

Thu 24 Mar 2022



This project has received funding from the European Union's Horizon 2020 research and innovation programme under grant agreement No 101004719.





Front Pages 24th of Marc... tomorrowpapers.co.uk



Front Pages 24th of Mar... tomorrowpapers.co.uk



Front Pages 24th of Mar... tomorrowpapers.co.uk



Daily Mail Front Page 24... tomorrowpapers.co.uk



Metro Front Page 24th of ... tomorrowpapers.co.uk



Newspaper front pages f... globalcirculate.com



March 24, 2022 | New York ... nypost.com



Financial Times on Twitte... twitter.com



Financial Times Front Pa... tomorrowpapers.co.uk



Newspaper front pages fr... globalcirculate.com



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Thursday, 24 March 2022 thesouthafrican.com



Daily Telegraph Front Pa... tomorrowpapers.co.uk



UK Newspaper Front Pag... m.thepaperboy.com



The Guardian on Twitter: "G... twitter.com



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UK Newspaper Front Page... m.thepaperboy.com



Newspaper front pages fr... globalcirculate.com



UK) Front Page for 24 Mar... thepaperboy.com



Newspaper front pages fr... globalcirculate.com



Gayelle TV #MeOnMyTV o... twitter.com



UK Newspaper Front Page... m.thepaperboy.com

```

# Import Virtual Observatory support modules
import pyvo
from pyvo.registry import search as regsearch

# helper function to actually do the query once we have a service
def do_query(service):
    print("#####")
    print("Asking service '{0}'".format(service.res_title) )
    try:
        res = pyvo.dal.TAPService( service.access_url ).run_sync( """
            SELECT TOP 20 *
            FROM ivoa.obscore
            ORDER BY t_min ASC""" )
        if res:
            print( res )
        else:
            print("No results")
    except Exception as e:
        print(e)
    print()

#####
# Ask the Virtual Observatory for
# all radio catalog services
#####
for srv in regsearch(waveband='radio', datamodel='ObsCore'):
    do_query( srv )

```

```
<22/search_evn_archive.py [FORMAT=unix] [TYPE=PYTHON] [ASCII=035] [HEX=23] [POS=0001,0001][2%] [LEN=36]
```

```
"search_evn_archive.py" 36L, 878B
```

```
res = pyvo.dal.TAPService( service.access_url ).run_sync( """  
    SELECT TOP 20 *  
    FROM ivoa.obscore  
    ORDER BY t_min ASC""" )
```

```
#####  
# Ask the Virtual Observatory for  
#   all radio catalog services  
#####  
for srv in regsearch(waveband='radio', datamodel='ObsCore'):  
    do_query( srv )
```

#####

Asking service 'The VO @ ASTRON TAP service'

obs_id	dataproduct_type	calib_level	t_min d	target_name	s_ra deg	s_dec deg	obs_freq_mhz m
object	object	int16	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
sauron/ngc2549.Mom0.High.fits	image	2	53007.04466		124.7450	57.80194	--

#####

Asking service 'EVN Data Archive TAP service'

obs_id	dataproduct_type	calib_level	t_min d	target_name	s_ra deg	s_dec deg	obs_freq_mhz m
object	object	int16	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
ES023	visibility	1	51139.81287326384	0016+731	4.940776791666668	73.45833816666666	4998.948305764251

#####

Asking service 'Nobeyama Radio Telescope FITS Archive'

obs_id	dataproduct_type	calib_level [1]	t_min [1] d	target_name	s_ra [1]	s_dec [1] deg	obs_freq_MHz [1] deg
object	object	int32	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
FGN00000003	cube	3	0.0	01100+0000 (2x2)	272.45757353	-19.41493744	110314.4162485902

#####

Asking service 'The VO @ ASTRON TAP service'

obs_id	dataprodect_type	calib_level	t_min d	target_name	s_ra deg	s_dec deg	obs_freq_mhz m
object	object	int16	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
sauron/ngc2549.Mom0.High.fits	image	2	53007.04466		124.7450	57.80194	--

#####

Asking service 'EVN Data Archive TAP service'

obs_id	dataprodect_type	calib_level	t_min d	target_name	s_ra deg	s_dec deg	obs_freq_mhz m
object	object	int16	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
<b>ES023</b>	<b>visibility</b>	<b>1</b>	<b>51139.81287326384</b>	<b>0016+731</b>	<b>4.940776791666668</b>	<b>73.45833816666666</b>	<b>4998.948305764251</b>

#####

Asking service 'Nobeyama Radio Telescope FITS Archive'

obs_id	dataprodect_type	calib_level [1]	t_min [1] d	target_name	s_ra [1]	s_dec [1] deg	obs_freq_MHz [1] deg
object	object	int32	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
FGN00000003	cube	3	0.0	01100+0000 (2x2)	272.45757353	-19.41493744	110314.4162485902



# EVN Data Archive

JIVE provides VO publication services on behalf of the European VLBI Network (EVN).

