Life Cycle of Projects, literature, Data Archives

Outline

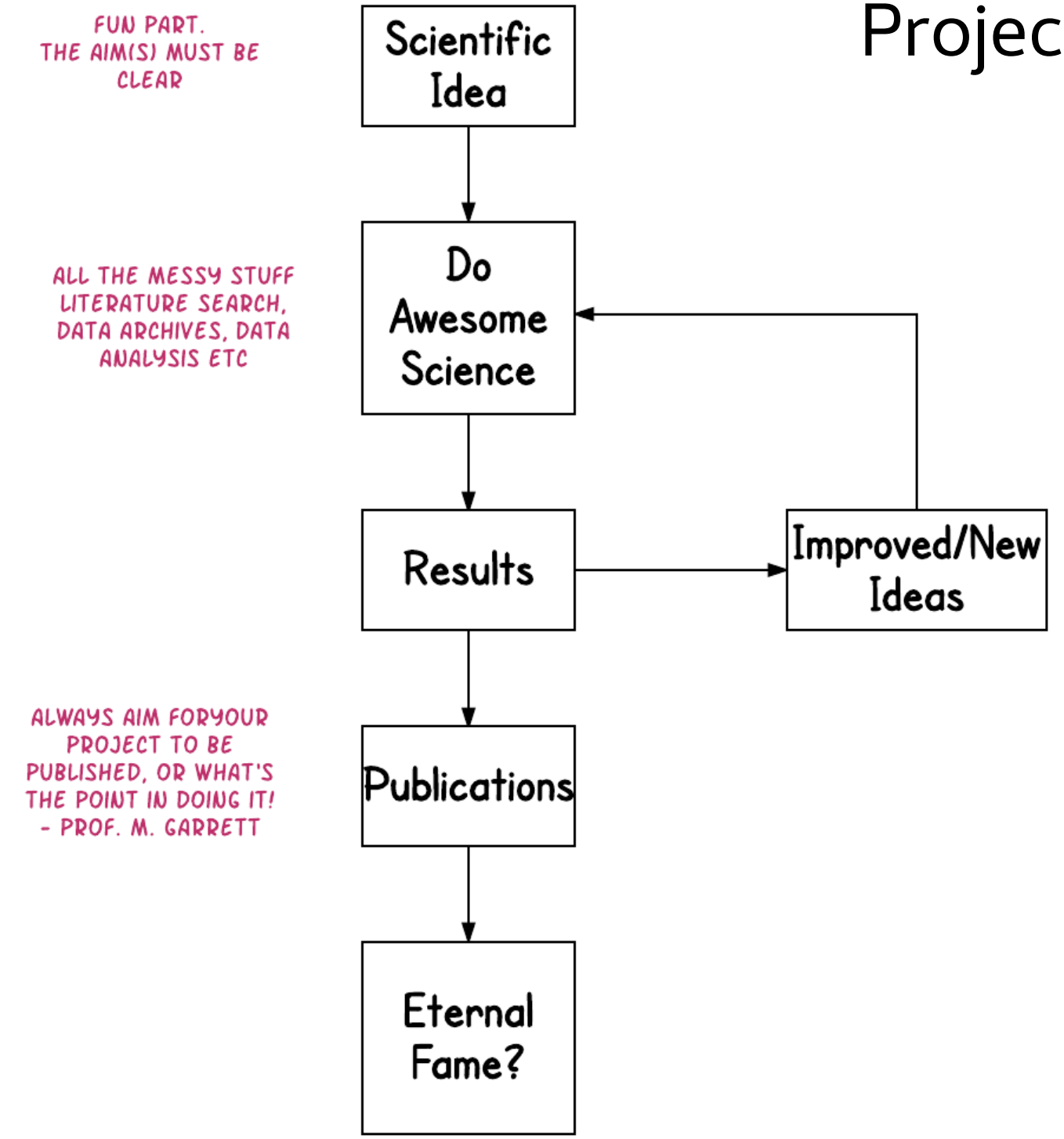
- Introduction
- Project lifecycle
  - General outline
  - How to do the Awesome Science
- Public Data gathering
- Literature Search
- Archive Data

Introduction

- So far you have had an introduction into the world of VLBI (and general radio interferometry) data reduction.
- So now you want to start your own projects, do astronomy, write papers etc.
- So how do we go about doing this?
- Let's start with a general view of the "Project Life-cycle"

Note: this talk is radio interferometry centred, not only VLBI

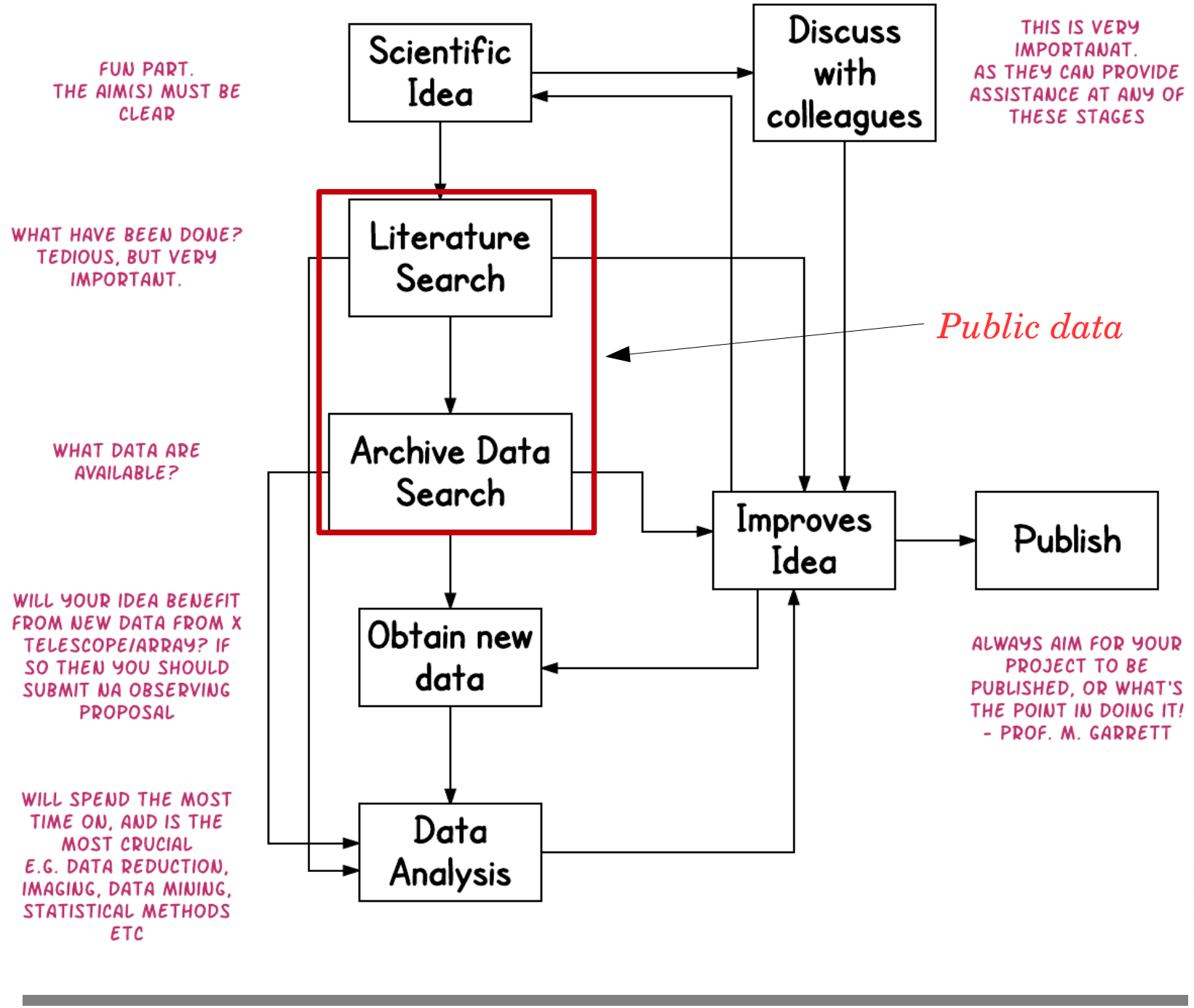
Project



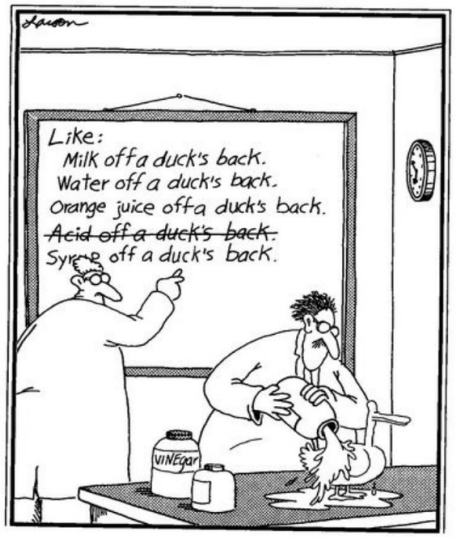
Flow chart

Most scientific projects will follow this general flow chart (even if most of us don't think about it)

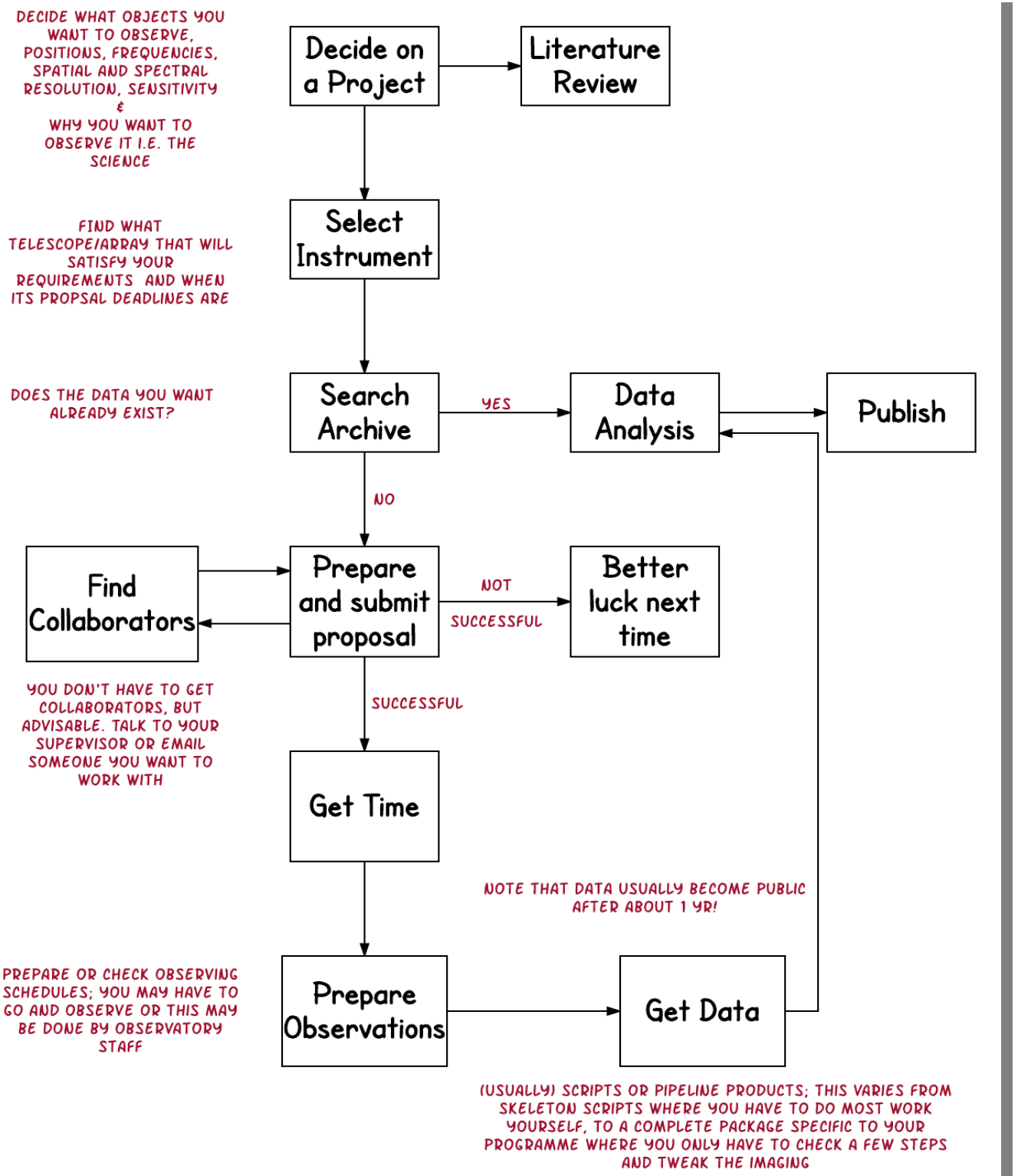
How to do the Awesome Science



- At each step, the idea will improve (or you may decide to abandon it)



Observing proposal flow-chart



See also tomorrow's discussion of observing proposals

Public Data Gathering

- When designing a project idea (e.g. observing proposal), or working on a thesis, or writing a paper you should always use any relevant publicly available data

- These are broadly classified into:

1) Literature

2) Data Archives

In both cases you will spend hours, days or even weeks trawling through lots and lots of information!

