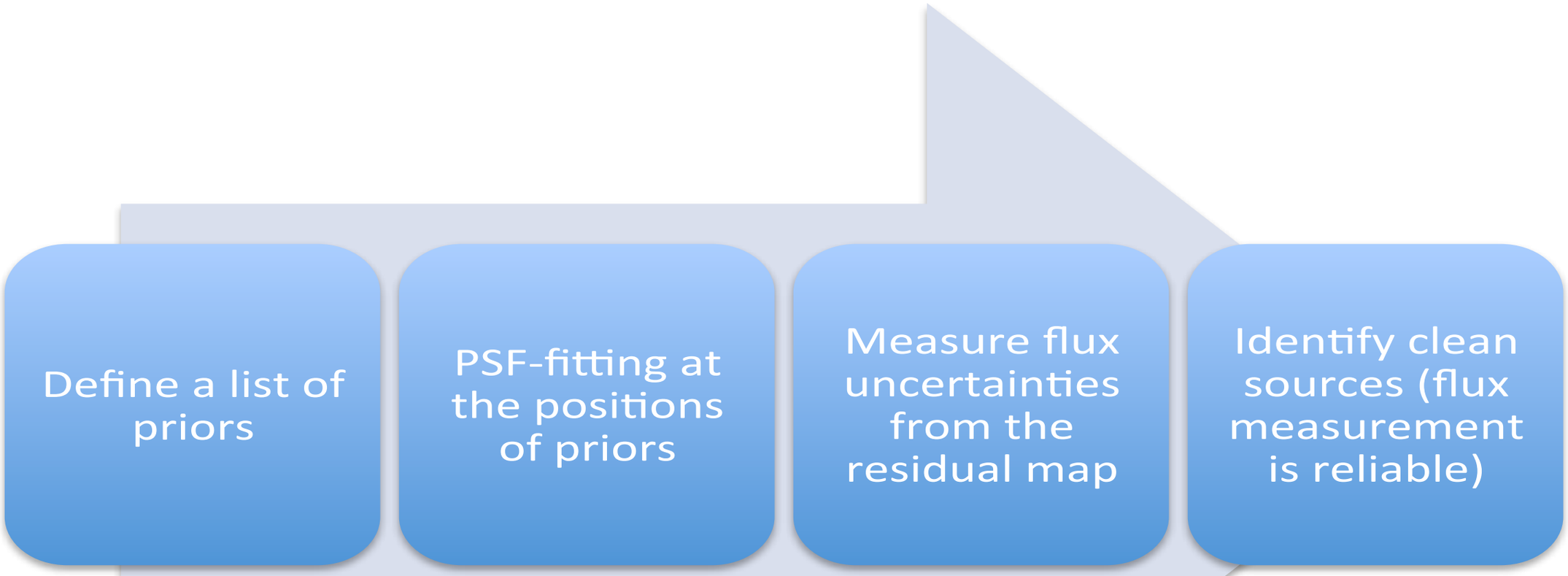
Toward the "ultimate" ASTRODEEP recipe

Tao Wang and the ASTRODEEP consortium

Previous standard prior source extraction procedure:



“Ultimate” ASTRODEEP source extraction procedure:

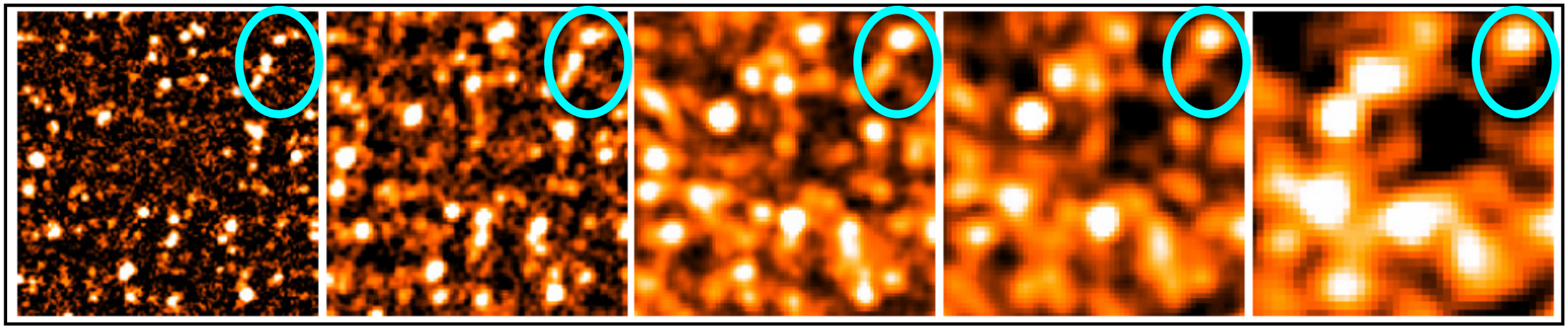


That's the first run!

In dense regions, flux uncertainties derived from covariance matrix tend to be underestimated.

a. sources have a close neighbor (~positional uncertainty, ~resolution)
b. sources with multiple neighbors (~ FWHM of the PSF)

Improve photometry accuracy of “non-clean” sources by “freezing” faint sources



$$m = \sum_{k=1}^{N_s} S_k PSF_{x_k,y_k} + \sigma + \mu,$$

$$-log(L) = \sum_{pixels} \frac{\left(m - \sum_{i=1}^{Nsources} PSF_{x_i,y_i} \times S_i - \mu\right)^2}{2n^2} + \sum_{pixel} log\left(C(n)\right) + \sum_{i=1}^{Nsources} \eta_i (S_i - \theta_i)^2 / 2\sigma_i^2$$

predicted flux

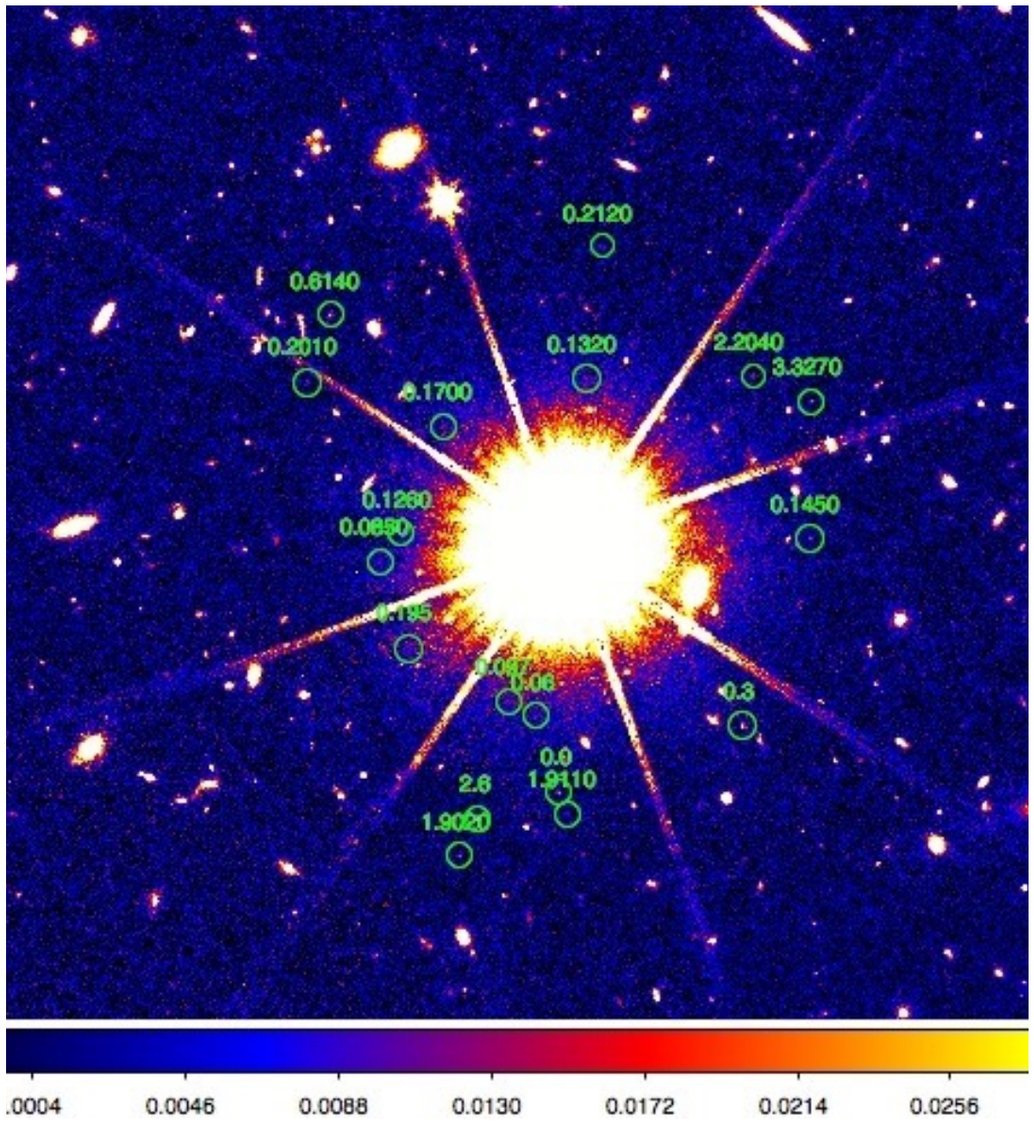
freezing flag (0,1)