Please check out our [site help](#). Data [on this site](#) can also be queried through [TAP](#) and an [ADQL form](#).

## Services available here

- By Title
- By Subject

E...

- [EVN Archive TAP service](#)  
The EVN Archive's TAP end point. The Table Access Protocol (TAP) lets you execute queries against our database tables, inspect various metadata, and upload your own data. It is thus the VO's premier way to access public data holdings. Tables exposed through this endpoint include: main from the evn schema, obscure from the ivoa schema, columns, groups, key\_columns, keys, schemas, tables from the tap\_schema schema.

https://evn-vo.jive.eu



# IVOA: Interoperability Standards

- VOExplorer exposes registry weaknesses
  - mostly in schemata/implimentation
- Images, spectra, time standards pretty OK
  - maybe some too complex
  - User-friendly metadata entry/ pu
- Not yet covered:
  - Polarization
  - Visibility plane quantities
    - Do we need these or should we d



A M S Richards

• Do we need a proposals standard?

Northstar/ALMA phase 1 to 2 proposal tools Dec 2007 Jive

SlidePlayer 10/10

## Visibility data for potential products

General	Spatial	Temporal	Spectral	Observable
frame/units	ICRF, deg	MJD	MHz	Jy/beam
Location	13.123456 +55.987654	50613.5	1658	0.001
Bounds	12.92, +55.58 13.32, +56.38	50613.0 50614.0	1650 1665	0.0002 0.5 (or function)
Support	13.123456 +55.987654	(on-source scan listing URL)	1650 1665	undef
Sensitivity	f(support, lary beam)	undef	(bandpass LUT URL)	1
Filling Factor	1	0.7	0.93	undef
Resolution	0".2 2".0 0".2 2".0	5 m	1000 kHz	50 100 μJy/beam
Sampling	0".04 0".0625 0".04 0".0625	16 s	1000 kHz	undef

From presentations by A.M. Richards, c. 2006, AVO+EuroVO workshops

# Visibility data for potential

General

Spatial

Temporal

- User-friendly metadata entry
- Not yet covered:
  - Polarization
  - Visibility plane quantities
- Do we need these or should we do



