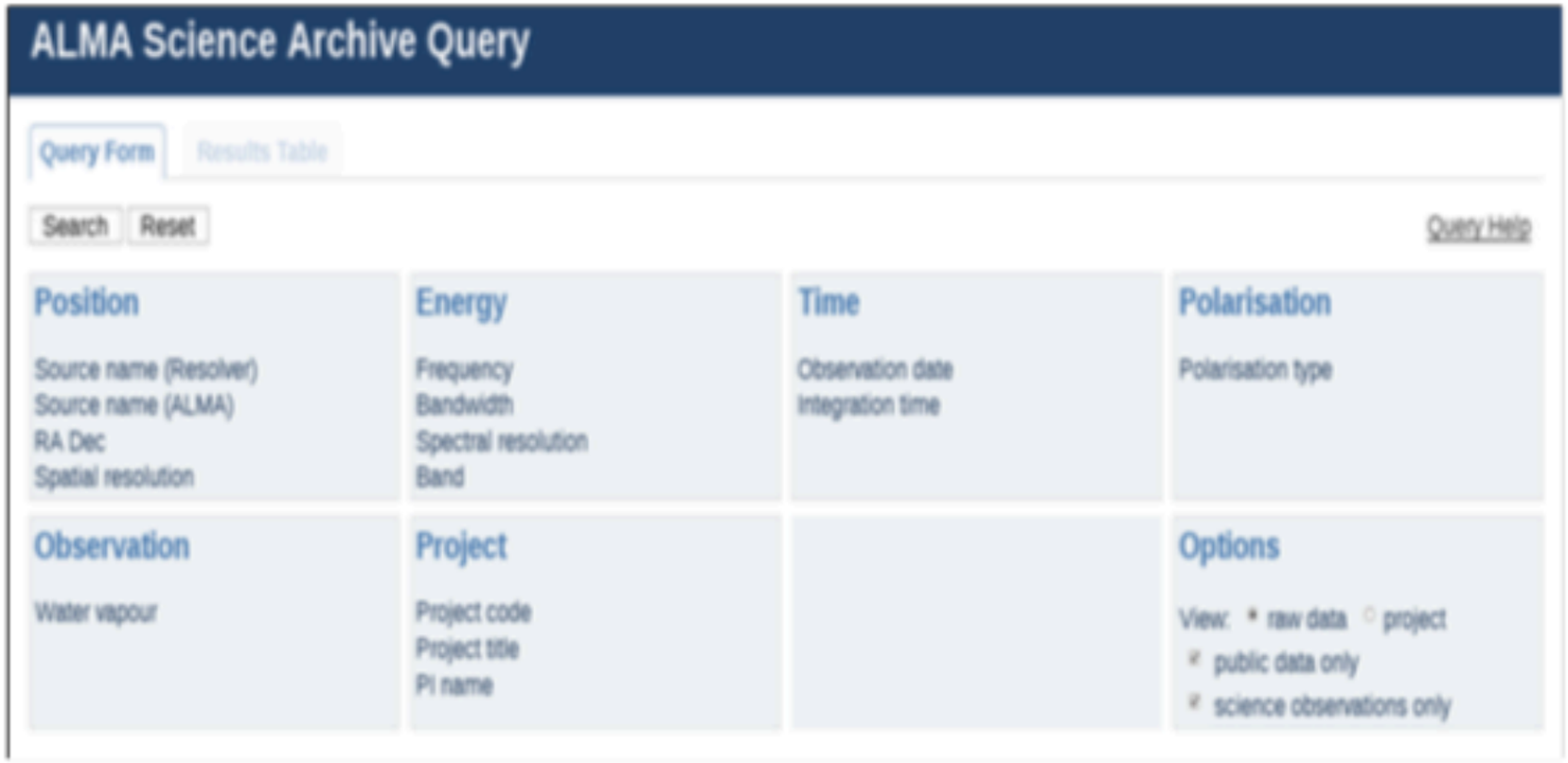

Using the ALMA Science Archive data

Ji-hyun Kang
(KASI)

Ref : EU Archive science file

Reasons to use archived data

- Check if data are already available for a target
- Check the feasibility of a project looking for similar targets
- Retrieving information on a large sample of objects (e.g. statistics of populations, stacking, …)
- Retrieving information on a single object but with different configuration (e.g. multifrequency studies) or in different epochs (e.g. variability studies)
- Extracting unpublished information from existing data (e.g. finding additional spectral lines, targets in the same region/time of other observations,)
- **For ALMA in particular avoid the stress of competition and oversubscription**

	Proposal submission	Archive mining
Time to get data	✖	✚
Amount of data	✖	✚
Data homogeneity	✚	✖
Adherence to idea	✚	✖

The Astrophysical Journal, 822:36 (12pp), 2016 May 1 doi:10.3847/0004-637X/822/1/36

ALMACAL I: FIRST DUAL-BAND NUMBER COUNTS FROM A DEEP AND WIDE ALMA SUBMILLIMETER SURVEY, FREE FROM COSMIC VARIANCE

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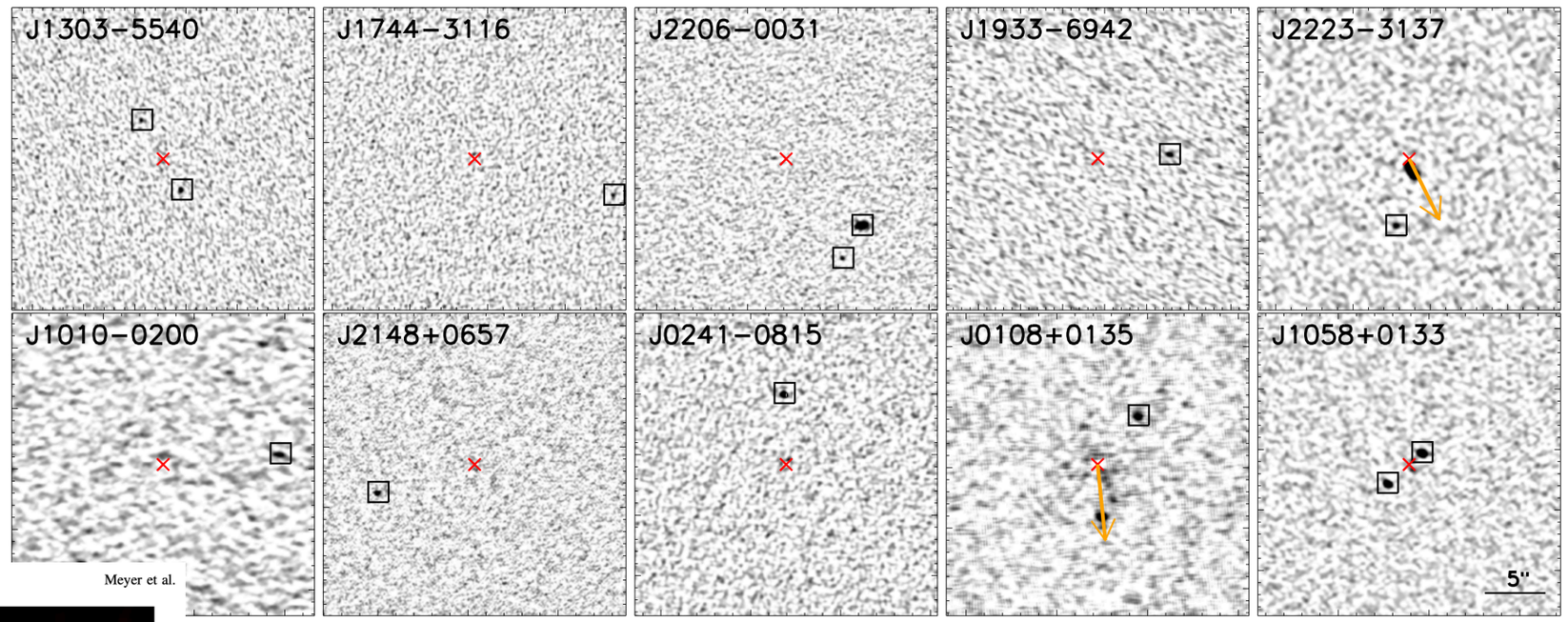
ABSTRACT

