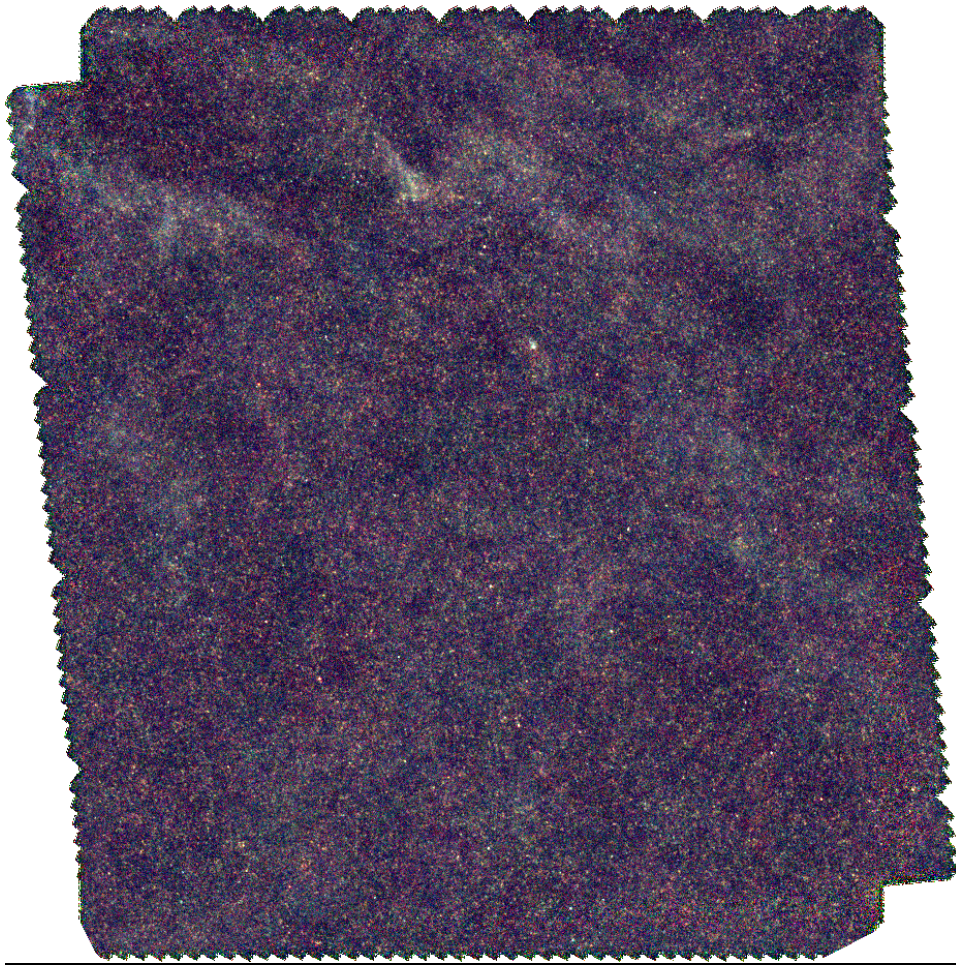
From Herschel to ALMA: looking at dusty and gassy galaxies.

