

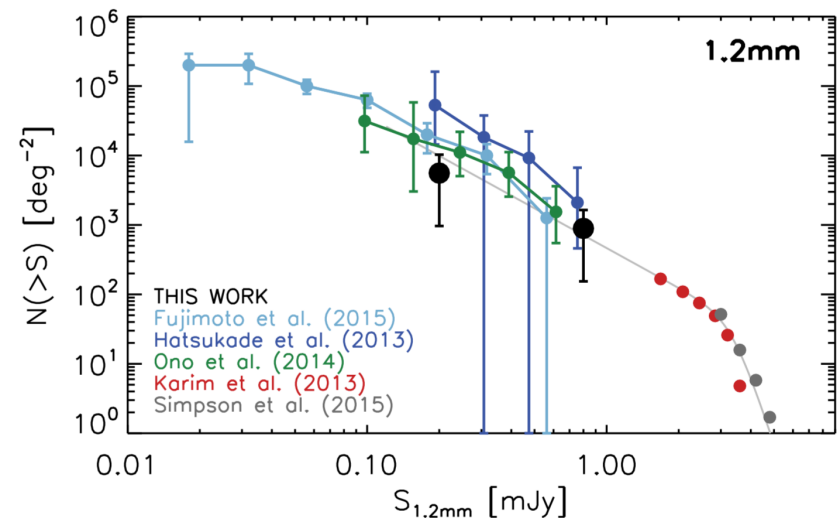
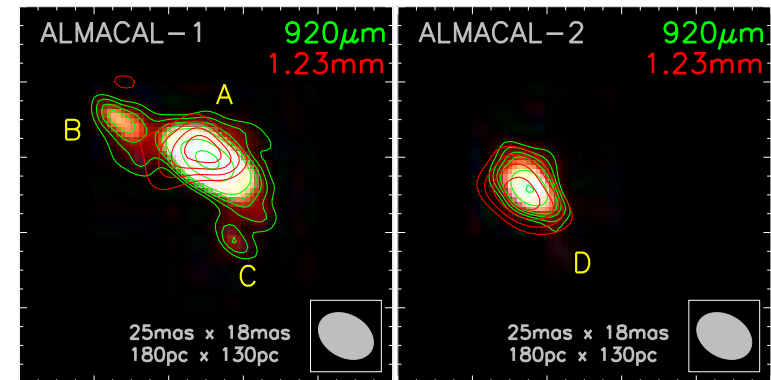
ALMACAL

Ivan **Oteo**, Martin **Zwaan**, Rob **Iverson**, Ian **Smail**, Andy **Biggs**, Anne **Klitsch**, Celine **Peroux**

A novel, wide and deep submm survey using
ALMA **calibrator** observations

Science:

- Blind detection of SMGs
- High resolution observations
- Intervening molecular absorption lines
- Blind CO emission line surveys
- Quasar jets



ALMACAL

A typical 5min bandpass scan
in band 6 reaches an rms
noise level of $60 \mu\text{Jy}$

intervening molecular
absorption lines, blind CO
emission line surveys, and
quasar jets

ALMACAL

Public data: simply extract data from archive, calibrate and throw away all science data

