

ALMA workshop

Nienke van der Marel

* Logan Francis

September 24 - 25th 2020

Friday lecture



University
of Victoria

Program Friday

- **Morning lecture (9-11 AM)**

- Using the ALMA archive (Nienke)
- Self-calibration (Logan)
- Interpretation and modeling (Nienke)
- Visibility curves disks (Nienke)
- Visibility analysis disks (Nienke)
- Frankenstein & Galario (Logan)



*Specific for
protoplanetary disks*

Program Friday

- Hands-on session (11-2.30 PM)
 - Self-calibration tutorial TW Hya
 - Galarío exercise

ALMA archive

- Often many datasets: figure out what you need

Observations (22) | Projects (13) | Publications (43)

Project code	ALMA source name	Ra	Dec	Sensitivity	Frequency	Release date	Publications	Ang. res.	Min. vel. res.	Array	Mosaic	Max. reco. scale	FOV	Scientific category	Science keyword
		h:m:s	d:m:s	mJy/beam				arcsec	km/s			arcsec	arcsec		
2011.0.00724.S	LkCa 15	04:39:17.801	+22:21:03.227	9	0.76	684.87..692.37GHz	2014-01-09	12	0.26	0.42	12m	2.39	8.46	Disks and planet forma...	Disks around low-mas...
2013.1.00226.S	lkca_15	04:39:17.806	+22:21:03.290	6	0.08	241.54..260.55GHz	2015-09-10	26	0.45	0.14	12m	3.97	23.19	ISM and star formation	Low-mass star formati...
2012.1.00170.S	LkCa_15	04:39:17.806	+22:21:03.285	7	0.07	329.21..343.00GHz	2015-11-15	2	0.19	0.11	12m	1.80	17.32	Disks and planet forma...	Disks around low-mas...
2012.1.00810.S	LkCa_15	04:39:17.806	+22:21:03.285	7	0.07	334.01..347.99GHz	2015-12-02	2	0.20	0.11	12m	1.89	17.08	Disks and planet forma...	Disks around low-mas...
2013.1.00226.S	lkca_15	04:39:17.806	+22:21:03.285	6	0.09	216.08..235.17GHz	2016-09-16	26	0.41	0.16	12m	4.47	25.82	ISM and star formation	Low-mass star formati...
2015.1.00657.S	lkca15	04:39:17.807	+22:21:03.265	7	0.03	275.21..290.96GHz	2017-03-14	2	0.96	1.17	12m	8.95	20.57	Disks and planet forma...	Disks around low-mas...
2015.1.00657.S	lkca15	04:39:17.807	+22:21:03.255	7	0.04	302.06..317.81GHz	2017-12-29	2	0.53	1.07	12m	5.18	18.79	Disks and planet forma...	Disks around low-mas...
2015.1.00657.S	lkca15	04:39:17.807	+22:21:03.255	7	0.03	283.46..299.20GHz	2017-12-29	2	0.56	1.14	12m	5.38	19.99	Disks and planet forma...	Disks around low-mas...
2015.1.00657.S	lkca15	04:39:17.807	+22:21:03.255	7	0.05	298.31..314.06GHz	2017-12-30	2	0.60	1.08	12m	6.00	19.02	Disks and planet forma...	Disks around low-mas...

Sensitivity Release date Resolution

Hover mouse on program number:
Abstract proposal

Hover mouse on Frequency:
Spectral setup

Project title
The origin of transitional disks: grain growth or dynamical clearing by planets?

