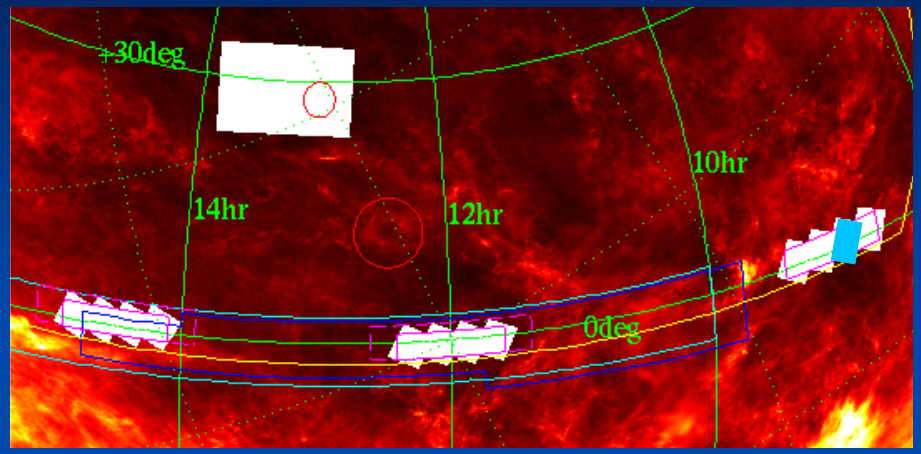
erschel ATLAS :
Source Counts and Clustering

- maps and source detection
- source counts
- clustering

Steve Maddox
and
H-ATLAS consortium

SD observations

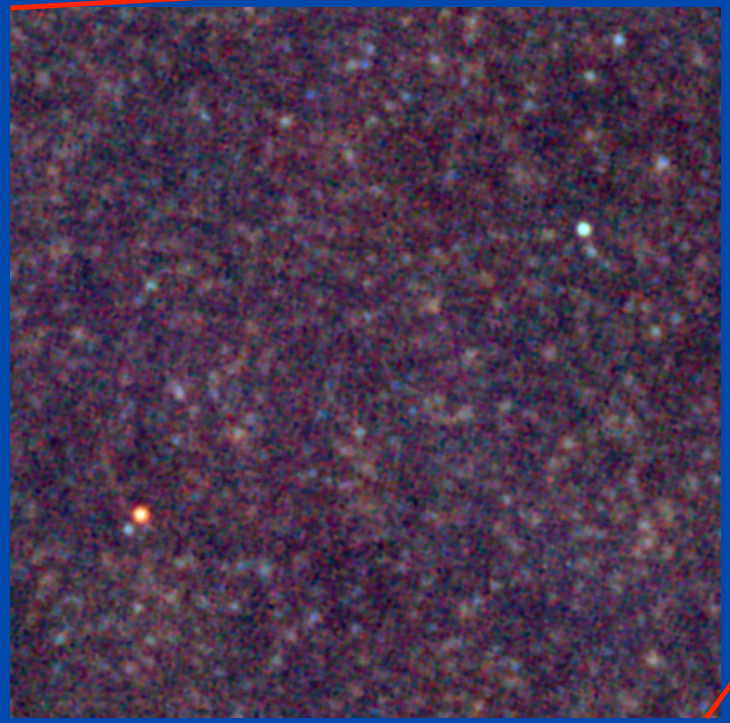
- A 4x4 degree field centred on 9hrs 0deg
- Observed in fast-scan parallel mode
- Single nominal and orthogonal scans

