JINGLE: the JCMT dust and gas In Nearby Galaxies Legacy Exploration

a new JCMT legacy survey

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on behalf of the JINGLE Team

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Outline

- Project Overview
- Survey Status
- First-science papers
- Lessons learned so far
- Website

JINGLE: project overview

JINGLE

780h legacy survey

SCUBA-2

250 h, weather bands 2-4

850um observations of 195 galaxies

RxA

530 h, weather bands 4-5

CO(2-1) observations of ~75 galaxies

Hours awarded per weather band

Large Program	Band 1	Band 2	Band 3	Band 4	Band 5
Transient	50	50	50		
S2-COSMOS		111	112		
SCOPE			150	150	
BISTRO		224			
JINGLE		57	123	200	400
STUDIES	330				
MALATANG		40	100	250	

JINGLE: project overview

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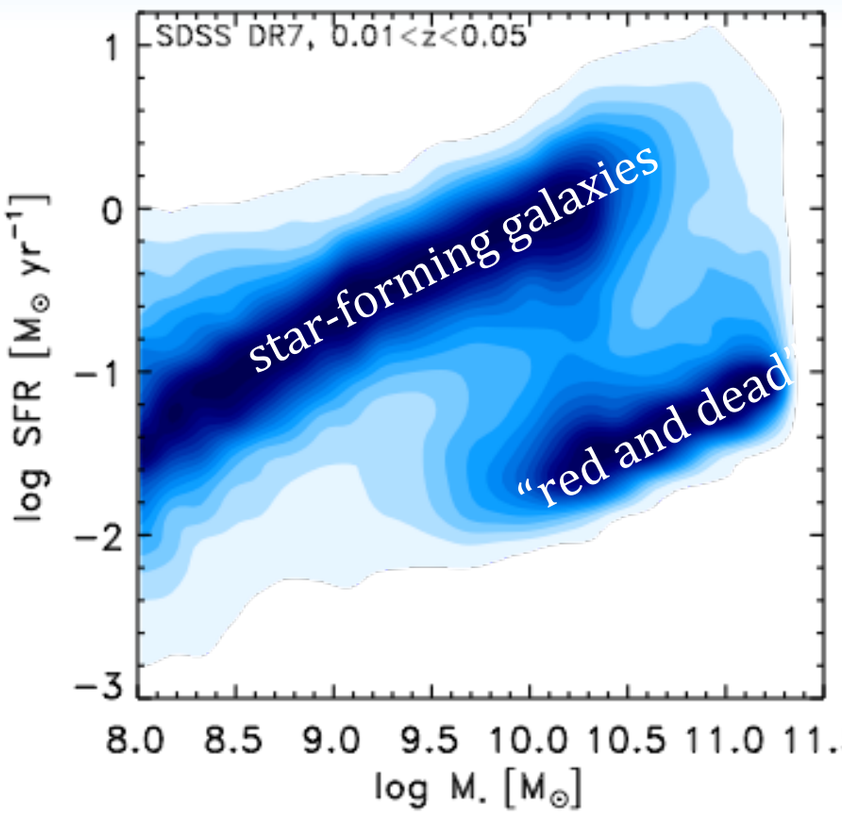
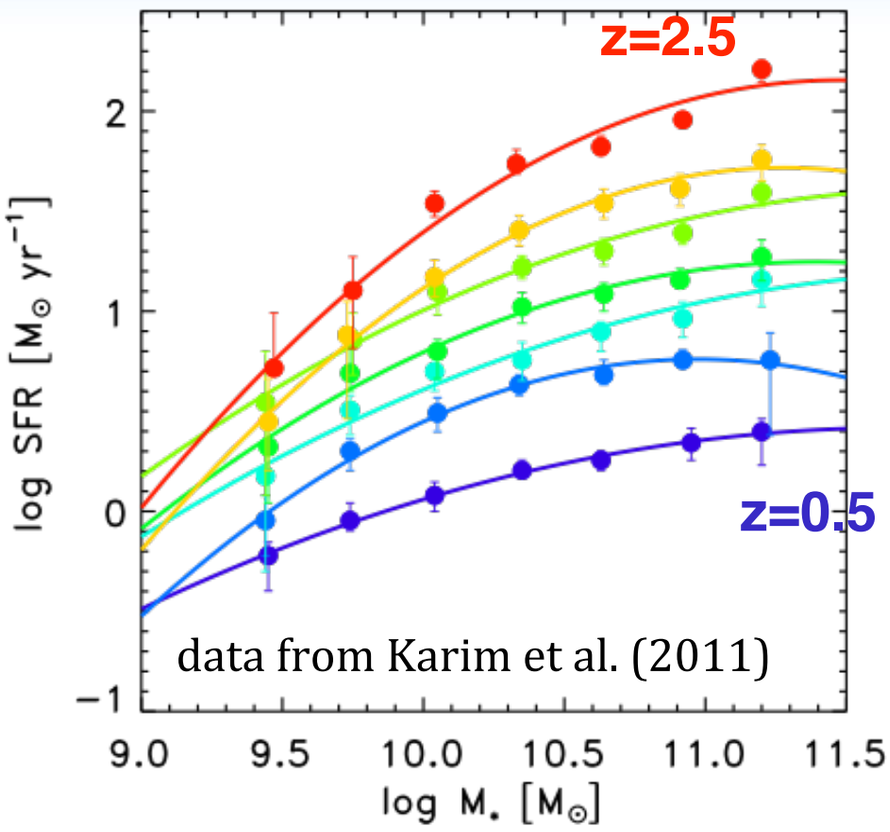
Survey objectives

- deriving scaling relations between dust properties (mass, temperature, emissivity) and global galaxy observables.
- studying the dust-to-gas ratio and its variations across the galaxy population.
- benchmarking relations that can be used to infer gas masses for large samples of high-redshift galaxies.
- correlation between molecular gas content with spatially-resolved galaxy properties
- investigating the correlation between ISM properties and the dynamics of galaxies.