What is ‘the literature’?

- In astronomy and astrophysics new scientific ideas are almost always published in papers in refereed scientific journals
- There are a few ‘big’ astronomy journals – Astrophysical Journal, Monthly Notices of the Royal Astronomical Society, Astronomy and Astrophysics, Astronomical Journal
- Plus Nature, Science and spinoffs (e.g. Nature Astronomy) and some more specialist journals
- Nobody ever looks at paper journals – they are still produced but all the action is online
- Journals send submitted papers to one or more scientific referees who make a recommendation about publication.

Example

Monthly Notices
of the
ROYAL ASTRONOMICAL SOCIETY

MNRAS 475, 2768–2786 (2018)
Advance Access publication 2018 January 4

doi:10.1093/mnras/stx3358

A simulation-based analytic model of radio galaxies

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Accepted 2017 December 29. Received 2017 December 21; in original form 2017 October 1

ABSTRACT

I derive and discuss a simple semi-analytical model of the evolution of powerful radio galaxies which is not based on assumptions of self-similar growth, but rather implements some insights about the dynamics and energetics of these systems derived from numerical simulations, and can be applied to arbitrary pressure/density profiles of the host environment. The model can qualitatively and quantitatively reproduce the source dynamics and synchrotron light curves derived from numerical modelling. Approximate corrections for radiative and adiabatic losses allow it to predict the evolution of radio spectral index and of inverse-Compton emission both for active and 'remnant' sources after the jet has turned off. Code to implement the model is publicly available. Using a standard model with a light relativistic (electron–positron) jet, subequipartition magnetic fields, and a range of realistic group/cluster environments, I simulate populations of sources and show that the model can reproduce the range of properties

‘The literature’

- Important to you in project planning in two ways:
  - Should contain everything that has already been done
  - You need to be aiming to contribute to it by producing a paper that describes your work – or nobody will ever know
- Scientists are judged by the number and quality of their published (refereed) journal papers and (barring spectacular success) maximizing this number is the route to a long-term career in science.
- First-author papers particularly important (in astronomy the first author is the lead author and generally gets the credit).

Literature Search

- Before you rush into data analysis/write proposals etc, it is important to:
  1. Research what has already been done regarding your scientific idea
  2. Obtain a clearer understanding of the question that you want to answer
- Probably the most important part of a research project and often the first part of a research postgraduate degree
- You may have to read many papers to understand the state of the art
- Literature search:
  - NASA ADS, arXiv, Google Scholar, NASA Extragalactic Database
  - CDS services: links to papers for particular objects/datasets from SIMBAD/Vizier

Useful if articles are behind a pay wall

- Save articles, organise research etc:
  - Zotero, Mendeley, Docear

Making sense of the Literature

Reading journal papers is a long, sometimes tedious process. How do you pick the most important ones?

Some tips:

- Review articles are a great place to start. These collect together (what the authors thinks) are the most important references on a topic. They may appear in specialist review journals like ARA&A
- Ask a senior colleague (e.g. research supervisor) for some advice, then follow the references in the papers you're given
- Make sure the paper you're reading hasn't been superseded by later work – things change fast
- When reading a paper, look at the abstract first, then the introduction and conclusions, then the rest – don't read the whole paper unless you need to

Making sense of the Literature

- Also look at the most recent papers – but beware very recent, especially pre-publication; they may be proposing explanations which are changed after more discussion…
- There are likely to be competing ideas about topics (e.g. was dust in the early universe formed by cool stars? Supernovae?)
- You need to form your own opinions where ‘the literature’ disagrees
- Don't be afraid to develop your own arguments even if they disagree with some papers – particularly if you have better data than they do

Google 'NASA ADS search'

Literature Search

Registration is free, and can save papers

Sign on

SAO/NASA ADS Astronomy Query Form for Tue May 24 10:13:58 2016

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Databases to query: ☑ Astronomy ☐ Physics ☑ arXiv e-prints

Search by author, year, object, keywords (in title and abstract)

Authors: (Last, First M, one per line) ☑ SIMBAD ☑ NED ☑ ADS Objects

☐ Exact name matching Object name/position search

☐ Require author for selection ☐ Require object for selection

(◉ OR ○ AND ○ simple logic) (Combine with: ◉ OR ○ AND)

Publication Date between (MM) (YYYY) and (MM) (YYYY)

Enter Title Words ☐ Require title for selection

(Combine with: ◉ OR ○ AND ○ simple logic ○ boolean logic)

Enter Abstract Words/Keywords ☐ Require text for selection

(Combine with: ◉ OR ○ AND ○ simple logic ○ boolean logic)

Return 200 items starting with number 1

Search within articles using ADS Bumblebee

myADS: Personalized notification service

Literature Search

SAO/NASA ADS Astronomy Abstract Service

· **Find Similar Abstracts** (with **default settings below**)
· **Electronic Refereed Journal Article (HTML)**
· **Full Refereed Journal Article (PDF/Postscript)**
· **Library Link Server**
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· **Translate This Page**

This awesome author has uploaded his paper to the free article service (arXiv). Always upload your papers on the arXiv service, NASA ADS will automatically link it to your paper.

Title:	A high-resolution wide-field radio survey of M51
Authors:	Rampadarath, H.; Morgan, J. S.; Soria, R.; Tingay, S. J.; Reynolds, C.; Argo, M. K.; Dumas, G.
Affiliation:	AA(International Centre for Radio Astronomy Research, Curtin University, Brodie-Hall Building, 1 Turner Avenue, Technology Park, Bentley, WA 6102, Australia; Department of Physics & Astronomy, University of Southampton, Highfield, Southampton SO17 1BJ, UK; Jodrell Bank Centre for Astrophysics, School of Physics and Astronomy, University of Manchester, Turing Building, Oxford Road, Manchester M13 9PL, UK haydenrampadarath@gmail.com), AB(International Centre for Radio Astronomy Research, Curtin University, Brodie-Hall Building, 1 Turner Avenue, Technology Park, Bentley, WA 6102, Australia), AC(International Centre for Radio Astronomy Research, Curtin University, Brodie-Hall Building, 1 Turner Avenue, Technology Park, Bentley, WA 6102, Australia), AD(International Centre for Radio Astronomy Research, Curtin University, Brodie-Hall Building, 1 Turner Avenue, Technology Park, Bentley, WA 6102, Australia), AE(International Centre for Radio Astronomy Research, Curtin University, Brodie-Hall Building, 1 Turner Avenue, Technology Park, Bentley, WA 6102, Australia), AF(Jodrell Bank Centre for Astrophysics, School of Physics and Astronomy, University of Manchester, Turing Building, Oxford Road, Manchester M13 9PL, UK), AG(Institut de Radioastronomie Millimètrique, 300 Rue de la Piscine, F-38406 Saint Martin d'Hères, France)
Publication:	Monthly Notices of the Royal Astronomical Society, Volume 452, Issue 1, p.32-53 (MNRAS Homepage)
Publication Date:	09/2015
Origin:	OUP
Astronomy Keywords:	instrumentation: interferometers, galaxies: individual: (M51), galaxies: Seyfert, radio continuum: general, X-rays: general
Abstract Copyright:	2015 The Authors Published by Oxford University Press on behalf of the Royal Astronomical Society
DOI:	10.1093/mnras/stv1275
Bibliographic	2015MNRAS.452..32R

Literature Search

Cornell University Library

We gratefully acknowledge support from the Simons Foundation and University of Manchester

arXiv.org > astro-ph

Search or Article-id (Help | Advanced search) All papers Go!

Astrophysics (since Apr 1992)

For a **specific paper**, enter the identifier into the top right search box.

- **Browse:**
  - new (most recent mailing, with abstracts)
  - recent (last 5 mailings)
  - current month's astro-ph listings
  - specific year/month:
    2016 all months Go
- **Catch-up:**
  Changes since: 17 05 (May) 2016 , view results without abstracts Go
- **Search** within the astro-ph archive
- Article statistics by year:
  2016 2015 2014 2013 2012 2011 2010 2009 2008 2007 2006 2005 2004 2003 2002 2001 2000 1999 1998 1997 1996 1995 1994 1993 1992

- *Astroph (i.e. arXiv astronomy, astrophysics and cosmology pages)*
- *Updated daily with the latest research papers*
- *Warning: papers on arXiv are not peer-reviewed, but most authors will upload papers once it has been accepted (this will normally be stated)*

Categories within Astrophysics

- **astro-ph.GA - Astrophysics of Galaxies** (new, recent, current month)
  Phenomena pertaining to galaxies or the Milky Way. Star clusters, galactic nebulae, the interstellar medium, clouds, dust. Galactic structure, formation, dynamics. Galactic nuclei, bulges, disks, halo. Active Galactic Nuclei, supermassive black holes, quasars. Gravitational lens systems. The Milky Way and its contents
- **astro-ph.CO - Cosmology and Nongalactic Astrophysics** (new, recent, current month)
  Phenomenology of early universe, cosmic microwave background, cosmological parameters, primordial element abundances, extragalactic distance scale, large-scale structure of the universe. Groups, superclusters, voids, intergalactic medium. Particle astrophysics: dark energy, dark matter, baryogenesis, leptogenesis, inflationary models, reheating, monopoles, WIMPs, cosmic strings, primordial black holes, cosmological gravitational radiation
- **astro-ph.EP - Earth and Planetary Astrophysics** (new, recent, current month)
  Interplanetary medium, planetary physics, planetary astrobiology, extrasolar planets, comets, asteroids, meteorites. Structure and formation of the solar system
- **astro-ph.HE - High Energy Astrophysical Phenomena** (new, recent, current month)
  Cosmic ray production, acceleration, propagation, detection. Gamma ray astronomy and bursts, X-rays, charged particles, supernovae and other explosive phenomena, stellar remnants and accretion systems, jets, microquasars, neutron stars, pulsars, black holes
- **astro-ph.IM - Instrumentation and Methods for Astrophysics** (new, recent, current month)
  Detector and telescope design, experiment proposals. Laboratory Astrophysics. Methods for data analysis, statistical methods. Software, database design
- **astro-ph.SR - Solar and Stellar Astrophysics** (new, recent, current month)