Proprietary data:
Submit ticket to ALMA helpdesk to obtain calibrator data

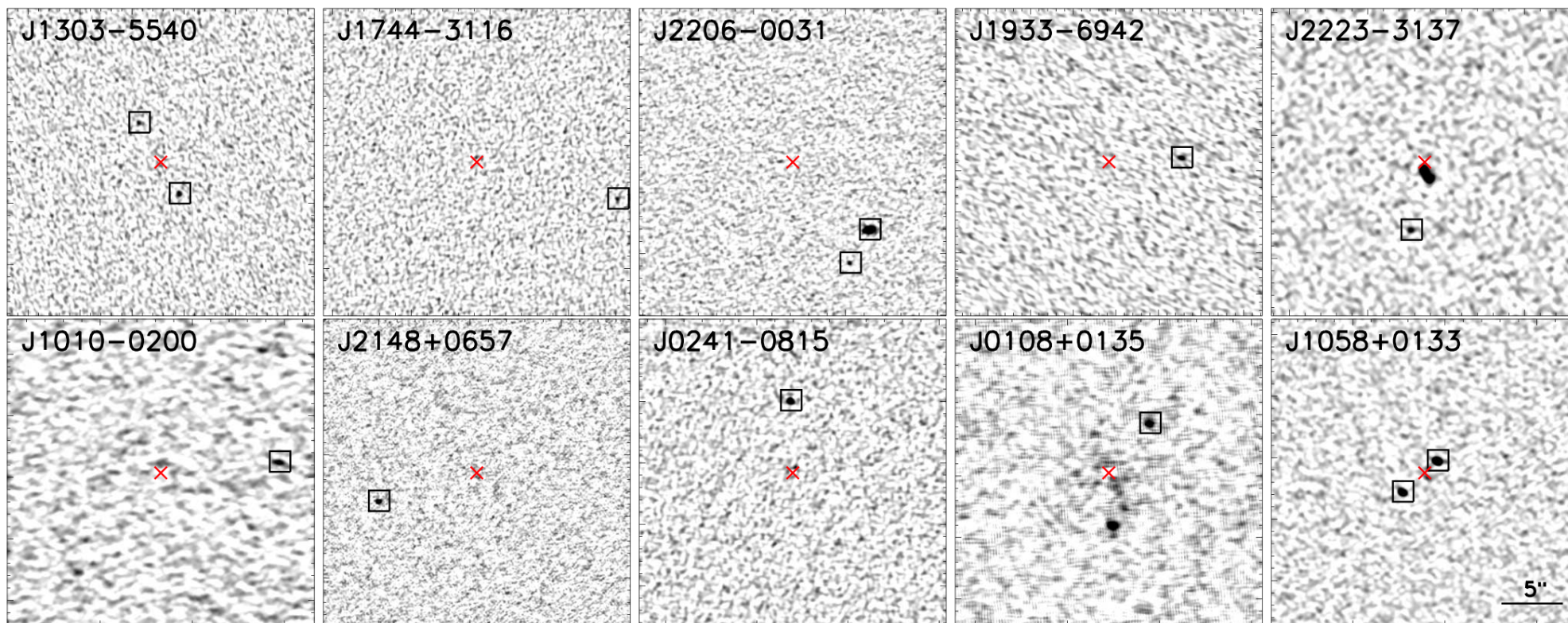
Automatic self-calibration

automatic point source subtraction

quick image of every observation to filter out corrupted data

stack observations for each field, make images

ALMACAL



13 SMGs detected in 20 arcmin sq

6 SMGs with multi-band detections \rightarrow spectral indices suggest $z > 2$

ALMACAL

Caveats:

Confusing high redshift galaxies with jets?