Context: the current view on galaxy evolution

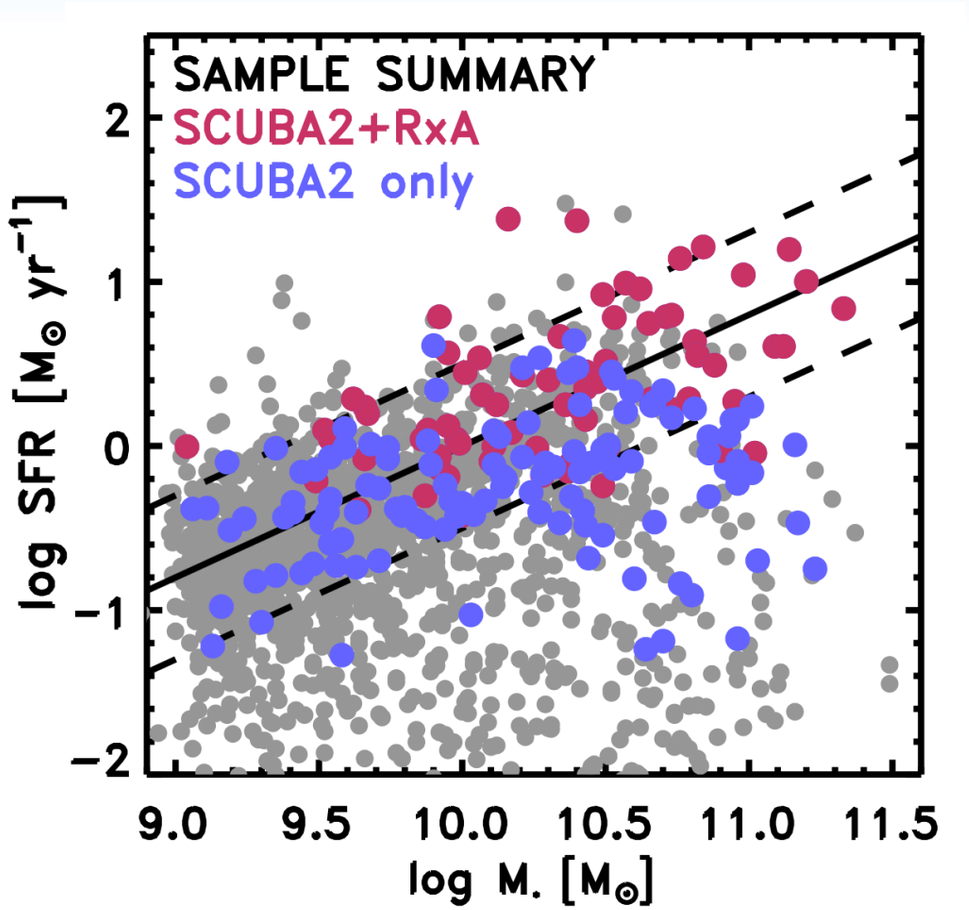




Cold gas is responsible for shaping the bi-modality of galaxy population, the presence of main sequence, and its evolution with redshift.

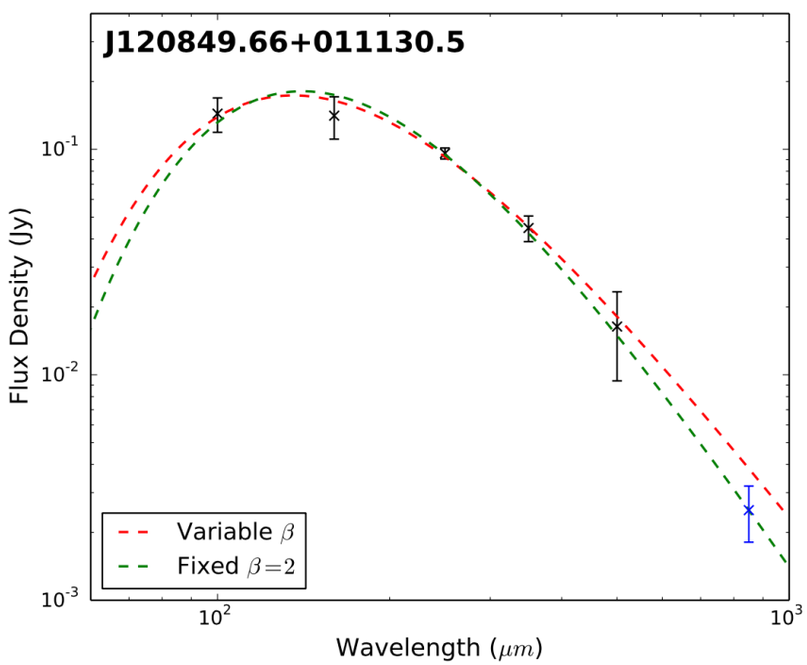
We must improve our understanding of the properties of the cold ISM across the entire galaxy population !

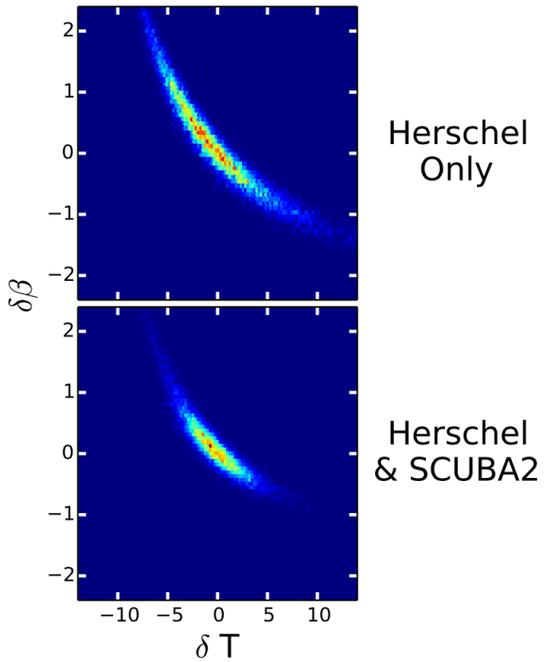
JINGLE: sample and survey strategy



Sample builds on multiple surveys

- H-ATLAS: Herschel PACS+SPIRE photometry
- GALEX/SDSS/WISE: UV-to-NIR photometry
- MaNGA/SAMI: optical IFU maps
- Apertif/ASKAP surveys: HI maps



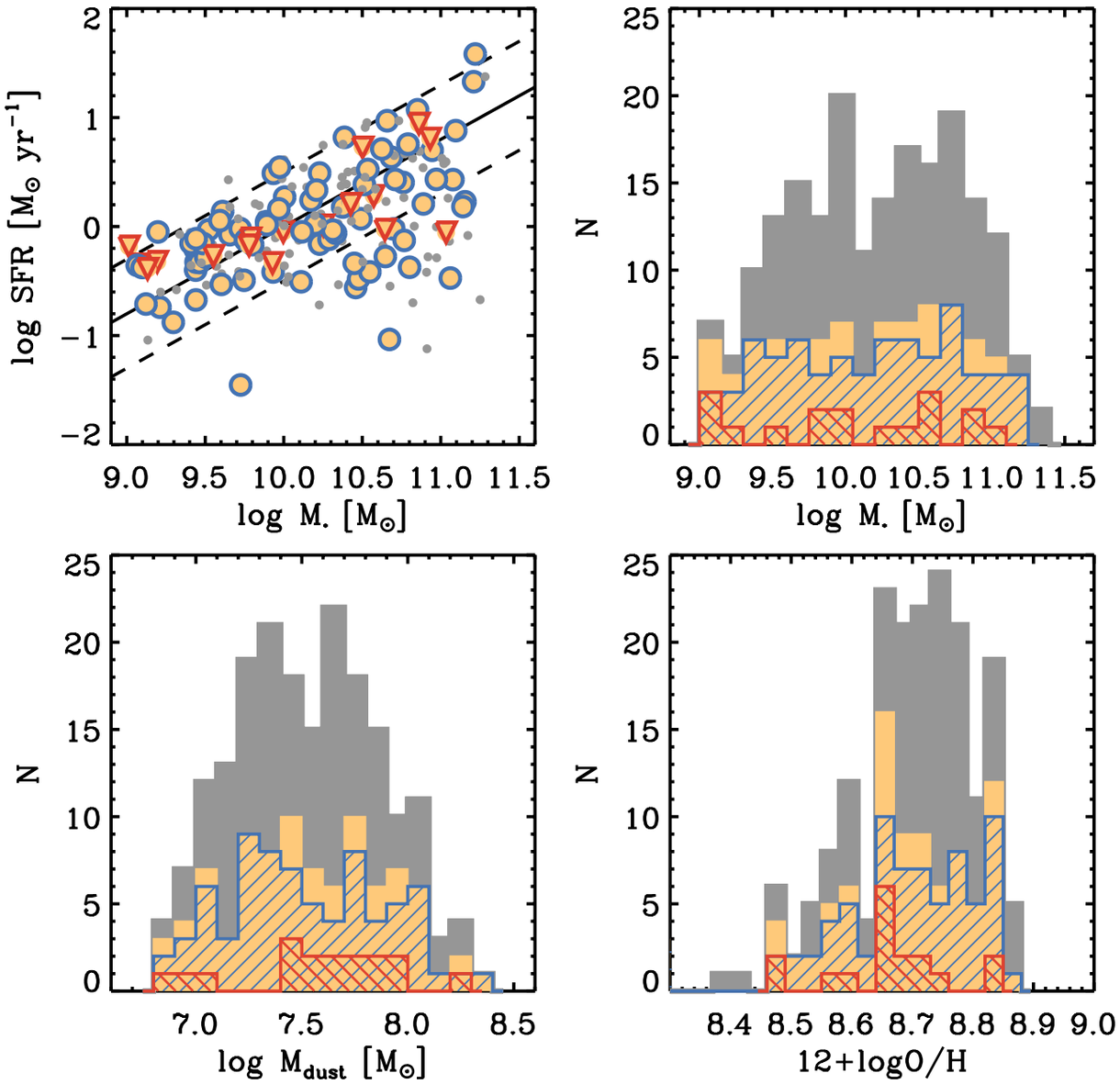


By adding SCUBA-2 data, can fit simultaneously for the temperature and emissivity of the dust.