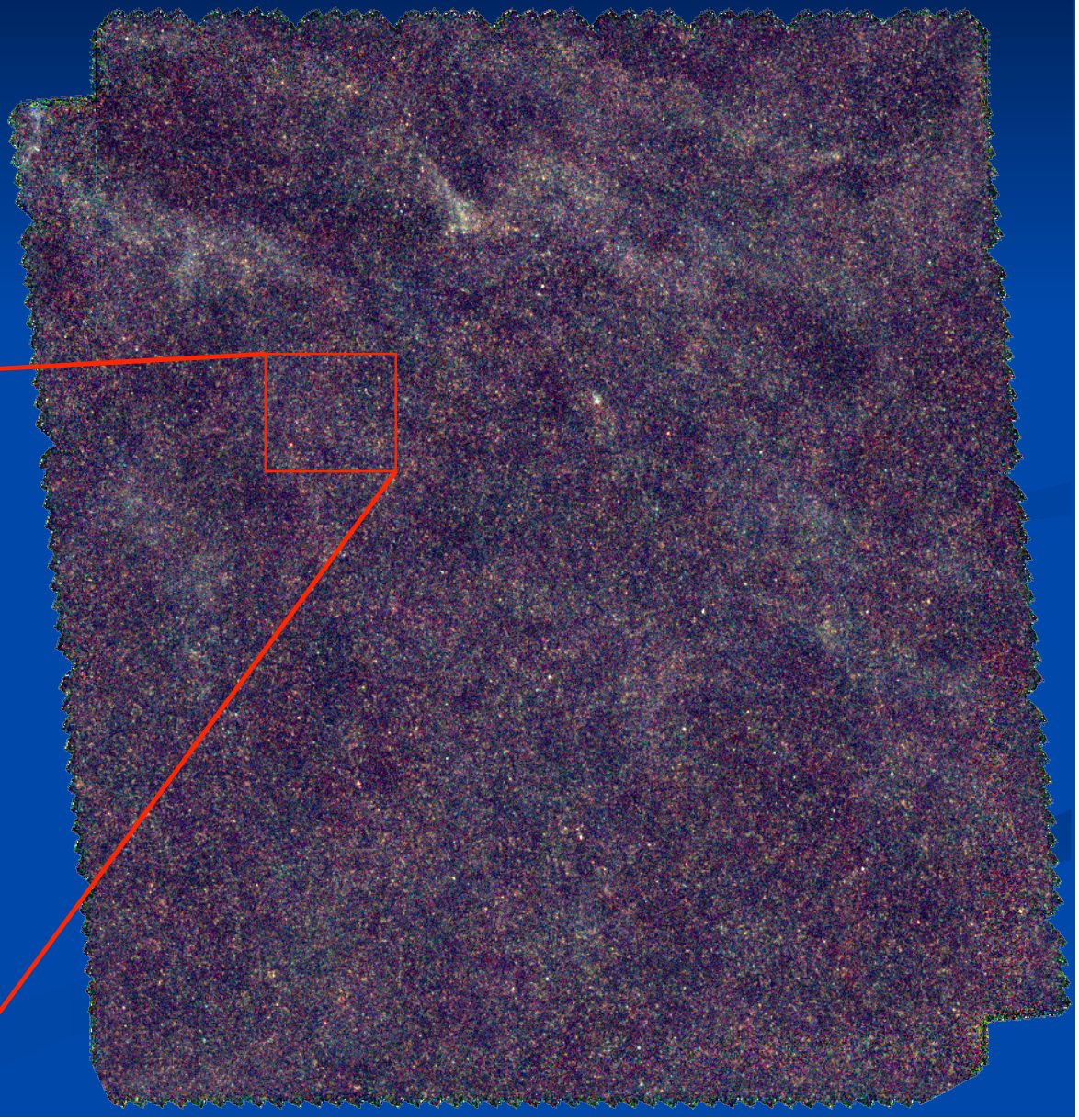


- SPIRE maps
  - temperature drifts corrected in time-line data
  - naïve map-maker – essentially no filtering
- PACS maps difficulties with
  - pcal flashes
  - deglitching
  - large maps - memory issues for MADMAP

SPIRE Maps

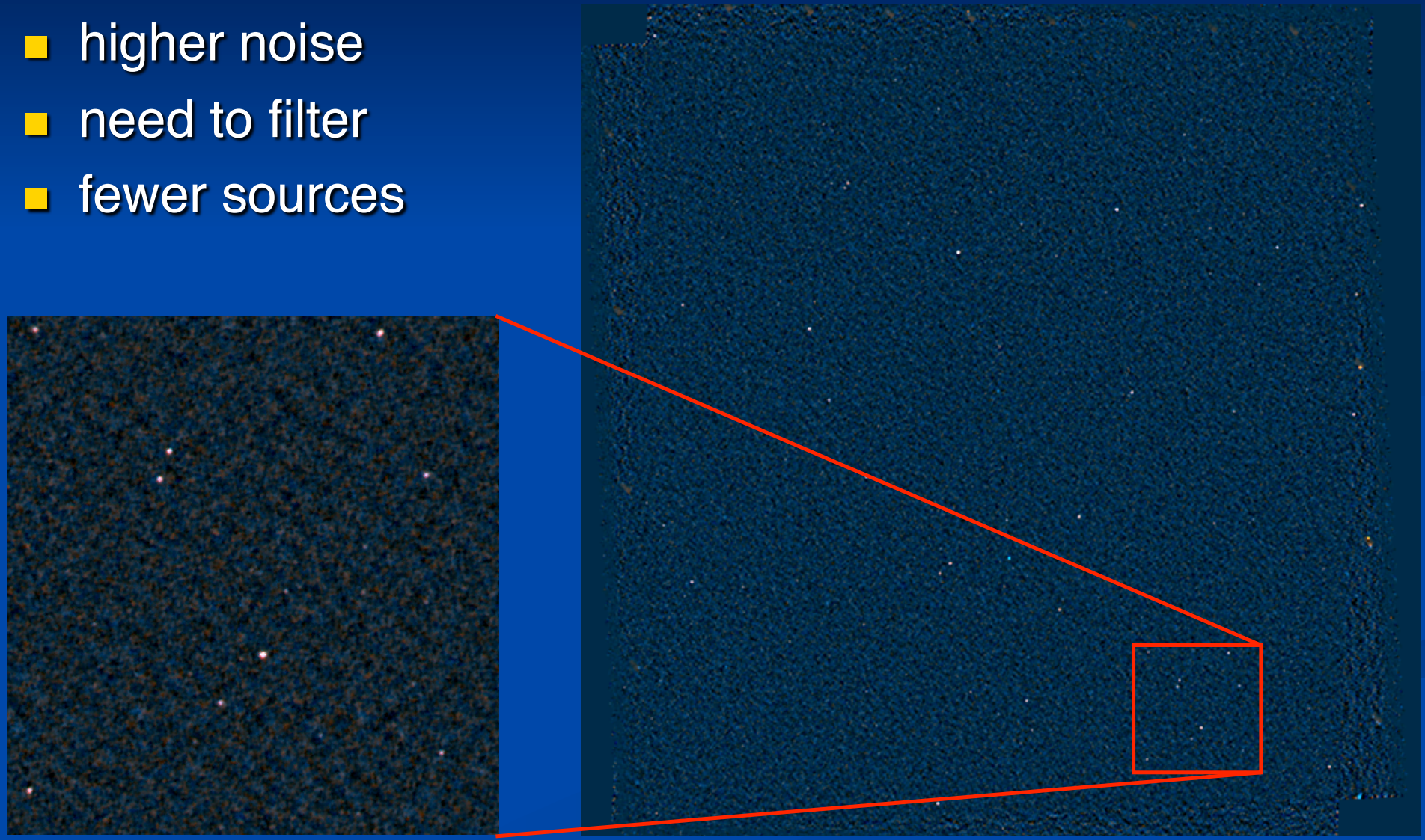
- no filtering
- cirrus background
- almost confused