spectral index helps to easily filter them out

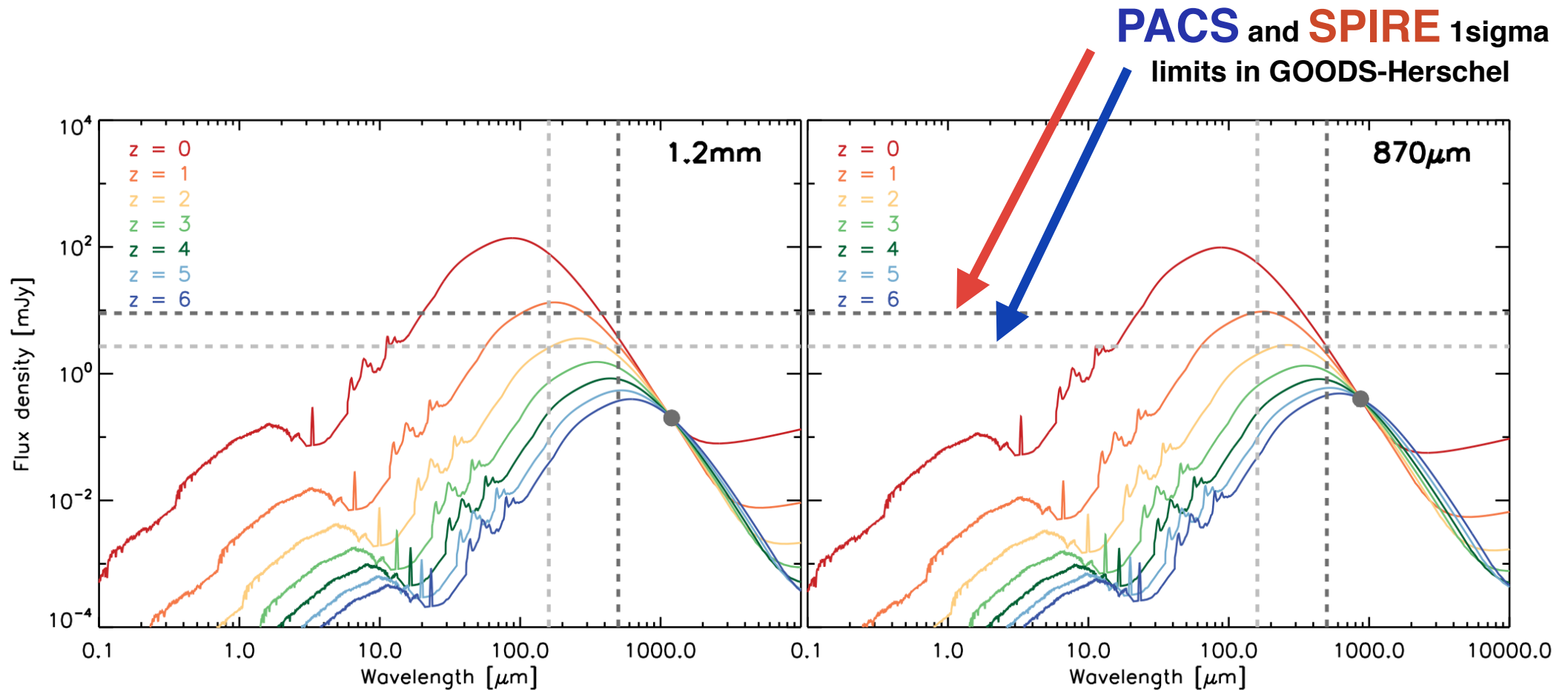
Over-densities around the calibrator sources?

our calibrators are blazars, not supermassive radio-galaxies

Spurious sources?