We have exploited ALMA calibration observations to carry out a novel, wide, and deep submillimeter (submm) survey, ALMACAL. These calibration data comprise a large number of observations of calibrator fields in a variety of frequency bands and array configurations. By gathering together data acquired during multiple visits to many ALMA calibrators, it is possible to reach noise levels which allow the detection of faint, dusty, star-forming galaxies (DSFGs) over a significant area. In this paper, we o
We have analyzed data for 69 calibrators, reaching depths of
conservative approach based on $\geqslant 5\sigma$ detections, we have 1
respectively, with flux densities $S_{1.2\,\mathrm{mm}} \geqslant 0.2$ mJy. The fair
deepest *Herschel* surveys. Our cumulative number counts h
1.2 mm from a sparse sampling of the astronomical sky, and a
are lower than reported previously by a factor of at least 2×
DSFGs with redshifts determined via the detection of submm
morphological studies of very faint DSFGs—representat
conventional submm galaxies—in fields where self-calib
resolution.

Key words: galaxies: evolution – galaxies: high-redshift – ga



mages of the 13 DSFGs detected around calibrators (represented by the black squares). The calibrators lie at the center of each map, represented by have been subtracted in the *uv* plane, using point-source models, prior to imaging. Orange arrows indicate the jets emanating from the calibrators, band-3 imaging and flux density ratios (see details in the main text). These are 870 μm (ALMA band-7) images, except in the two cases where are available, shown prior to the correction for PB attenuation. For J0108+0135 we also use the ALMA band 6 image in order to show 38.75+013455.9, part of the jet emanating from the calibrator. Each image is 25″ on each side (∼1.5× the FWHM of the band-7 PB). The jet e calibrator, J2223−3137, is clearly visible. N is up; E is to the left.

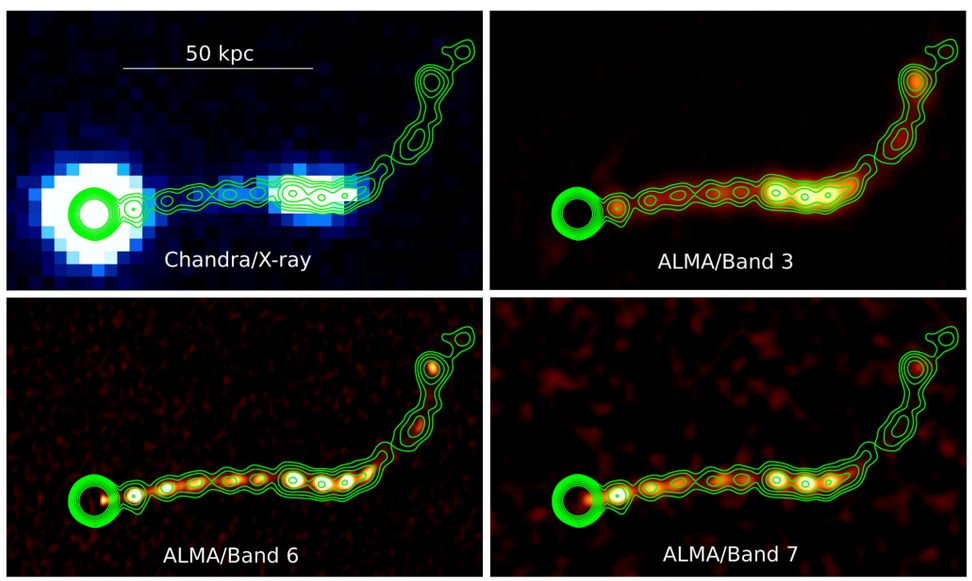


Figure 1. Top left: an archival *Chandra* X-ray image of PKS 0637−752 with 17 GHz radio contours (Godfrey et al. 2012) overlaid. The same contours are shown in all four images. The other panels show the ALMACAL program images (uncorrected for primary beam) for PKS 0637−752 in bands 3, 6, and 7. In the ALMA imaging, the core has been subtracted to allow for higher contrast in the fainter knots. Primary-beam correction was applied before measuring individual knot fluxes.

AGN Torus Detectability at Submillimeter Wavelengths: What to Expect from ALMA Continuum Data

Show affiliations

Pasetto, Alice; González-Martín, Omaira; Esparza-Arredondo, Donaji; Osorio-Clavijo, Natalia; Victoria-Ceballos, César Ivan; Martínez-Paredes, Mariela

X-ray and the radio fundamental plane scaling relations. We find that it is more likely to detect bigger and denser dusty tori at the highest ALMA frequency (666 GHz/450 μm). We also find that with 1h at 353 GHz/850 μm and 10h at 666 GHz/450 μm we can detect, with a high detection limit, a 1 mJy torus (characteristic of bright AGN).