JINGLE: status of observations

Survey is 36% complete!

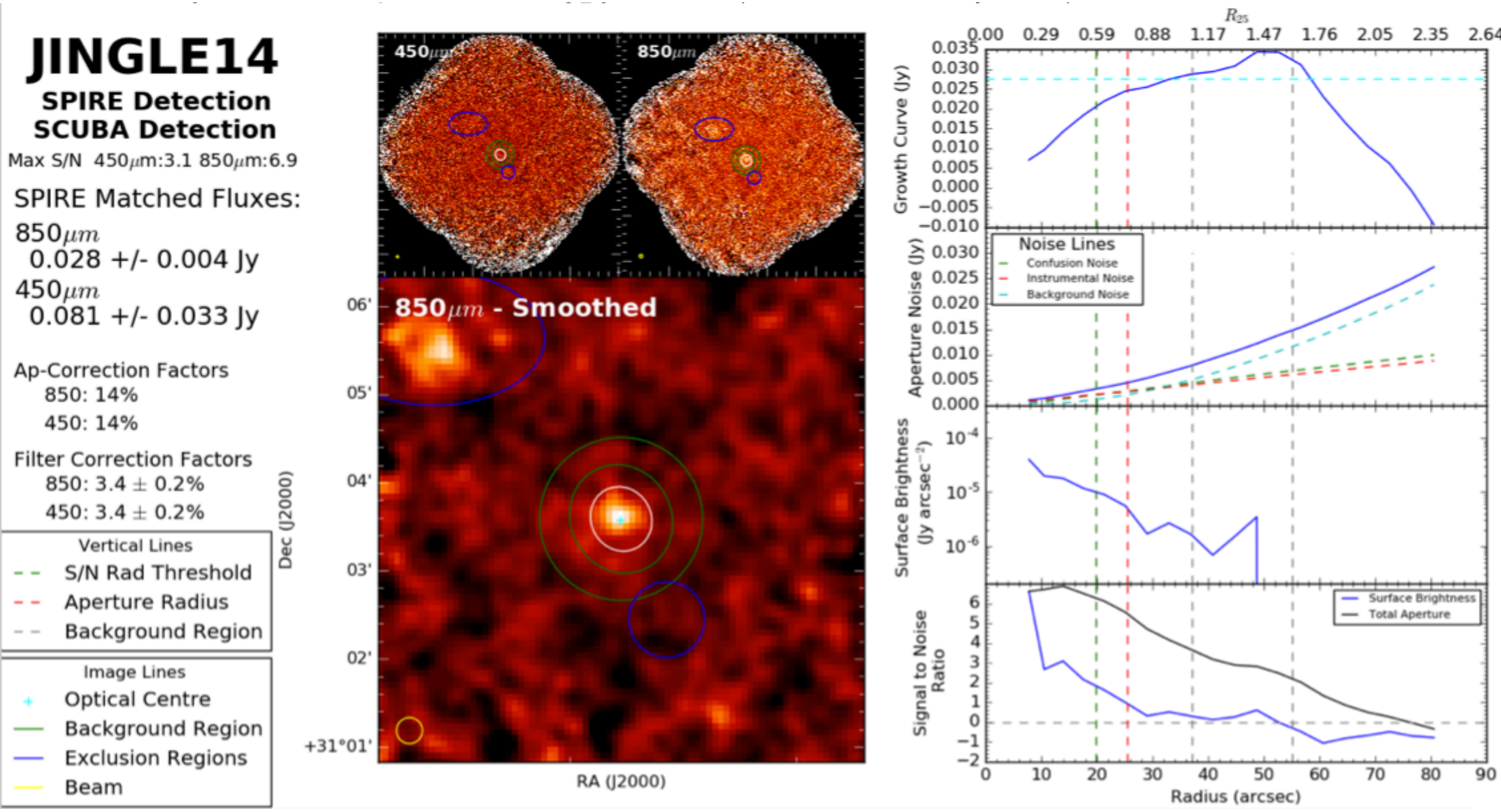
- ✧ **106 galaxies with SCUBA-2 observations.**
- ✧ **34 galaxy with RxA observations so far.**



Credit: Matthew Smith

JINGLE: status of Scuba2 data reduction

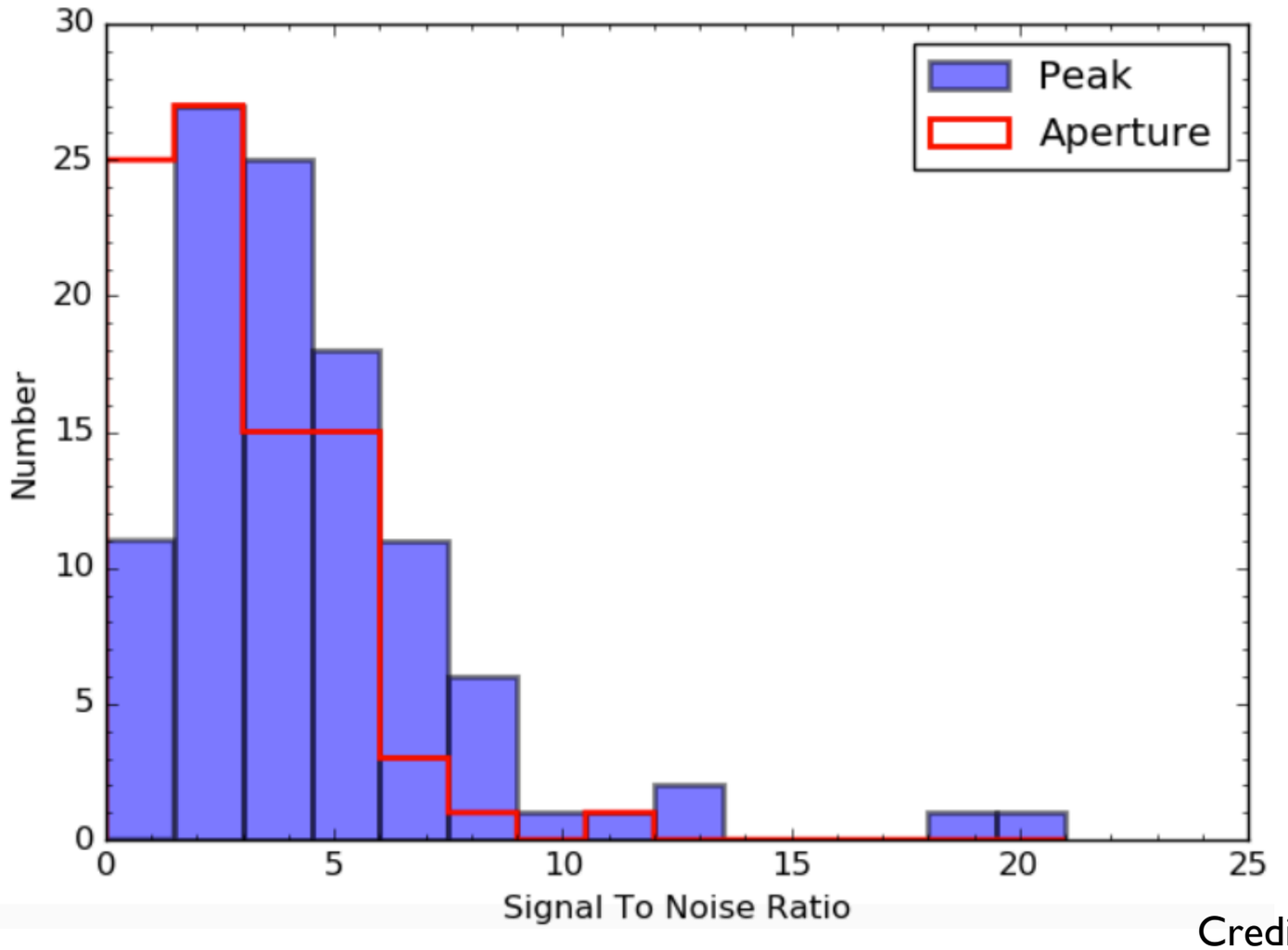
- all maps have been processed using the modified skyloop script (including 450 micron maps)
- uncertainty of 7% on the SCUBA-2 calibration remains