PI name
Perez, Laura

Proposal abstract
Most young, low mass stars are surrounded by optically thick accretion disks. A small fraction of these stars show a remarkable depletion of dust in the inner disk regions. These so-called "transition disks" are thought to represent a brief, but extremely important, evolutionary phase between young, optically thick protoplanetary disks and old, optically thin debris disks. A number of mechanisms have been proposed to deplete the inner regions of transition disks, including grain growth, photo-evaporation by the central star, and dynamical clearing by a recently formed planet. Observationally, distinguishing between these mechanisms has been difficult up to now. In this proposal, we request time with ALMA to image a subset of transition disks with large inner holes, large disk masses, and high accretion rates, that likely originate by either grain growth or dynamical clearing by a planetary object. ALMA's exquisite sensitivity and high angular resolution, already available in Early Science, can resolve the inner disk and detect

↑ Frequency	Resolution	Sensitivity 10Km/s	Sensitivity native	Pol. Product	Type
↔ 329.21..329.45GHz	122.07kHz	1.19mJy/beam@10km/s	0.26uJy/beam@native	XX YY	line
↔ 330.50..330.74GHz	122.07kHz	1.50mJy/beam@10km/s	0.33uJy/beam@native	XX YY	line
↔ 339.02..341.00GHz	31250.00kHz	1.49mJy/beam@10km/s	0.11uJy/beam@native	XX YY	continuum
↔ 341.02..343.00GHz	31250.00kHz	1.49mJy/beam@10km/s	0.11uJy/beam@native	XX YY	continuum

Or check directly at
publications/projects

ALMA archive

- Download:



- Check what you need

ALMA Request Handler

Login

Anonymous User: Request #1653683601122 ✓

Request Title: [click to edit](#)

Download Selected

readme product auxiliary raw raw (semipass) external

Project / OUSet / Executionblock	File	Size	Accessible
Request 1653683601122		185 MiB	
Project 2017.1.00727.S			
Science Goal OUS uid://A001/X1296/X66d			
Group OUS uid://A001/X1296/X66e			
Member OUS uid://A001/X1296/X66f			
SB LkCa15_a_09_TM1			
<input type="checkbox"/> readme	member.uid__A001_X1296_X66f.README.txt	3 KIB	✗
<input type="checkbox"/> product	2017.1.00727.S_uid__A001_X1296_X66f_001_of_001.tar	87 GiB	✗
<input type="checkbox"/> auxiliary	2017.1.00727.S_uid__A001_X1296_X66f_auxiliary.tar	1 GiB	✗
<input type="checkbox"/> raw	2017.1.00727.S_uid__A002_Xe03886_X11ca2.asdm.sdm.tar	84 GiB	✗
<input type="checkbox"/> raw	2017.1.00727.S_uid__A002_Xe03886_X6b03.asdm.sdm.tar	100 GiB	✗
<input type="checkbox"/> raw (semipass)	2017.1.00727.S_uid__A002_Xe1142b_X9308.asdm.sdm.tar	77 GiB	✗
Member OUS uid://A001/X1296/X671			
SB LkCa15_a_09_TM2			
<input checked="" type="checkbox"/> readme	member.uid__A001_X1296_X671.README.txt	259 B	✓
<input checked="" type="checkbox"/> product	2017.1.00727.S_uid__A001_X1296_X671_001_of_001.tar	4 MiB	✓
<input checked="" type="checkbox"/> auxiliary	2017.1.00727.S_uid__A001_X1296_X671_auxiliary.tar	181 MiB	✓
<input type="checkbox"/> raw	2017.1.00727.S_uid__A002_Xd189ef_X16c4.asdm.sdm.tar	109 GiB	✓

ALMA archive

- Select what you need and click Download selected
- Script recommended: easy to continue
- Keep in mind that datasets are huge, 100s of Gb!
Need storage, also for reduction
- Different Cycles: different CASA versions to reduce

Choose one of the following download methods:

Download Script	The downloads are scripted for you. You just need to execute the script from the command line, after making it executable by typing <code>chmod u+x download*.sh</code>
Java Download Manager	ALMA's download manager had to be discontinued due to changes in java. Please use one of the other options instead.
File List	View a text file containing a list of URLs. This is useful for using third-party download manager's such as <i>DownThemAll</i> .