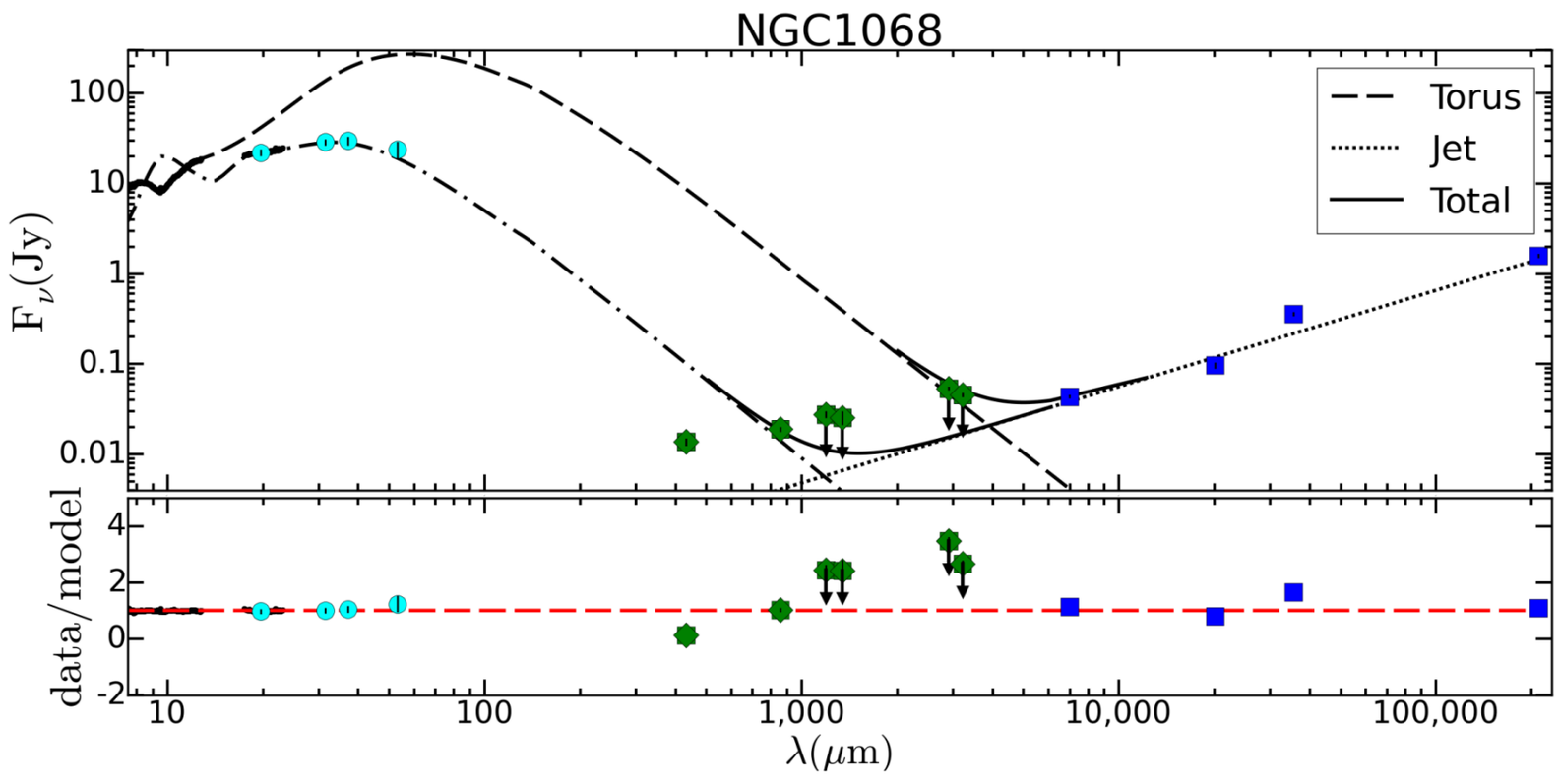


Figure 9. SED fit for NGC 1068 to the mid-IR spectra (black spectrum) with the torus model (long-dashed and dot-dashed lines show the fit to the N- and Q-band respectively, see text) and to the cm wavelengths (blue points) with synchrotron emission (dotted line). Cyan circles are the SOFIA data points. Green stars are sub-mm and far-infrared data. Arrows indicate plausible upper limits when the spatial resolution is worse than 0.3″ (see text). Note that residuals for the sub-mm data are computed using the Q-band mid-IR fit to the torus together with the VLA fit to the jet.

T-ReCS/Gemini,
SOFIA
ALMA,
JVLA

Data structure

Sensitivity goals are defined on SG basis

Science goal:
Sources in the same sky region that share the same calibration, spectral setup and PI requests

OUS= Observing Unit Set
Smallest unit for data processing

A **Group** can contain several configurations to be combined in data processing (e.g. several arrays), each of them is a Member.
Now for ALMA there is 1 Group/SG

A **Member** can contain multiple executions of Scheduling Blocks.
It is the minimum scheduling entity.
Pipeline operates at this level

The **Scheduling Block** is the smallest entity used for observing

Each repetition of a SB is an **Execution Block**

Data Quality Assessment

The goal of ALMA Quality Assurance (QA) is to deliver to the PI a reliable final data product that has reached the desired control parameters outlined in the SG, that is calibrated to the desired accuracy and free of calibration or imaging artifacts
i.e. ALMA performs **science-goal-oriented service data analysis**

ALMA QA happens on 4 levels:

QA0: near-real time verification of weather and hardware issues carried out on each execution block immediately after the observation.

QA1: verification of longer-term observatory health issues like absolute pointing and flux calibration.

QA2: offline calibration and imaging (using CASA) of a completely observed MOUS.

- Performed by expert analysts with the help of a semi-automatic procedures, based on common practice.
- Calibration can be “Manual” or based on the “Pipeline”
- Imaging so far is always manual (partially depends upon the analyst “taste”)
- It is limited to verify the achievement of the PI requests for each MOUS (do not even consider other data possibilities)
- Results are archived and given to the PI.

QA3: (optional) PIs may request rereduction, problem fixes, possibly reobservation

What is in the archive?

For each project the main deliverables are
Raw Data, Calibration Scripts and Tables

Users need to run the proper version of CASA to generate the Calibrated Data.
The resulting calibrated data is considered science-ready.

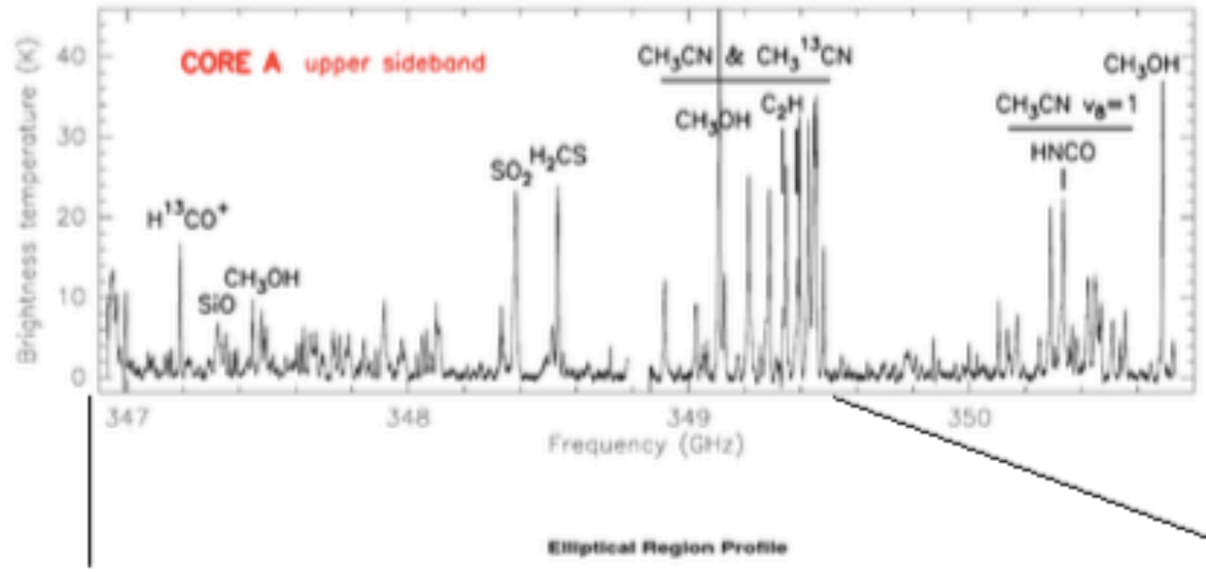
As a consequence of the process only data that passed QA2 (at least in part) are in the archive