we use a very high S/N limit of 5

ALMACAL

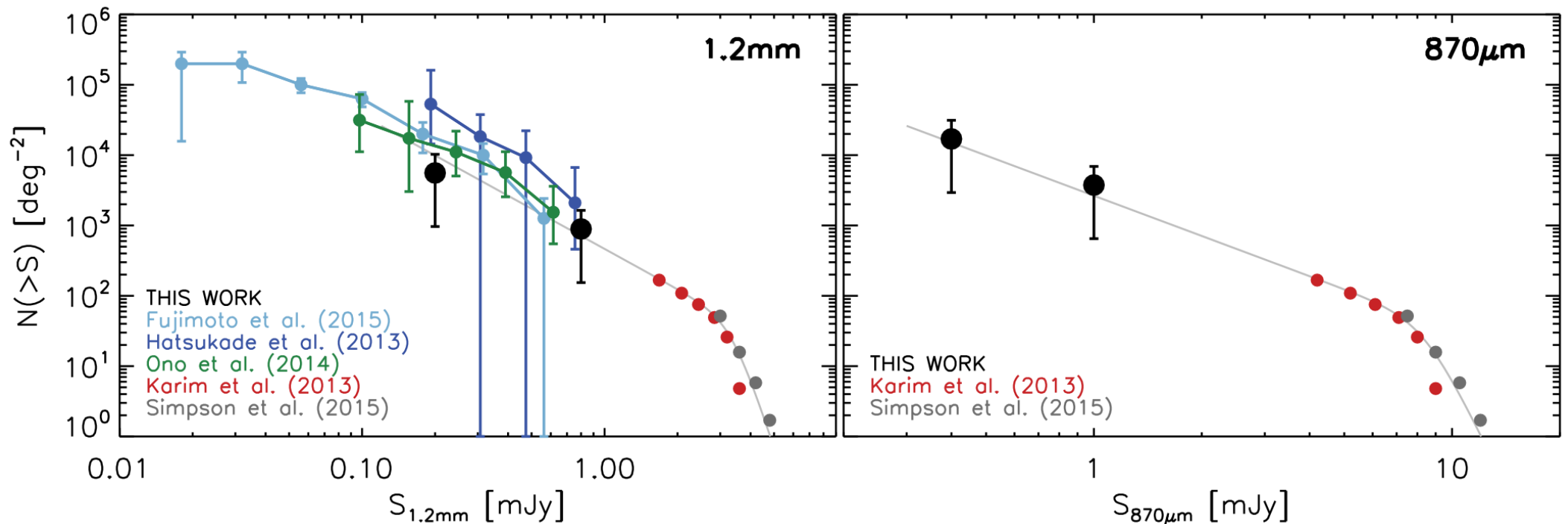


The faintest SMGs would have been missed by the deepest Herschel surveys...

The bridge population between SMGs and UV-selected galaxies?

ALMACAL

NUMBER COUNTS \rightarrow models of galaxy formation and evolution



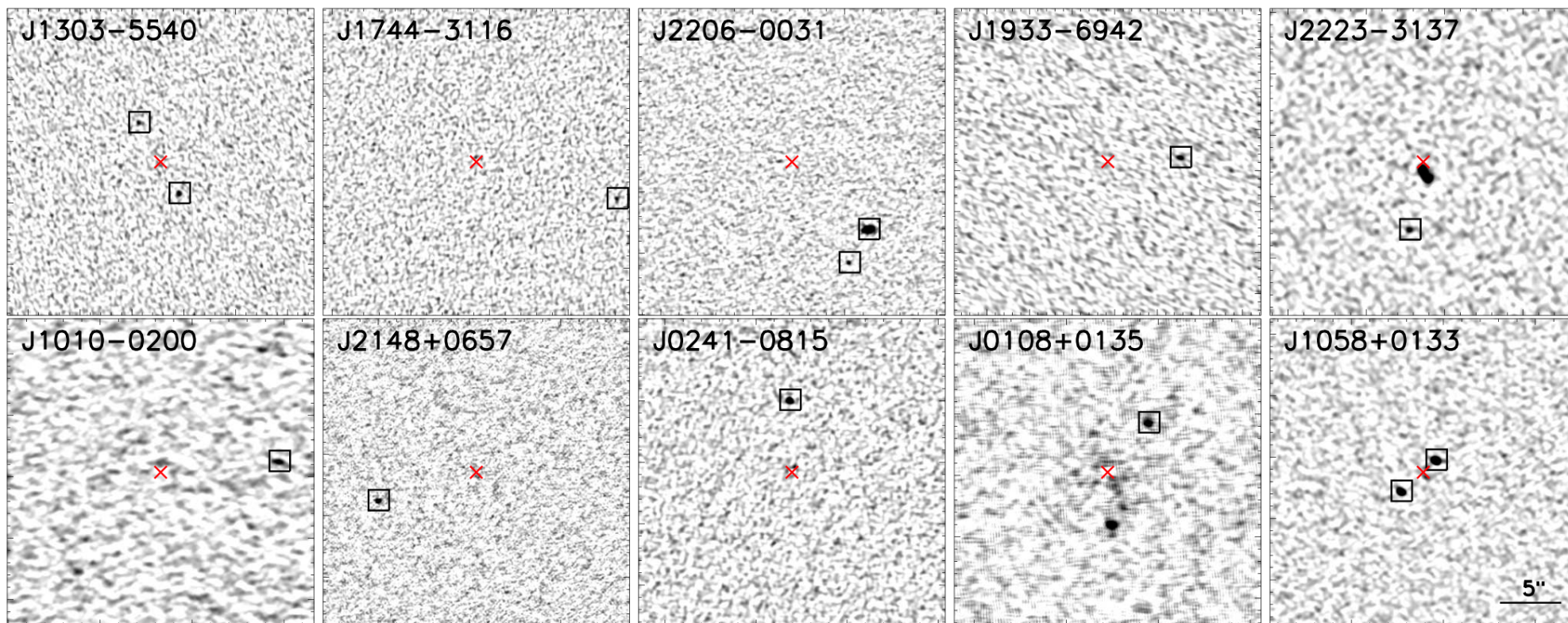
1.2 mm number counts lower in a factor of ~ 2 with respect to previous works