ALMA archive

- Full dataset: folder structure
- README:
comments reduction,
CASA version
- Raw: raw data (ASDM)
- Script: contains main calibration scripts
- QA: quality assessment
- Product: basic reduction: often very large and unnecessary!
- Calibration: calibration tables
- Calibrated: measurement sets (after running script)

Name	Size	Type
▶ calibrated	10 items	Folder
▶ calibration	12 items	Folder
▶ log	7 items	Folder
▶ product	4 items	Folder
▶ qa	24 items	Folder
▶ raw	0 items	Folder
▶ script	8 items	Folder
▶ README	6.3 kB	Text

ALMA archive

- Trick for quick look at product fits files: NAOJ fits archive!
<https://jvo.nao.ac.jp/portal/top-page.do>
- Fill in program number and browse through fits images

ALMA FITS Archive : Project Info

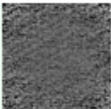
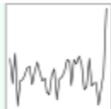




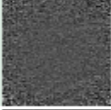



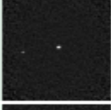



Project Code: 2013.1.00220.S [ALMA Sci Portal](#)

Show all the data including calibration (*.flux.fits, *.pb.fits, target=J#####[+]-#####), duplicated, and deprecated data.

Number of data per page : 20

Ordered by dataset_id (desc)

Total number : 78

#	dataset id	<input type="checkbox"/> all	Download all the checked data	origin ?	image	spect	ra/dec (J2000)	target name	Cube size (XxYxF) ?	Image size (arcmin2)	pixel scale, beam size (arcsec)	band	freq. range (GHz)	freq. scale per pix (MHz)	obs date	release date ?	data type	3rd axis	mem
1	ALMA01024028	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h47m50.6 -35d28m35	LupusIII_1002	640 x640 x40 x1	0.32 x0.32	0.030, 0.344 x0.300	Band7	329.304 -- 329.348	1.098	2015-06-15	2016-09-05	CUBE	frequency	A001_X12
2	ALMA01024025	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h39m27.7 -34d46m17	Lupus_4	640 x640 x1 x1	0.32 x0.32	0.030, 0.325 x0.258	Band7	326.285 -- 343.660	17,375.016	2015-06-15	2016-09-05	IMAGE	frequency	A001_X12
3	ALMA01024024	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h59m25.2 -42d35m07	LupusIV_142	640 x640 x40 x1	0.32 x0.32	0.030, 0.342 x0.314	Band7	329.304 -- 329.348	1.098	2015-06-15	2016-09-05	CUBE	frequency	A001_X12
4	ALMA01024023	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			16h00m07.4 -41d49m48	LupusIV_146	640 x640 x1 x1	0.32 x0.32	0.030, 0.334 x0.271	Band7	326.285 -- 343.660	17,375.047	2015-06-15	2016-09-05	IMAGE	frequency	A001_X12
5	ALMA01024022	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h39m27.7 -34d46m17	Lupus_4	640 x640 x1 x1	0.32 x0.32	0.030, 0.325 x0.258	Band7	326.285 -- 343.660	17,375.016	2015-06-15	2016-09-05	IMAGE	frequency	A001_X12
6	ALMA01024021	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h39m27.7 -34d46m17	Lupus_4	640 x640 x1 x1	0.32 x0.32	0.030, 0.325 x0.258	Band7	326.285 -- 343.660	17,375.016	2015-06-15	2016-09-05	IMAGE	frequency	A001_X12
7	ALMA01024018	<input type="checkbox"/>	Download WebQLv4 VO Search	ALMA official			15h58m02.5 -37d36m02	LupusIII_1006	640 x640 x1 x1	0.32 x0.32	0.030, 0.335 x0.260	Band7	326.285 -- 343.660	17,375.028	2015-06-15	2016-09-05	IMAGE	frequency	A001_X12

ALMA archive

- ALMA data is quality assessed (checked for noise/beam size proposal: QA1 and QA2) and basic reduced (product fits files) but often room for improvement
- Possible improvements: additional flagging, combination of configurations, self-calibration, imaging (weighting, velocity resolution, etc.)
- Recommended to download raw data, run calibration script and redo imaging for the purpose of your science.
- Very annoying: many different incompatible CASA versions required. Possible solution next year with ARCADE environment.
- Product fits files can be used for initial inspection, but often not science ready