From presentations by A.M. Richards, c. 2006, AVO+EuroVO workshops



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ERIC

*Marjolein Verkouter*



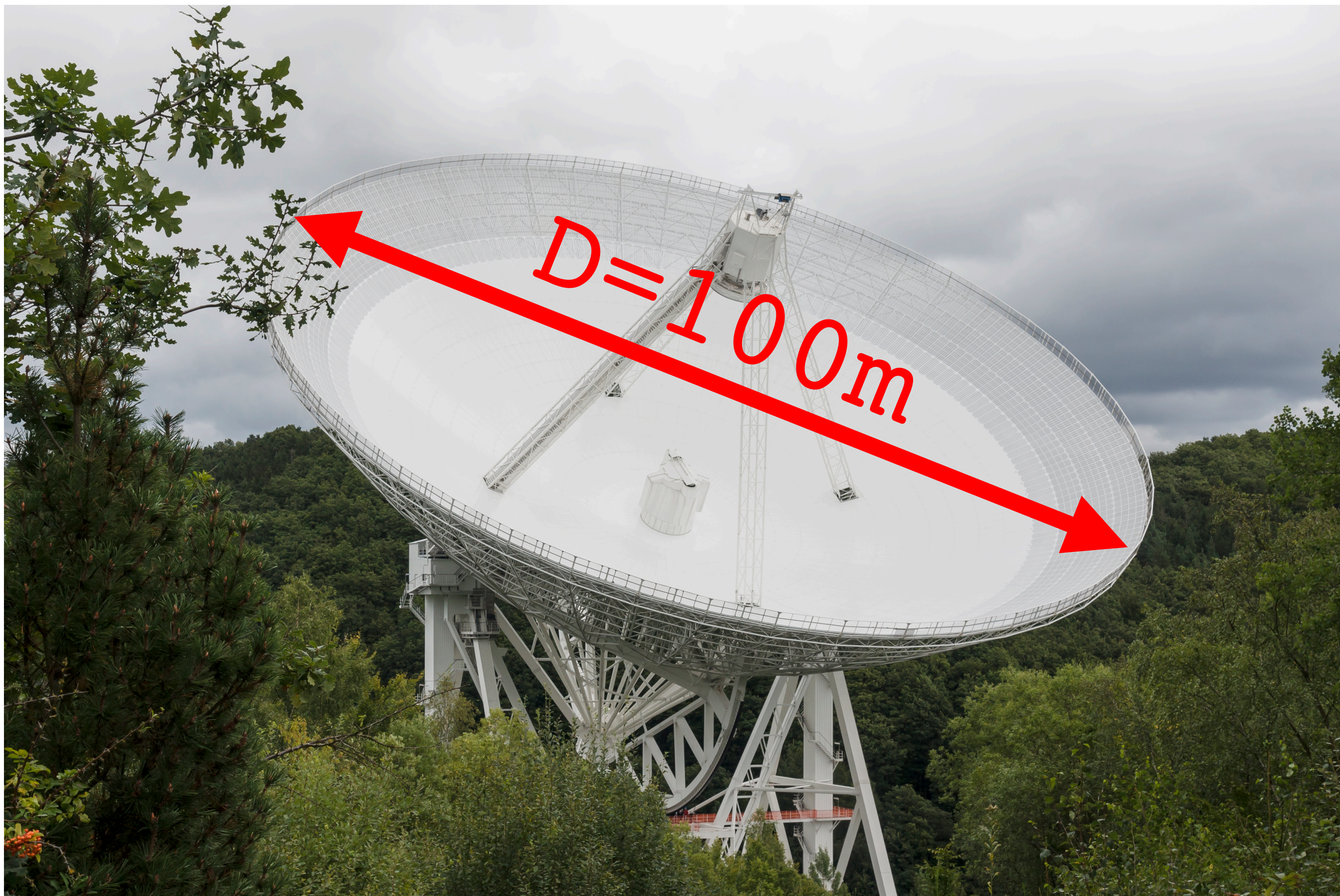
**JIVE**

Joint Institute for VLBI  
ERIC

# VLBI into the VO

thanks to the ESCAPE project