previous works

First ALMA 870 μm number counts at $S < 2$ mJy !!

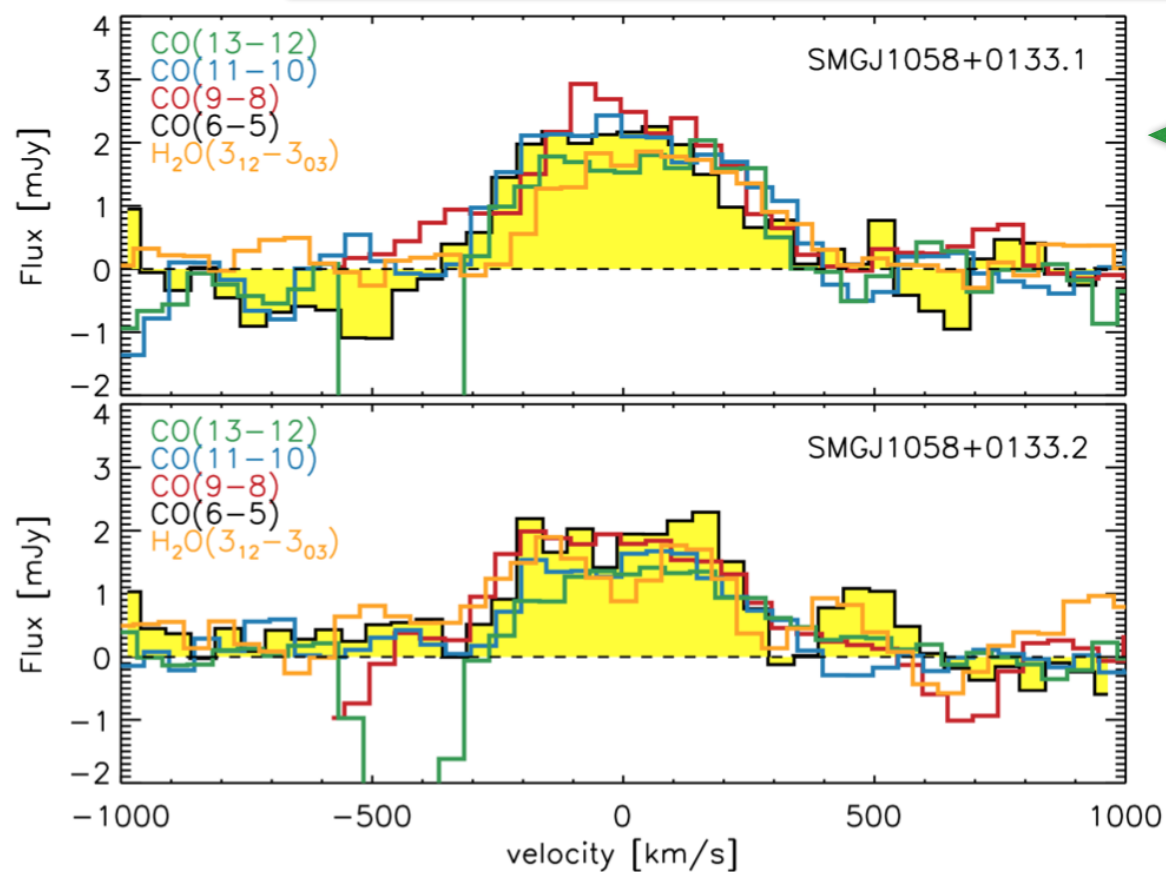
counts at $S < 2$ mJy !!