PACS Maps

- higher noise
- need to filter
- fewer sources



Source Detection Methods

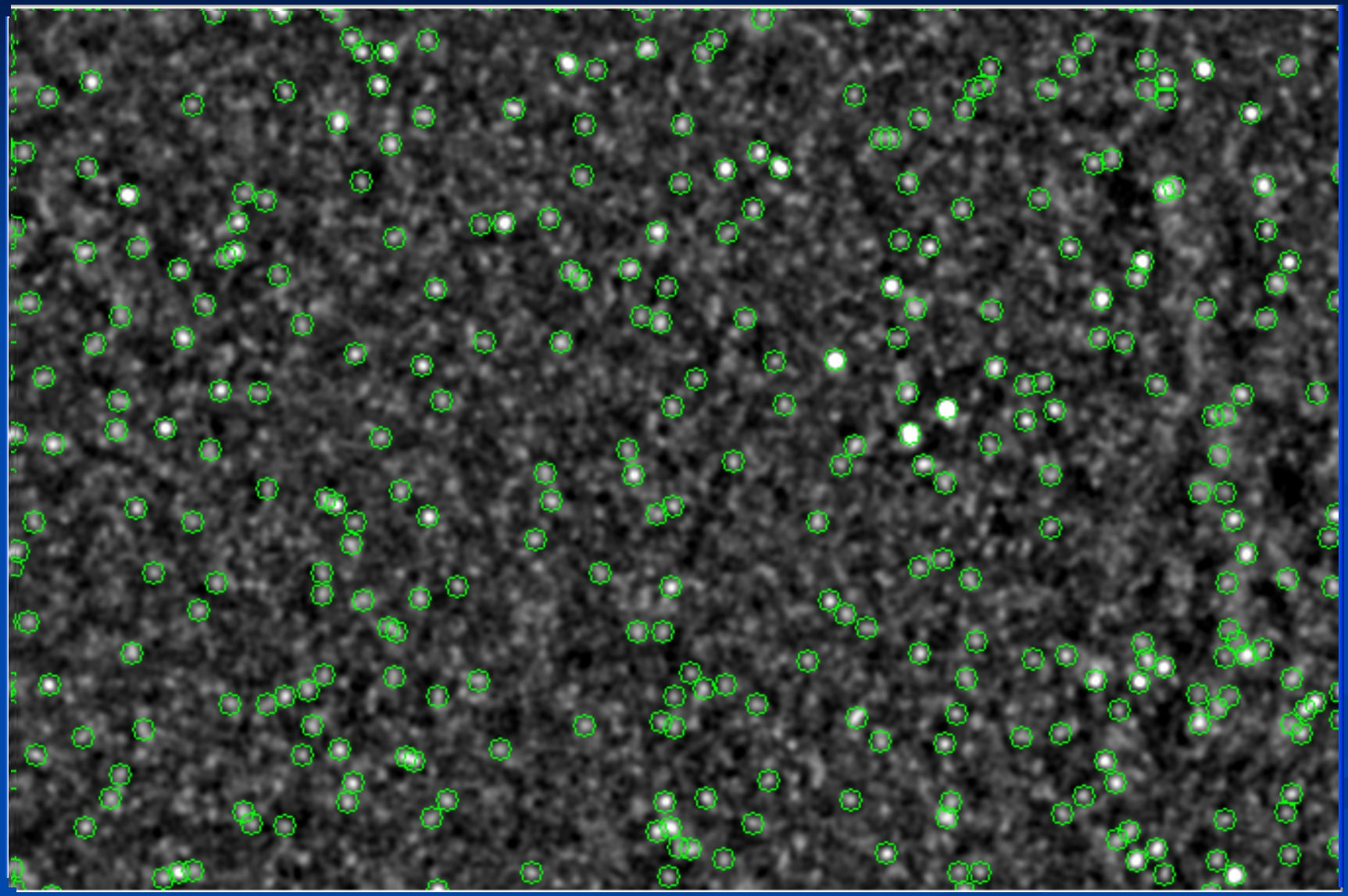
- Plan to do extensive testing of a variety of methods:
  - Sextractor
  - DAOPHOT
  - SUSSEXtractor
  - MADX
  - Mexican hat wavelet
  - Multi-wavelength Matrix filter
- For SD data used MADX and Sextractor

Source detection

(see poster by Rigby)

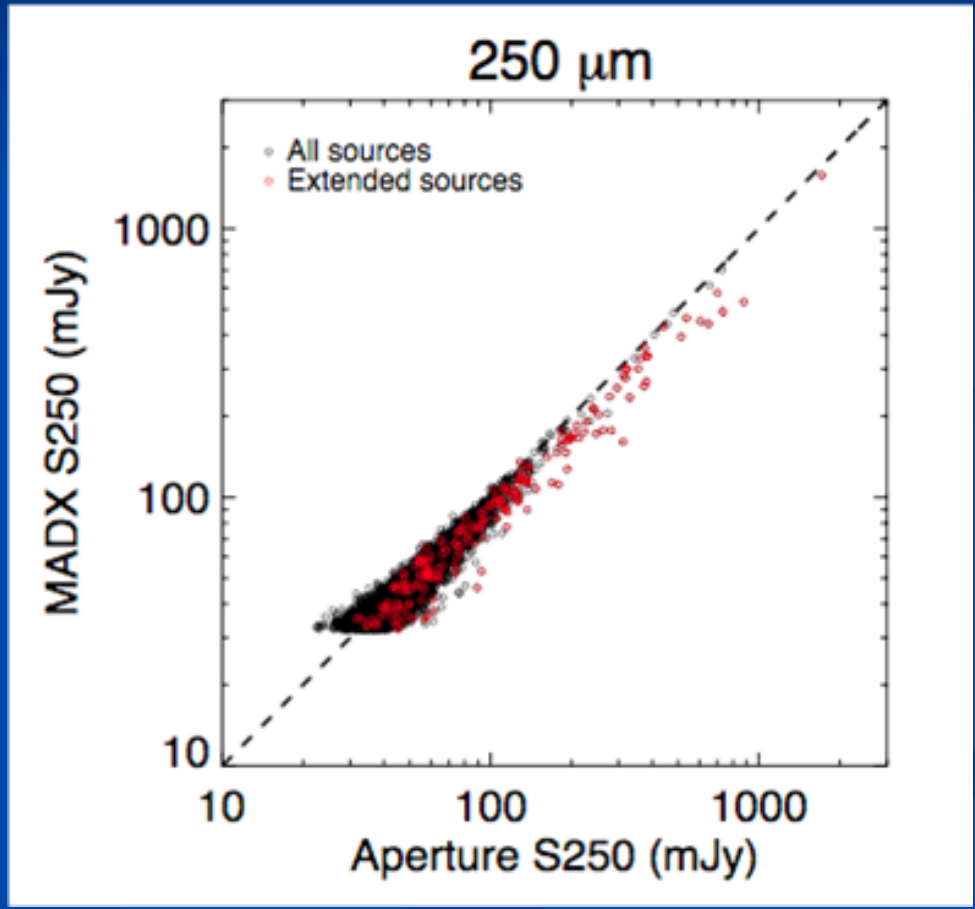
- MADX used for 250, 350 and 500
  - Multiband Algorithm for Detection and eXtraction
  - Developed for H-ATLAS at Nottingham
  - Detects sources with matched filter in multiple bands
  - Point source fluxes recovered from individual bands
- Sextractor used for 110 and 160