Eelco van Kampen, ESO

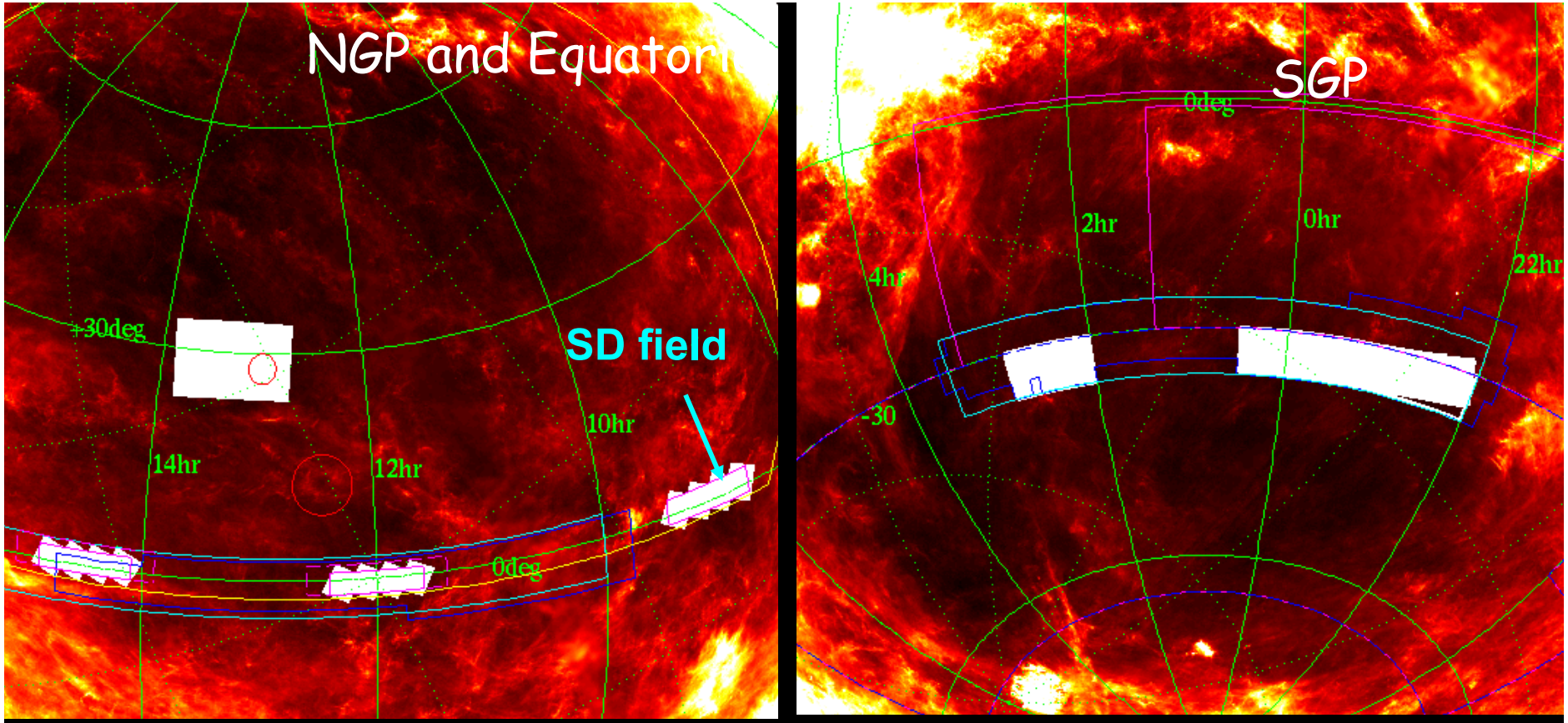
Herschel-ATLAS



3-col SPIRE H-ATLAS SD field

- The widest area survey with Herschel (~ 550 sq deg)
- Consortium of 150+ astronomers worldwide led by Nottingham and Cardiff (Dunne, Eales)
- Covering 5 bands with PACS and SPIRE (110 – 500 microns) in fast parallel mode
- 5 sigma sensitivities of 132, 126, 33, 36 and 45 mJy / beam from 110-500μm
- Detect ~10^5 sources to z~3

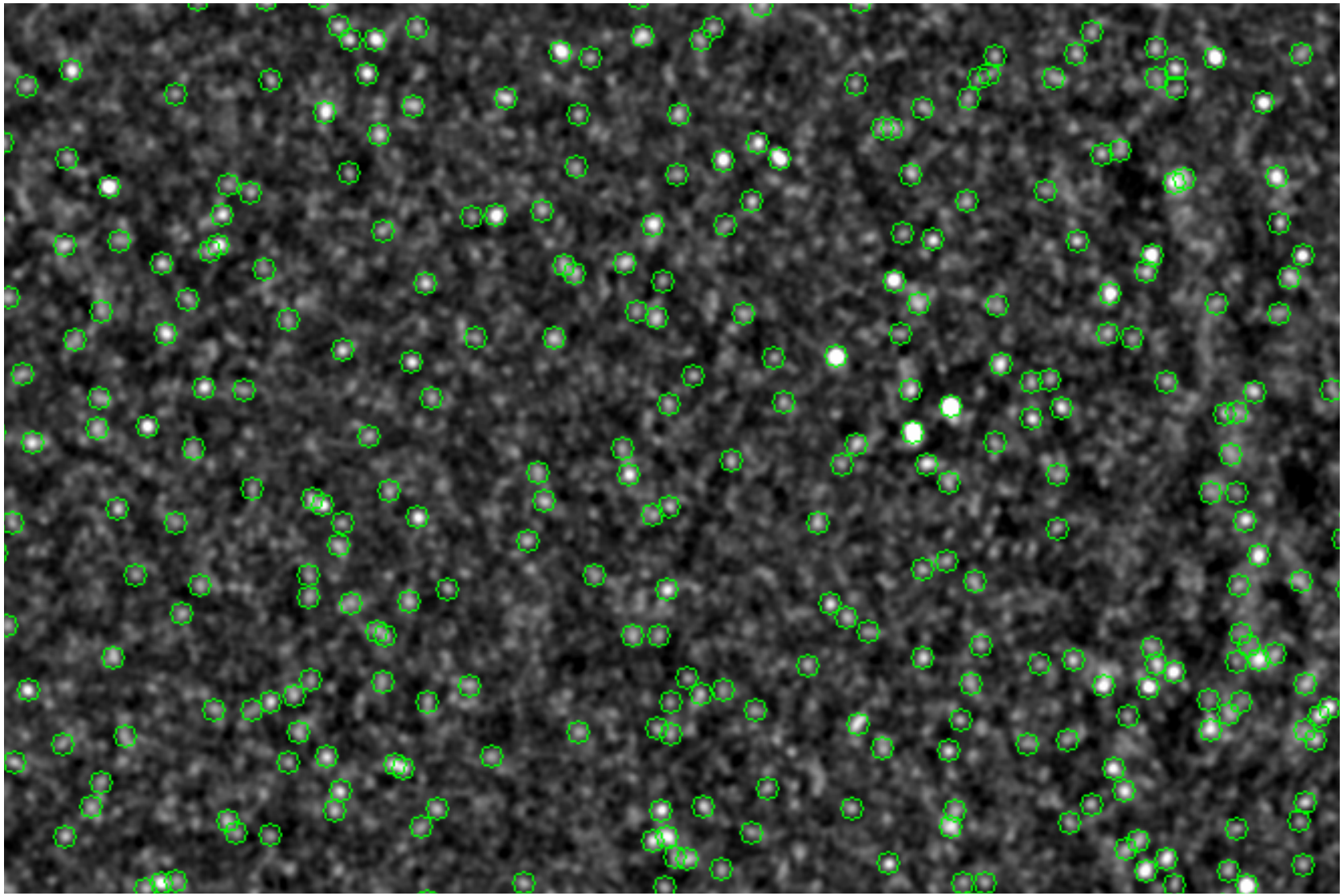
Herschel-ATLAS



Fields chosen to allow maximum overlap with existing and planned surveys
GALEX, 2dF, SDSS, GAMA, UKIDSS, KIDS, VIKING, PanSTARRS, DES, SPT, SASSy

and to be accessible to new facilities which will be valuable for follow-up
ALMA, SKA and prototypes, SCUBA2, LOFAR, e-MERLIN