Archives Search

If you think you need more observations it is always advisable to search the publicly available archives for data on your object(s)

Public Astronomy archives are divided into:

1. Surveys
2. Data release and public archives

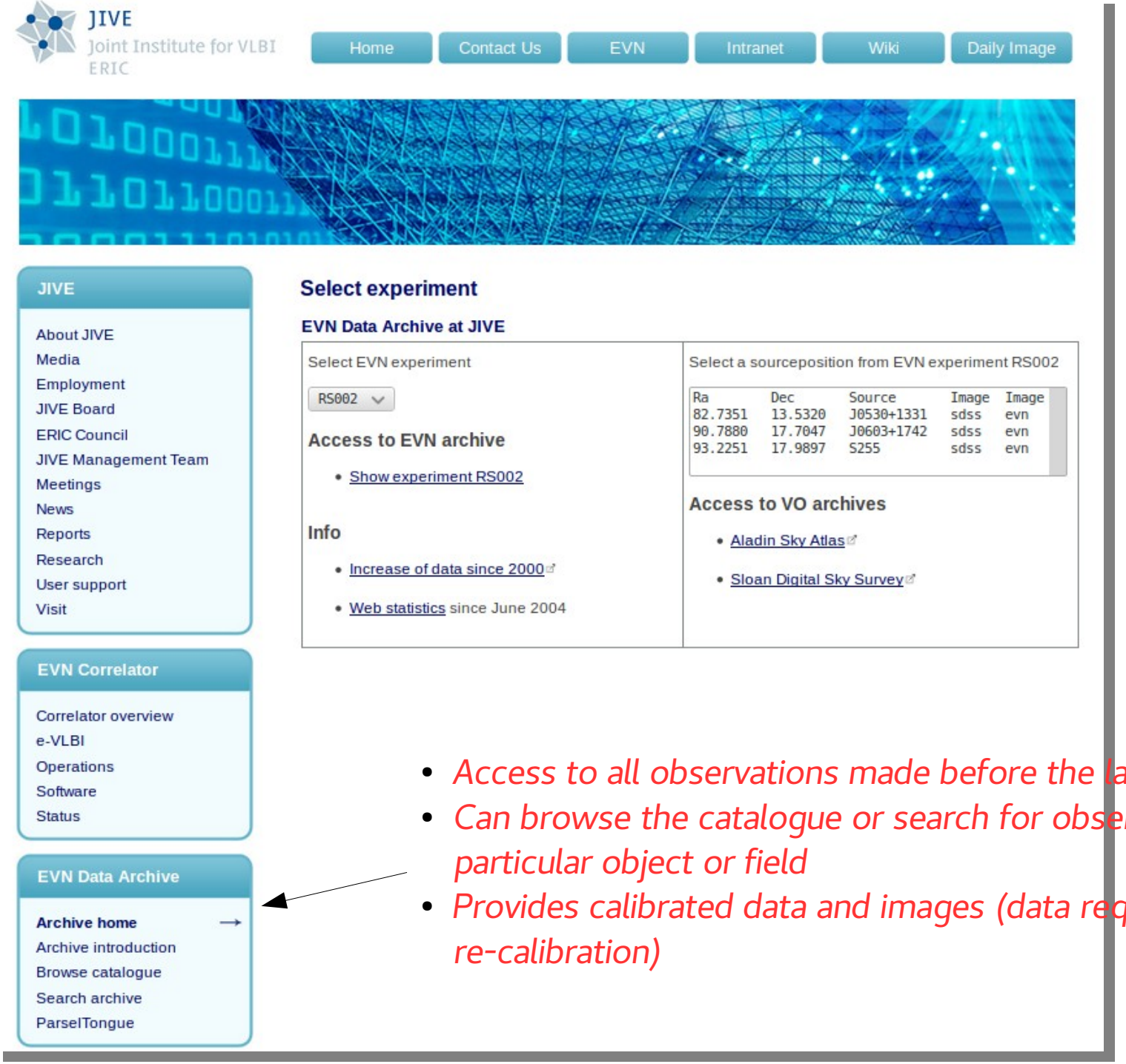
Surveys:

- Images and (sometimes) calibrated uv datasets
- e.g. NVSS, VLA FIRST, WENSS WSRT, mJIVE-20, MOJAVE
- Provides a web interface to obtain the data

Data release and public archives:

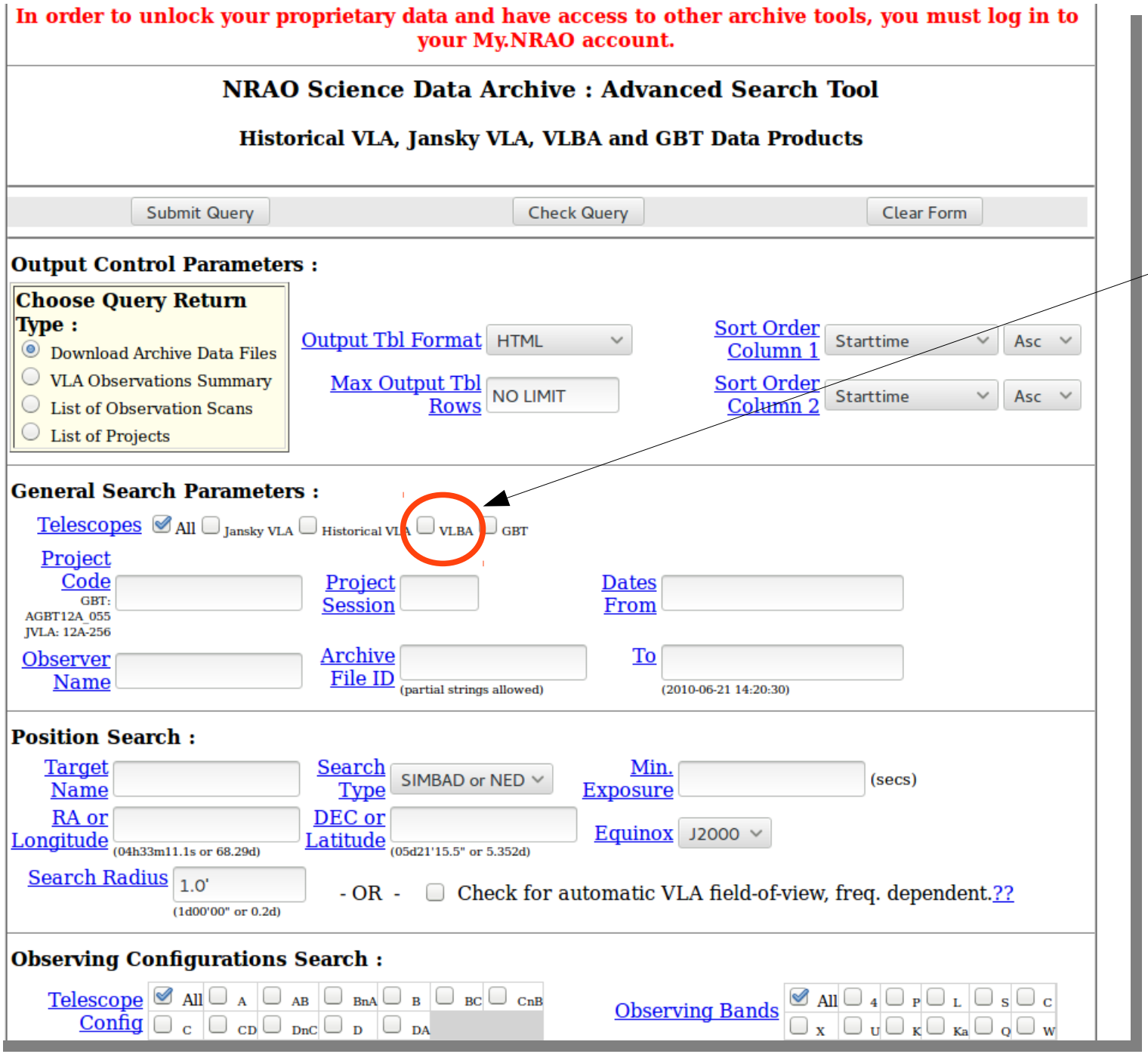
- Provided by the individual instruments/organising institutions
- e.g. NRAO (JVLA, VLBA), EVN, ATCA, ALMA, GMRT, LOFAR etc.
- Observations after 12-18 months become publicly available.
- Provides a web interface to obtain the data
- Some may even provide the calibrated uv datasets e.g. EVN

VLBI Data Archives - EVN



- *Access to all observations made before the last 12-18 months*
- *Can browse the catalogue or search for observations of a particular object or field*
- *Provides calibrated data and images (data requires flagging and re-calibration)*

Data Archives – VLBA, JVLA …



In order to unlock your proprietary data and have access to other archive tools, you must log in to your My.NRAO account.

NRAO Science Data Archive : Advanced Search Tool

Historical VLA, Jansky VLA, VLBA and GBT Data Products

Submit Query | Check Query | Clear Form

Output Control Parameters :

Choose Query Return Type :
- Download Archive Data Files
- VLA Observations Summary
- List of Observation Scans
- List of Projects

Output Tbl Format: HTML
Max Output Tbl Rows: NO LIMIT
Sort Order Column 1: Starttime Asc
Sort Order Column 2: Starttime Asc

General Search Parameters :

Telescopes: All | Jansky VLA | Historical VLA | VLBA | GBT

Project Code (GBT: AGBT12A_055, JVLA: 12A-256)
Project Session
Dates From
Observer Name
Archive File ID (partial strings allowed)
To (2010-06-21 14:20:30)

Position Search :

Target Name
Search Type: SIMBAD or NED
Min. Exposure (secs)
RA or Longitude (04h33m11.1s or 68.29d)
DEC or Latitude (05d21'15.5" or 5.352d)
Equinox: J2000
Search Radius: 1.0' (1d00'00" or 0.2d)
- OR - Check for automatic VLA field-of-view, freq. dependent.??