Source detection - SPIRE



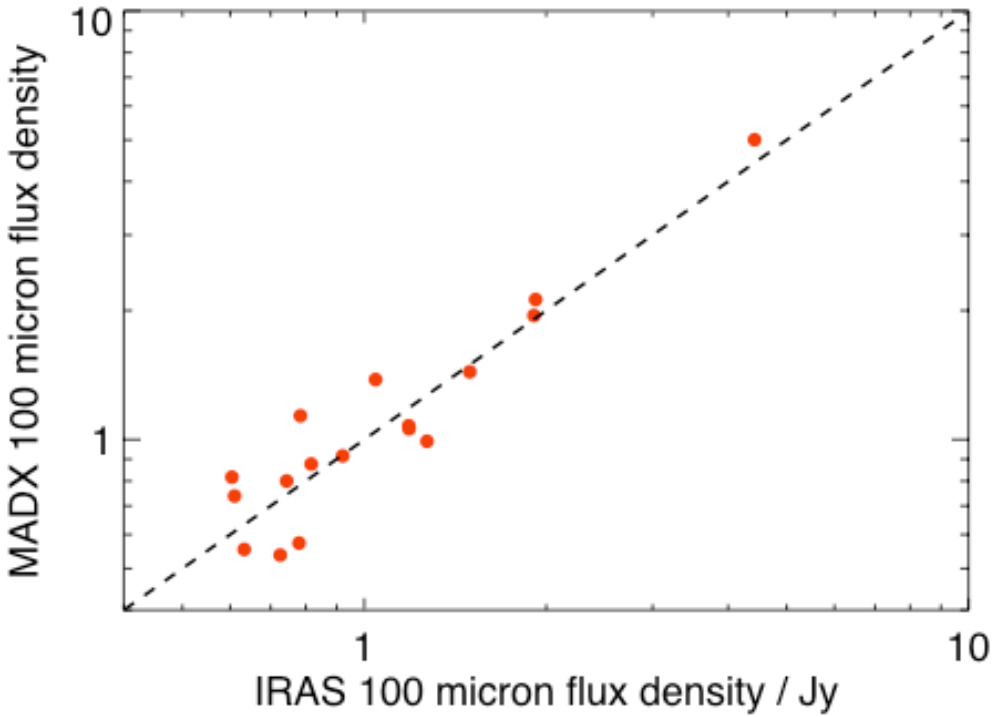
Source detection - SPIRE

- Total 5-sigma limits including confusion noise 33, 36 and 45mJy
- 6878 sources are detected at more than 5 sigma in any of the 3 SPIRE bands
- Extended sources identified from optical counterparts, and fluxes replaced by aperture measurements
  - 200 sources extended at 250
  - 83 sources extended at 350.



Source detection - PACS

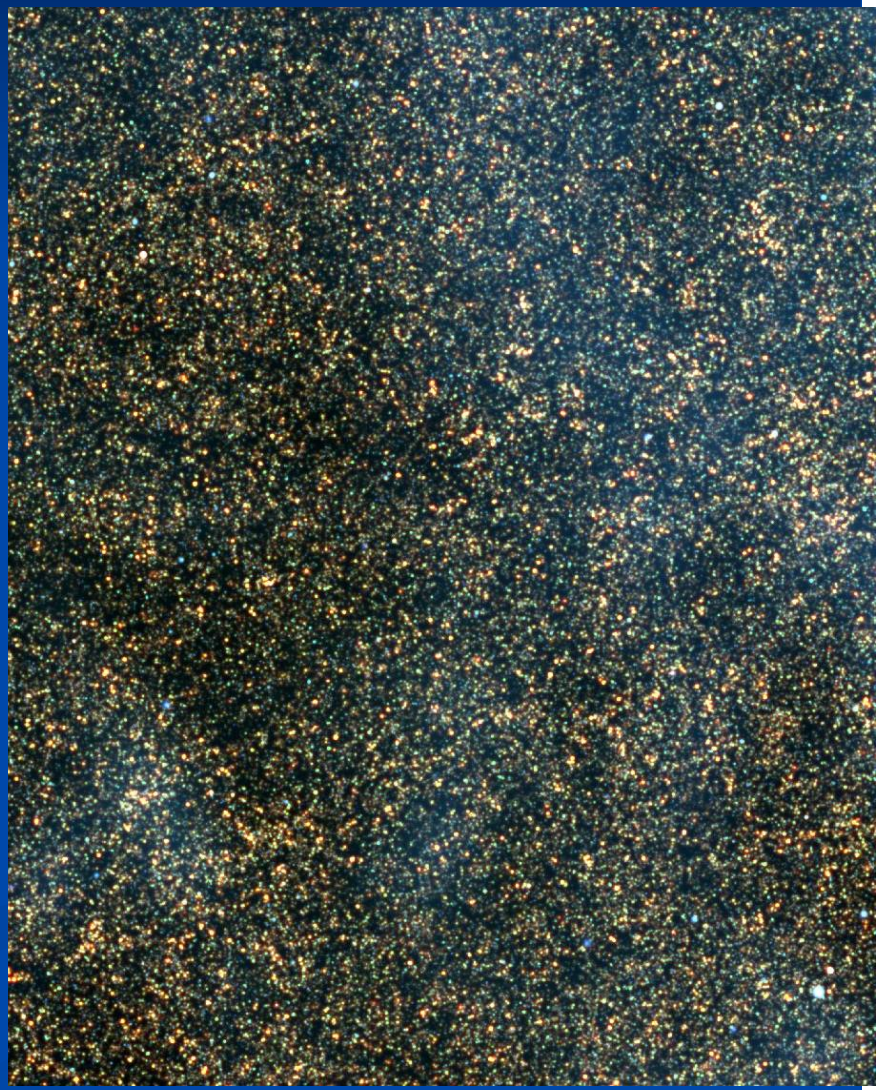
- 3-σ detections
- fluxes measured using aperture photometry
- matched to SPIRE catalogue
- 5-σ limits 132 and 126 mJy
  - 337 sources at 110
  - 525 sources at 160