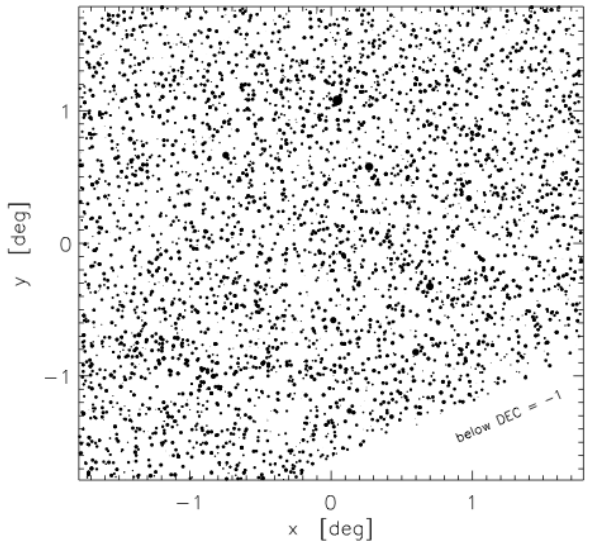
Herschel data: population statistics



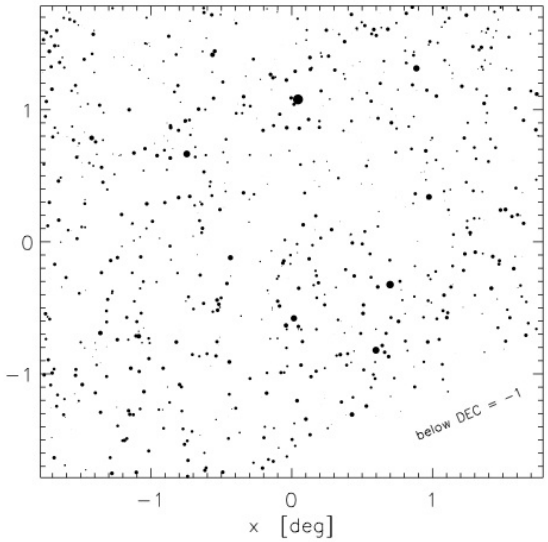
Angular clustering of local sub-mm galaxies

From *Herschel*-ATLAS + GAMA

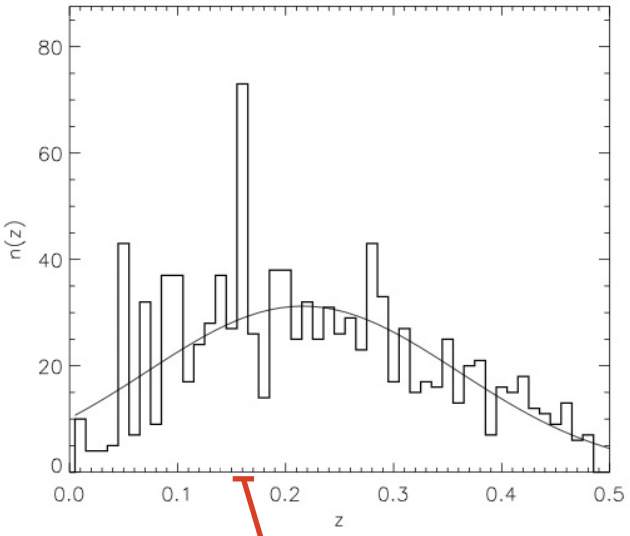
All 250 micron sources

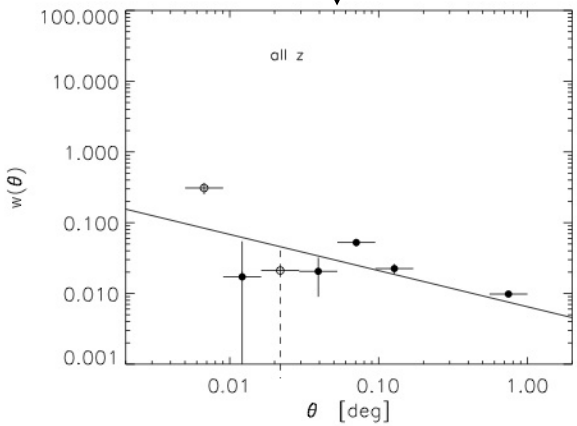


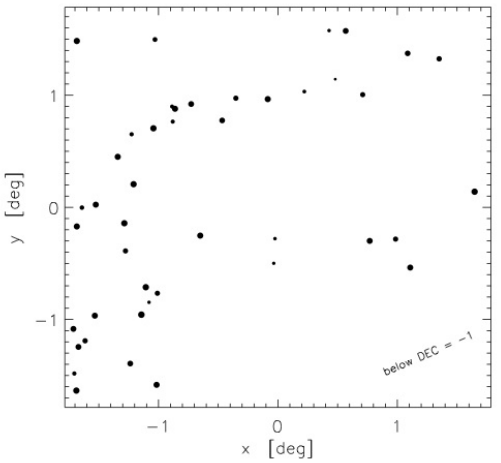
sources with redshifts (GAMA+photo-z)