Credit: Matthew Smith

JINGLE: status of Scuba2 data reduction

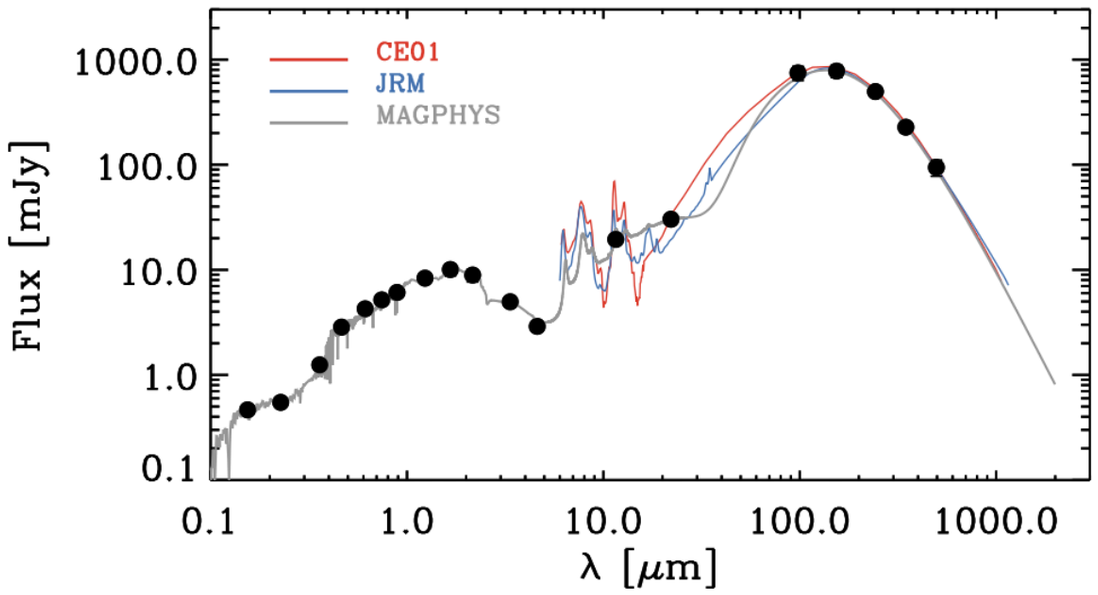
- all maps have been processed using the modified skyloop script (including 450 micron maps)
- uncertainty of 7% on the SCUBA-2 calibration
- S-to-N ratio mostly peaks around 3-5 sigma with a longer tail of higher S-to-N detections
- Detection rate ~ 70%