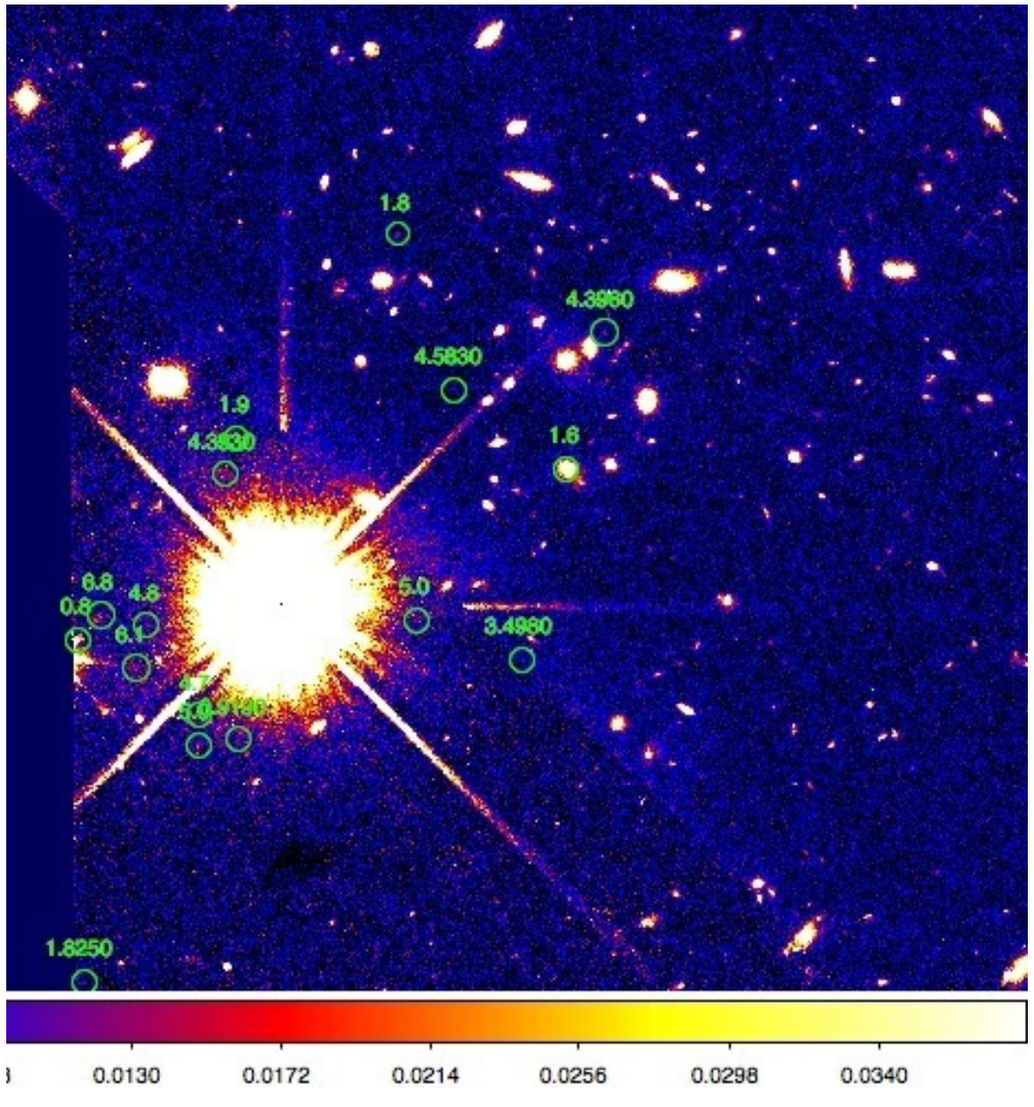
flux unc

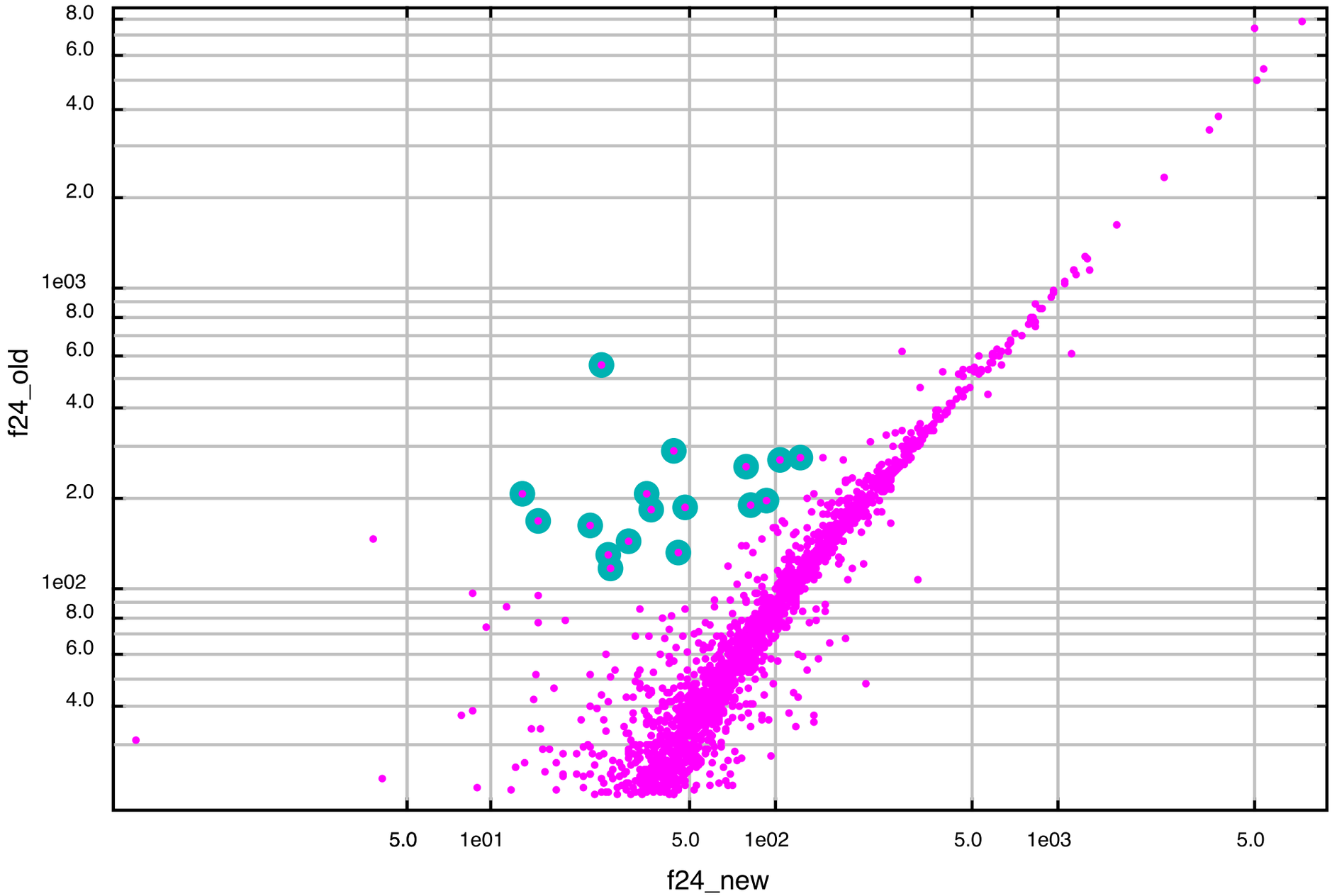
Further improvements:

MIPS 24 um (IRS 16um): fake detections around bright extended sources.

not only for mid-infrared images


0.2120
0.6140
0.2010
0.1320
2.2040
3.3270
0.1700
0.1260
0.0650
0.1450
0.195
0.3
0.0
2.6
1.9020
.0004
0.0046
0.0088
0.0130
0.0172
0.0214
0.0256


1.8
4.3960
4.5830
1.9
1.6
6.8
4.8
0.8
5.0
3.4980
1.8250
0.0130
0.0172
0.0214
0.0256
0.0298
0.0340

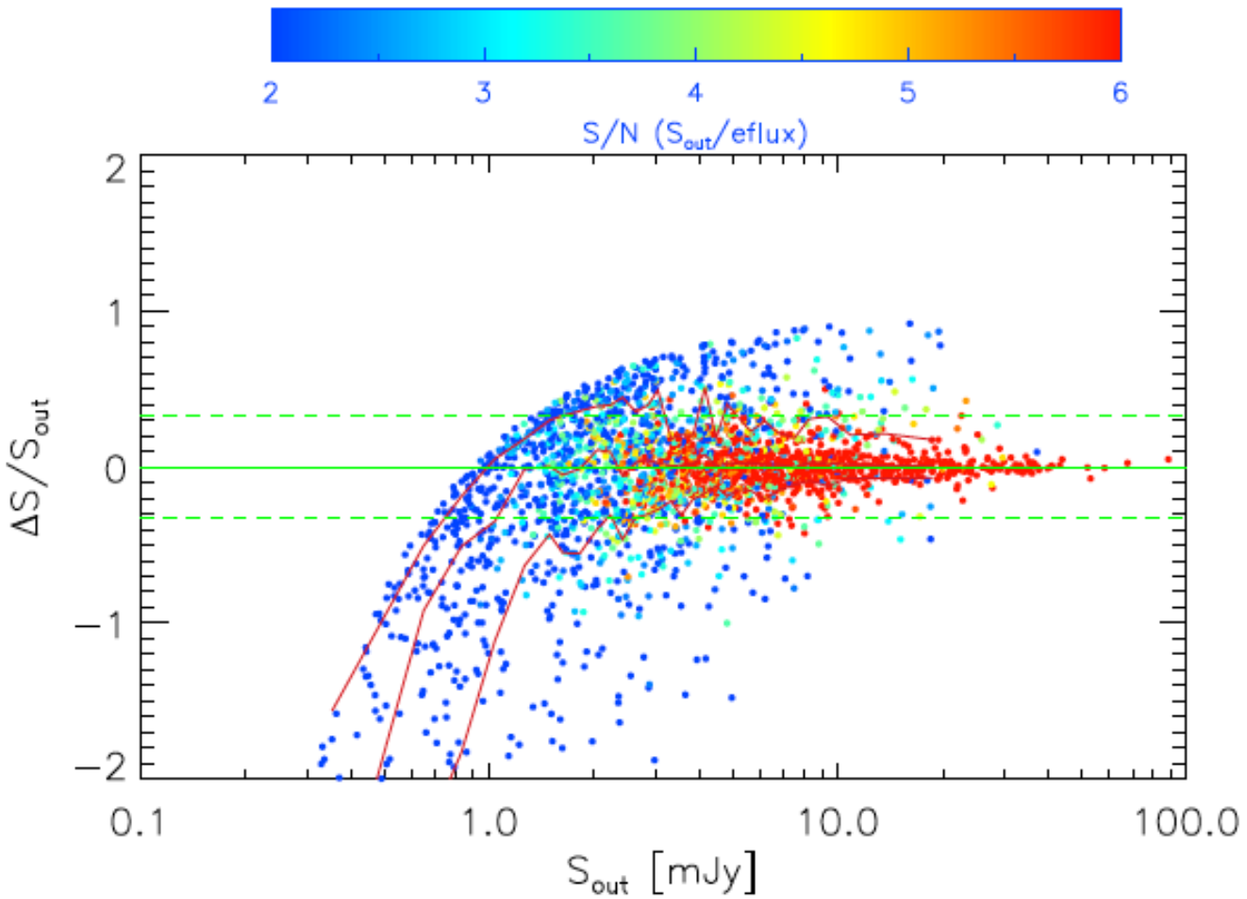

8.0
6.0
4.0
2.0
1e03
8.0
6.0
4.0
2.0
1e02
8.0
6.0
4.0
f24_old
5.0
1e01
5.0
1e02
5.0
1e03
5.0
f24_new

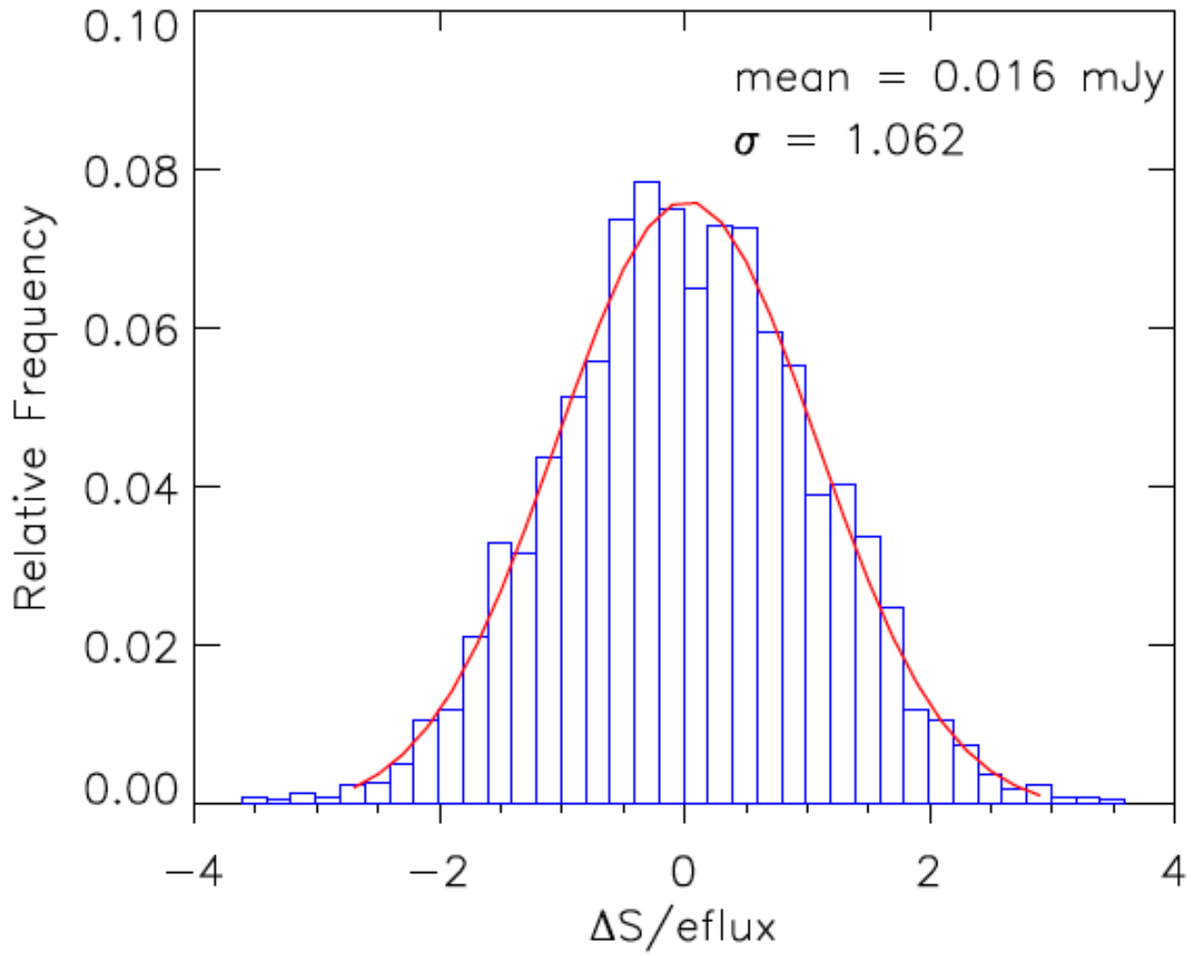
Status:

GOODS:24um + 1.4 GHz + SCUBA + main-sequence

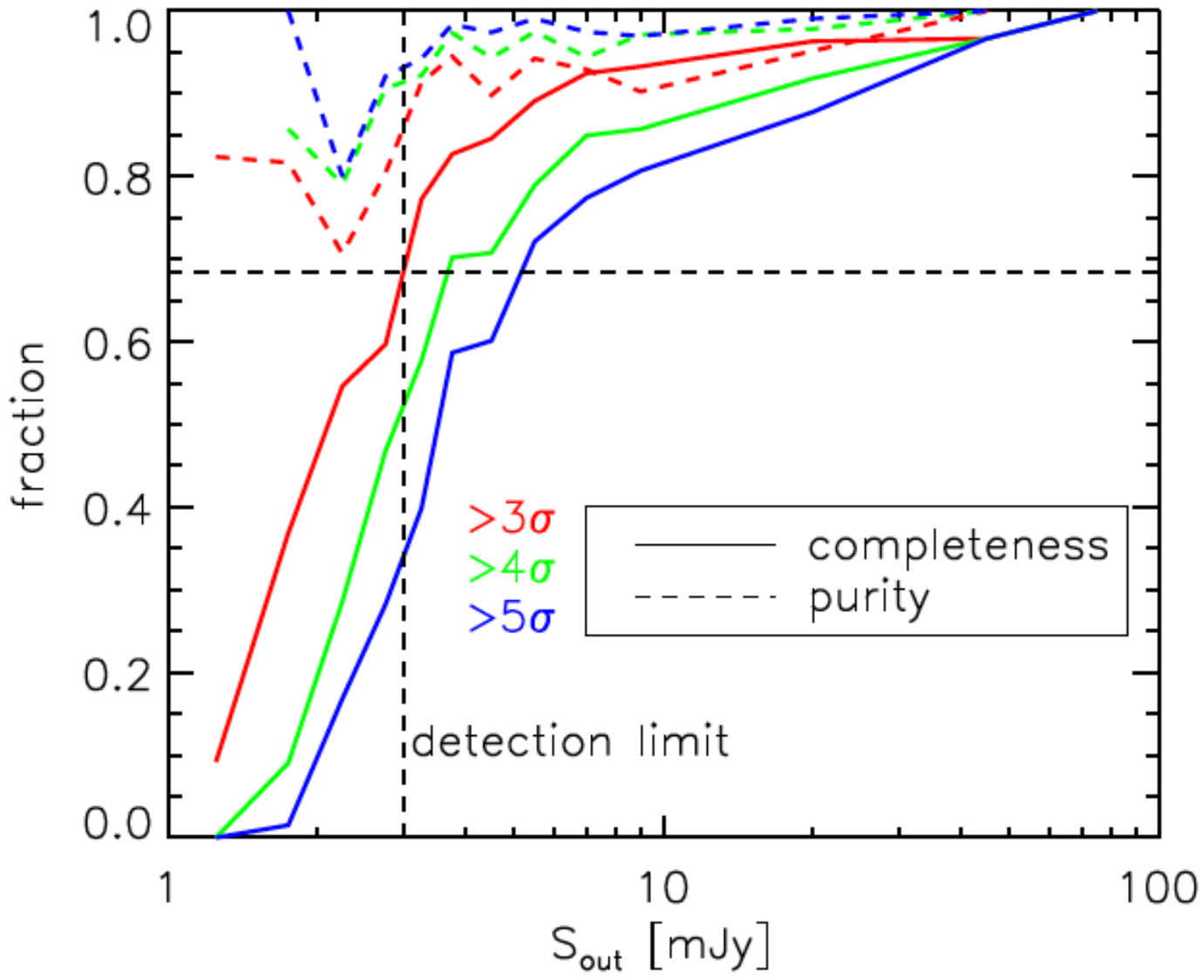
COSMOS/UDS/EGS:

measure flux uncertainties with covariance matrix

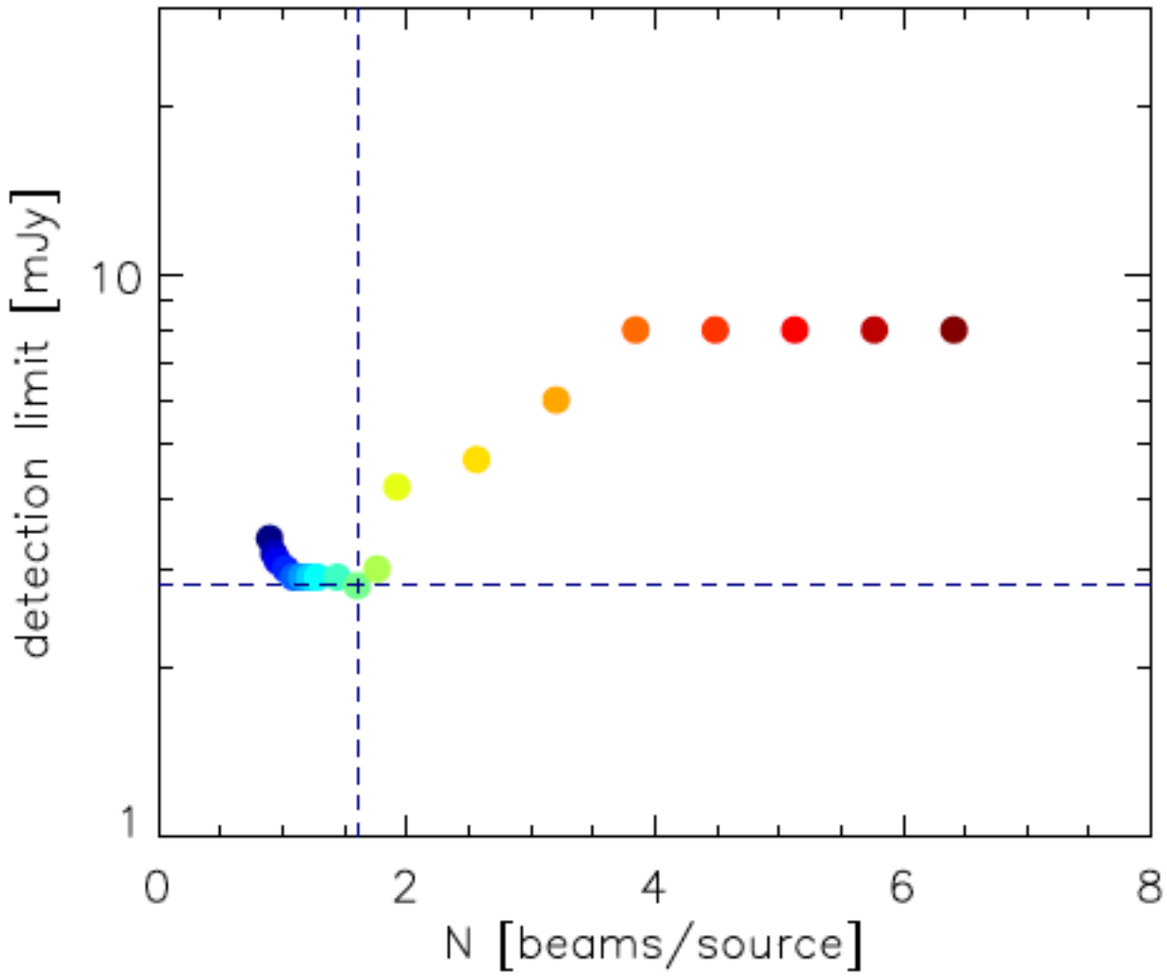


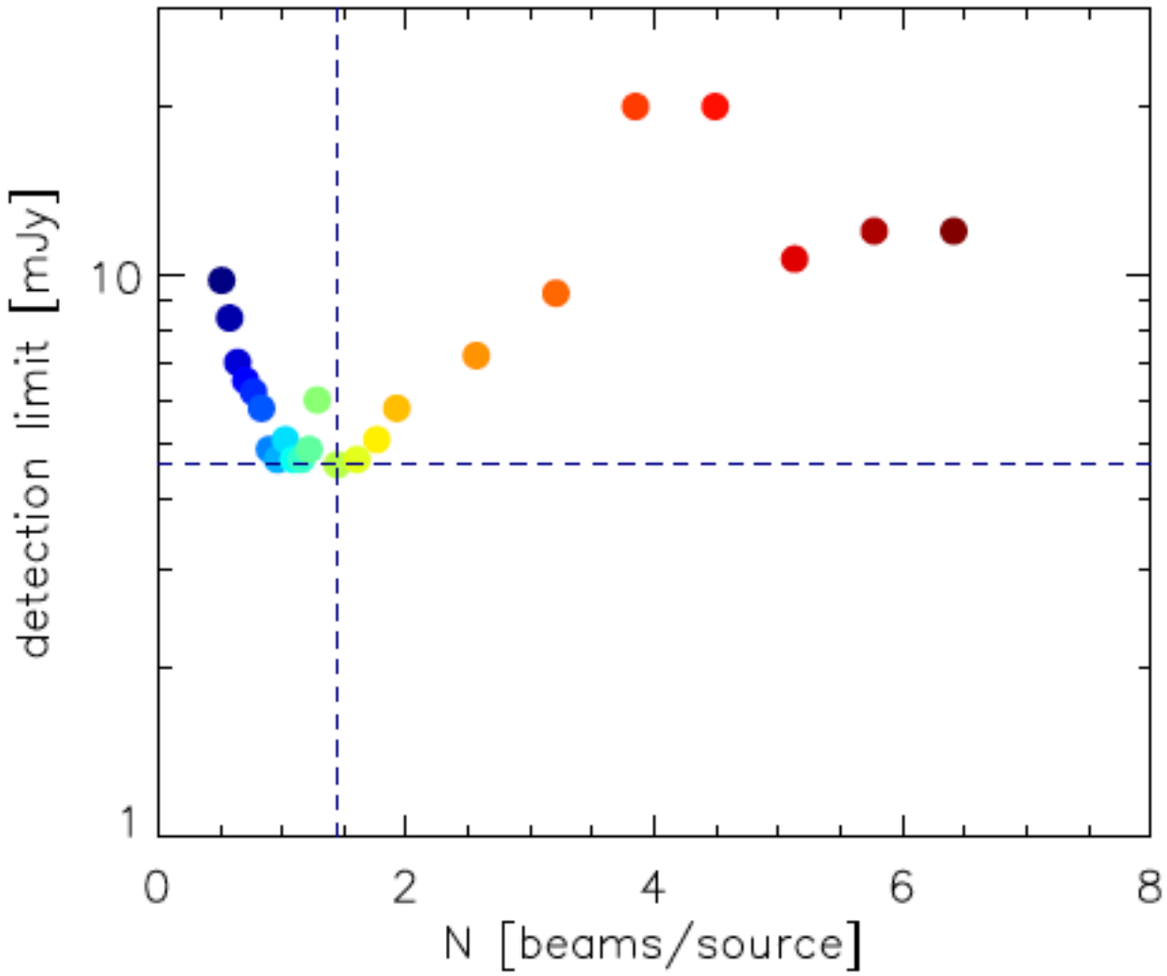


The optimum number of priors