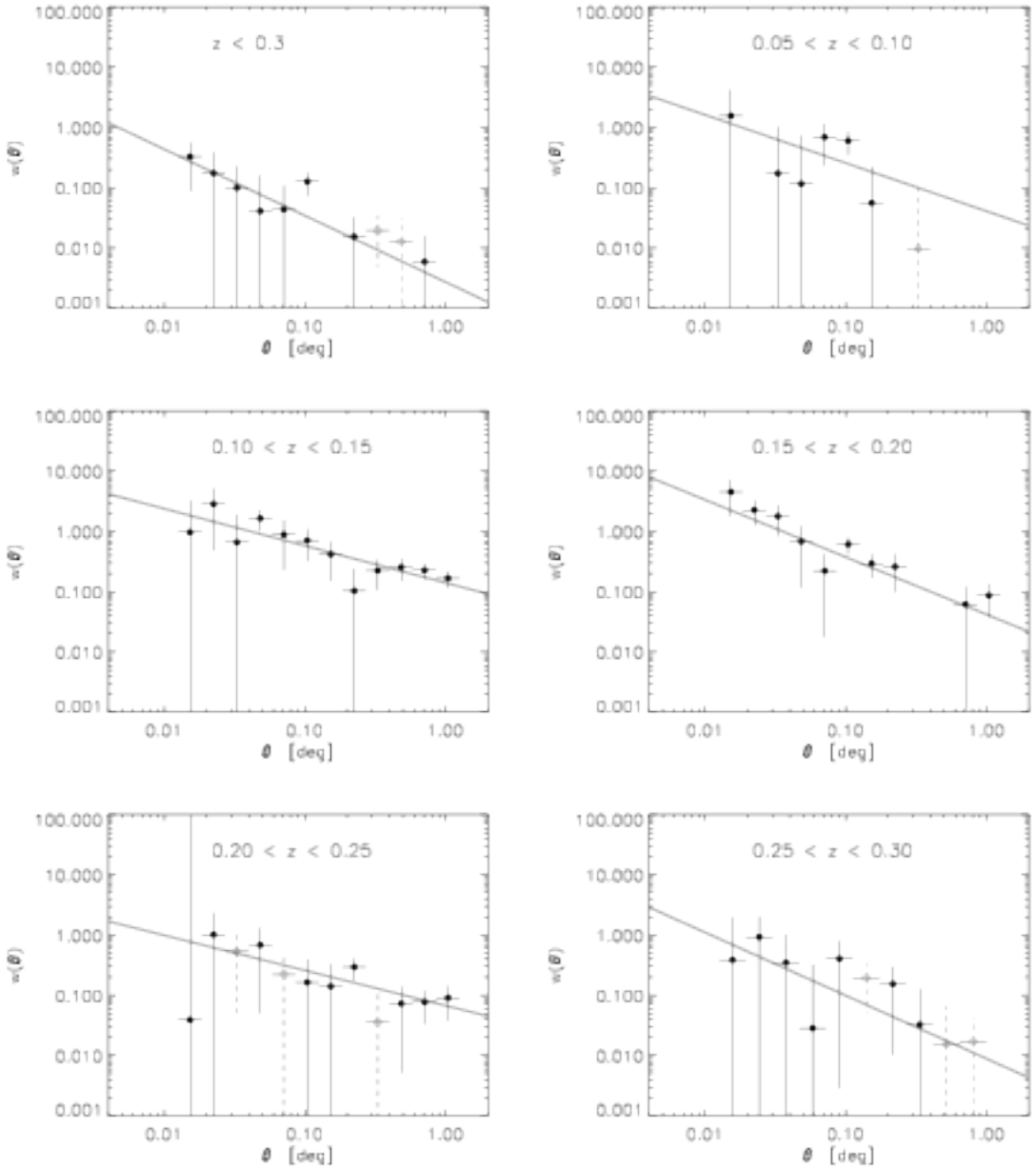
redshift distribution







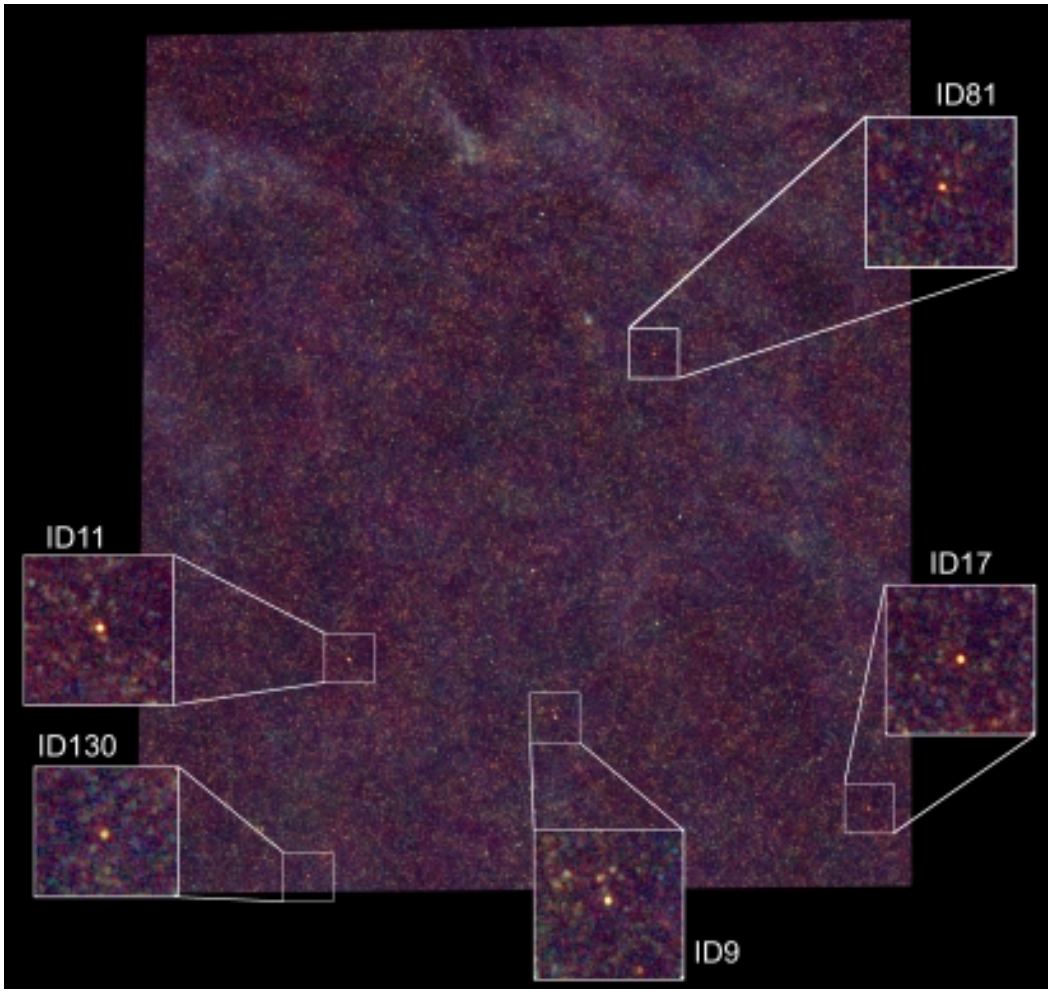
Angular clustering of local sub-mm galaxies