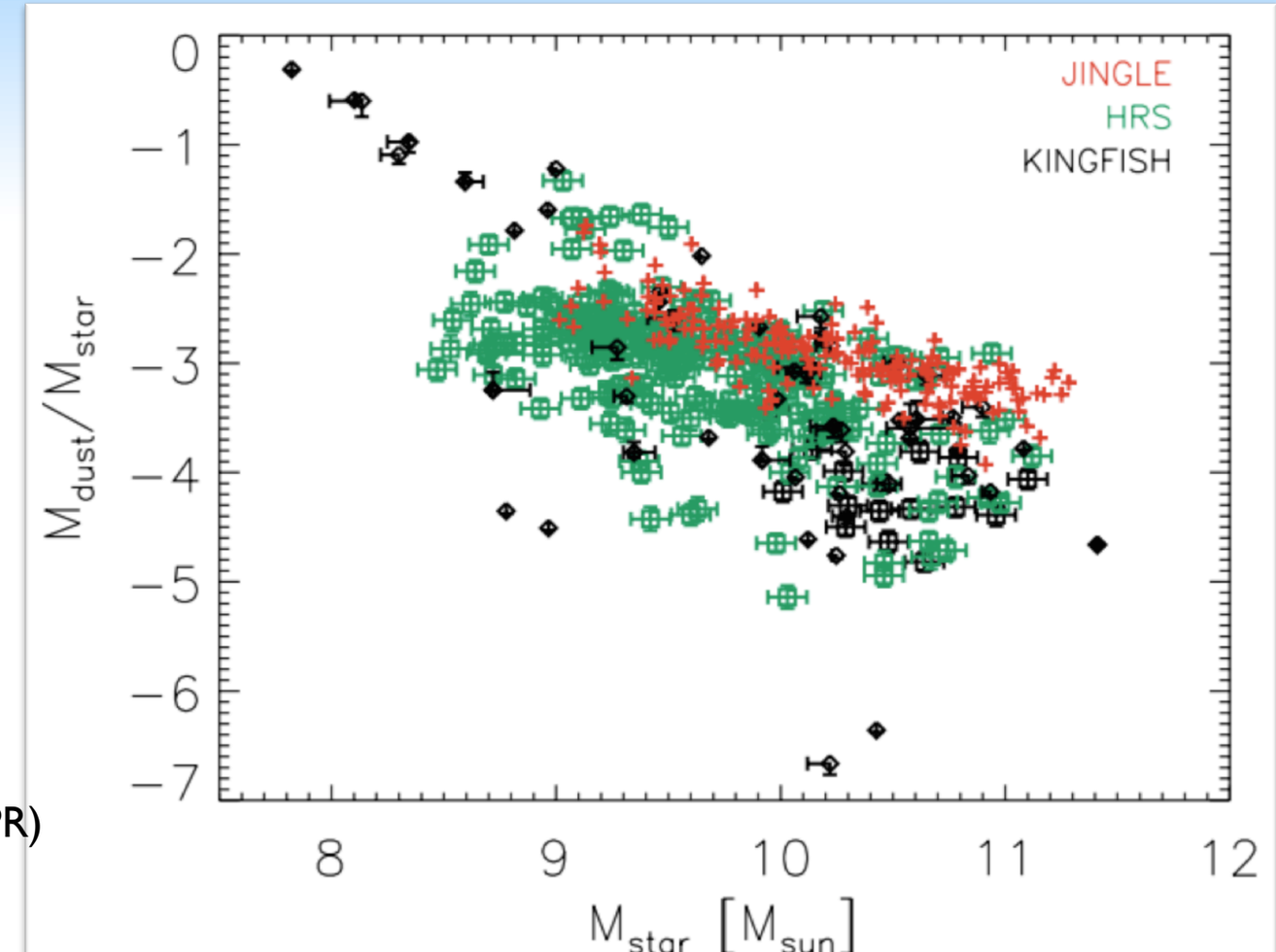
Credit: Matthew Smith

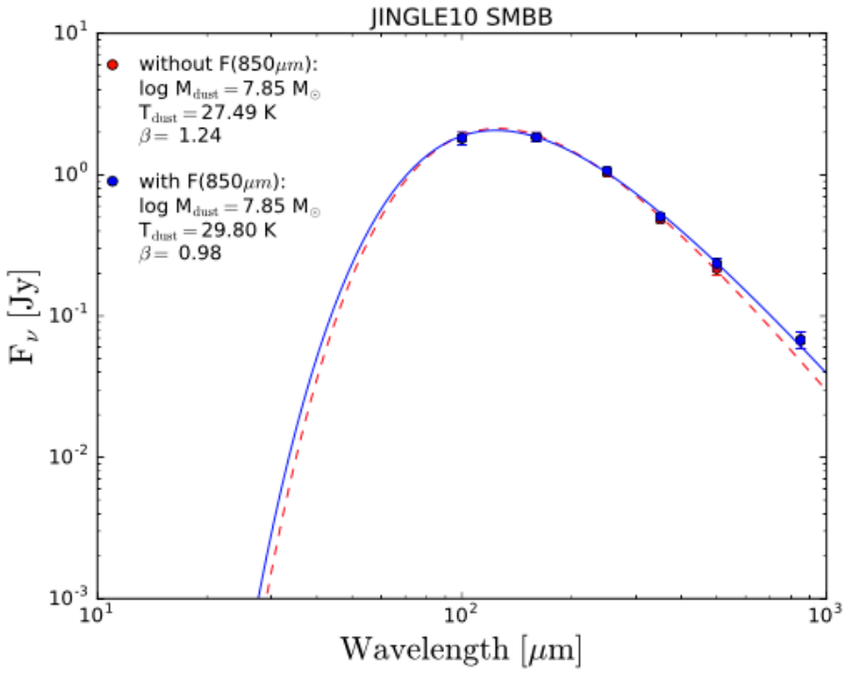
S/N

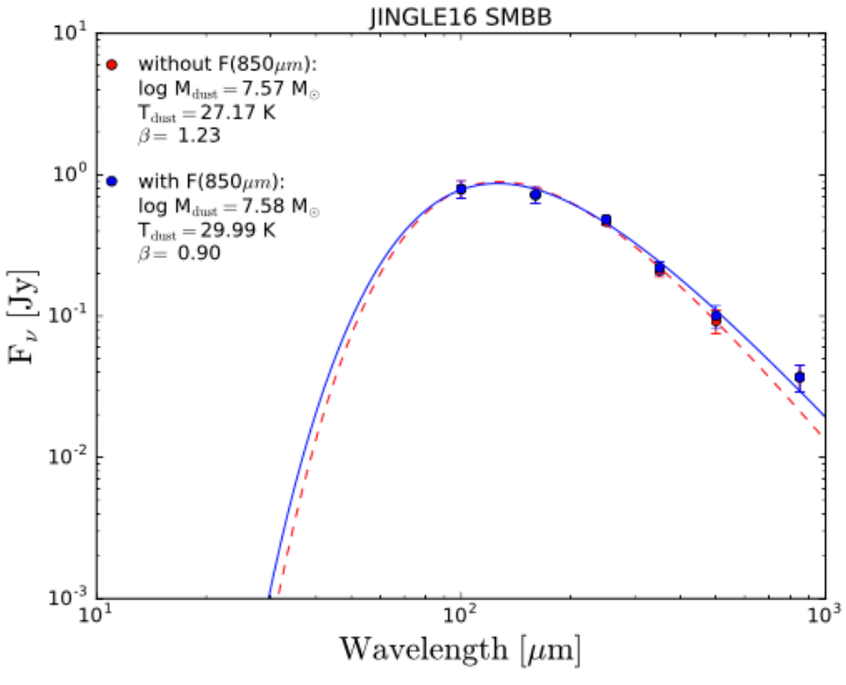
JINGLE: SED fitting results



Comprehensive Adjustable Aperture Photometry Routine (CAAPR) pipeline by C. Clark