Some Imaging Products are delivered too, as result of QA2 processing
(in Early Science provided on a best effort basis, not necessarily science-ready)
a) for Line Observations:
- continuum-subtracted (where needed) image cubes at the requested resolution
- a continuum image for all line-free channels (where possible)

b) for Continuum Observations:
- a continuum image combining all SPWs

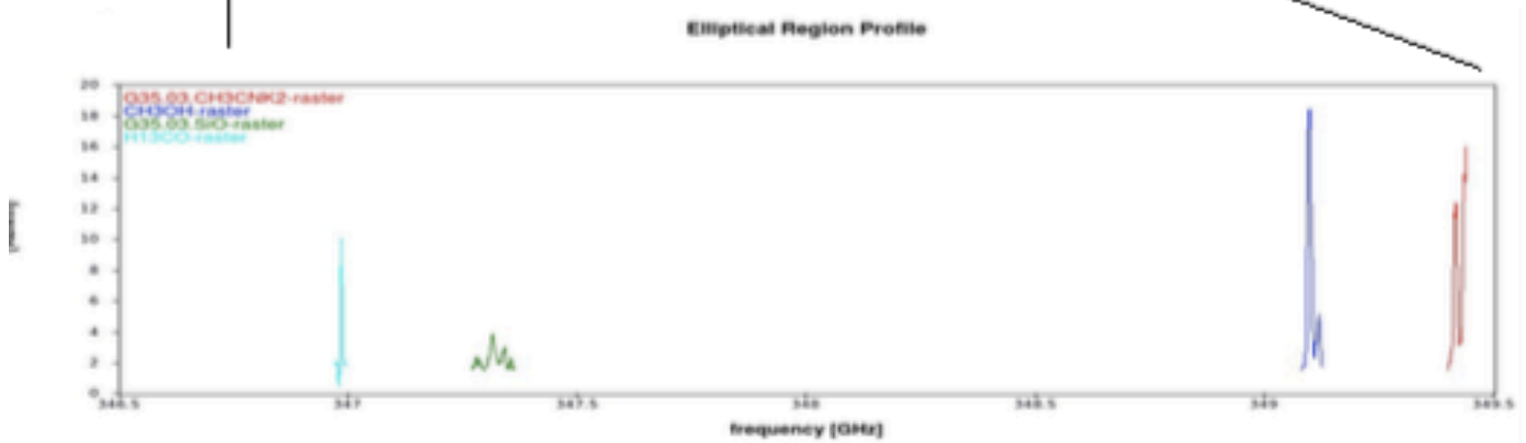
Images in the archive are provided as starting point on the way to obtain the final images and a valuable basis for archive researchers
(i.e. they are not considered science-ready!!!)

What is in the archive?

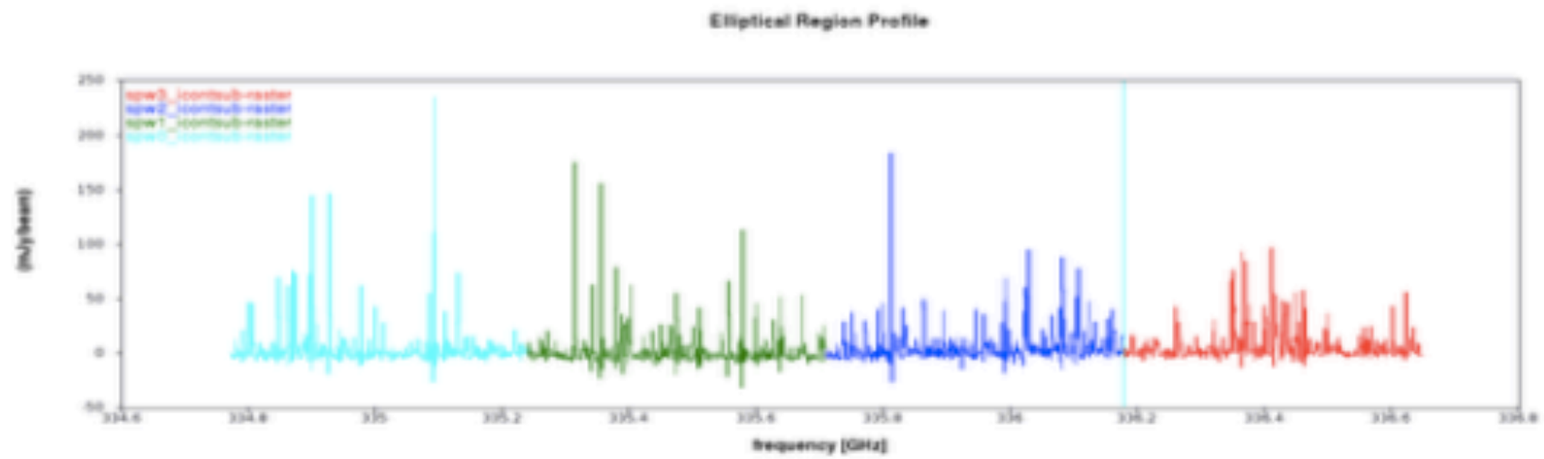


Images in the archive might cover only a fraction of the spectrum available

Spectrum observed
(and available in the raw data)