Observing Configurations Search :

Telescope Config: All | A | AB | BnA | B | BC | CnB | C | CD | DnC | D | DA
Observing Bands: All | 4 | P | L | S | C | X | U | K | Ka | Q | W

- *NRAO data archive provides access to all observations made with the VLBA, JVLA, and other NRAO instruments*
- *For the VLBA, need to select "VLBA" in telescopes*
- *Will provide a list of the observations and the corresponding data*
- *An email will be sent when the data are ready to be copied*

Data Archives - Reducing & calibrating data

Calibrating and Reducing EVN & VLBA data:

- Official EVN data reduction guide (http://www.evlbi.org/user_guide/evn_datareduc.html)
- Official VLBA data reduction guide (http://www.vlba.nrao.edu/astro/calib/pipeline/)
- Sadly in AIPS
- Can calibrate in AIPS and export to CASA to image

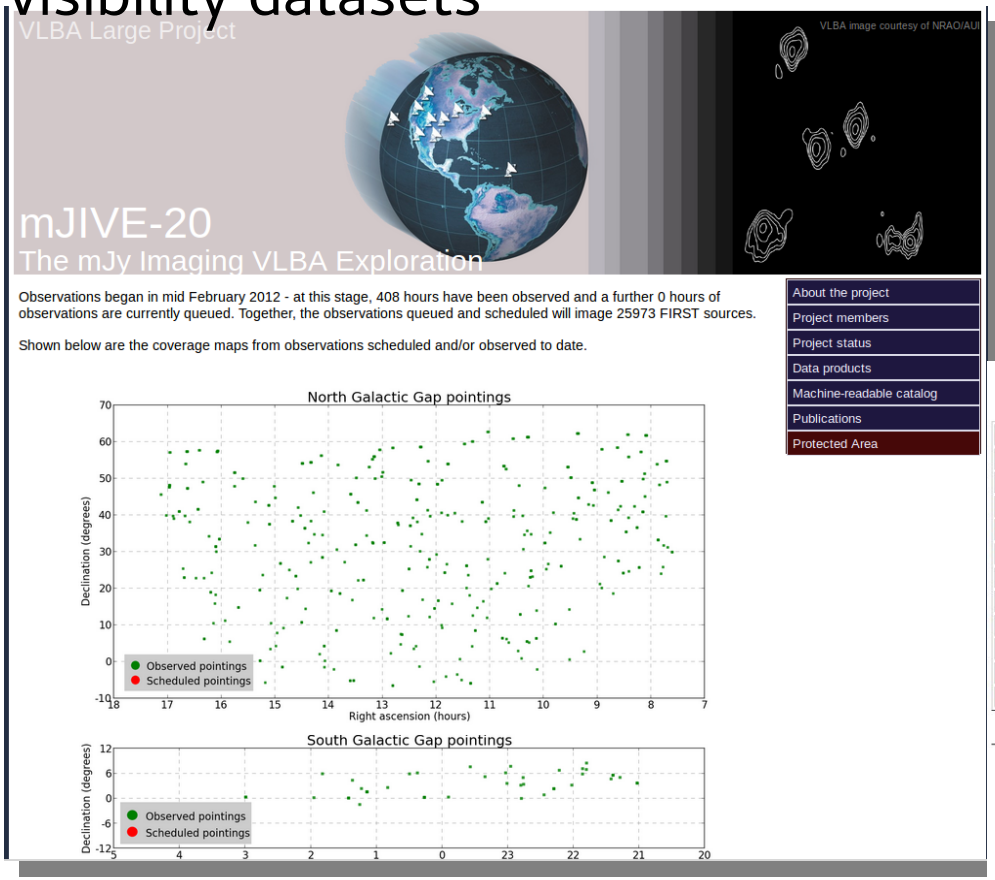
Calibrating and Reducing JVLA data:

- All done in CASA
- Suggest to follow the JVLA online tutorials:

- CASA main page: https://casaguides.nrao.edu/index.php/Main_Page
- JVLA tutorials:
https://casaguides.nrao.edu/index.php/Karl_G._Jansky_VLA_Tutorials

VLBI Image Archives/Surveys

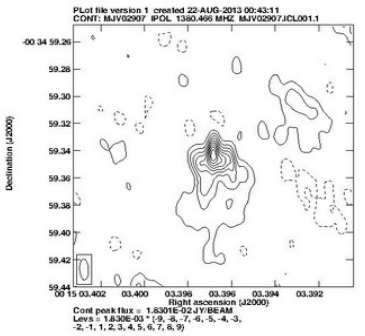
Search for images of your VLBI source. They also provide the calibrated visibility datasets

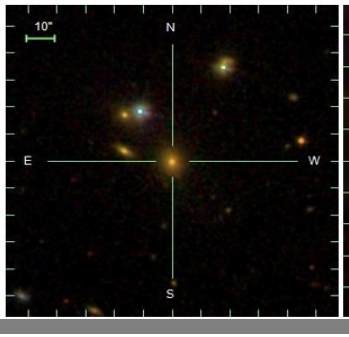


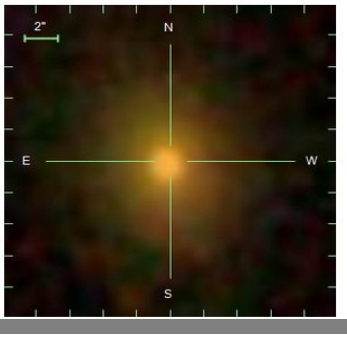
Observations of all VLA FIRST sources at 1.4 GHz with the VLBA
24903 FIRST sources imaged to date.
4965 sources detected

Information on object MJV02907

mJIVE-20 Identifier	MJV02907
Right Ascension	00:15:03.396
Declination	-00:34:59.34
Position shift (arcsec) from the FIRST position	0.079
VLBI flux (peak, mJy/beam)	18.34
VLBI flux (int., mJy)	76.42
FIRST flux (peak, mJy/beam)	139.9
FIRST flux (int., mJy)	142.6
VLBI flux ratio	0.131
Link to NED search	here
Link to SDSS search	here
Calibrated uv dataset	here



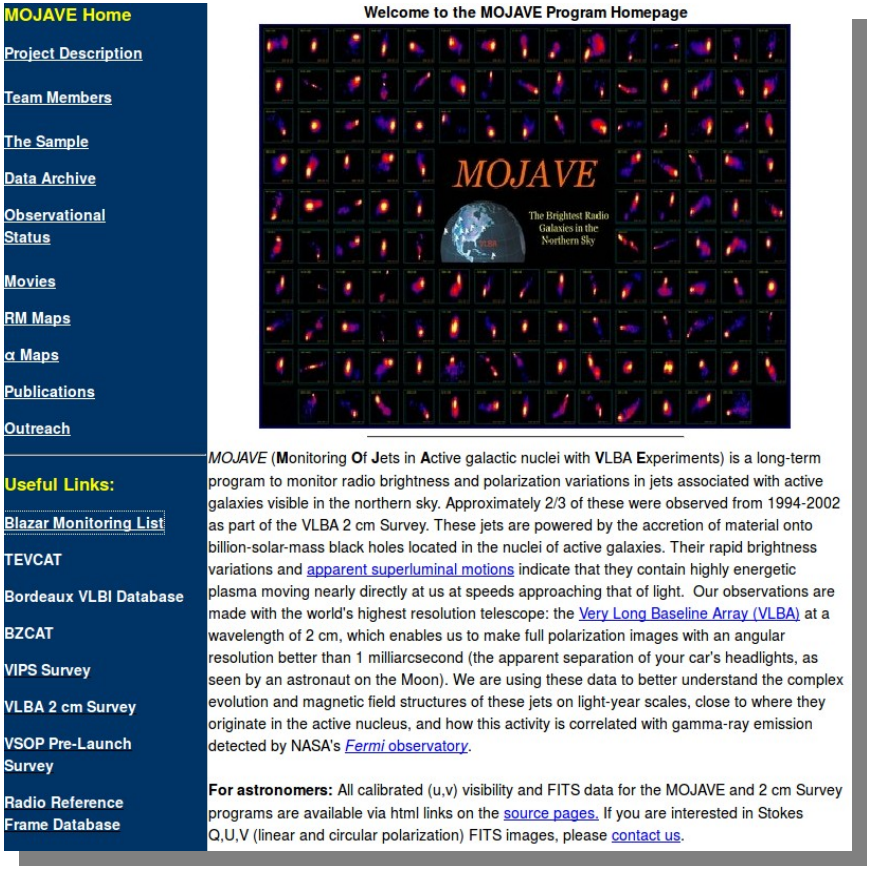




VLBI Image Archives/Surveys

Search for images of your VLBI source. They also provide the calibrated visibility datasets

Observations of Jets and AGNs at 15 GHz with the VLBA



VLBI (EVN, VLBA and others) images at 2 & 8GHz (some 24 and 43 GHz)

VLBI Image Archives/Surveys

Search for images and also provide the calibrated visibility datasets

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May 26, 2016

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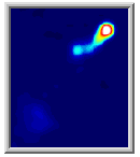
-Delta M
> ERLcat
> OID
> RORF
> RRFID
> TAC
> Tycho-2
> UCAC2

The Radio Reference Frame Image Database (RRFID)



- **VLBA S/X-band Images** -- 2.3 and 8.4 GHz `snapshot' images made using the **National Radio Astronomy Observatory** (NRAO) **Very Long Baseline Array** (VLBA) telescope. Images using the VLBA together with several geodetic antennas are also available for some sources. These 'VLBA+' images provide enhanced *uv*-plane coverage and up to twice the resolution of the VLBA alone. Available items include contour plots and visibility plots in PostScript format. Images and/or visibility data can also be obtained in FITS format upon request.
- **VLBA K/Q-band Images** -- 24 and 43 GHz `snapshot' images made using the **National Radio Astronomy Observatory** (NRAO) **Very Long Baseline Array** (VLBA) telescope. Available items include contour plots and visibility plots in PostScript format.
- NEW **LBA X-band Images** -- 8.4 GHz `snapshot' images made using the **Australia Telescope National Facility** (ATNF) **Long Baseline Array** (LBA) telescope. Available items include contour plots and visibility plots in PostScript format.
- **Geodetic VLBI Images** -- `snapshot' images made using geodetic and/or astrometric Very Long Baseline Interferometry (VLBI) observations. Available items include contour plots in PostScript format.

The data presented here are the result of an ongoing program to image radio reference frame sources on a regular basis. Our goal is to establish a database of images of all of radio reference frame sources at the same wavelengths as those used for precise astrometry. These data allow us to monitor sources for variability or structural changes so they can be evaluated for continued suitability as radio reference frame objects. Further information concerning these data can be found in the following publications:

- "VLBA Observations of Radio Reference Frame Sources. I.," Astrophysical Journal Supplement Series, August 1996 issue (Vol. 105, No. 2, Pages 299-330).
- "VLBA Observations of Radio Reference Frame Sources. II. Astrometric Suitability Based on Observed Structure," Astrophysical Journal Supplement Series, July 1997 issue (Vol. 111, No. 1, Pages 95-142).
- "VLBA Observations of Radio Reference Frame Sources. III. Astrometric Suitability of an Additional 225 Sources," Astrophysical Journal Supplement Series, May 2000 issue (Vol. 128, No 1, Pages 17-83).
- NEW "VLBI Observations of Southern Hemisphere ICRF Sources - I," Astronomical Journal, June 2004 issue (Vol. 127, Pages 3609-3621).

Radio Reference Frame Database

For astronomers: All calibrated (u,v) visibility and FITS data for the MOJAVE and 2 cm Survey programs are available via html links on the source pages. If you are interested in Stokes Q,U,V (linear and circular polarization) FITS images, please contact us.

VLBI (EVN, VLBA and others) images at 2 & 8GHz (some 24 and 43 GHz)

BVID The Bordeaux VLBI Image Database

CNRS université BORDEAUX OSU LAB

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VLBI Image Archives/Surveys

Search for images and also provide the calibrated visibility datasets

Naval Meteorology and Oceanography Command — U.S. Naval Observatory

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The Radio Reference Frame Image Database (RRFID)

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> OID
> RORF
> RRFID
> TAC
> Tycho-2
> UCAC2

The VLBA Imaging and Polarimetry Survey

The VLBA Imaging and Polarimetry Survey, **VIPS** for short, is a combined 5 GHz and 15 GHz survey with the Very Long Baseline Array of ~1100 active galactic nu (AGN) with full polarization and high dynamic range. The parent sample is the CLASS survey in the region covered by the Sloan Digital Sky Survey in order to facil multi-wavelength science.

- "VLBA Observations of Radio Reference Frame Sources. I.," Astrophysical Journal Supplement Series, August 1996 issue (Vol. 105, No. 2, Pages 299-330).
- "VLBA Observations of Radio Reference Frame Sources. II. Astrometric Suitability Based on Observed Structure," Astrophysical Journal Supplement Series, July 1997 issue (Vol. 111, No. 1, Pages 95-142).
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Radio Reference Frame Database

programs are available via html links on the source pages. If you are interested in Stokes Q,U,V (linear and circular polarization) FITS images, please contact us.