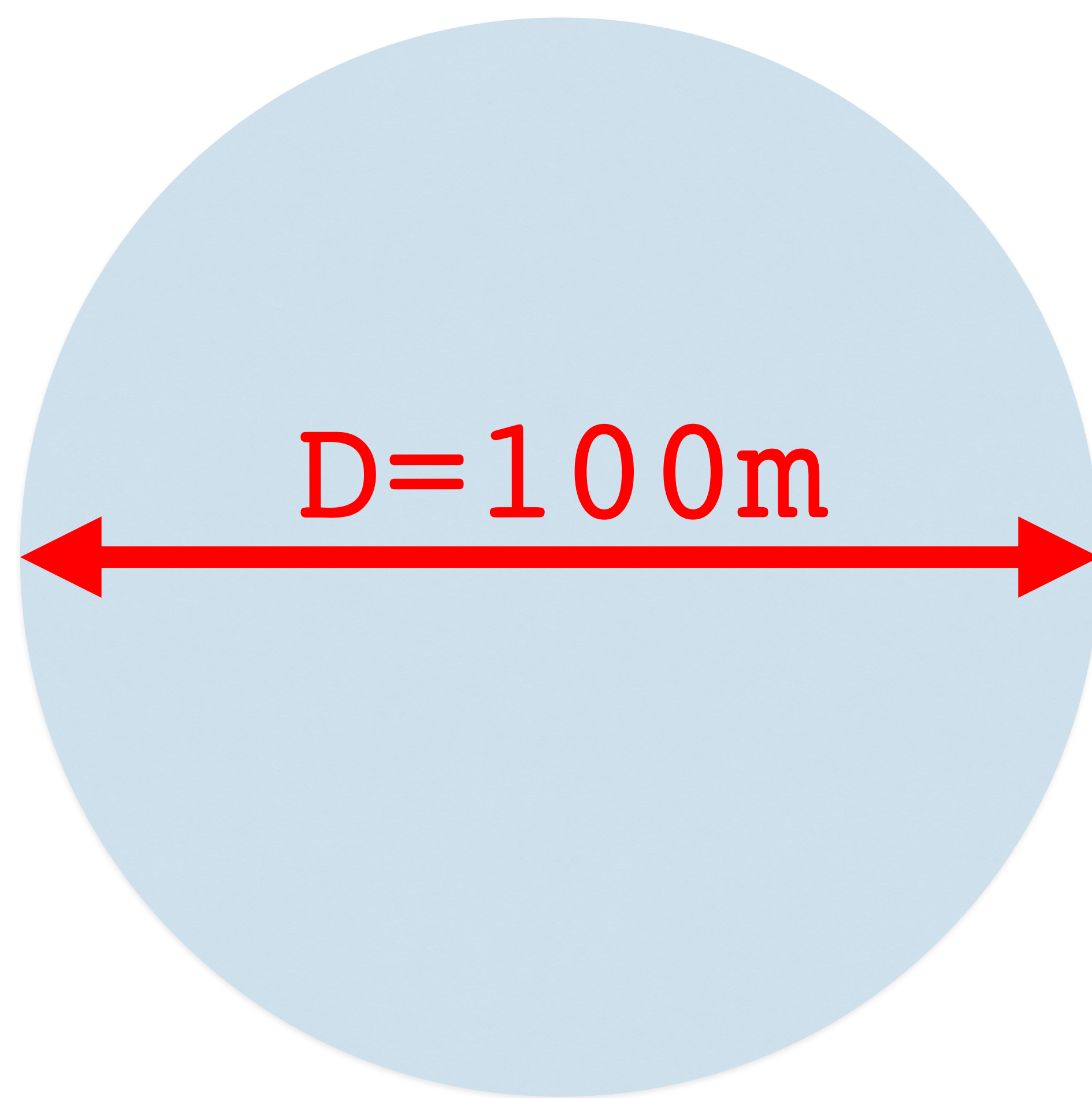
*Marjolein Verkouter*

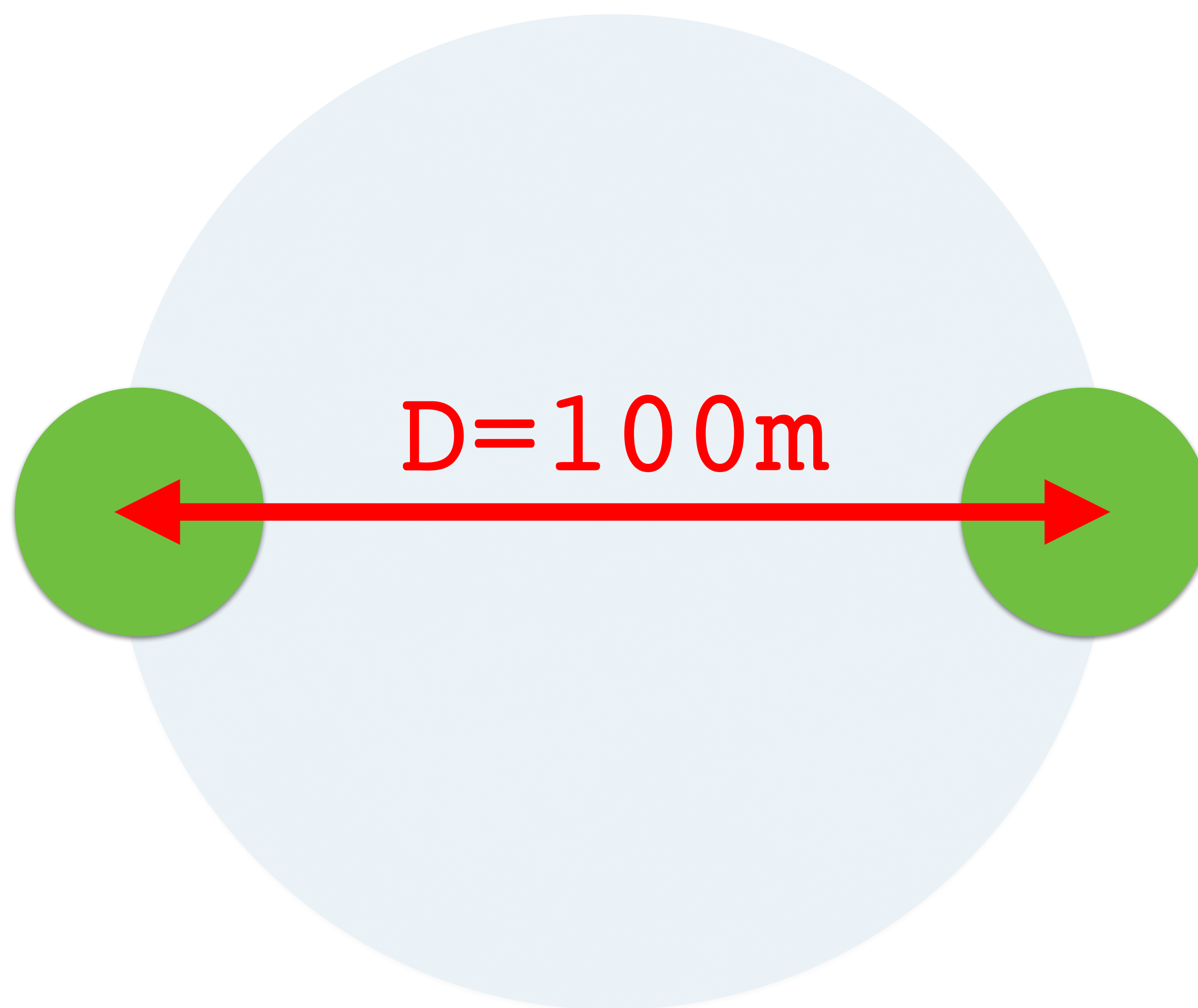


Radioteleskop Effelsberg, DE