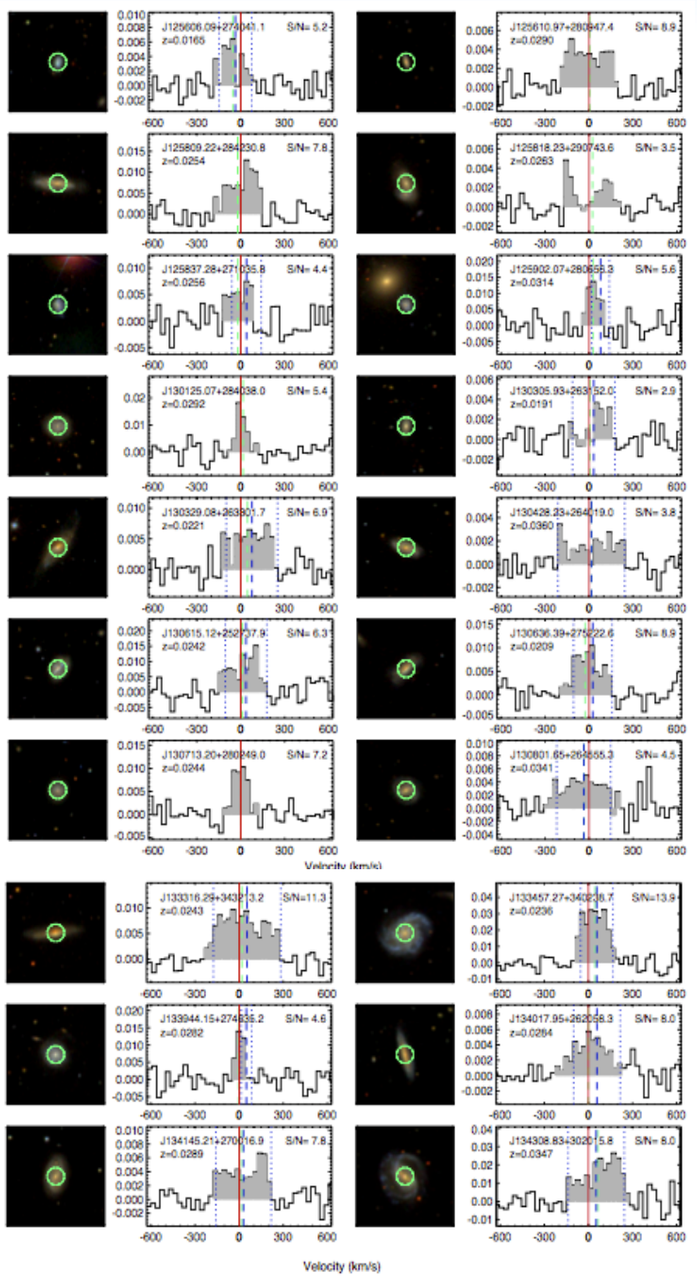


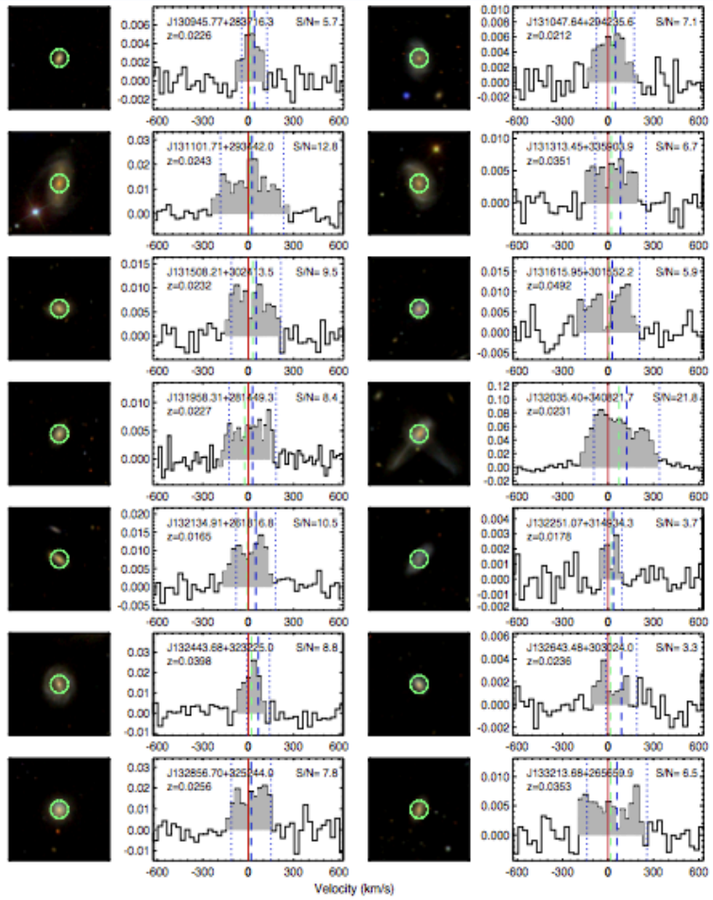


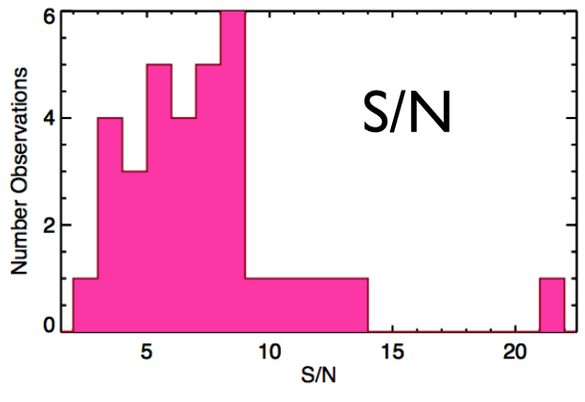
Credit: I. De Looze

Comparison between SED fitting w/o 850um data.