VLBI (EVN, VLBA and others) images at 2 & 8GHz (some 24 and 43 GHz)

BVID — The Bordeaux VLBI Image Database

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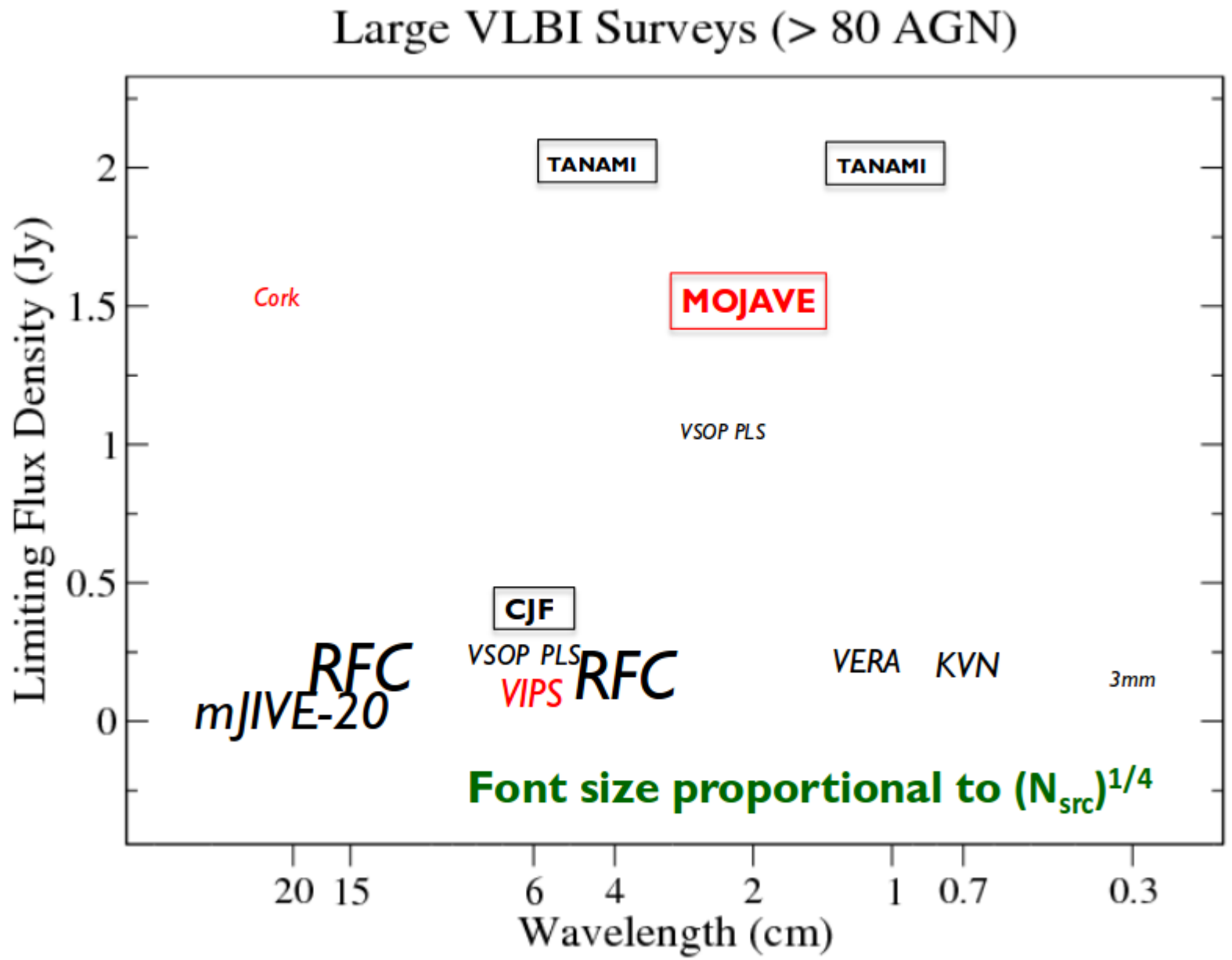
Searcl



Boxed = Multiepoch monitoring

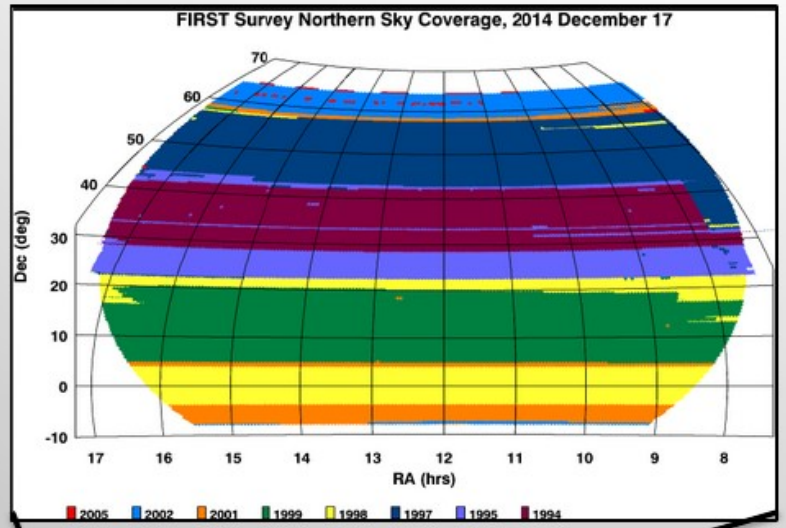
Red = Full polarization

Other Public Radio Image Archives

- List of the largest radio interferometric image databases >10^5 sources
- Lower resolution radio surveys → can survey more sky area
- Provides the images in FITS or PNG format
- uv data in FITS format
- will help you understand your objects and science goals (i.e. don't use only VLBI)

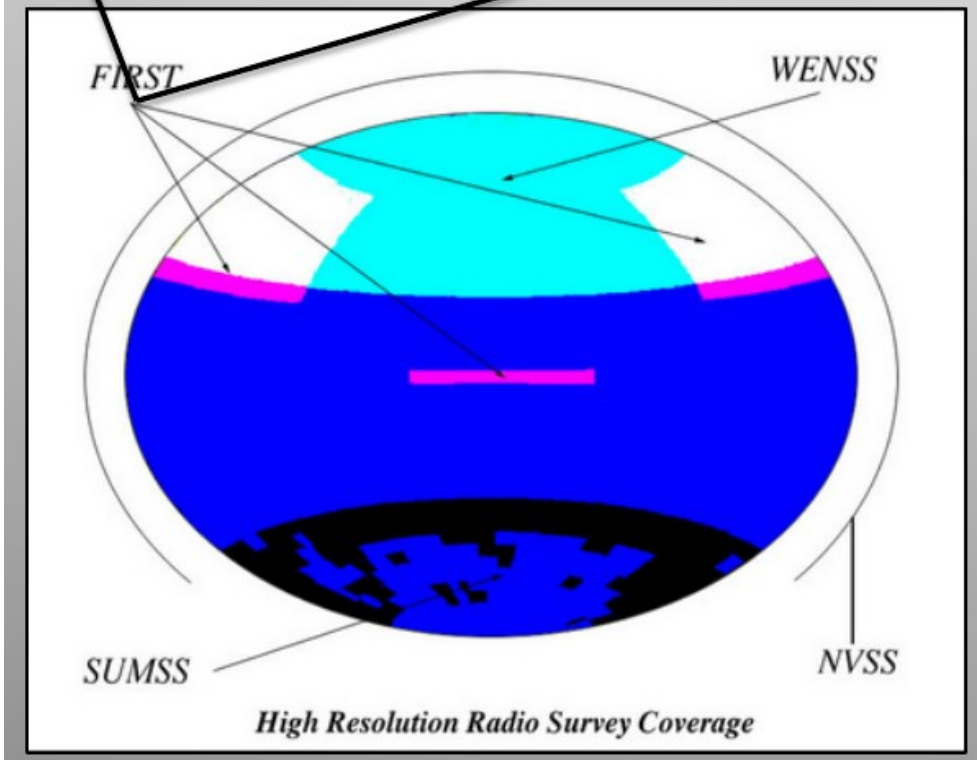
Survey	ν MHz	Ang. Res. "x"	Sensitivity (1σ) mJy/b	Area deg^2
NVSS VLA-D	1400	40x40	0.45	δ > -40° 35000
FIRST VLA-B	1400	5x5	0.15	δ > -10° 10000
SUMSS Molonglo	843	45x45cosecδ	~ 6 - 10	δ < -30° 11600
WENSS WSRT	327	54x54cosecδ	3.6	δ > 30° 10000
TGSS GMRT	150	20x20	~7 – 9	δ > -35° 32000
VLSSr VLA-B	74	80x80	100	δ > -30° 30000

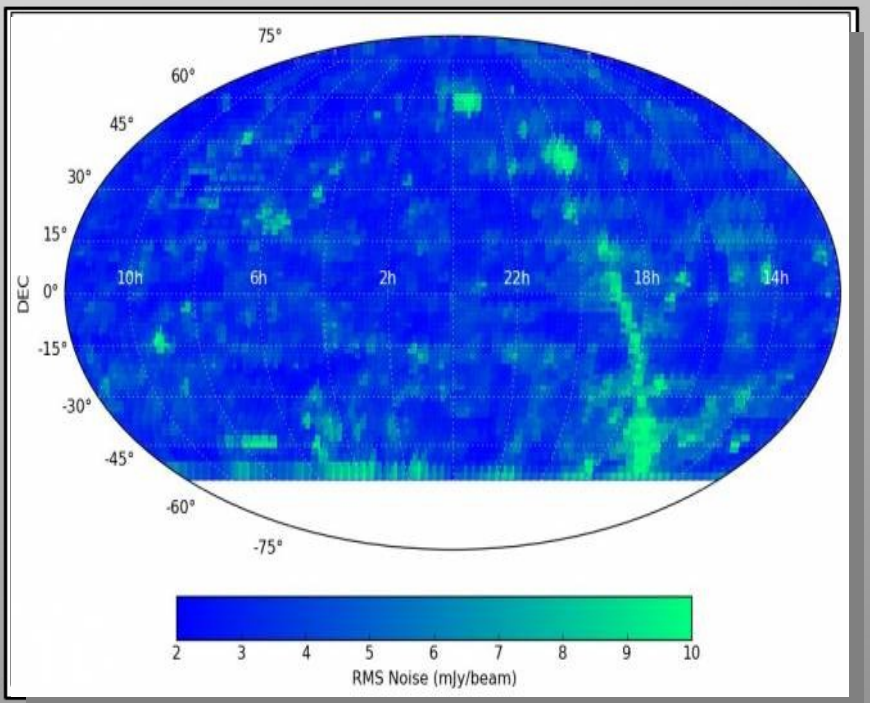
Other Public Radio Image Archives



Sky coverage of the available public surveys

TGSS





Other Public Radio Image Archives (e.g. FIRST)

Home | What's New | Description | Status | Publications | Cutouts | Search | Images | Catalog