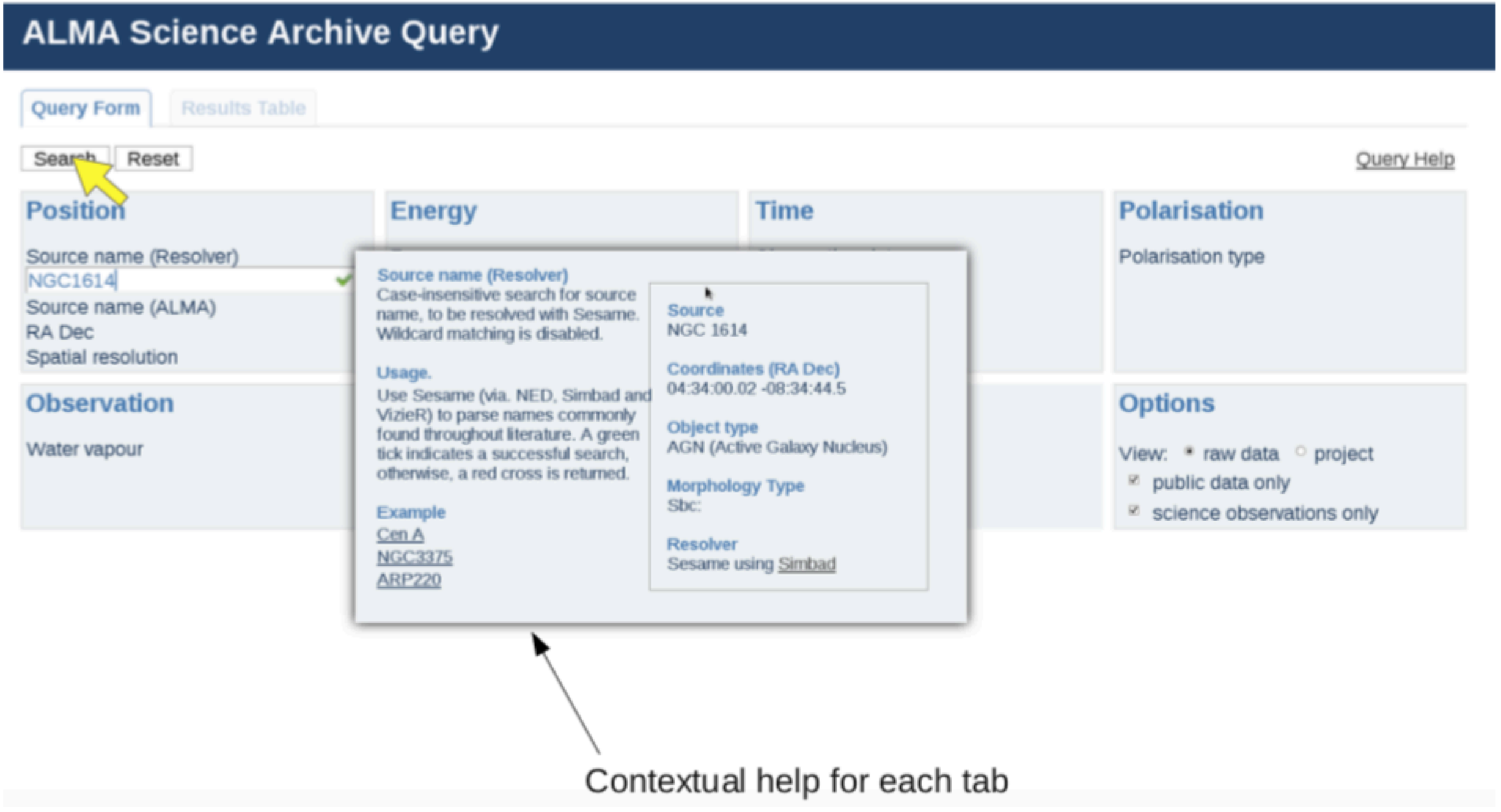
Imaged data for QA2



Different data and PI requests
on different sources
generate different products
In the archived images
but raw data contain the full
spectral windows

The ALMA archive: help

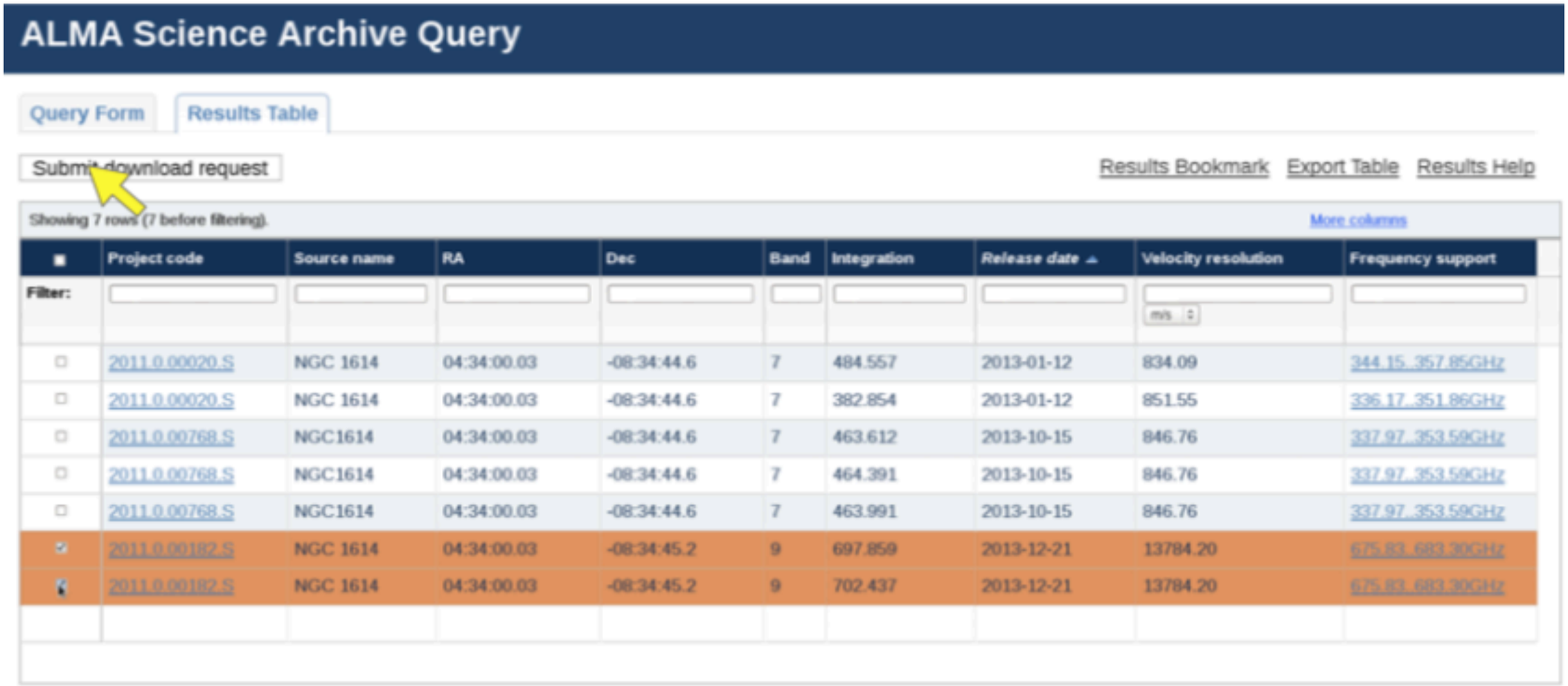
1) Search with the criteria you need and click Search