- Comparison to IRAS fluxes at 100 micron shows good agreement

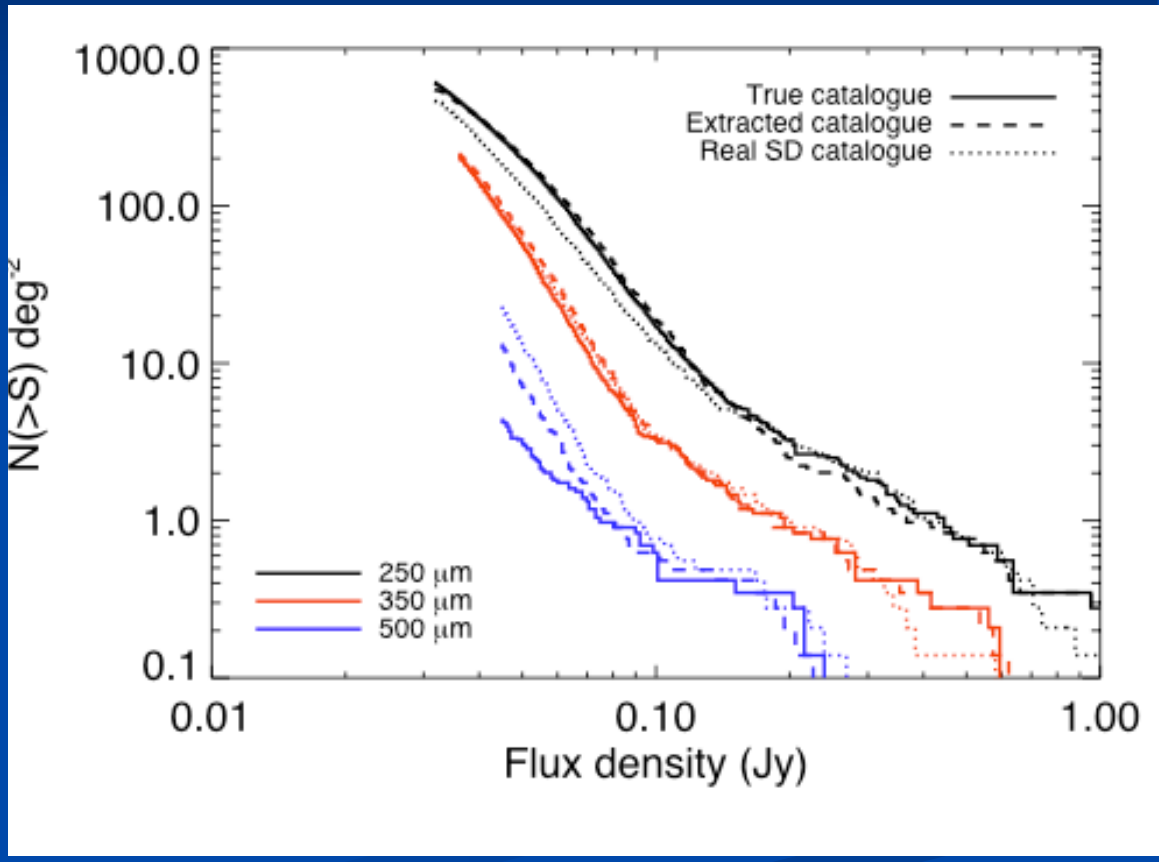
Simulations

- 250,350 and 500 micron fluxes chosen from Negrello model, scaled to match observed counts
- exponential galaxy profiles with 3kpc scale length
- non-uniform background from SFD IRAS maps
- filter with instrumental PSF for each band
- use pixel scale appropriate for each band
- Gaussian noise with amplitude from real coverage maps



Simulations - 2

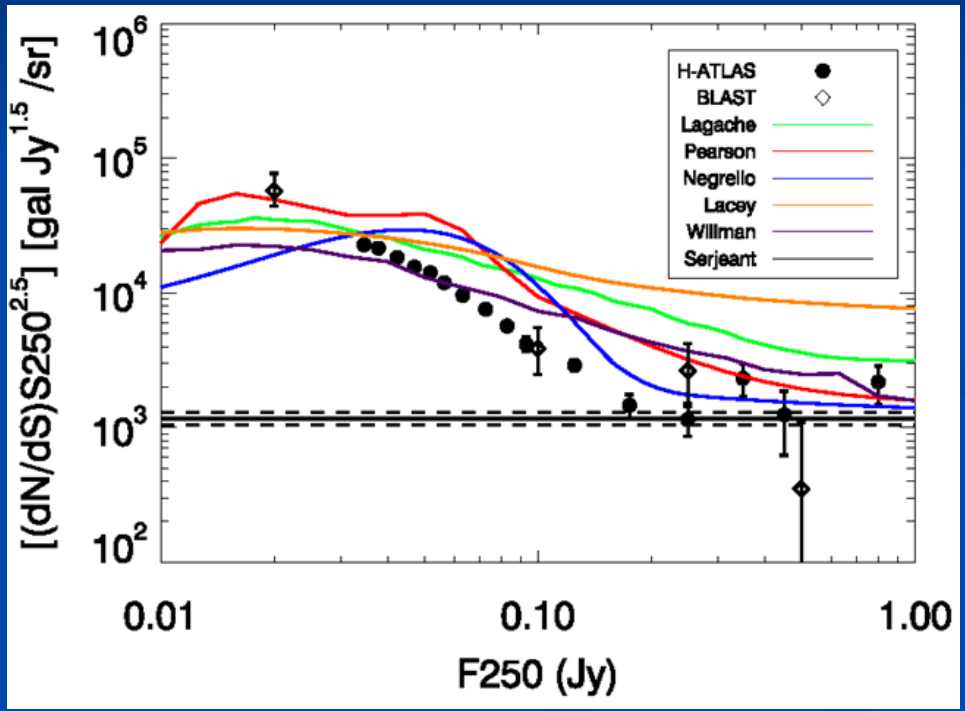
- Use simulations to test reliability, completeness, and noise of source detection
- Recovered counts match the input counts with small corrections