From *Herschel*-ATLAS + GAMA

van Kampen et al. (2012)

Lenses in the *Herschel*-ATLAS SDP field

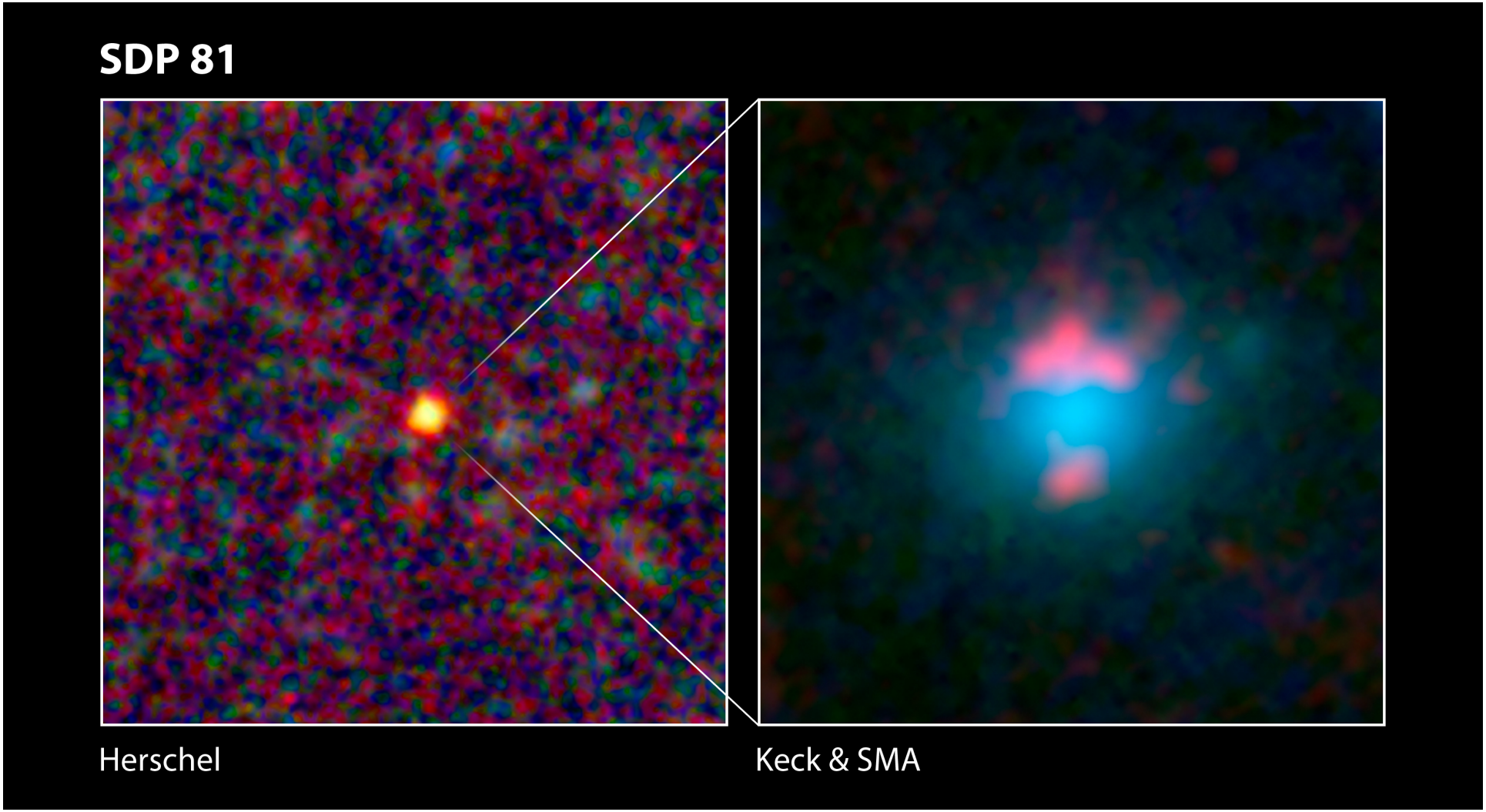


Negrello et al. (2010)