Extract FIRST Image Cutouts

Hosted by the LLNL Institute for Geophysics & Planetary Physics

RA and Dec: 10 50 07.270 +30 40 37.52 **Equinox:** J2000

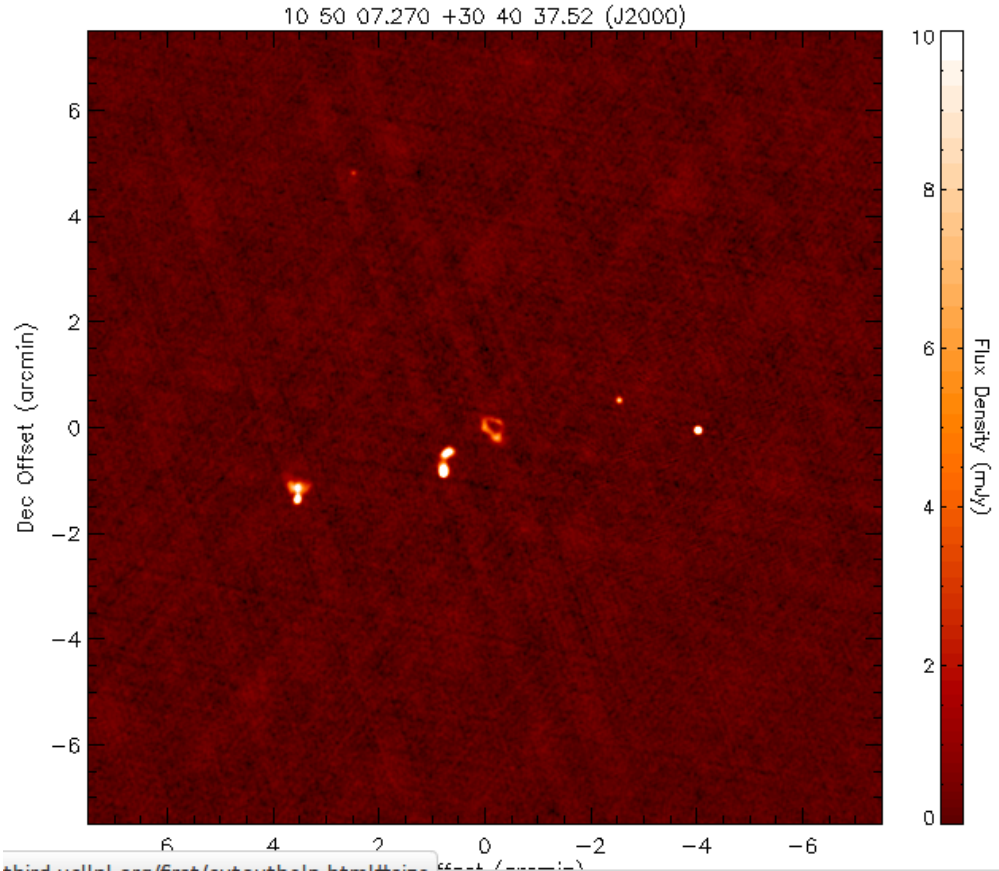
Image Size: 15 **arcmin**

Image Type: GIF FITS Image FITS File

Maximum Intensity for Scaling: 10 **mJy**

Extract the Cutout | Reset Form | *Help*

Extracted Image



Archive of the Faint Images of the Radio Sky at Twenty-cm (FIRST) with the VLA.

Provides FITS images good enough for science (if you don't mind not having short baselines!)

Other Public Radio Image Archives (e.g. NVSS)

Archive of the NRAO VLA Sky Server. Lower resolution than FIRST

Provides FITS images good enough for science

National Radio Astronomy Observatory

Wednesday, May 25, 2016

NVSS Postage Stamp Server

This postage Stamp server for NRAO/VLA Sky Survey (NVSS) returns radio images of the sky in FITS or JPEG format, or as a contour plot. For detailed general instructions or information about this survey, see the Help File under "general"; or use the links on the forms for help about each item.

Equinox:	J2000
Polarization:	Stokes I
Object name *[optional]*:	
Central Right Ascension:	00 00 00.00
Central declination:	+00 00 00.00
Desired image size (degrees): See Pixel Spacing for size limit.	0.25 0.25
Pixel spacing: Desired pixel size in arcseconds (Min 0.001; max image size 262144 pixels, e.g. 512 x 512)	15.0 15.0
Projection:	Sine
Desired rotation (N through E) on the sky in degrees. (Use 0.0 for contour plots)	0.0
Image Type: Don't use "FITS *Image*" unless you have an external viewer configured to activate for fits files in your browser. Also, for JPEG images, you may need to "reload" the image if you've fetched more than one.	JPEG Image
Submit!	Clear Form (ALL!)

Note: these images will have a relatively high dynamic range which will cause them to appear as white dots on a black background unless the viewer used has suitable control over brightness, contrast and the range of values to be displayed. The "noise" level in these images is about 0.5 mJy/beam.

the FITSview family of FITS image viewers is available for a variety of computer systems. For a short discussion of installing external viewers for FITS files click here.

In publications using NVSS results please reference Condon, et al. 1998, AJ, 115, 1693; a preprint of this paper which describes the design and techniques of the NVSS is available here. The NVSS survey now complete. Entire 4 x 4 degree fields may be obtained as FITS files using either a Web browser or ftp. (*Reminder:* shift-click will generally force your browser to save the requested image to a file rather than displaying it in a text window.) For the latest information and detailed descriptions of the NVSS survey see its home page. An online source catalog search is also available.

Users of the AIPS task IMAGR often need to image extra fields covering nearby confusing sources. A **RUN file generator** produces the required list of field offsets for NVSS sources whose flux densities, attenuated by the primary beam, exceed a chosen cutoff.

Other Public Radio Image Archives (e.g. NVSS)

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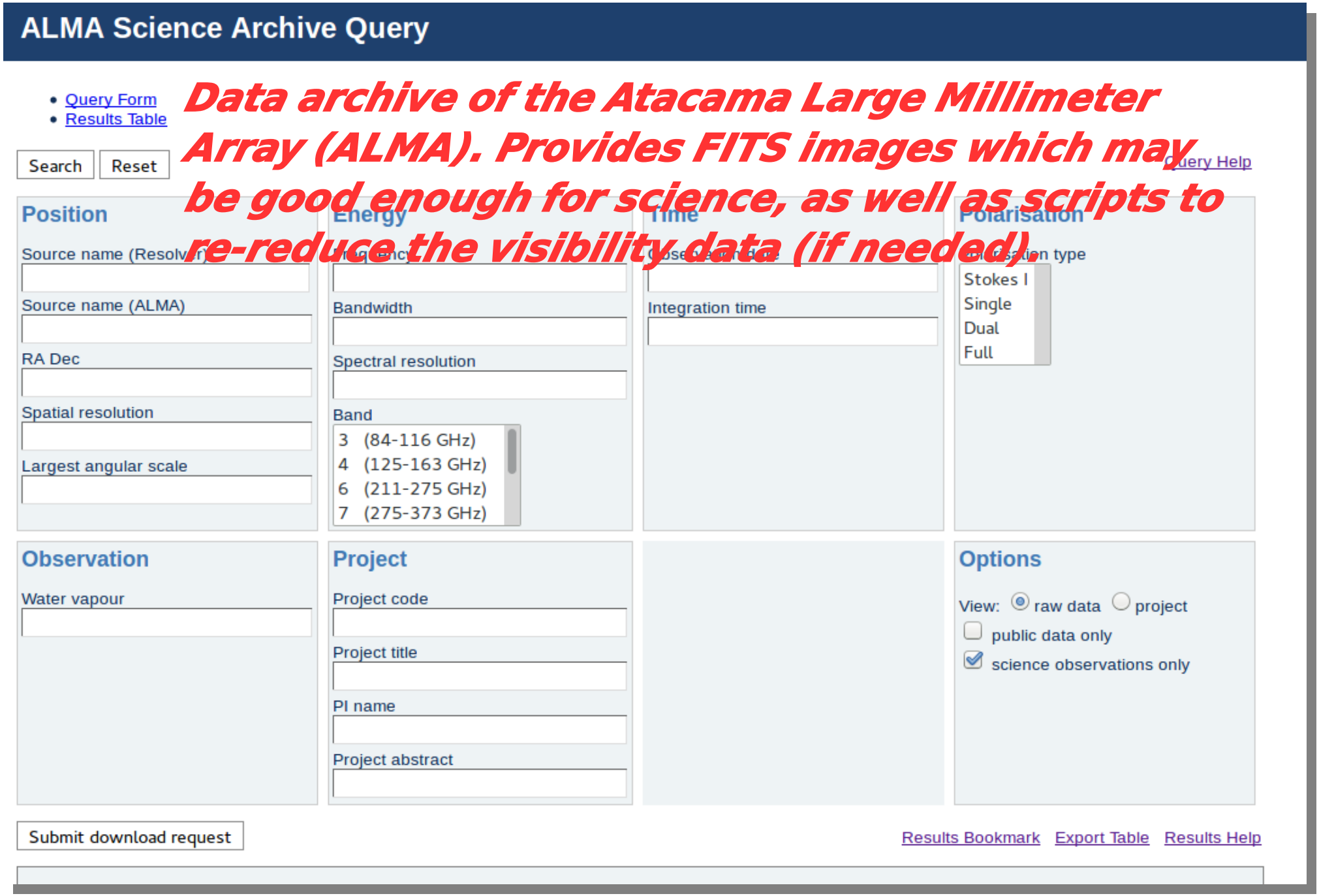
Other Public Radio Image Archives (e.g. ALMA)



Data archive of the Atacama Large Millimeter Array (ALMA). Provides FITS images which may be good enough for science, as well as scripts to re-reduce the visibility data (if needed).

Data Archives: Useful Tools (1)

A couple of useful tools to browse multi-wavelength images and data:

- ALADIN Sky Atlas (http://aladin.u-strasbg.fr/)
  - Multi-wavelength archive: all major surveys from radio to X-rays
  - Access to archives of Galactic and extragalactic data
  - Desktop applet runs on any OS
  - Upload your own (FITS) image and search for archive data at any wavelength!
  - Can give a list of all publications that have observed a particular object! (as can NED, ADS…)