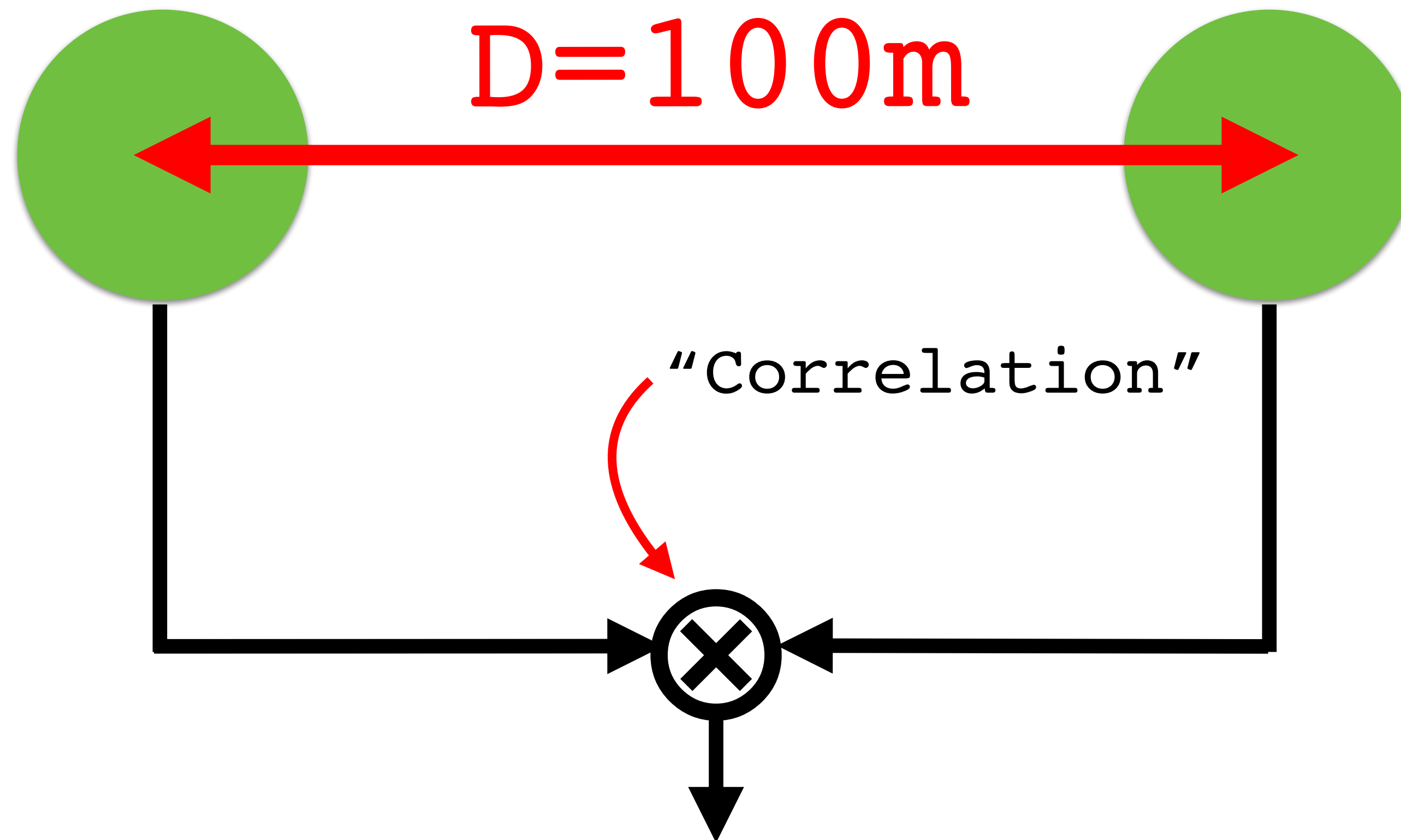


Radioteleskop Effelsberg, DE









interferometric dataset with same  
resolution as a single 100 m telescope