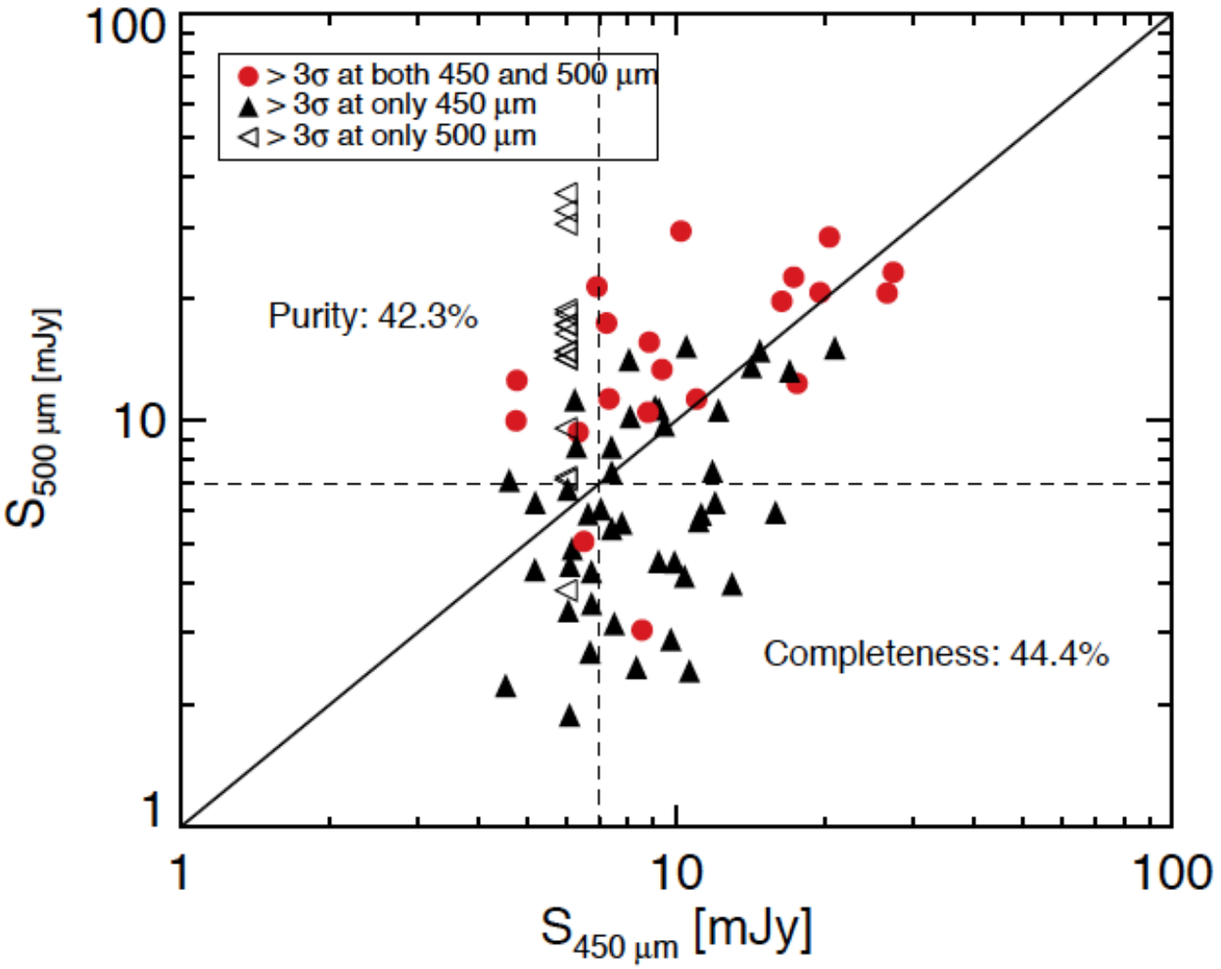


The optimum number of priors

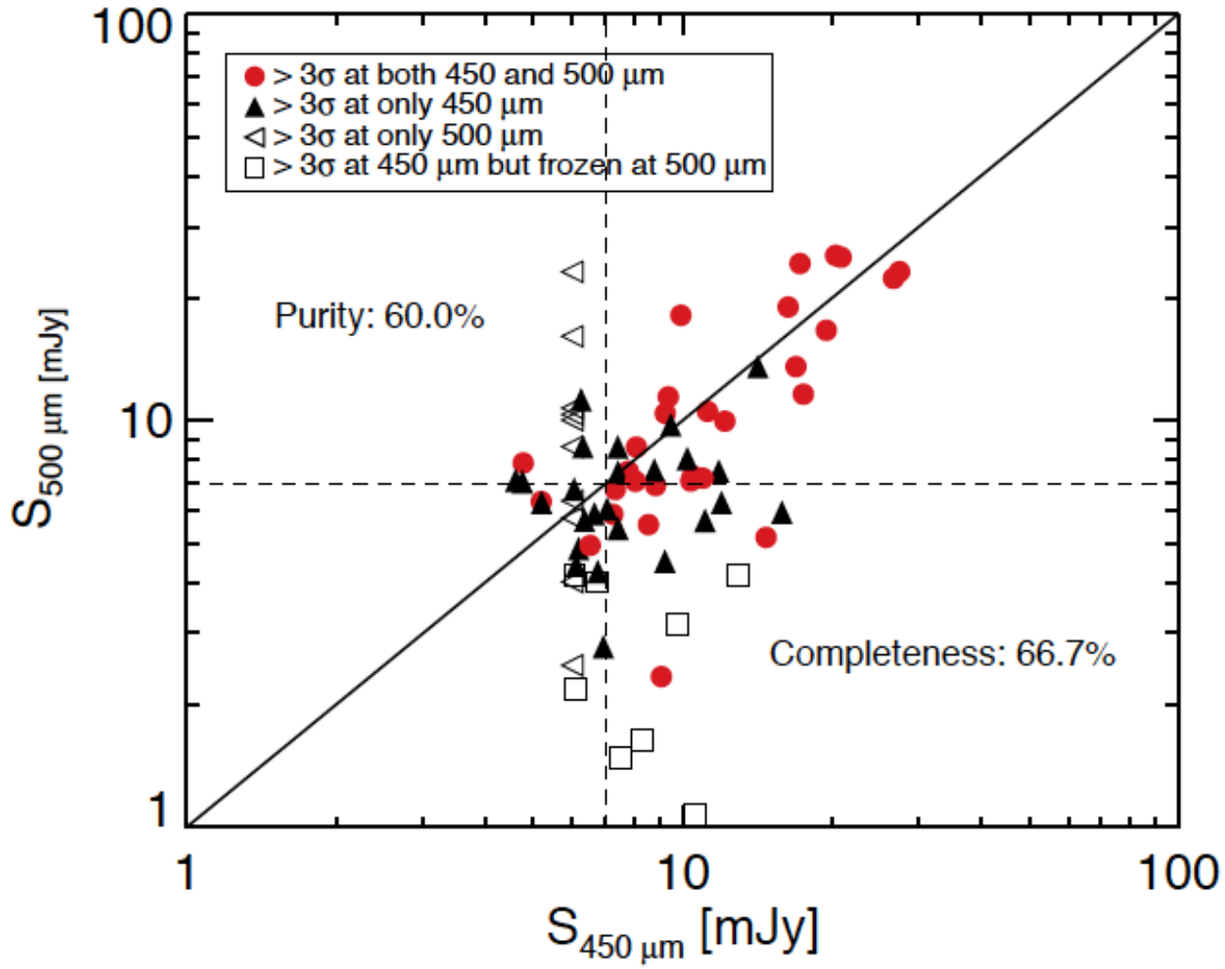




Tests in real SPIRE images, and comparison with SCUBA 2 images (450 um)