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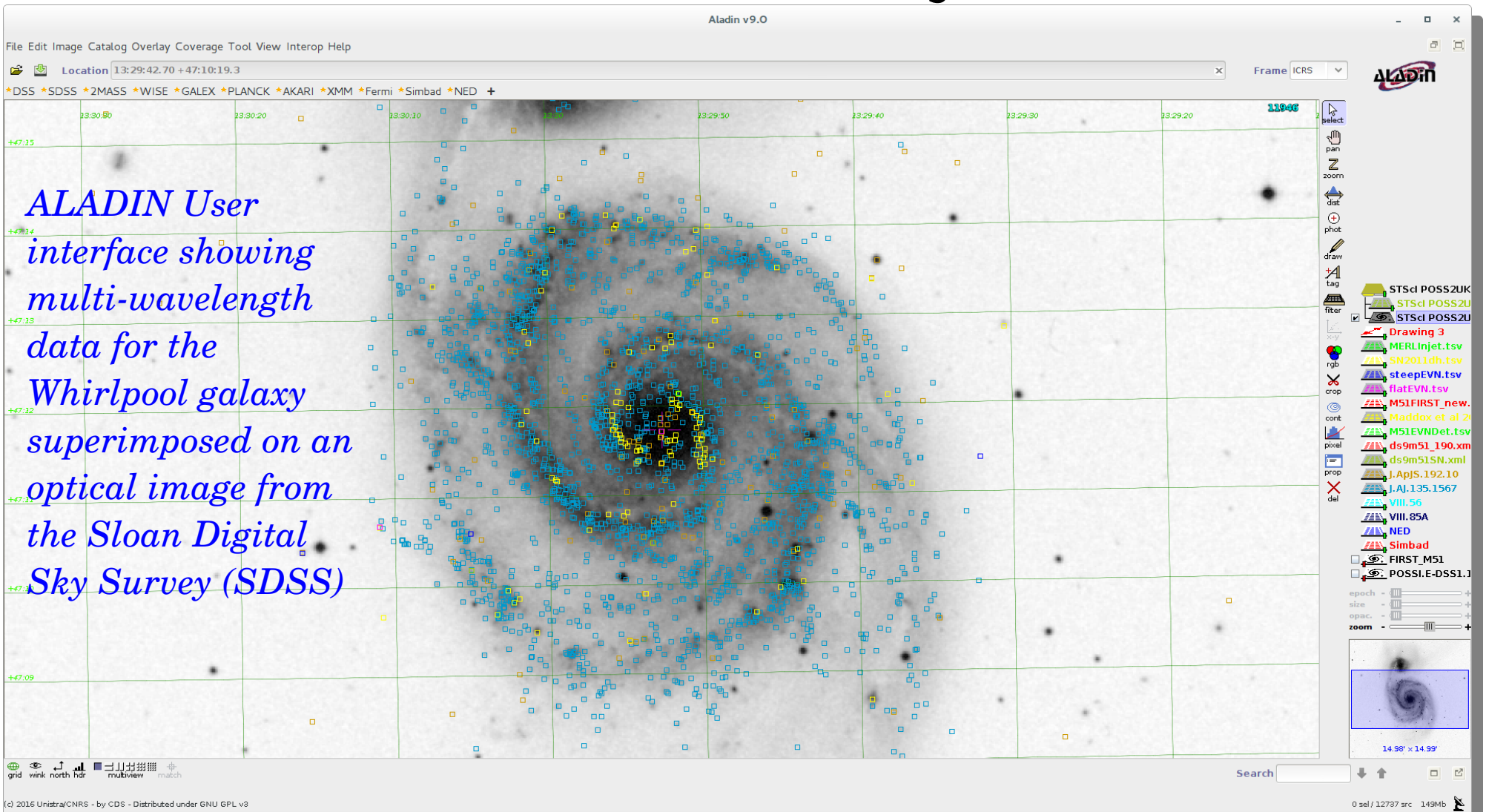
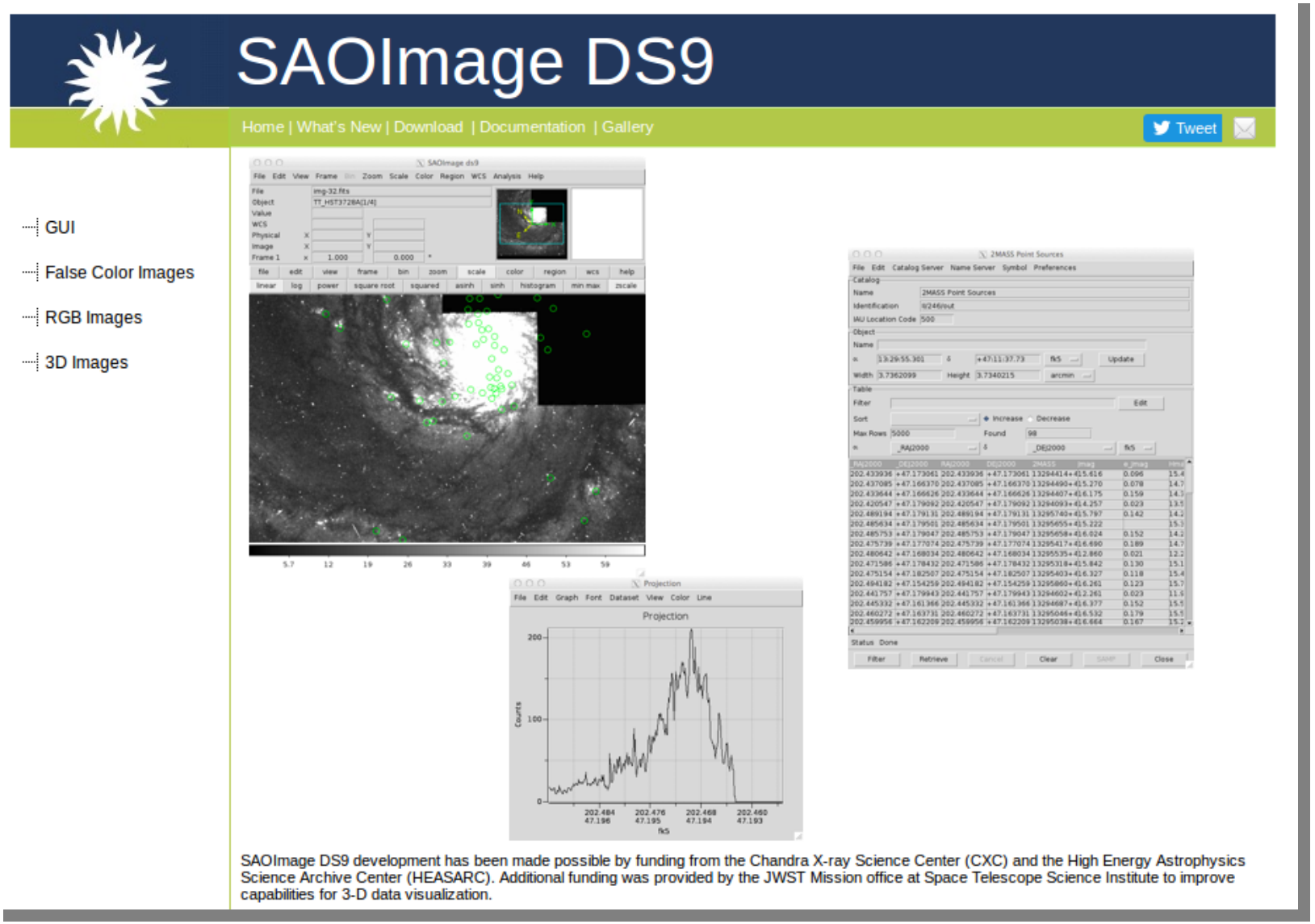


ALADIN User interface showing multi-wavelength data for the Whirlpool galaxy superimposed on an optical image from the Sloan Digital Sky Survey (SDSS)

Data Archives: Useful Tools (2)

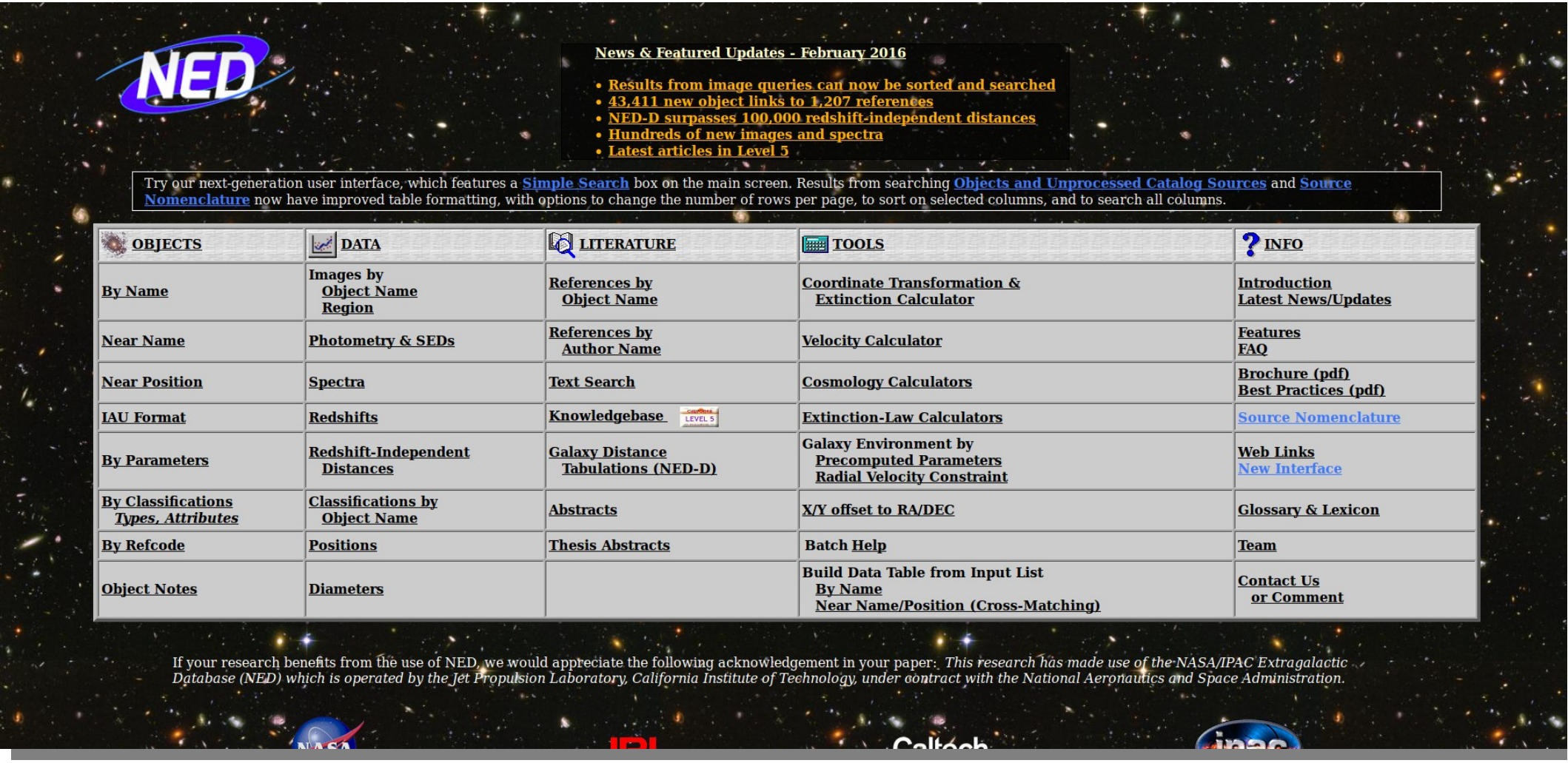
Another useful tool to browse images and data is DS9.
Not as versatile as ALADIN, but more of a FITS viewer and data analysis tool. Can obtain multi-wavelength data & run on any OS



Data Archives: Useful Tools (3)

The NASA Extragalactic database (NED)

- Catalogue of published data for all extragalactic sources that have ever been observed by any instrument! (*mostly* complete)
- Can search by name, position type …



Data Archives: Useful Tools (3)

The NASA Extragalactic database (NED)

- Provides redshifts, spectral energy distributions, images etc

NASA/IPAC EXTRAGALACTIC DATABASE

Date and Time of the Query: 2016-05-25 T03:53:05 PDT

Help | Comment | NED Home

You have selected the following parameters to search on:

Parameters for Distances and Cosmology: H_o= 73.0; Ω_{matter} = 0.27; Ω_{vacuum} = 0.73;
Derived Quantities use a Redshift corrected to a Reference Frame defined by the 3K CMB

NED results for object NGC 4051

1 objects found in NED.