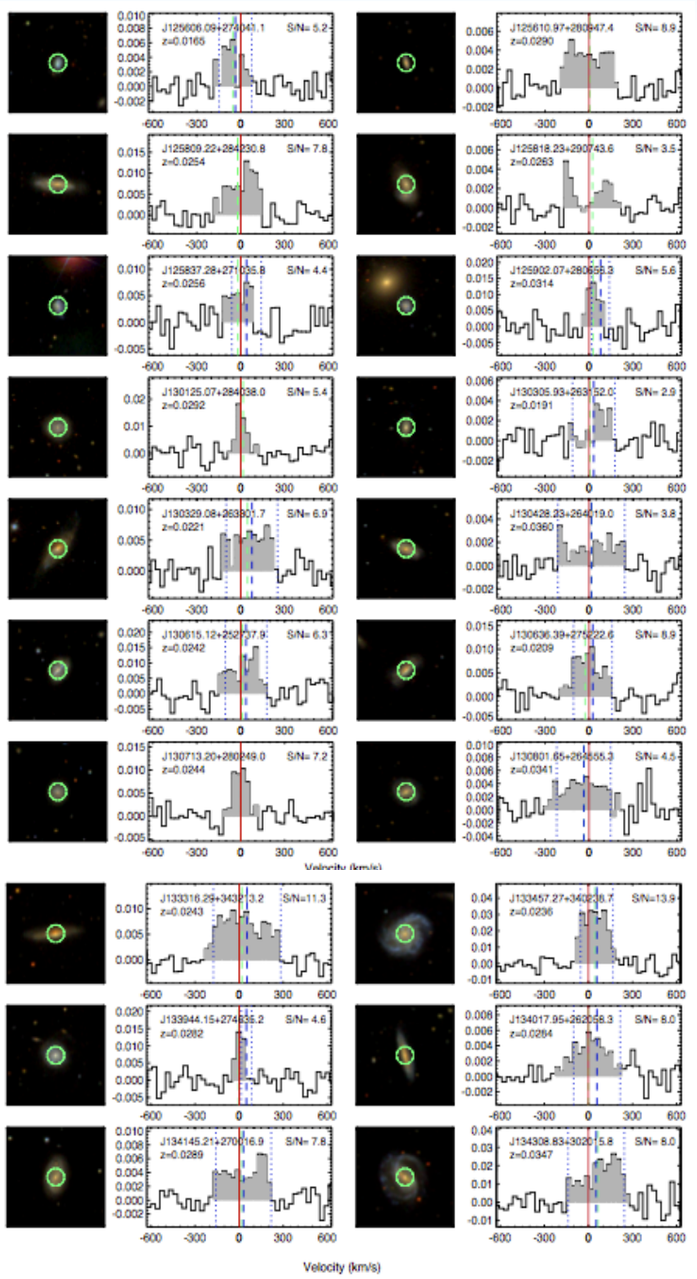
SDSS images and CO spectra

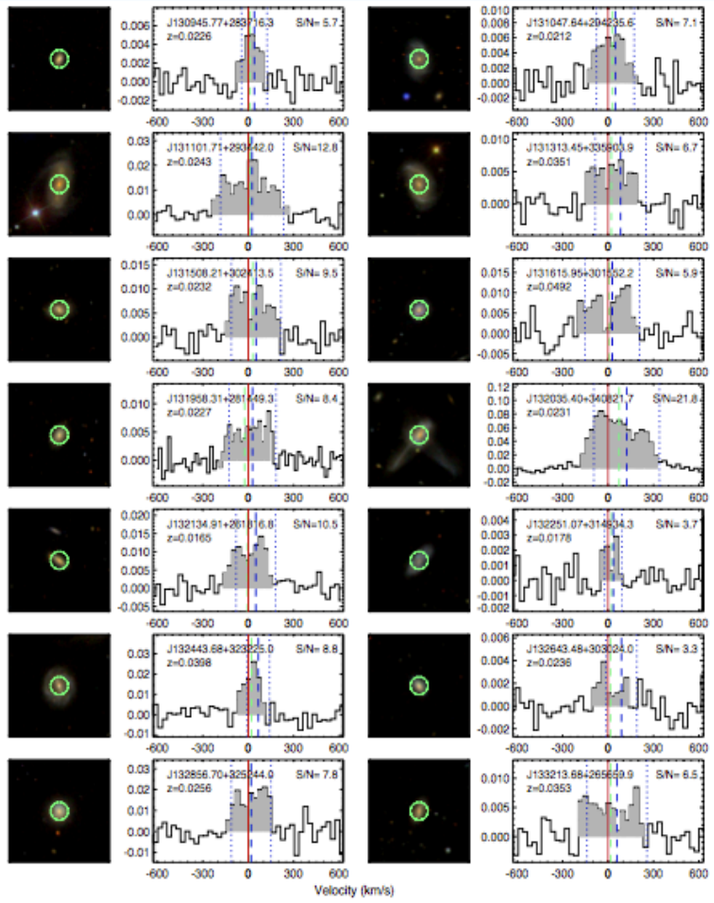


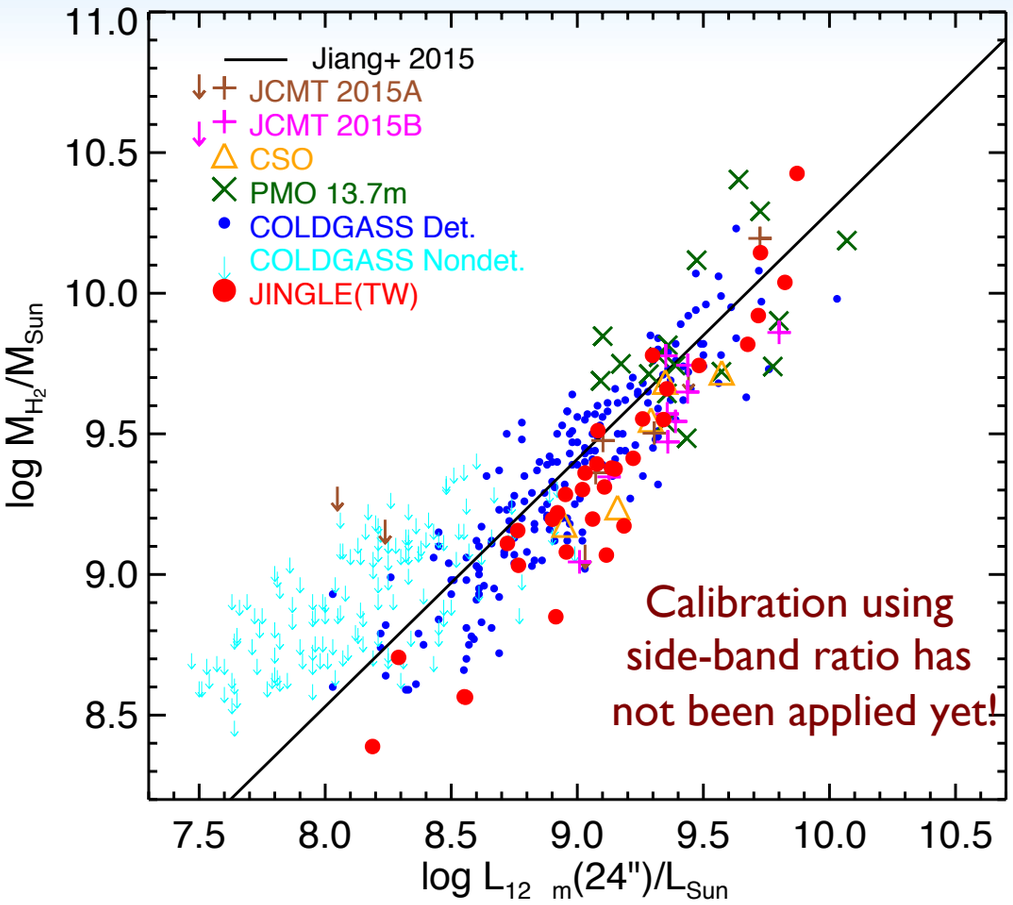


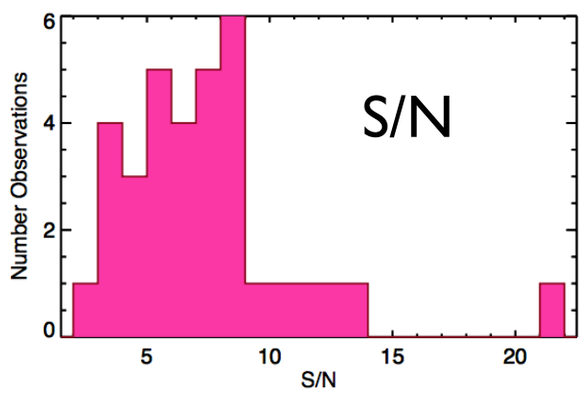


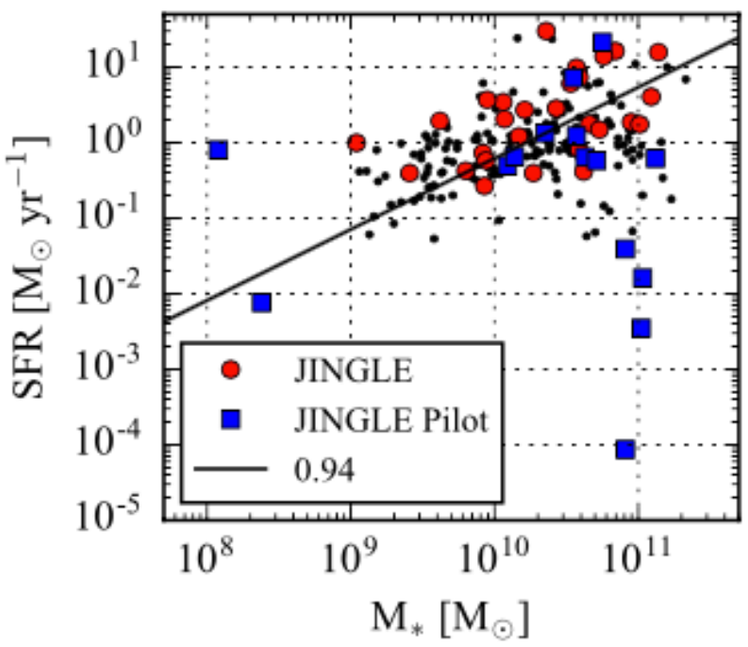
SDSS images and CO spectra

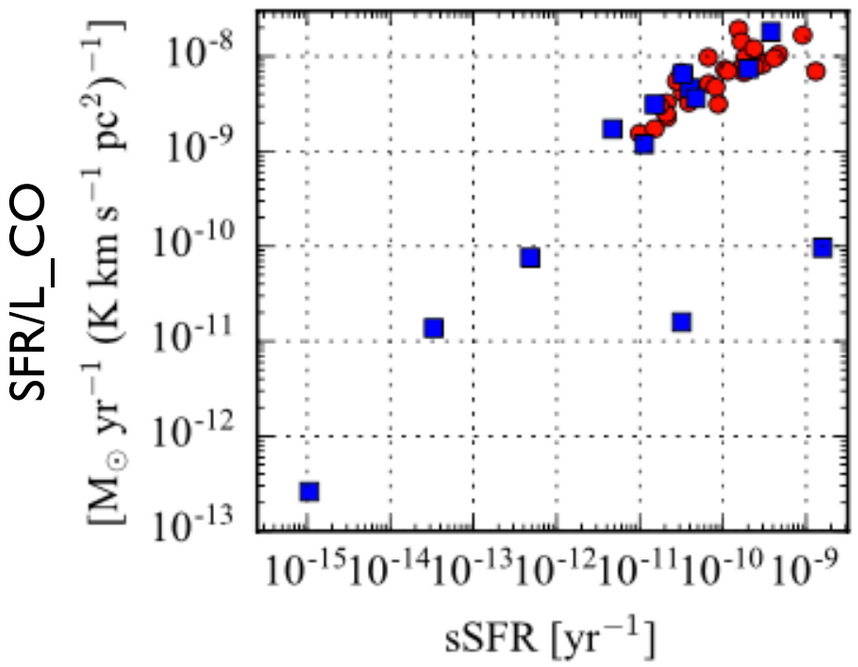












See more in Hsi-An Pan's poster!

JINGLE: Team structure

- 102 members from all JCMT partner regions.

- Open enrolment is closed, but we still welcome to the team students and postdocs working with faculty members who are full JINGLE team members.