Contextual help for each tab

The ALMA archive: result table

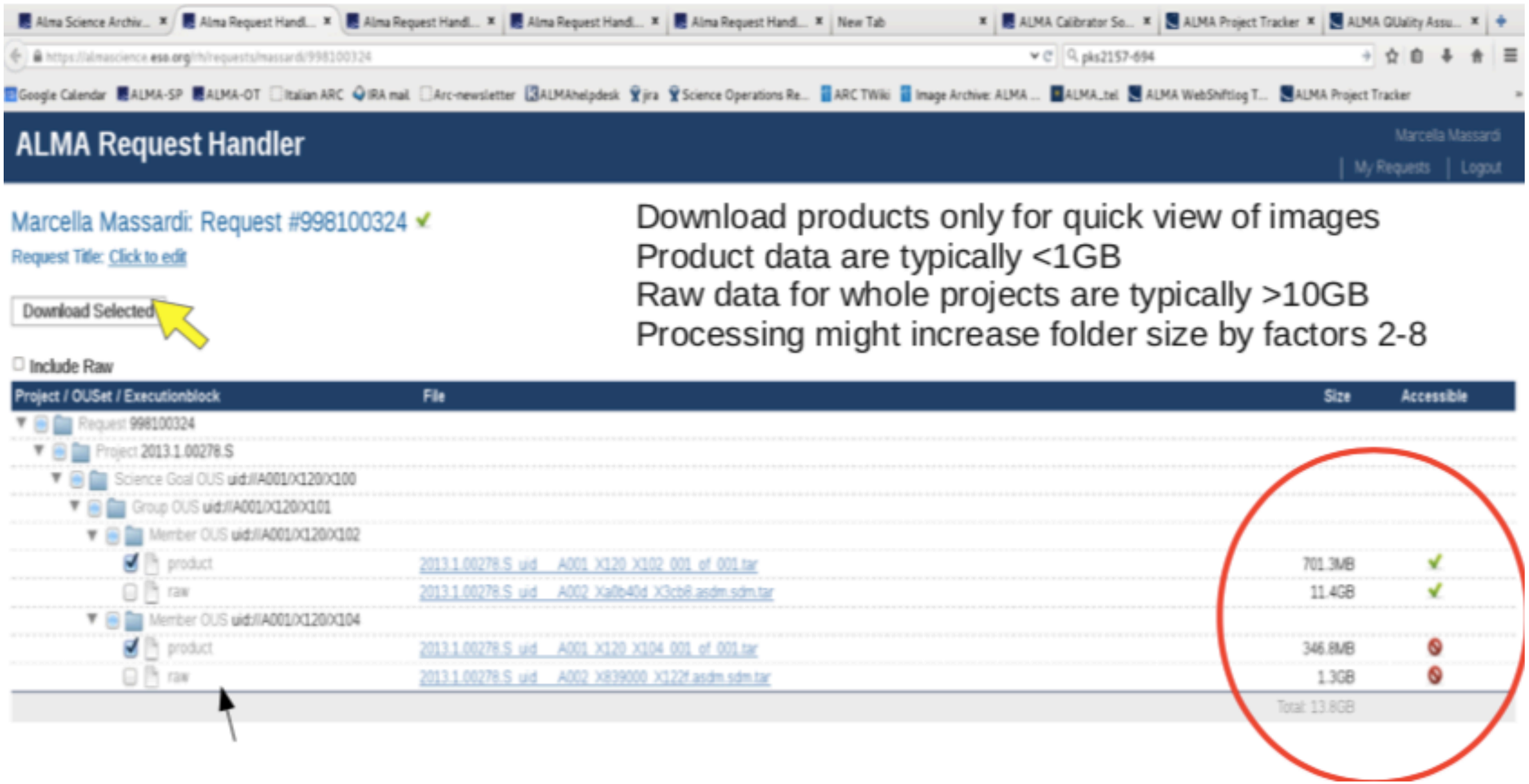
2) Select the project/execution blocks you need and click “Submit the download request”



The query runs on the raw data so returns one entry per target per Execution Block.
It is possible that for a project several rows are displayed for the same source.
Projects that contain many sources, many Sbs or mosaics might returns many lines.
Columns values are only indicative. Data structure can be more complex than what shown.