SOURCE LIST

Row No.	Object Name (* => Essential Note)	EquJ2000.0 RA	DEC	Object Type	Velocity/Redshift km/s	z	Qual	Mag./ Filter	Separ. arcmin	Number of Refs	Notes	Phot	Posn	Vel/z	Diam	Assoc	Images	Spectra	Row No.
1	NGC 4051	12h03m09.6s	+44d31m53s	G	700	0.002336		10.83	...	1235	40	326	36	36	8	0	Retrieve	Retrieve	1

Detailed information for each object

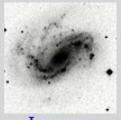
Object No. 1 - NGG 4051

INDEX for NGC 4051

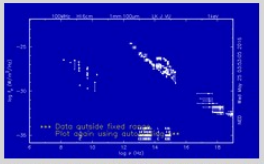
Essential Data (jump to sub-section of this query report):

- Essential Note
- Cross-IDs
- Coordinates
- Basic Data
- Quantities Derived from Redshift
- Redshift-Independent Distances
- Quick-Look Photometry and Luminosities
- Quick-Look Angular and Physical Sizes
- Classifications
- Foreground Galactic Extinction
- External Services

Detailed Data (NED queries):



Images

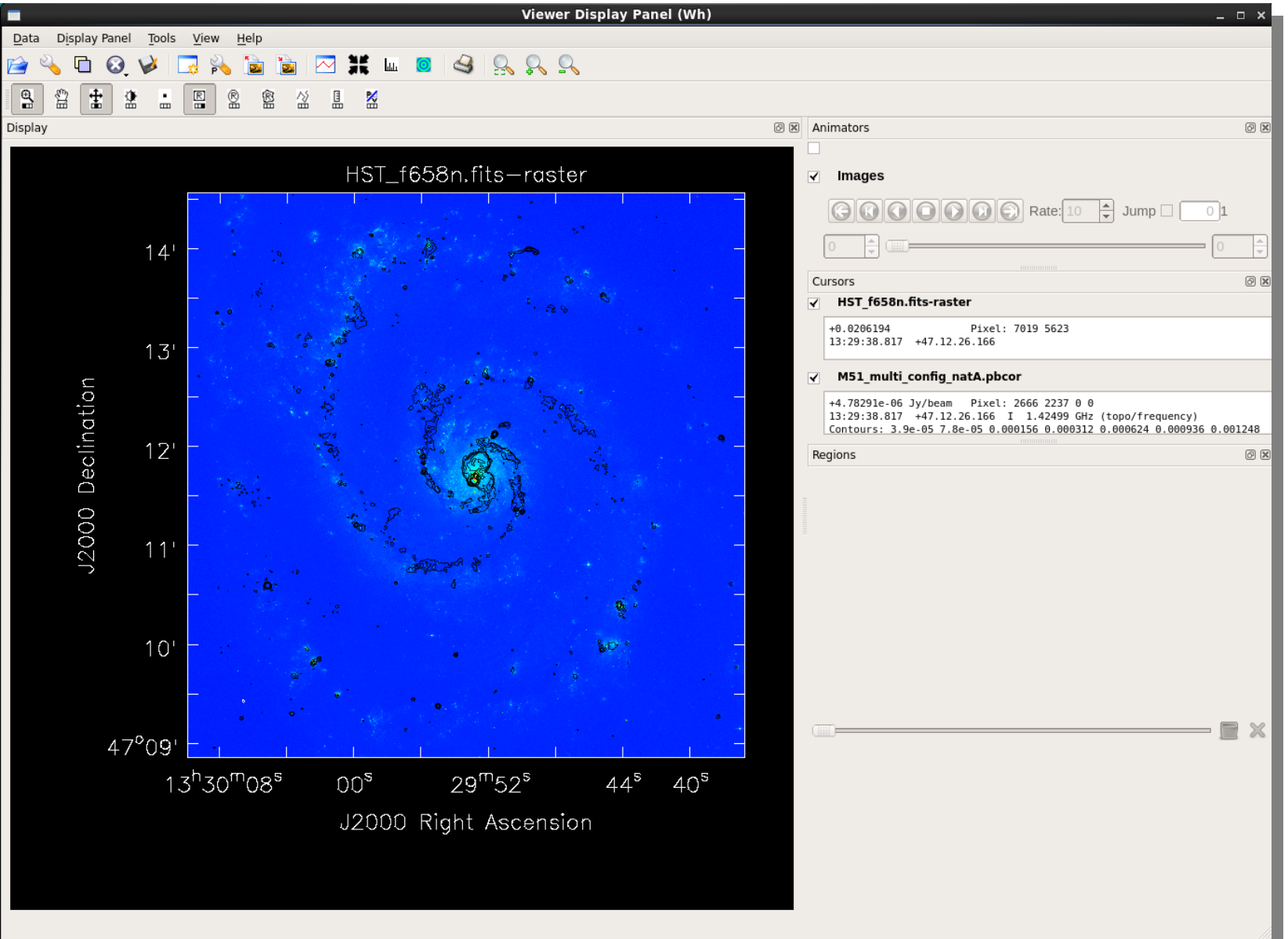


326 Photometric data point(s) and SED

- Spectra
- Redshift-Independent Distances
- 1235 Reference(s)
- 36 Position data point(s)
- 36 Redshift data point(s)
- 8 Diameter data point(s)
- 40 Note(s)
- UGC data
- RC3 data

Data Archives: Useful Tools (4) The CASAVIEWER

Not a multiwavelength archive tool, but great for viewing multiple FITS images at different wavelengths.



CASAVIEWER user interface displaying an optical image of M51 from the Hubble Space Telecsope, with radio contours from the VLA at 1.4 GHz overlaid

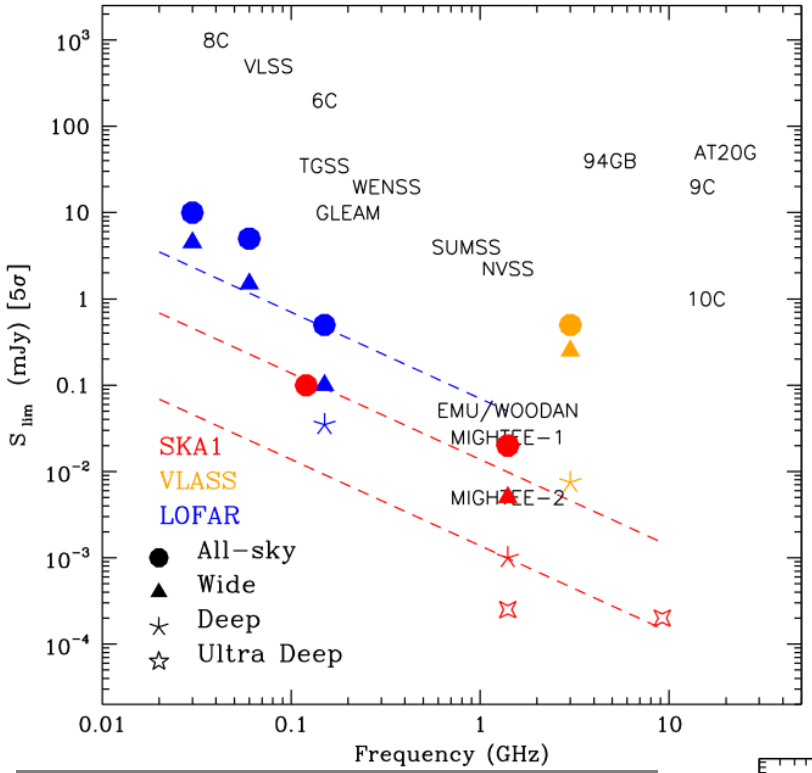
Future

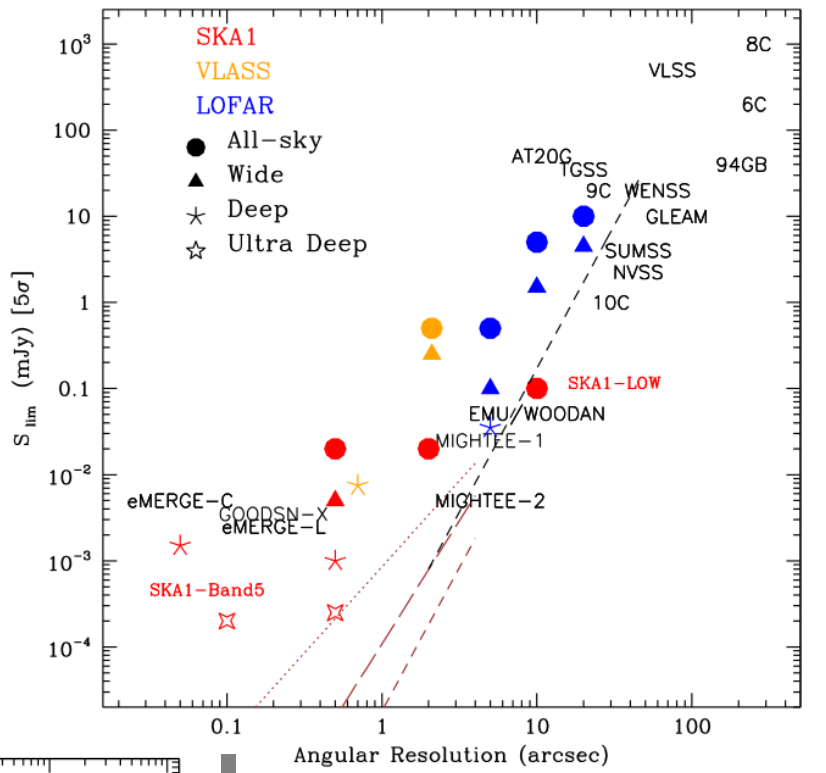
There will be soon a number of surveys and legacy programs from next generation telescopes, producing very rich data archives

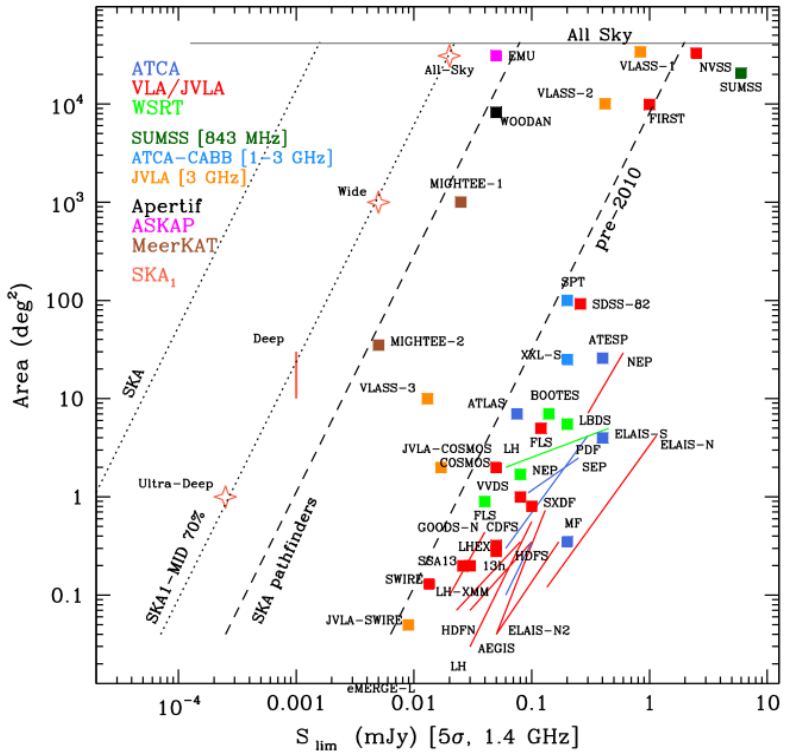
- Low-frequency & low/medium resolution (<1 GHz)
  - LOw Frequency ARray (LOFAR) (6 arcseconds)
  - Murchison Widefield Array (MWA) (~ 2 arcmin)
- Mid-frequencies & Medium resolution (<10 GHz & <10 arcseconds):
  - MeerKAT
  - Australian Square Kilometre Array Pathfinder (ASKAP)
  - Jansky Very Large Array (JVLA) – VLASS 2.5 arcsec at 2.5 GHz
- Mid-frequencies & High resolution (<10 GHz & < 1arcseconds)
  - eMERLIN
- High frequencies (>10 GHz)
  - Atacama Large Millimeter Arraay (ALMA)

Then in the near future (beyond 2020) the SKA phase 1 (LOW and MID) will produce the largest scientific data archive … ever!

Future Surveys vs Current







Summary

- Many standard astronomical projects do follow a specific life-cycle
- It starts with an idea and ends in publication or multiple publications
- The processes in between are where the majority of work occurs
- Public data in the form of literature or data archives are very important
- Always do extensive background reading and search the data archives
- Submit an observing proposal for new data if and only if it is really needed
- With a large number of upcoming radio surveys, it's never been a better time to do radio astronomy!
- Finally: always aim to publish your work