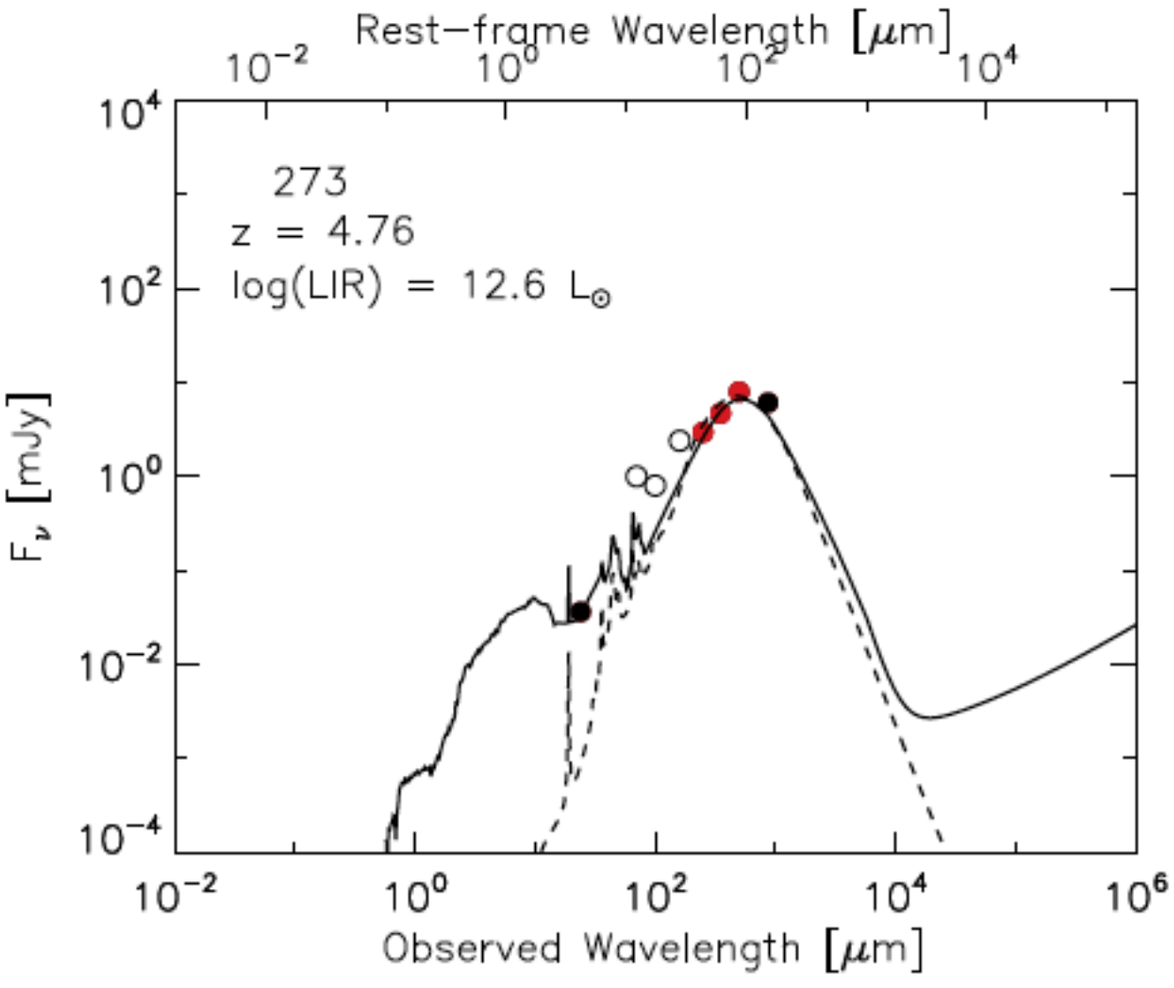


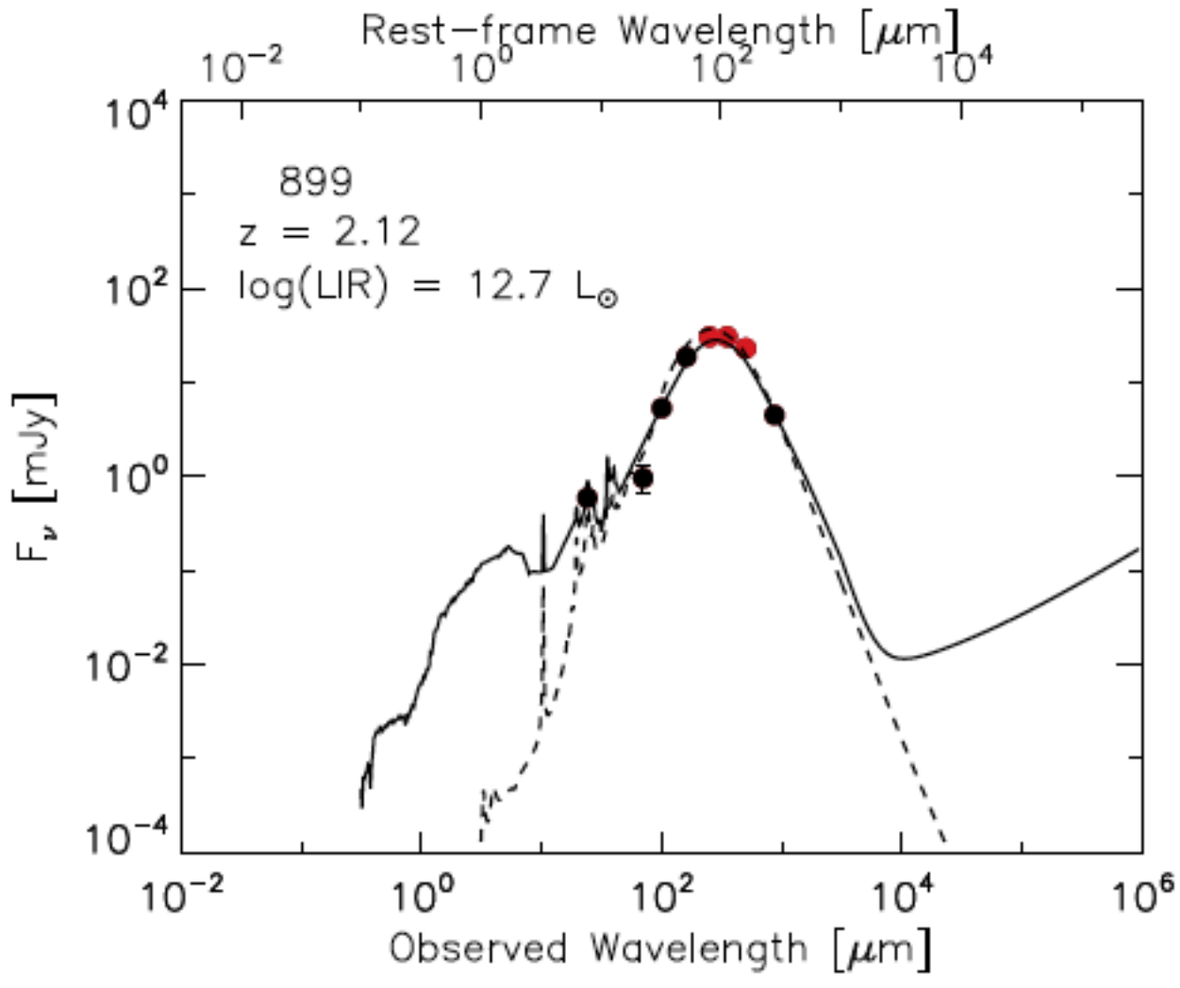
before freezing fainter sources



after freezing fainter sources

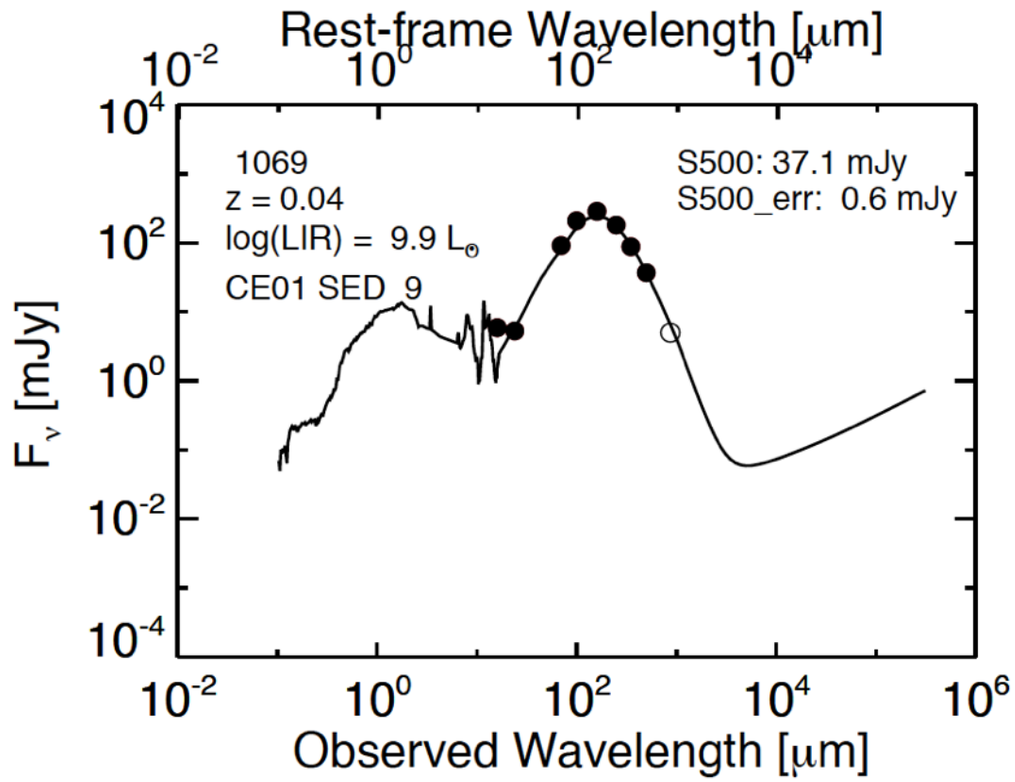
Example SEDs of sources with detections in all the three SPIRE bands