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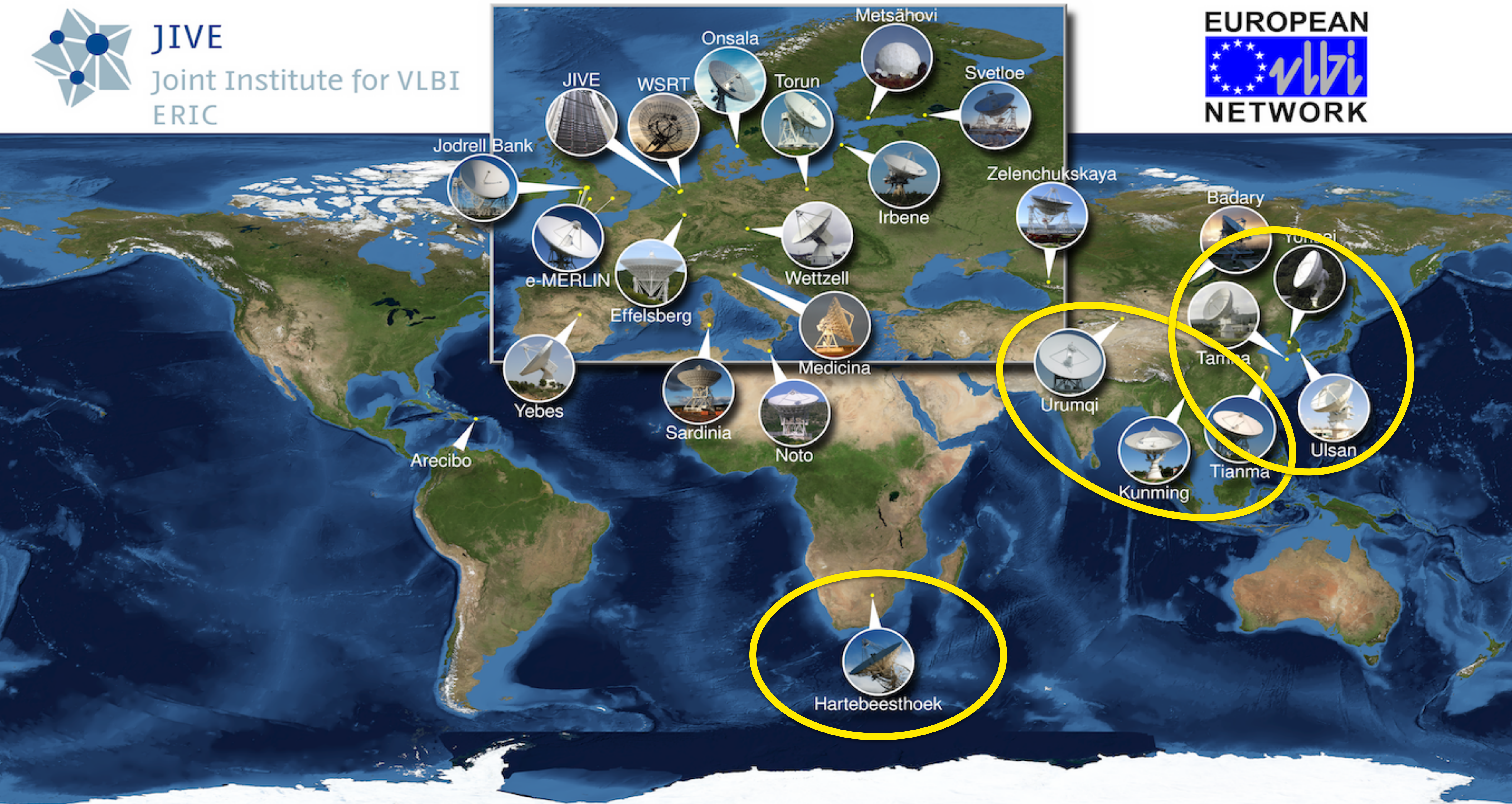
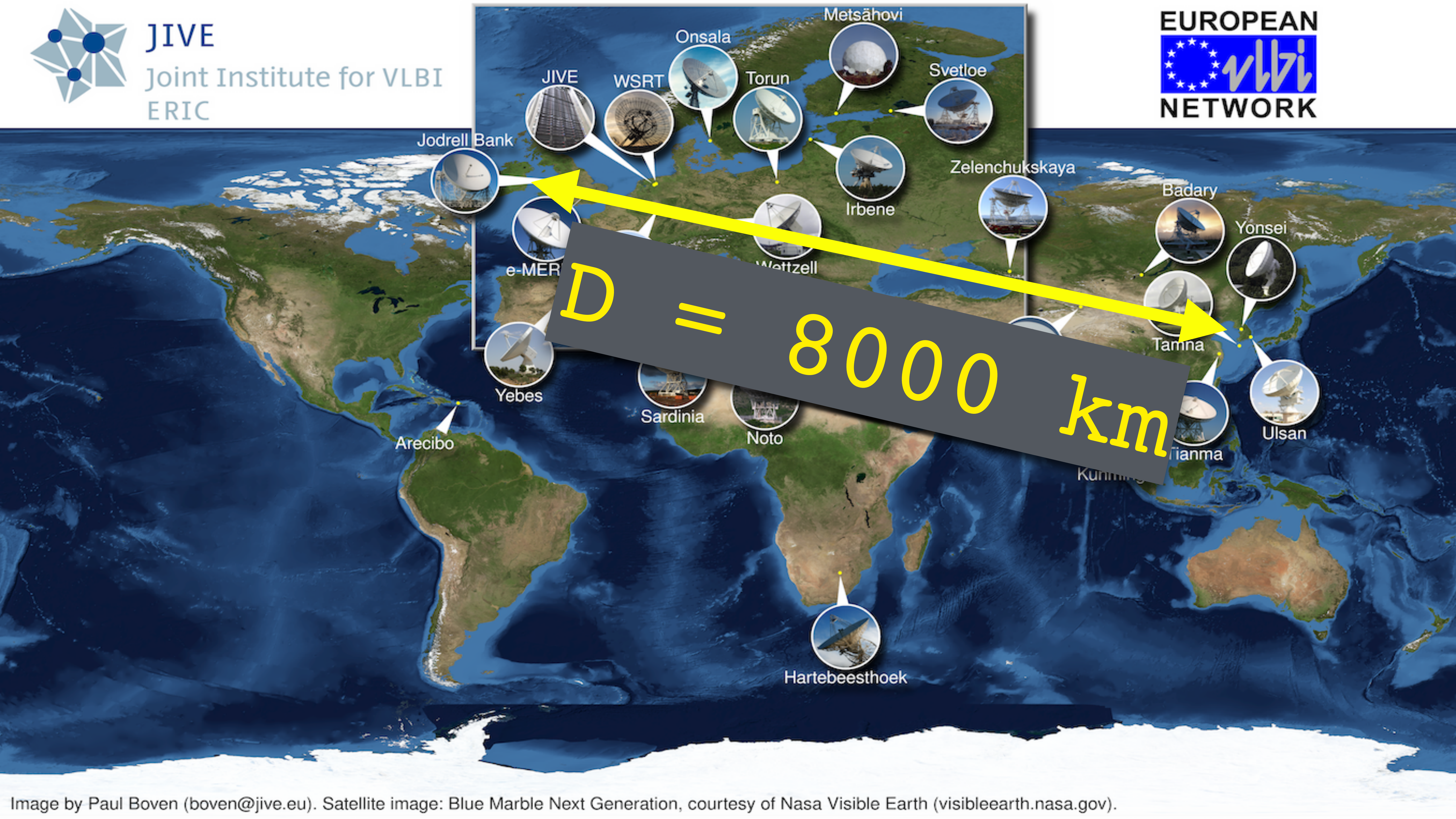