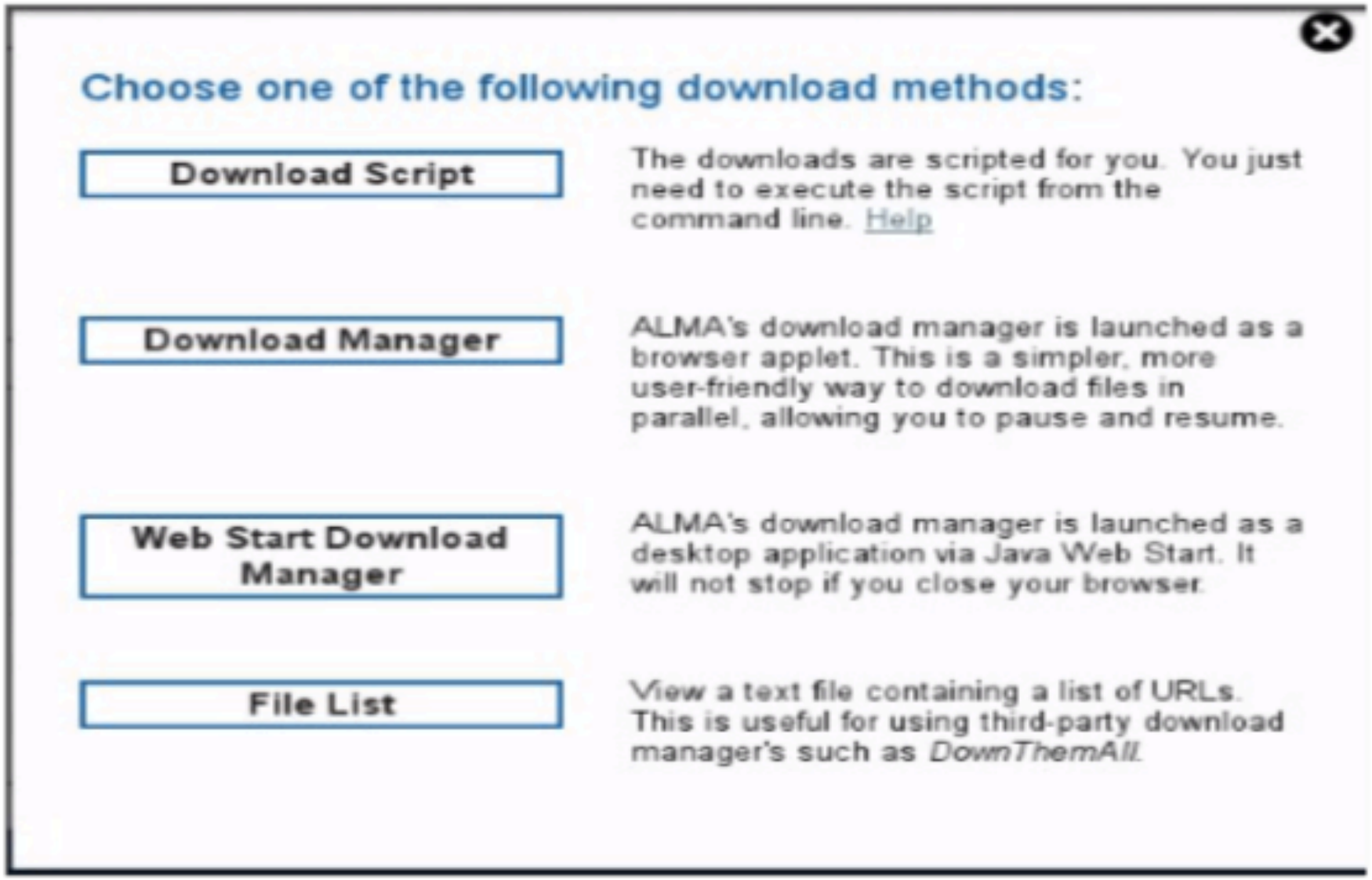
The ALMA archive: download manager

3) Select the data you want



The ALMA archive: download manager

4) Choose the download method



What is in the packages?

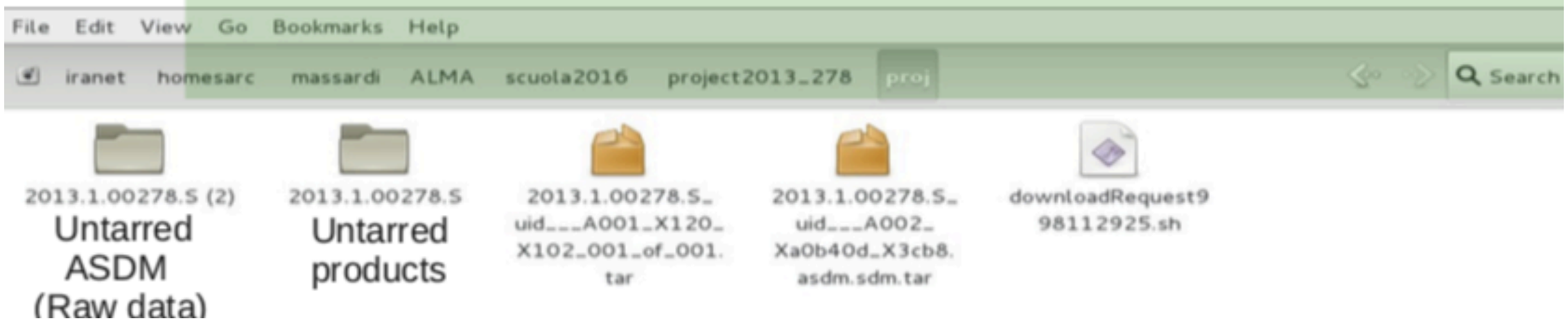
When untarred, the Product Package standard directory structure contains

Untarred products only

```
|-- project_id/
| |-- sg_ouss_id/
| | |-- group_ouss_id/
| | | |-- member_ouss_id/
| | | | |-- README .....important summary of the contents
| | | | |-- product/ .....all the imaging products as result of QA2
| | | | |-- calibration/ .....calibration and flagging tables
| | | | |-- qa/ .....diagnostic plots generated during QA2
| | | | |-- script/ .....the scripts necessary to regenerate the products
| | | | |-- log/ .....CASA log files from QA2 calibration and imaging
```

Untarred ASDM (raw data)

```
| | | | |-- raw/ .....for calibration move it in the products folder at the
                                                    right level  (follow the README)
```



Untarred ASDM (Raw data)

Untarred products

What to do after download?

```
[massardi@arcbl02 member.uid___A001_X120_X102]$ cd script/
[massardi@arcbl02 script]$ casapy-setup 42.2.30986-pipe-1-64b
[massardi@arcbl02 script]$ casapy --pipeline
...

CASA <2>: execfile('scriptForPI.py')
```

1) Untar the packages

2) Look at weblog and/or QA reports

3) Read the README file and follow the instructions: typically

- Launch the correct CASA (with pipeline) version in the script folder
- Run the “Script_for_PI” to generate the calibrated MS
- Run the “Script_for_Imaging” to regenerate the images

4) Edit the scripts where needed according to your purposes

What is in the packages?

After running the ScriptForPI.py

Down loaded data

```
|-- project_id/
| |-- sg_ouss_id/
| | |-- group_ouss_id/
| | | |-- member_ouss_id/
| | | | |-- README .....important summary of the contents
| | | | |-- product/ .....all the imaging products as result of QA2
| | | | |-- calibration/ .....calibration and flagging tables
| | | | |-- qa/ .....diagnostic plots generated during QA2
| | | | |-- script/ .....the scripts necessary to regenerate the products
| | | | |-- log/ .....CASA log files from QA2 calibration and imaging

| | | | |-- raw/ .....moved in the main folder from raw data download

| | | | |-- calibrated/ .....calibrated ms, flagging and calibration tables
```

New folder produced by script

Caveats

- **There are differences between cycles**
- **There are differences between pipeline and manual data reduction, calibration and imaging**
- **Images are not science-ready!!!**