Source counts

(see Clements et al poster, and A&A paper)

- Differential counts corrected for completeness and flux boosting by comparing to simulations
- very steep below 100mJy
- consistent with BLAST P (d) analysis
- no model matches well



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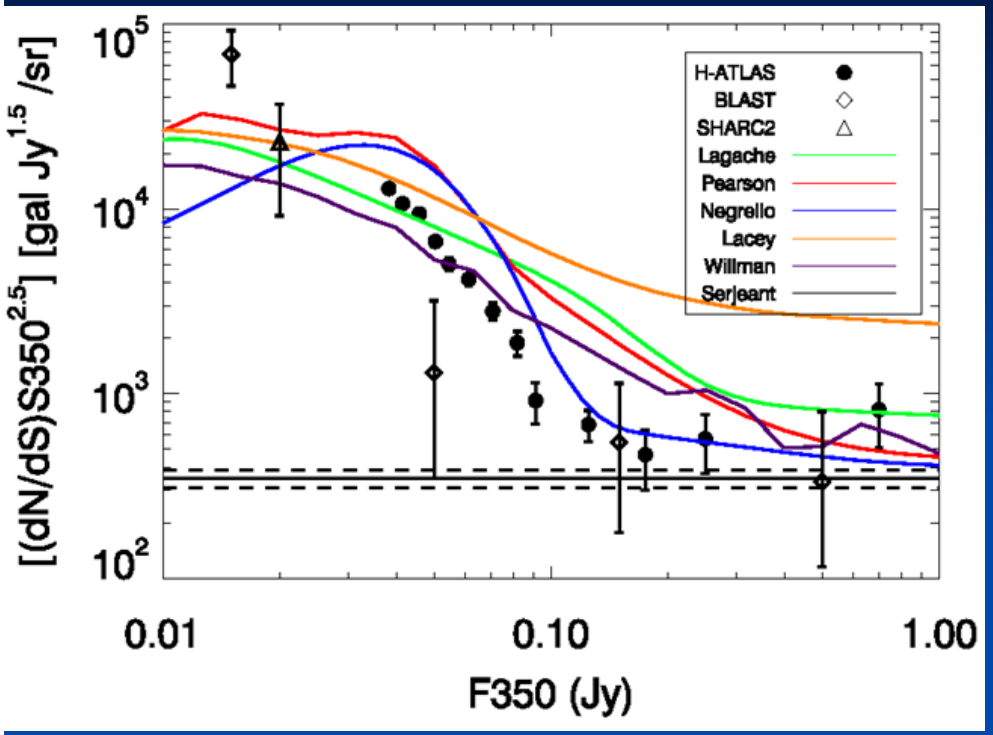
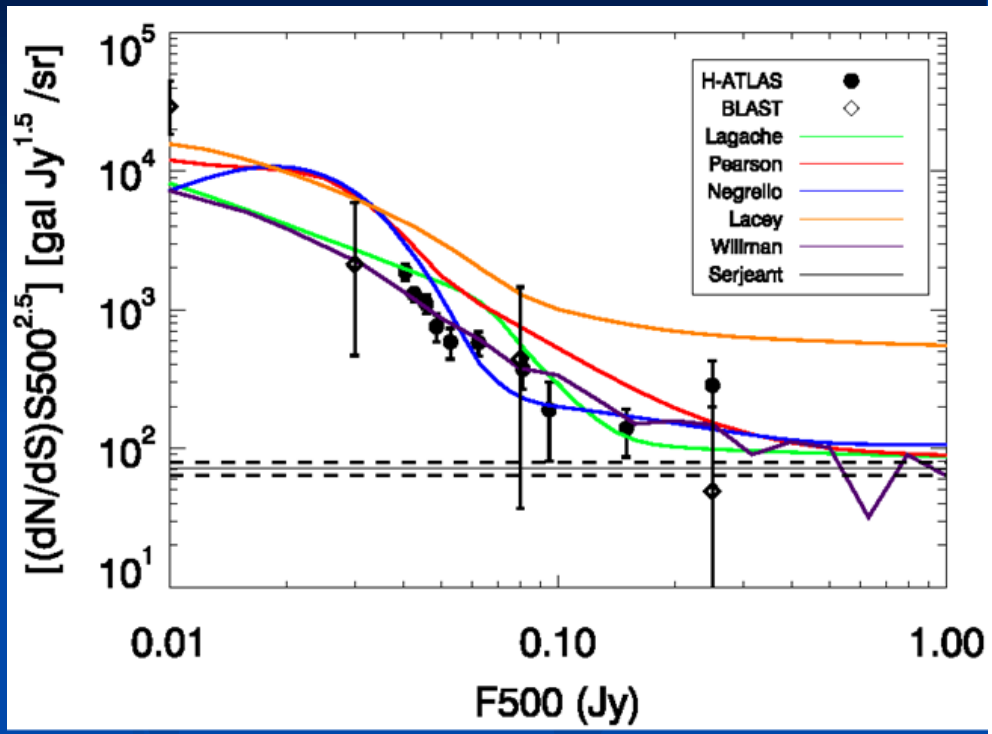
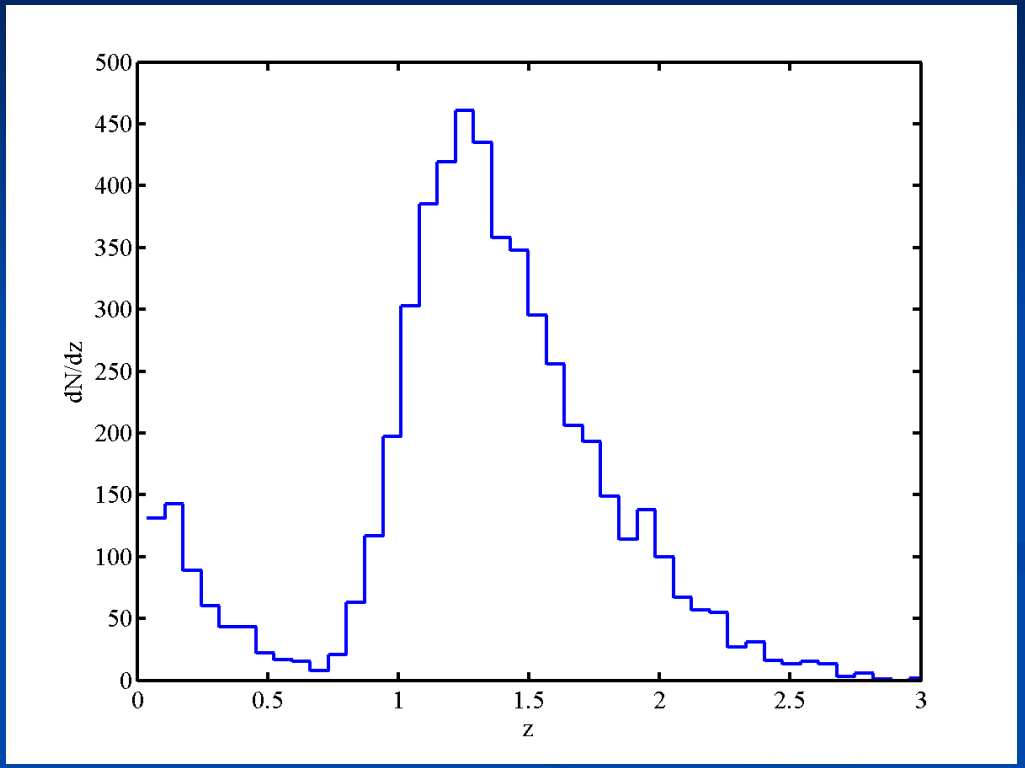