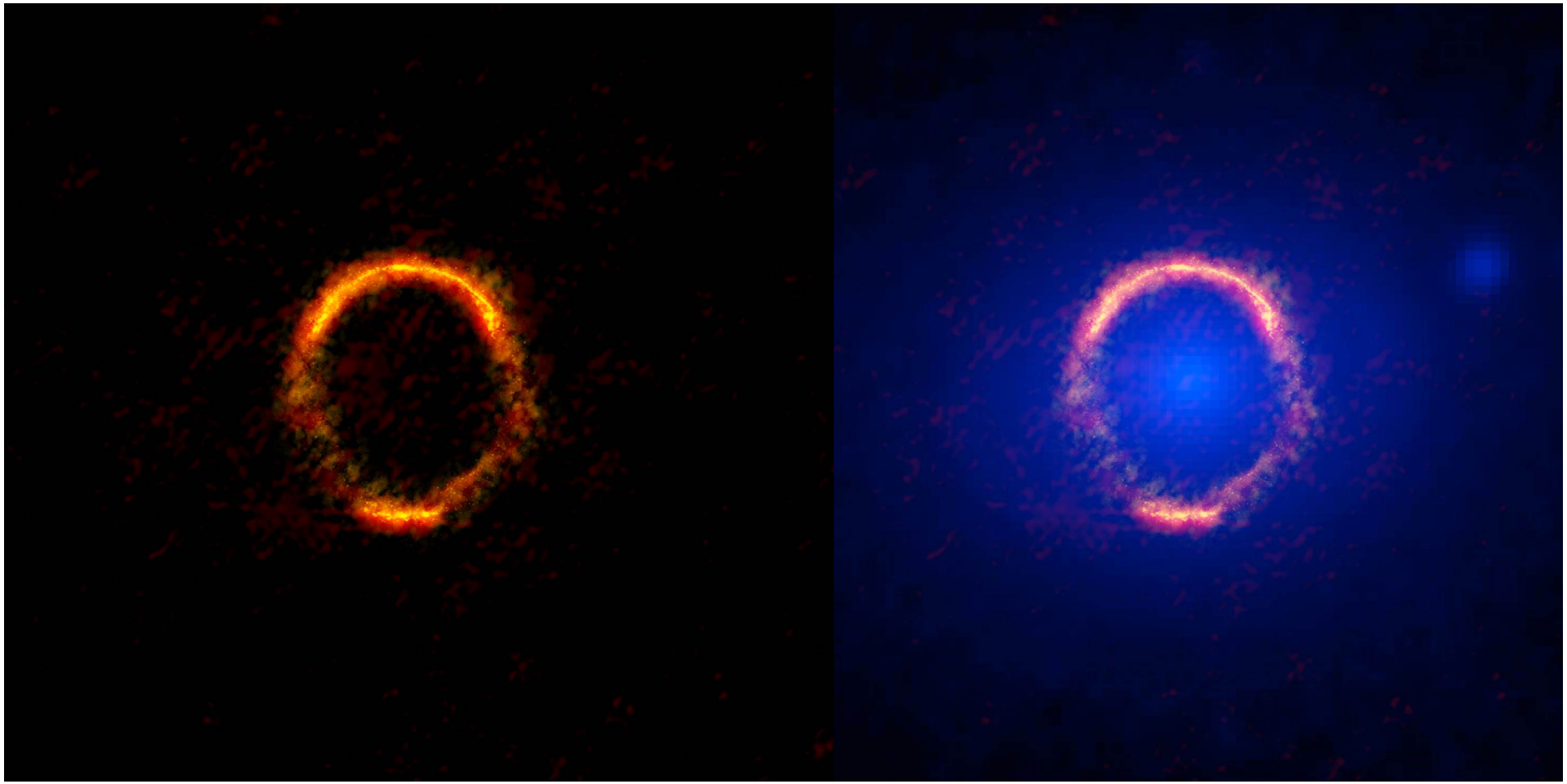
H-ATLAS ID	SDP ID	S_{100} (mJy)	S_{160} (mJy)	S_{250} (mJy)	S_{350} (mJy)	S_{500} (mJy)	S_{880} (mJy)	S_{1200} (mJy)
H-ATLAS J090740.0−004200	9	187±57	416±94	485±73	323±49	175±28	–	7.6±0.8
H-ATLAS J091043.1−000321	11	198±55	397±90	442±67	363±55	238±37	–	12.2±1.2
H-ATLAS J090302.9−014127	17	78±55	182±56	328±50	308±47	220±34	–	15.3±1.3
H-ATLAS J090311.6+003906	81	≤62	≤83	129±20	182±28	166±27	76.4±3.8	20.0±0.7
H-ATLAS J091305.0−005343	130	–	–	105±17	128±20	108±18	39.3±2.3	11.2±1.2

SMA IRAM

SDP 81 before ALMA …



SDP 81 with ALMA



ALMA Partnership et al. 2015, arXiv:1503.02652

2012.1.00973.S – PI: Dunne
2013.1.00058.S – PI: Vlahakis

CO + CI for nearby *Herschel*-ATLAS galaxies

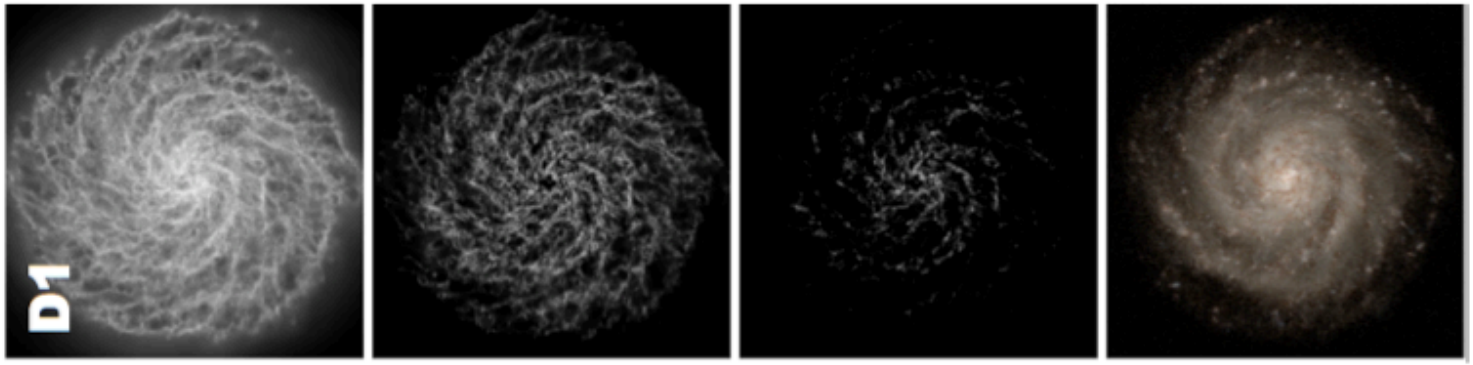


Figure 1: *Simulations of HI, H2 and CO (as a molecular gas tracer) from Pelupessy & Papadopoulos (2009). The right-hand panel shows the combined simulation of stars, gas and dust. The two central panels clearly show how much more extended the true H2 distribution is compared to CO.*

2012.1.00973.S: 12 galaxies around z~0.35, band 3 for CO(1-0), band 7 for CI(1-0)
sources unresolved in band 3, resolved in band 7