ALMACAL

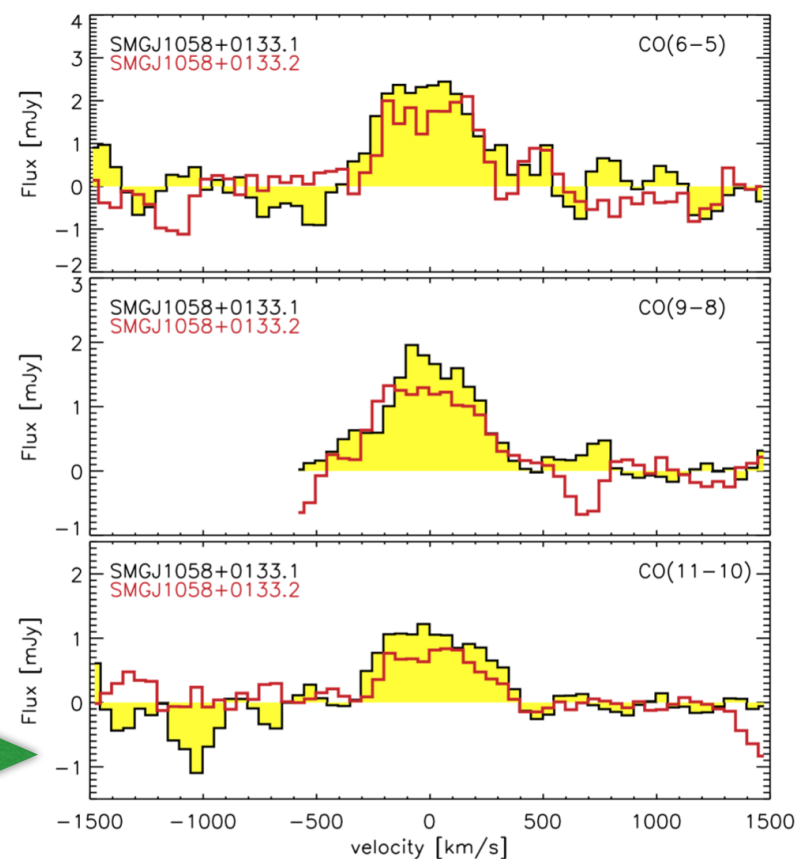


ALMACAL

Multi-frequency observations \rightarrow redshifts from CO and H₂O lines



J1058+0133 \rightarrow a pair of SMGs at $z = 3.442$

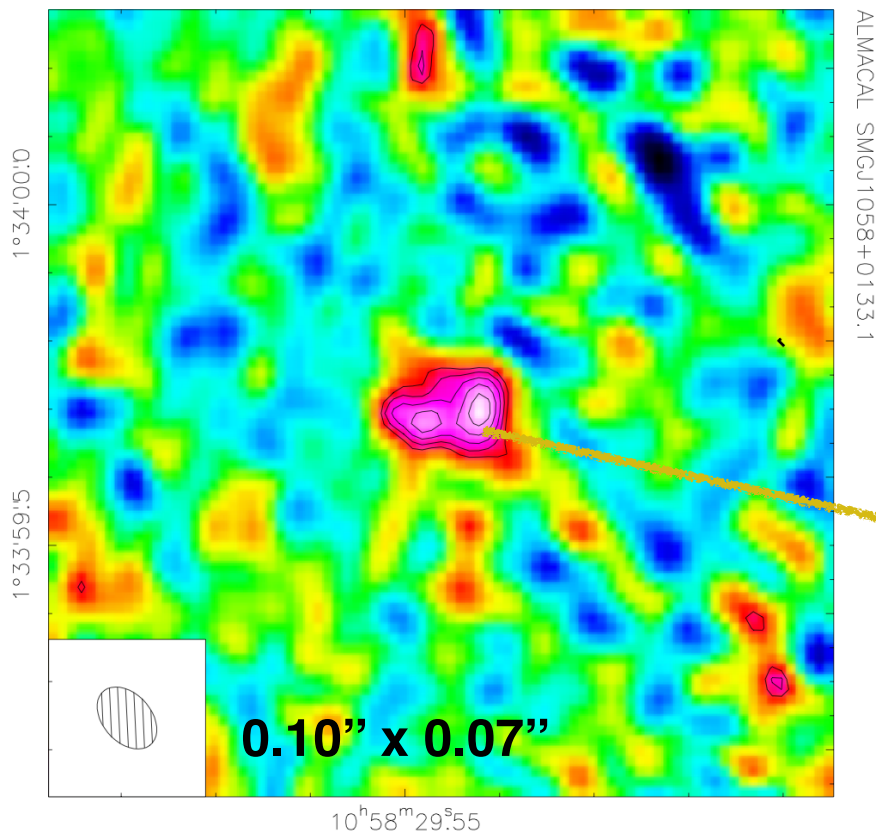


Two interacting SMGs with different dynamical properties

ALMACAL

High-spatial resolution studies

J1058+0133 ($z = 3.442$) was the flux calibrator of the ALMA long-baseline observations of SDP.81. Only 5 mins integration, but...