- Negrello model matches the steep slope, but is too high at 350 and 250

Source Counts

- Steep counts are dominated by a population of high z protospheroids
- possible solutions
  - move protospheroids to higher redshifts
  - change the SEDs



- Photometric redshifts from the SPIRE colours suggest that the high z population is at z~2 (see Amblard et al A&A paper)

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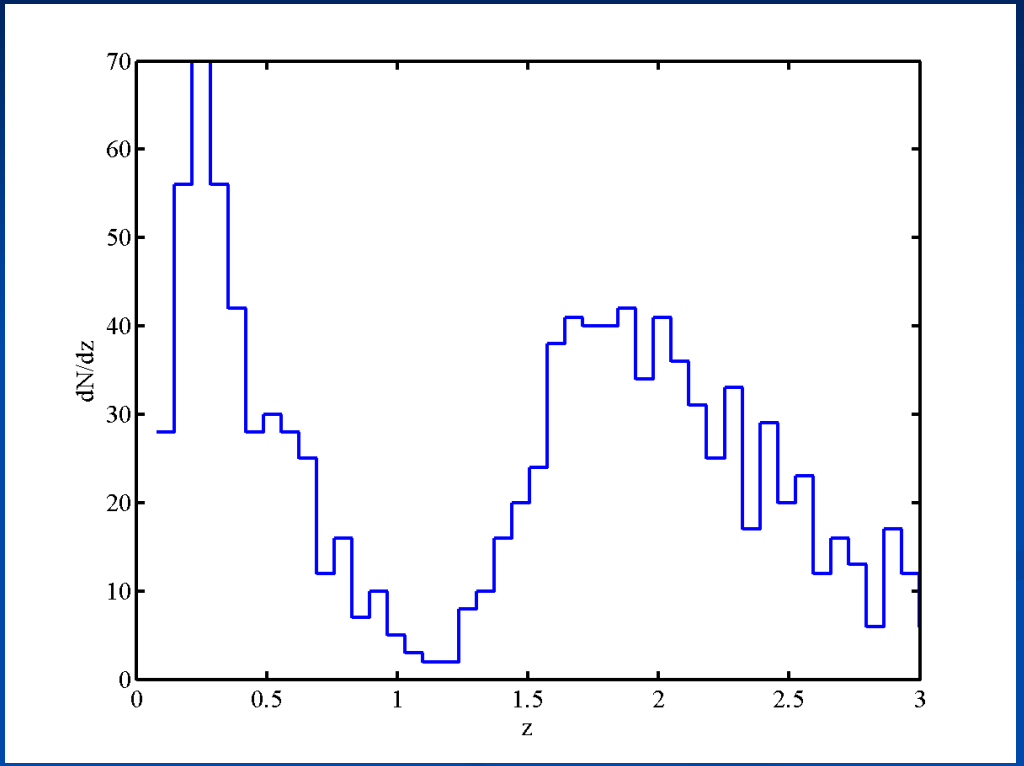

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Clustering

(Maddox et al A&A paper)

- Measure w(θ) using Landy & Szalay estimator
- Cirrus is a potential problem
  - tests on simulations with clustered positions
  - recover correct amplitude with background subtraction as implemented
  - mask out worst cirrus regions
- 4 subsamples
  - S_{250}>33mJy
  - S_{350}>36mJy & 3σ
  - S_{500}>45mJy
  - S_{350}>36mJy and S_{500}/S_{250}>0.75