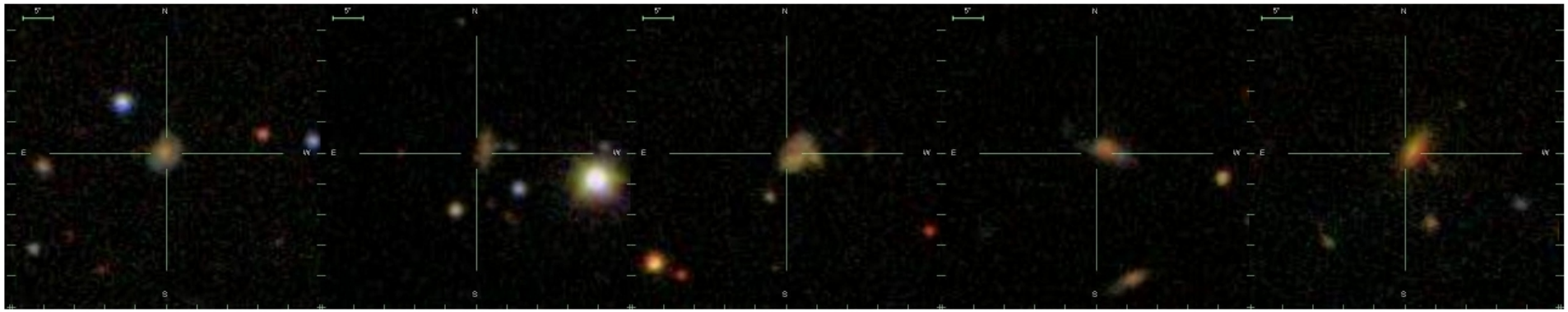
2013.1.00058.S: 15 galaxies around z~0.07, band 3 for CO(1-0), band 8 for CI(1-0)
aim to resolve sources in band 3 as well as band 8

2012.1.01080.S – PI: Ibar

- 41 galaxies in the redshift range 0.15 – 0.35, band 3 for CO(1-0) line detection

- most compact configuration (barely resolving the galaxies)

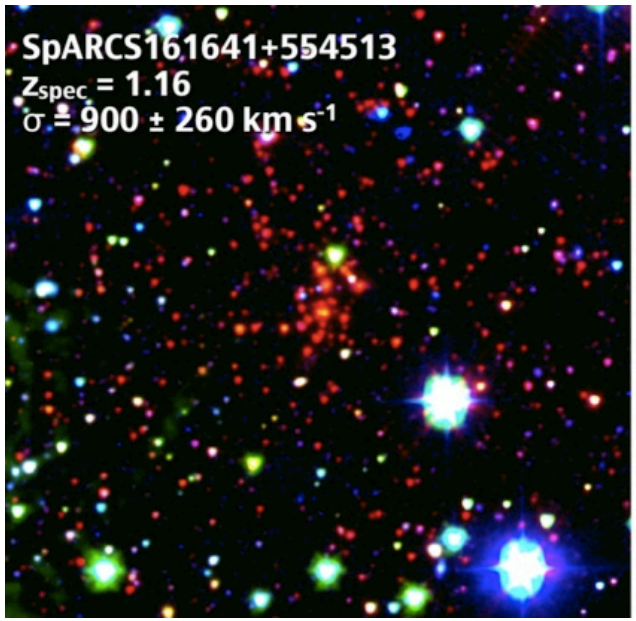
- each galaxy has Herschel photometry from 100 to 500um and optical spectroscopy from SDSS and GAMA surveys

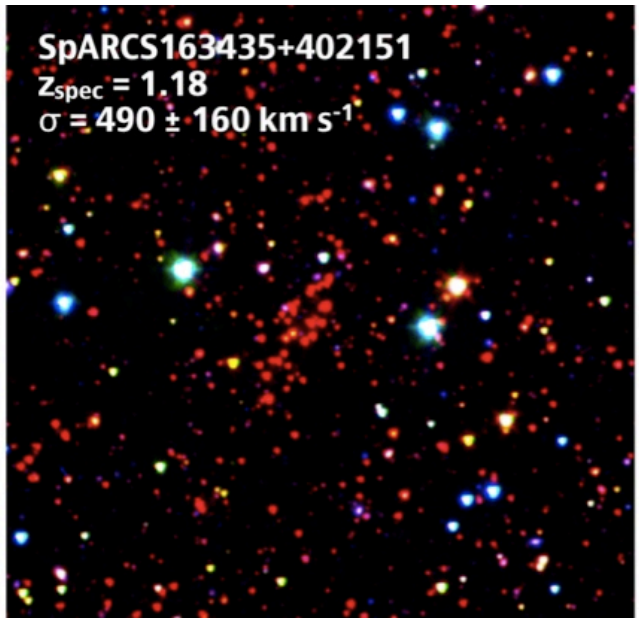


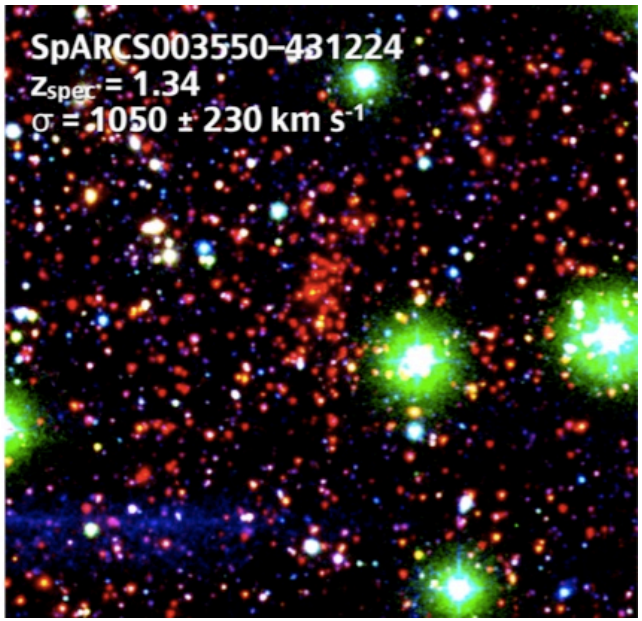
false-colour *Herschel* PACS images of five of the targets