- Regional coordinators:

Canada: Chris Wilson (McMaster University), *wilson@physics.mcmaster.ca*
China: Ting Xiao (Shanghai Astronomical Observatory), *xiaoting@shao.ac.cn*
Japan: Tomoka Tosaki (Joetsu University of Education), *tosaki@juen.ac.jp*
Korea: Ho Seong Hwang (Korea Institute for Advanced Study), *hhwang@kias.re.kr*
Taiwan: Lihwai Lin (ASIAA), *lihwailin@asiaa.sinica.edu.tw*
UK: Amelie Saintonge (University College London), *a.saintonge@ucl.ac.uk*

JINGLE: Data Releases

- ✓ As part of the JINGLE DR1, we will make available this SCUBA-2 data reduction pipeline, which will benefit the JCMT community beyond the group interested in JINGLE science.

- ✓ All the SCUBA2 450 & 850μm reduced images and a catalog of the measured 850μm fluxes is available to the entire JINGLE team via the wiki.

- ✓ All the CO(2-1) fluxes measured for the JINGLE galaxies are already available to the team via the JINGLE wiki.

Early-science papers:

I. JINGLE survey overview, led by A. Saintonge [UK] & C. Wilson [CA]

II. RxA technical paper, led by T. Xiao [CN] & M. Sargent [UK]
Presentation of the RxA data, both from JINGLE itself and the various pilot programs.

III. SCUBA-2 technical paper, led by M. Smith [UK]
Summary of sample selection and observing strategy, data reduction (map making, source extraction, calibration), presentation of images and first data release of 850μm fluxes.

IV. Dust properties and scaling relations, led by I. De Looze & I. Lamperti [UK]
Presents a range of SED fitting methods used to extract dust properties. A catalog of these measurements is given; produce a first set of scaling relations between dust and other global galaxy properties (metallicity, stellar mass, SSFR,...).

Subsequent papers in plan:

(V) Role of environment: Using the SDSS group catalogues and other environment measures to assess how dust / gas properties of galaxies vary as a function of environment. Paper led by A. Mok ([CA], PhD student).

(VI) JINGLE as a blind survey for rare objects An analysis of the high-redshift background objects detected in the JINGLE SCUBA-2 images (see details above), using multi-wavelength information. Paper led by J. Greenslade ([UK], PhD student)

(VII) Starbursts and dust-obscured galaxies A detailed analysis of the molecular gas and dust contents of actively star-forming galaxies, based on JINGLE observations and those of PI project M16AP042. Paper led by M. Sargent [UK] & J. Chul Lee [KR].

(VIII) The dependence of the resolved SFR and stellar mass relation on the gas contents of galaxies A first analysis making use of the resolved information available from the MaNGA survey with the integrated gas measurements obtained as part of JINGLE. Paper led by Hsi-An Pan & Lihwai Lin [TW].

(IX) A comparison of dust extinction derived from the optical IFU data from MaNGA and the dust emission constraints from SCUBA-2 + Herschel This project will allow us to study the dust energy balance in JINGLE galaxies and put better constraints on the star-dust geometry and dust grain properties. Paper led by Ilse De Looze [UK].

Lessons learned so far:

- Scuba2 flux/noise estimates, less detections than expected.

- the problem was that we should not have used point source processing to estimate the time required for extended sources. If one can't use point source processing, the noise goes up by a factor of 2.

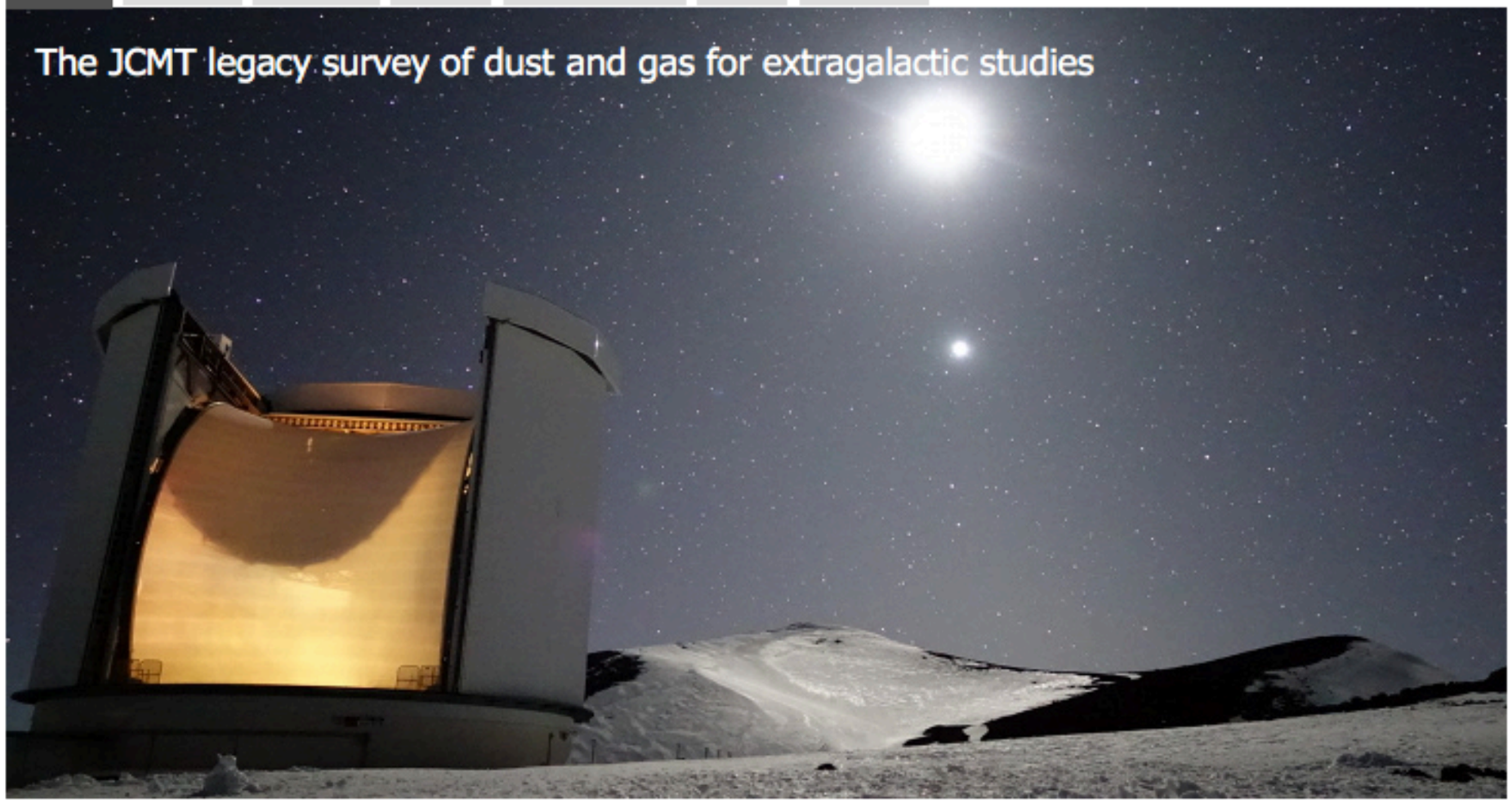
- Unresolved issues with the RxA calibration. Side-band ratio as a function of LO or observed frequency?

JINGLE public website will be online soon!

JINGLE | JCMT | EAO | Team Wiki

JINGLE

Home | Survey | Science | Team | Publications | Data | Contact



Studying the cold interstellar medium of galaxies

JINGLE is a large programme ongoing at the James Clerk Maxwell Telescope (JCMT) and aimed at establishing a detailed understanding of the cold gas and dust contents of galaxies in the local universe. By benchmarking relations between the cold dusty interstellar medium and global galaxy properties, JINGLE opens up new possibilities for the study of galaxy evolution in the near and distant universe.

News

Feb. 3, 2017

JINGLE observations are now 35% complete!

James Clerk Maxwell Telescope
East Asian Observatory

Thank You!