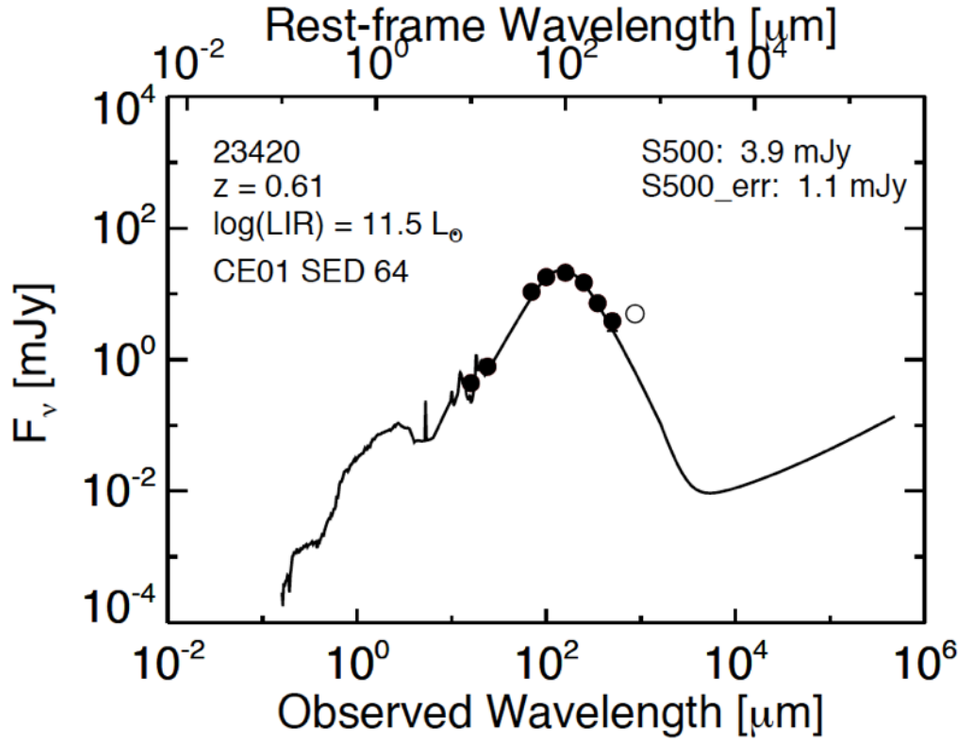


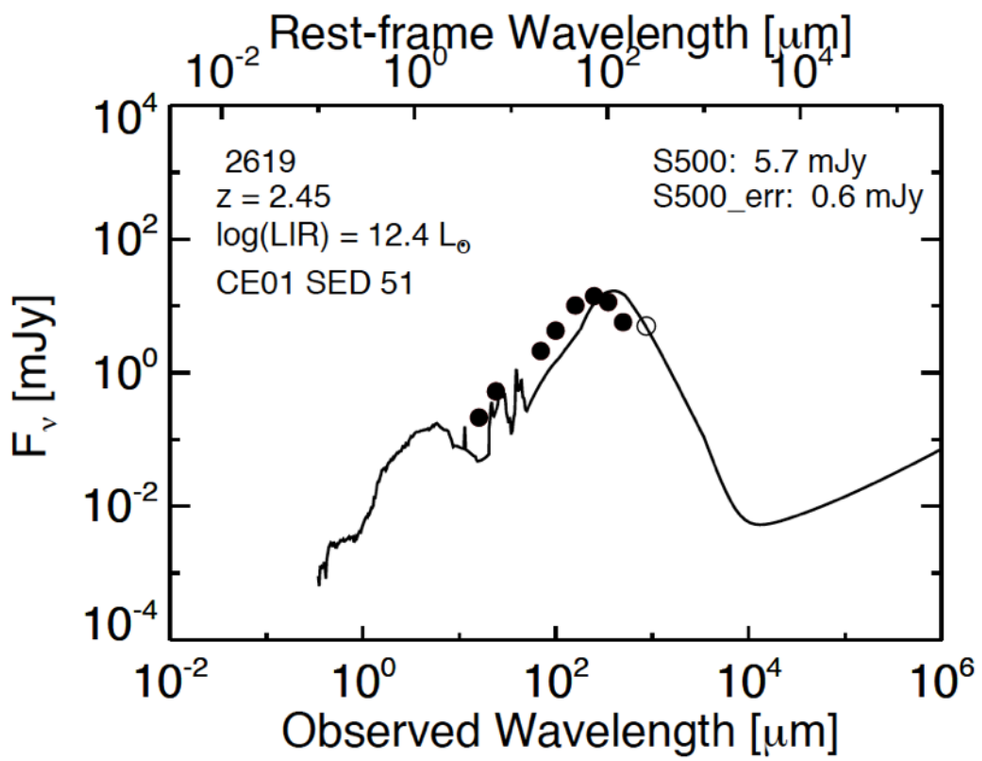


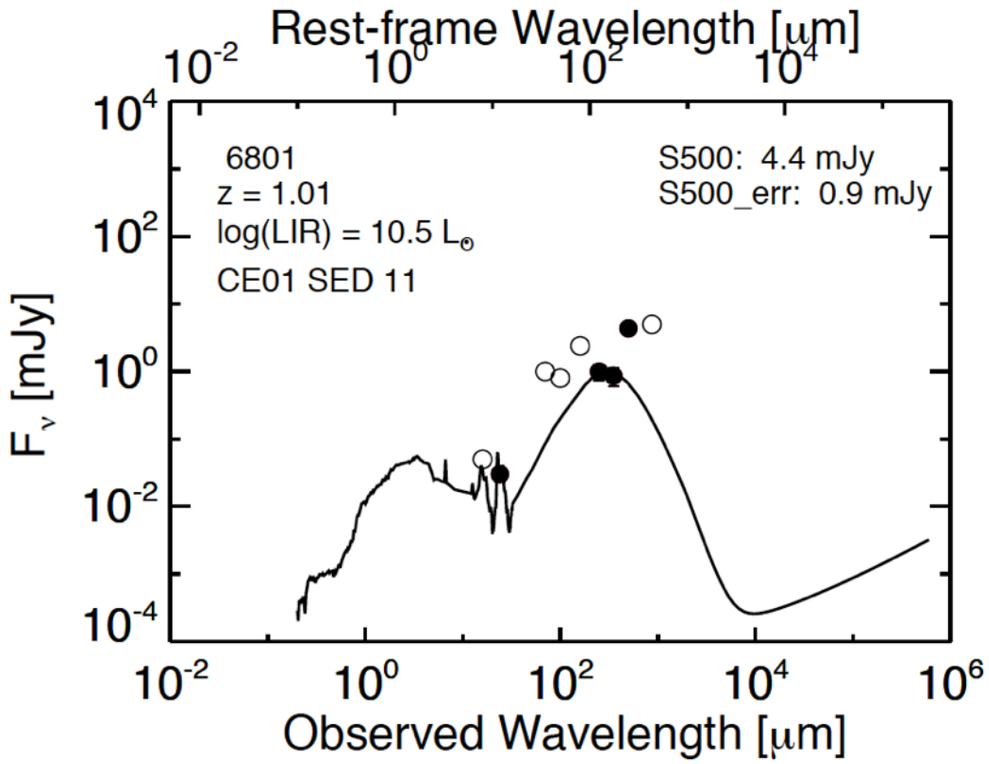
We detect **138** sources with S/N > 3, compared to ~10 in previous released catalogs, in all the three SPIRE bands in GOODS-South

Example SEDs of non-870 um sources

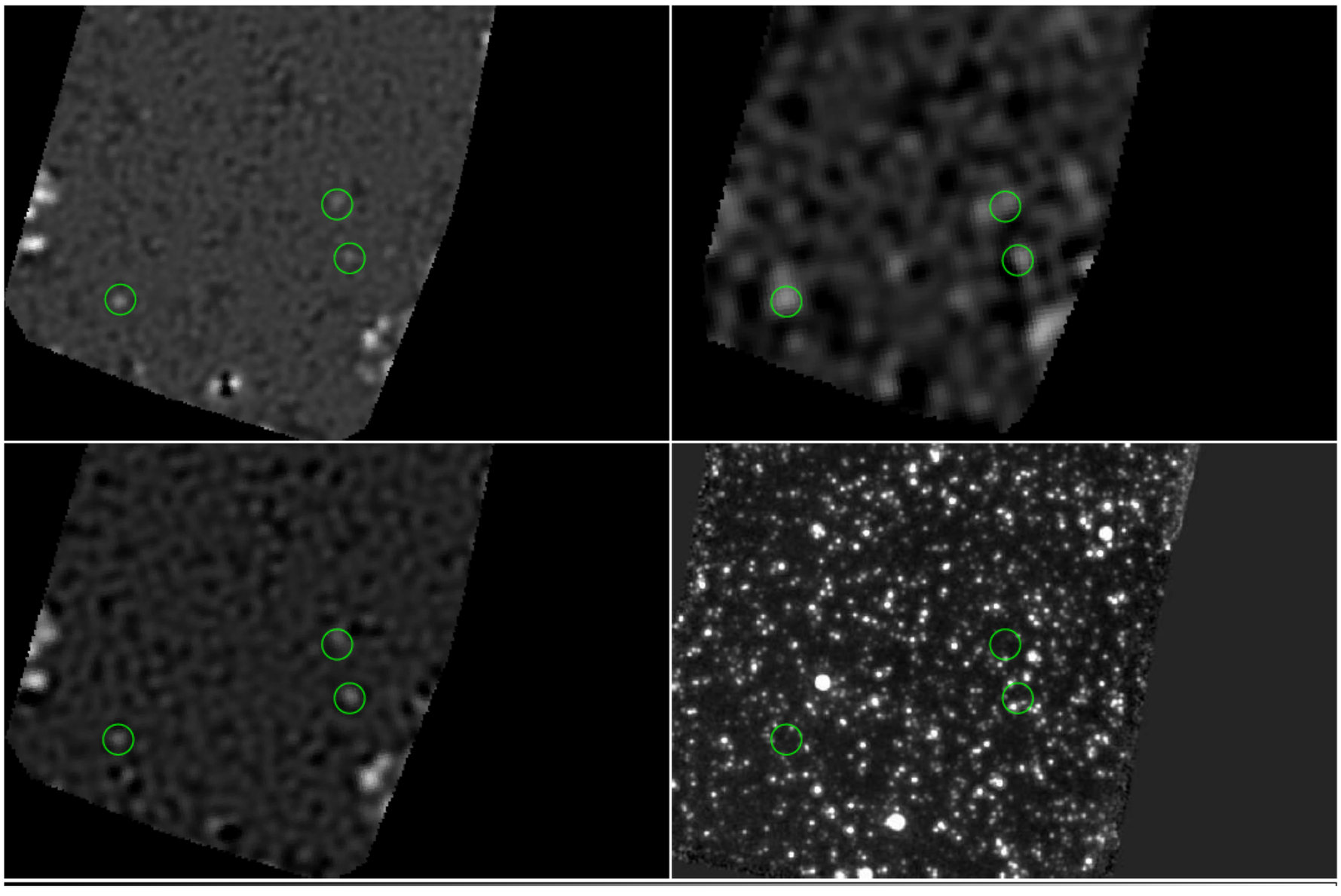








Identify sources that are missed in the prior list



Run STARFINDER on residual images and identify sources that are missed in the prior list (mostly z>~3 sources)