ALMA follow-up for high-z clusters

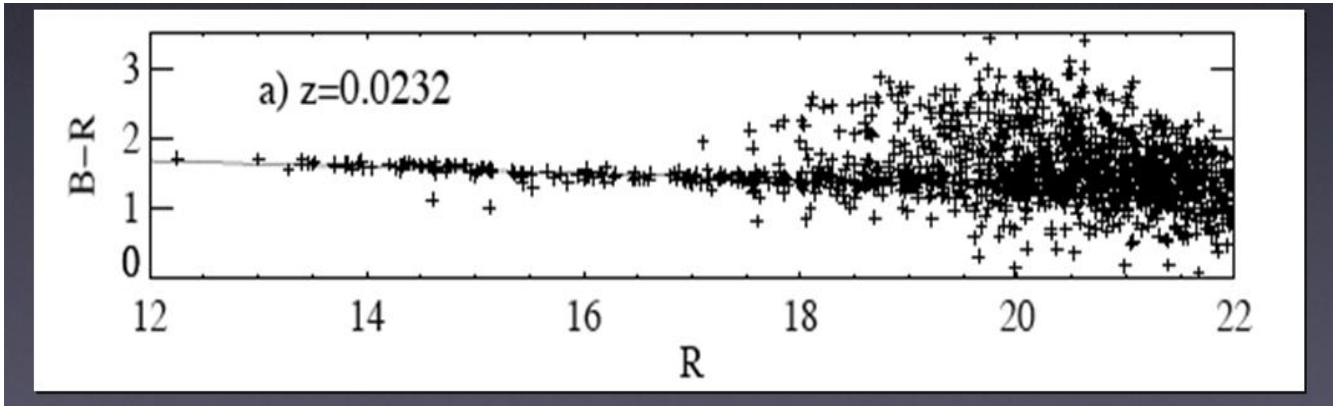
For example, those detected by SpARCS:
The Spitzer Adaptation of the Red-Sequence Cluster Survey (PI: Gillian Wilson)







Detected using the cluster red sequence, then confirmed by spectroscopic redshifts



Coma cluster color-magnitude diagram

2012.1.00463.S – PI: Demarco

Resolving SPIRE blobs: an ALMA Cycle 2 filler project to resolve the SPIRE emission of a cluster galaxy at z=1.63

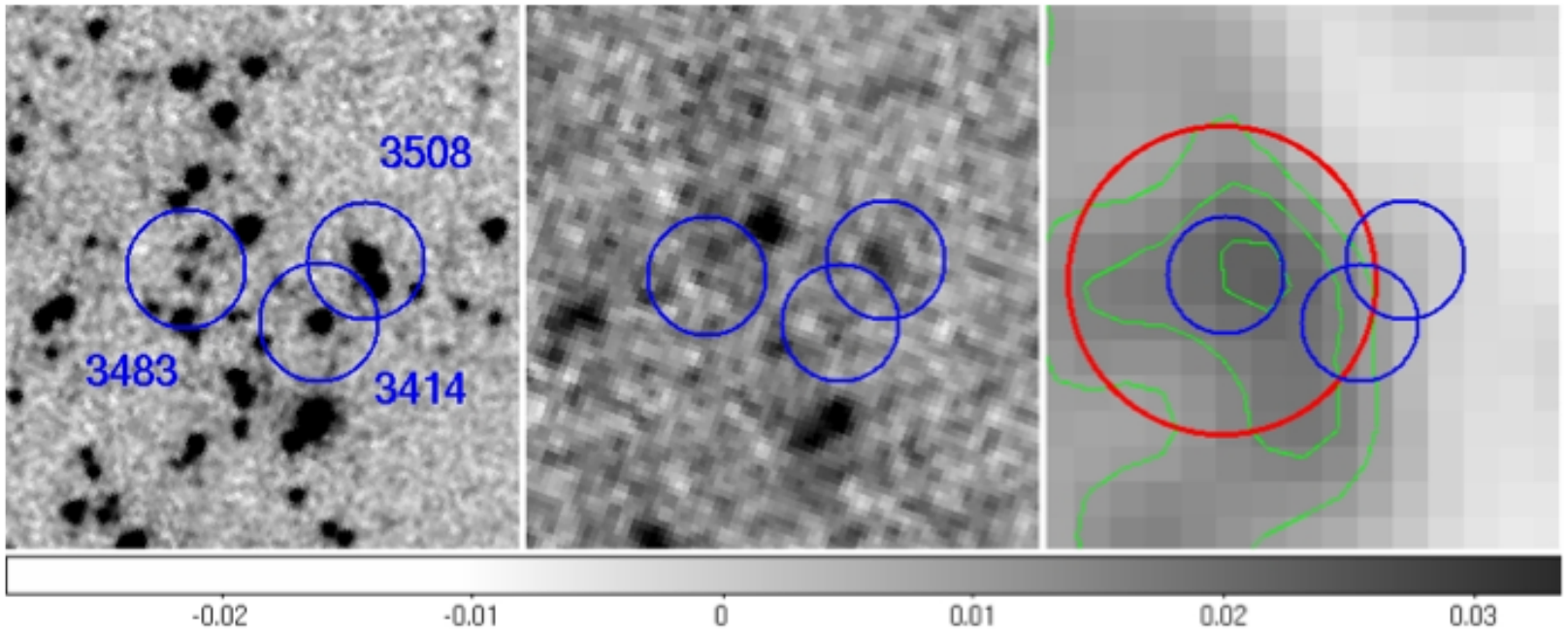


Figure 1: Positions of the three central cluster members (blue circles) in SpARCS J022426-032330 ($z = 1.63$) and their surroundings, superimposed on the IRAC 1, MIPS 24 μm and SPIRE 250 μm images (from left to right). The BCG is the object ID 3508. The green contours help to visualize the 250 μm flux distribution, whereas the red circle represents ALMA's band 3 primary beam at the proposed pointing. Each image is around 2 arcmin a side.

Which archive ?

Lots more ALMA proposals and projects based on *Herschel* data …

but also based on data from SCUBA-2, SPT, APEX, etc.

Accessibility and user-friendliness of the archive can be a deciding factor for ALMA PIs in their quest for interesting targets …