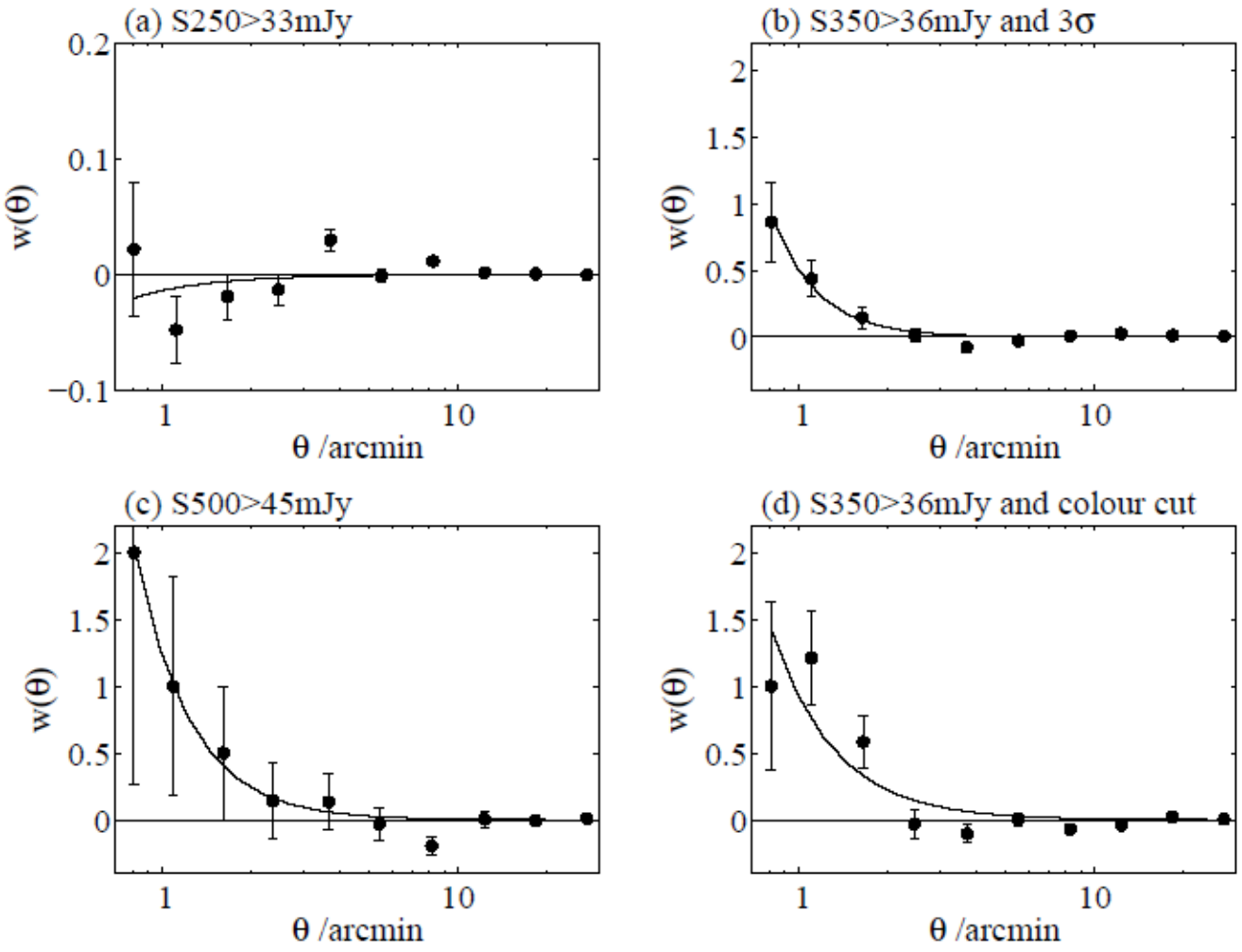
Clustering

250

350

500

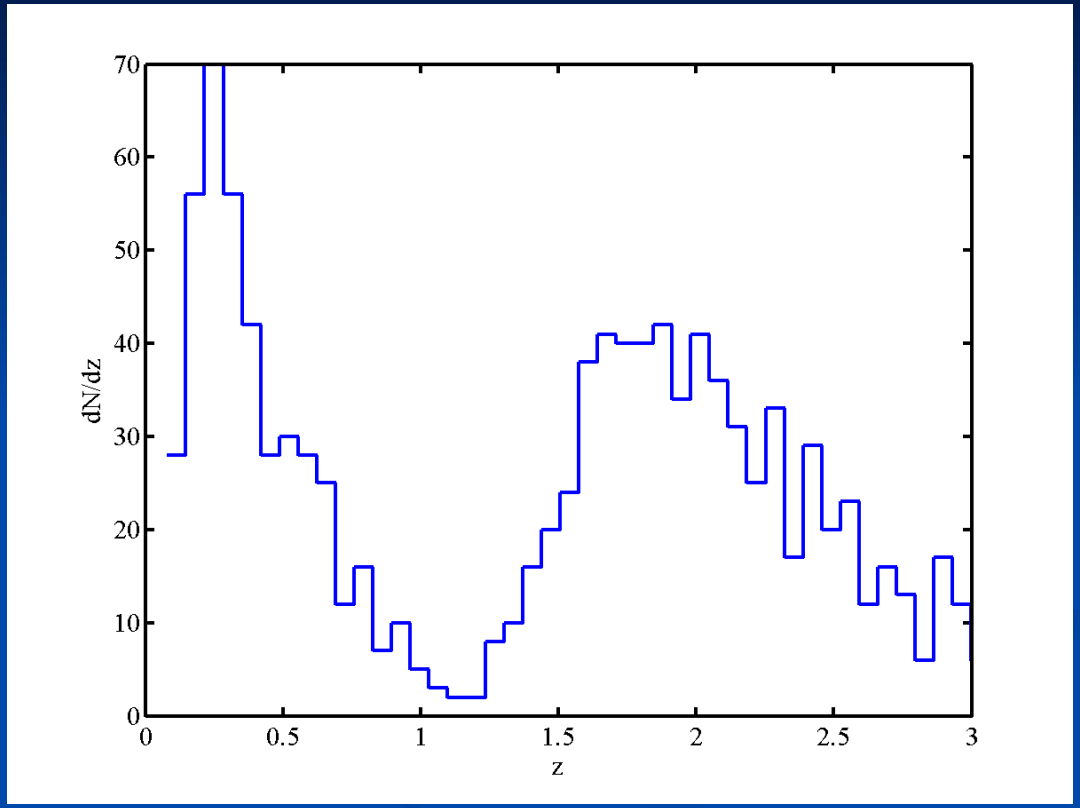
colour



- The amplitude increases for redder samples

Clustering

- The 250 sample is dominated by low-z galaxies
- The 350 and colour selected samples dominated by the high-z peak (see Amblard et al A&A paper)



- Non-detection at 250 - consistent with the low-z population cluster as normal galaxies (r_0~4Mpc)
- The angular amplitude of the 350 samples and Amblard $n(z)$ implies high-z population has intrinsically stronger clustering (r_0~10Mpc)

Conclusions

- SD data: 4x4 degree maps in GAMA 9hr field
- ~7000 sources detected at >5σ
- Source counts steeper than most models
  - Negrello model with multiple populations fits best
- Strong clustering for redder bands
  - z>1 population of highly clustered protospheriods
  - z<0.5 population of normal galaxies