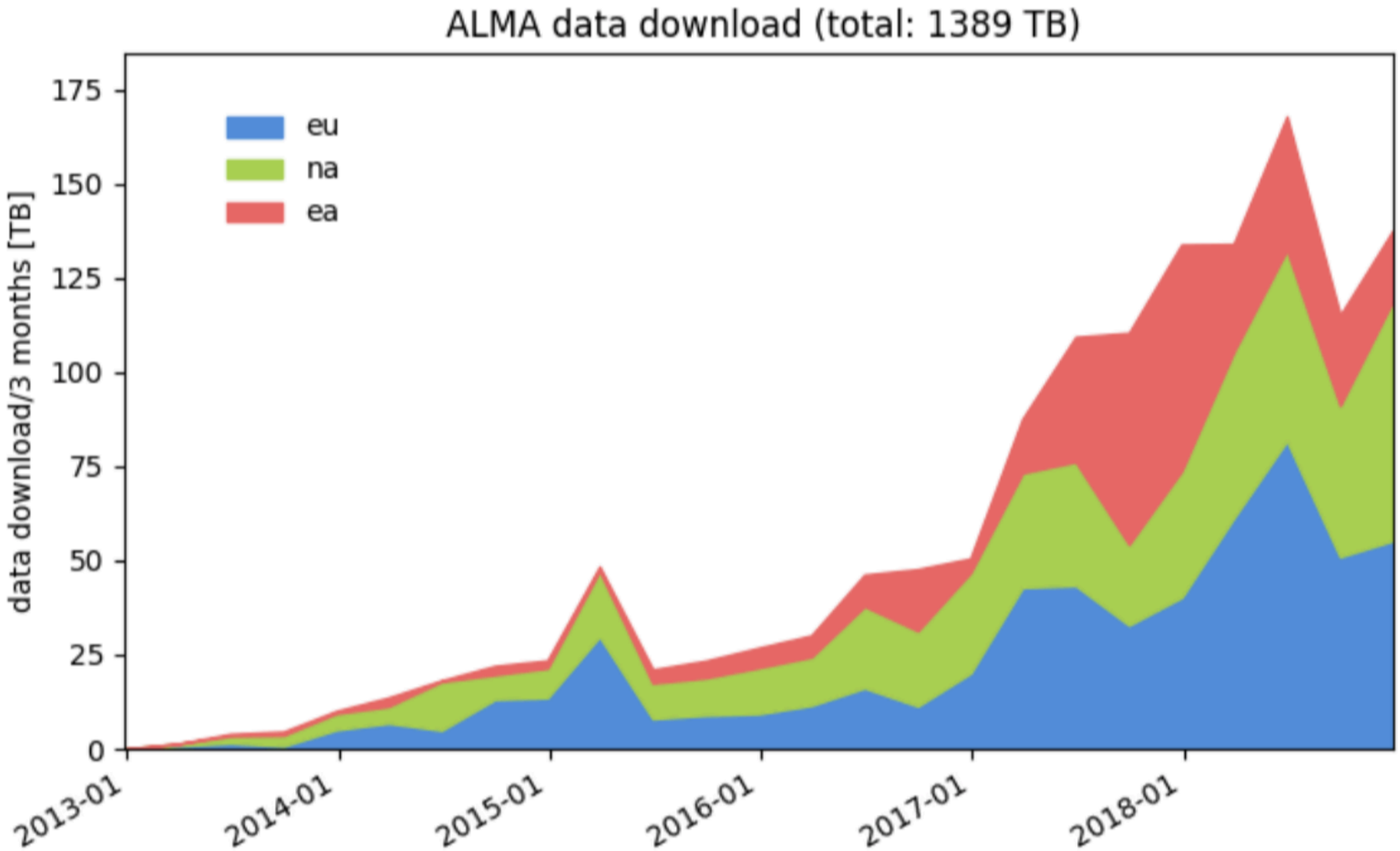
In publications with ALMA data!

Acknoweledgement Statement:

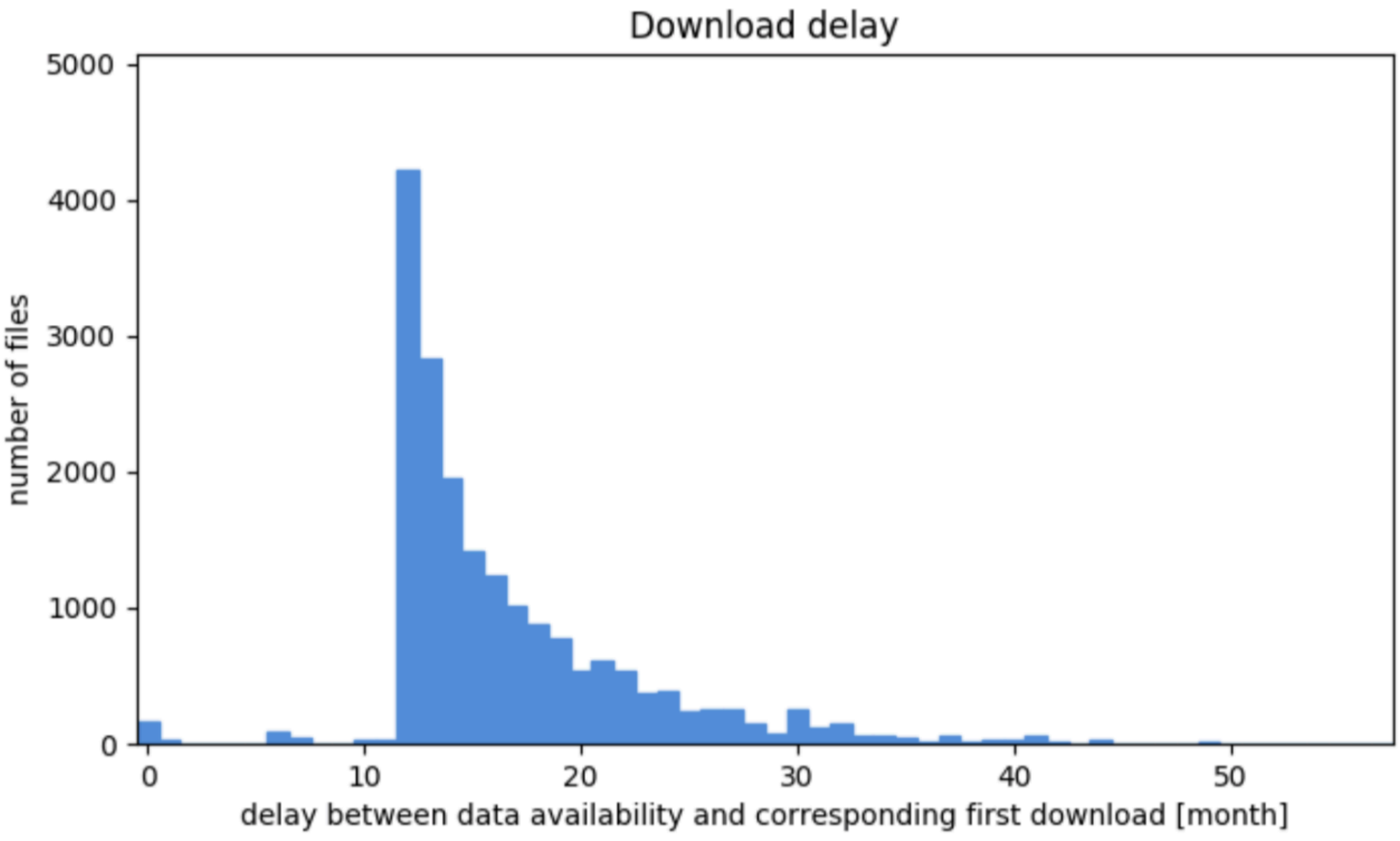
“This paper makes use of the following ALMA data: ADS/JAO.ALMA#2011.0.01234.S. ALMA is a partnership of ESO (representing its member states), NSF (USA) and NINS (Japan), together with NRC (Canada), NSC and ASIAA (Taiwan), and KASI (Republic of Korea), in cooperation with the Republic of Chile. The Joint ALMA Observatory is operated by ESO, AUI/NRAO and NAOJ.”

(Can be found in the SP, on the ‘ALMA-Data’ page or in the Archive)

ARC Evolution



Download Delay: after becoming public



Archive & JVO