High-spatial resolution imaging of SMGs

**Self-calibration feasible ->
maximize calibration quality**

**Compact dust emission
0.07" -> 500 pc
Pair of interacting galaxies?**

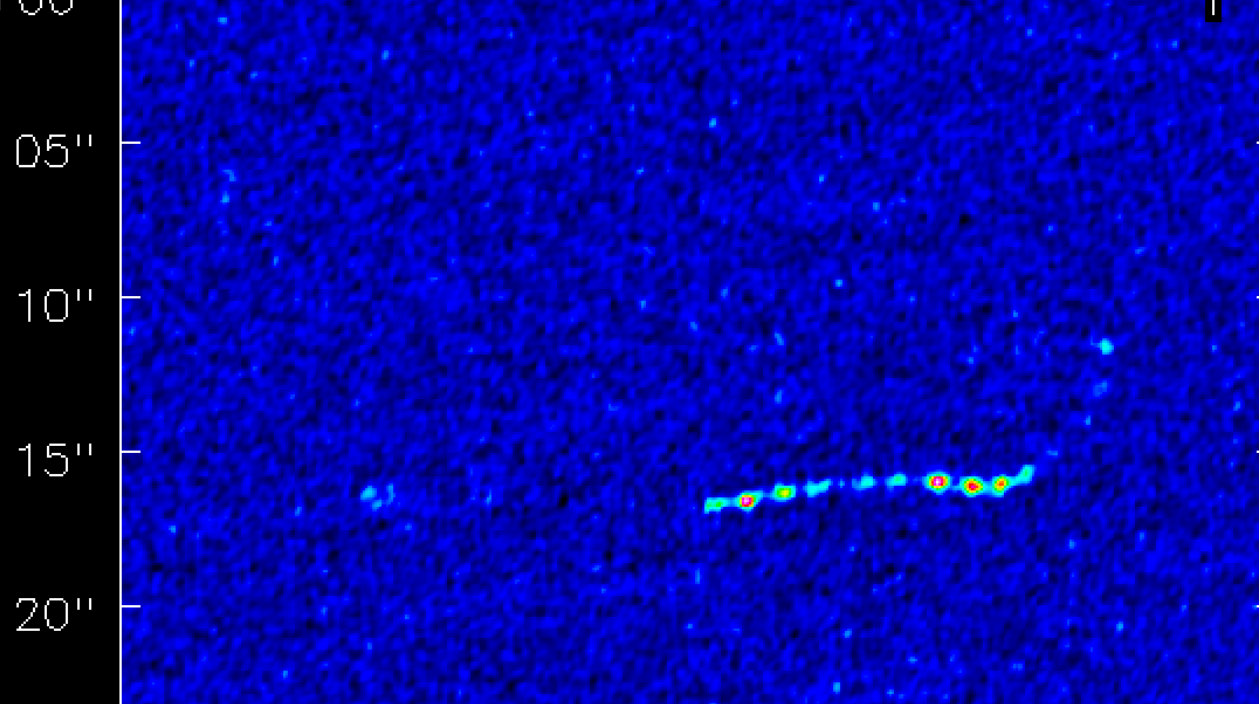
ALMACAL

What's next

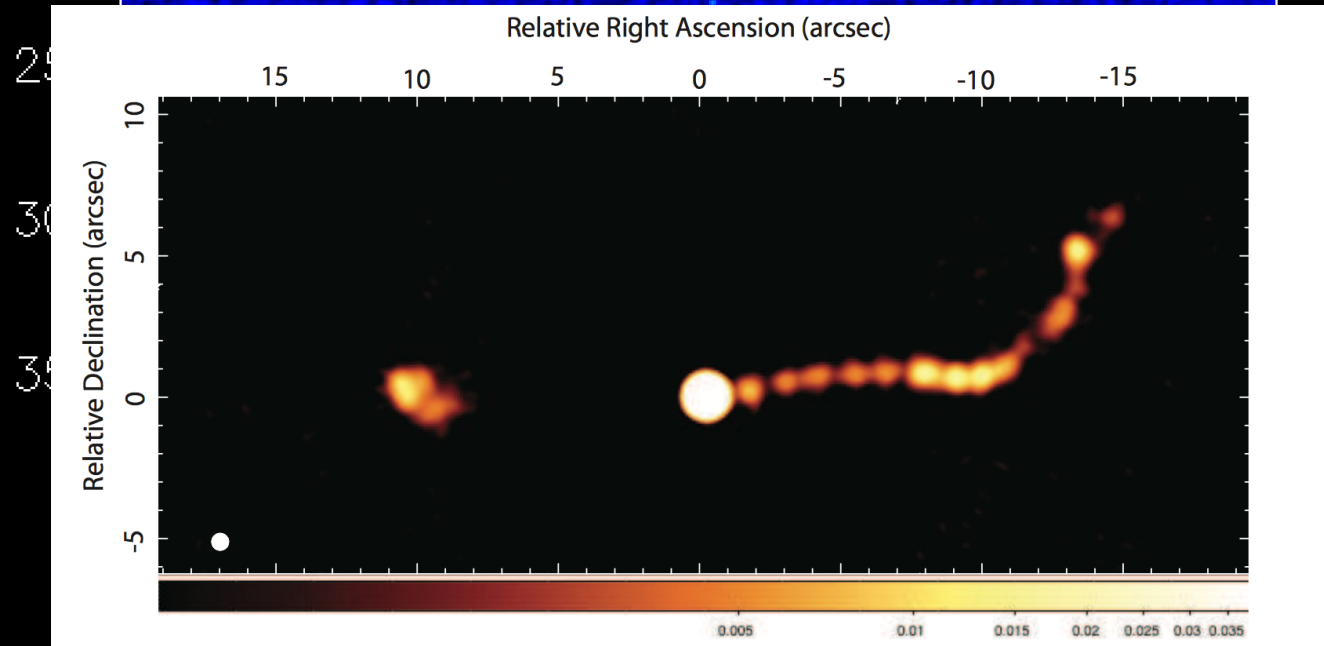
We are not just interested in source counts, but also

- ◆ **Blind CO detections -> CO luminosity function (z)**
- ◆ **Blind molecular absorption systems**
- ◆ **Outflows from quasars**
- ◆ **Jets**
- ◆ **...**

J2000 Declination



ALMA



ATCA
18 GHz