Image by Paul Boven (boven@jive.eu). Satellite image: Blue Marble Next Generation, courtesy of Nasa Visible Earth (visibleearth.nasa.gov).



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Private Not Secure — archive.jive.nl/scripts/portal.php

iptables - Fai... - Server Fault SFXC Real-Time Fringe Plot INFRA-TECH P...oogle Drive ESCAPE plan... Documenten Overview - ...REDMINE OSU VLBI and PFB - Google Docs Joint R&D an...Group topics JIVE ZoomRoom#1 JIVE ZoomRoom#2

## EVN Data Archive at JIVE

The [EVN](#) Data Archive at [JIVE](#) contains correlated data associated with [EVN](#) observations processed at [JIVE](#). The archive includes a growing database of VLBI observations that have entered the public domain.

In addition, the archive makes available various correlator and pipeline products that give an impression of the data quality. In some cases, preliminary images of calibrators and target sources are also available. The archive allows these to be combined with external VO resources in a natural way.

Select EVN experiment

ES023

**Access to EVN archive**

- [Show experiment ES023](#)
- [Show catalogue of experiments](#)
- [Search archive by sourcename or position](#)
- [The Bologna archive of EVN observations.](#)

**Info**

- [Increase of data since 2000](#)
- [Web statistics](#) since June 2004

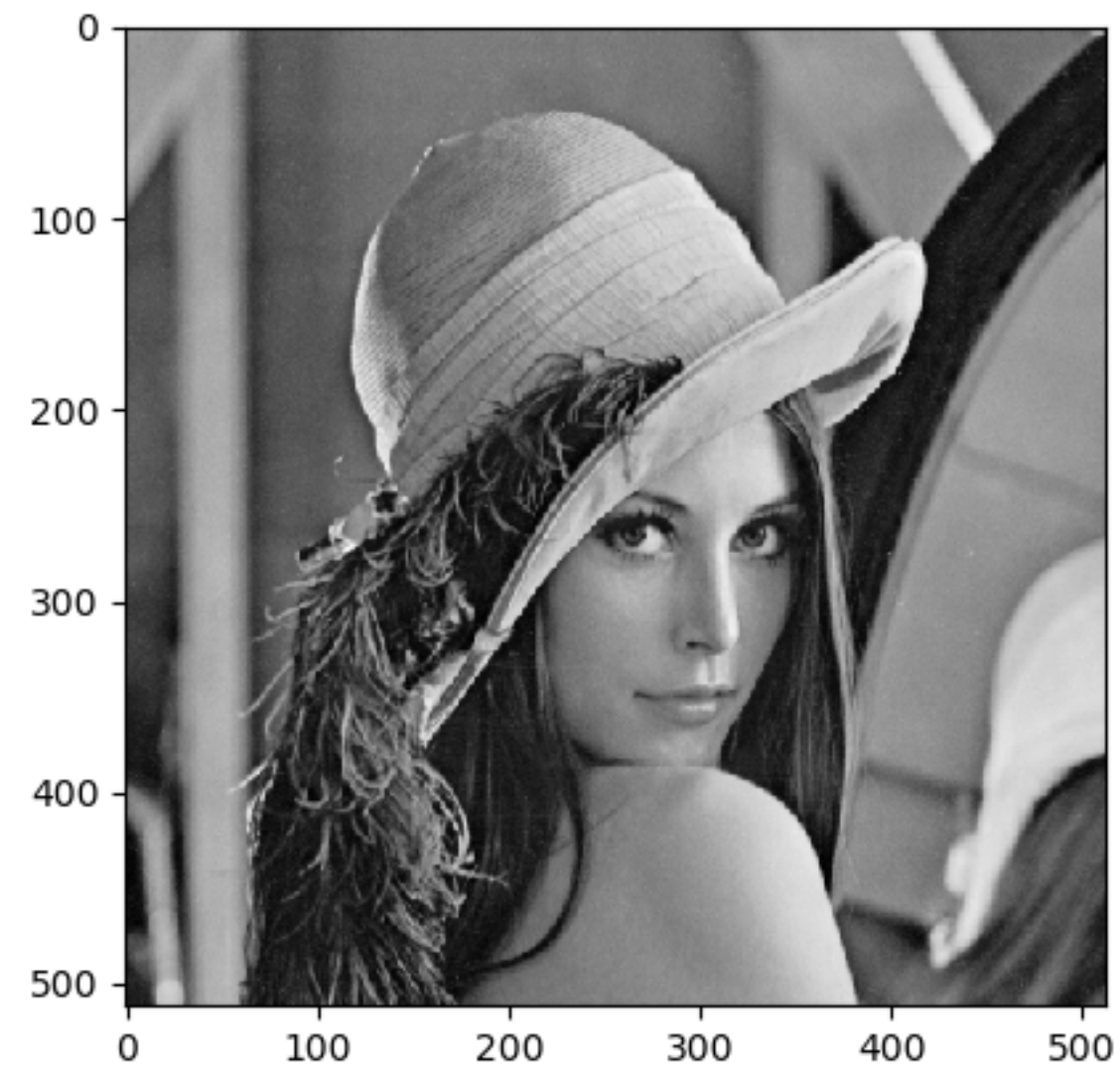
Select a sourceposition from EVN experiment ES023

Ra	Dec	Source	Image	Image
4.9408	73.4583	0016+731		
68.1521	41.6412	0429+415		
88.8784	39.8137	DA193		
202.7845	30.5092	1328+307	sdss	

**Access to VO archives**

- [Aladin Sky Atlas](#)
- [Sloan Digital Sky Survey](#)

# image domain



# image domain

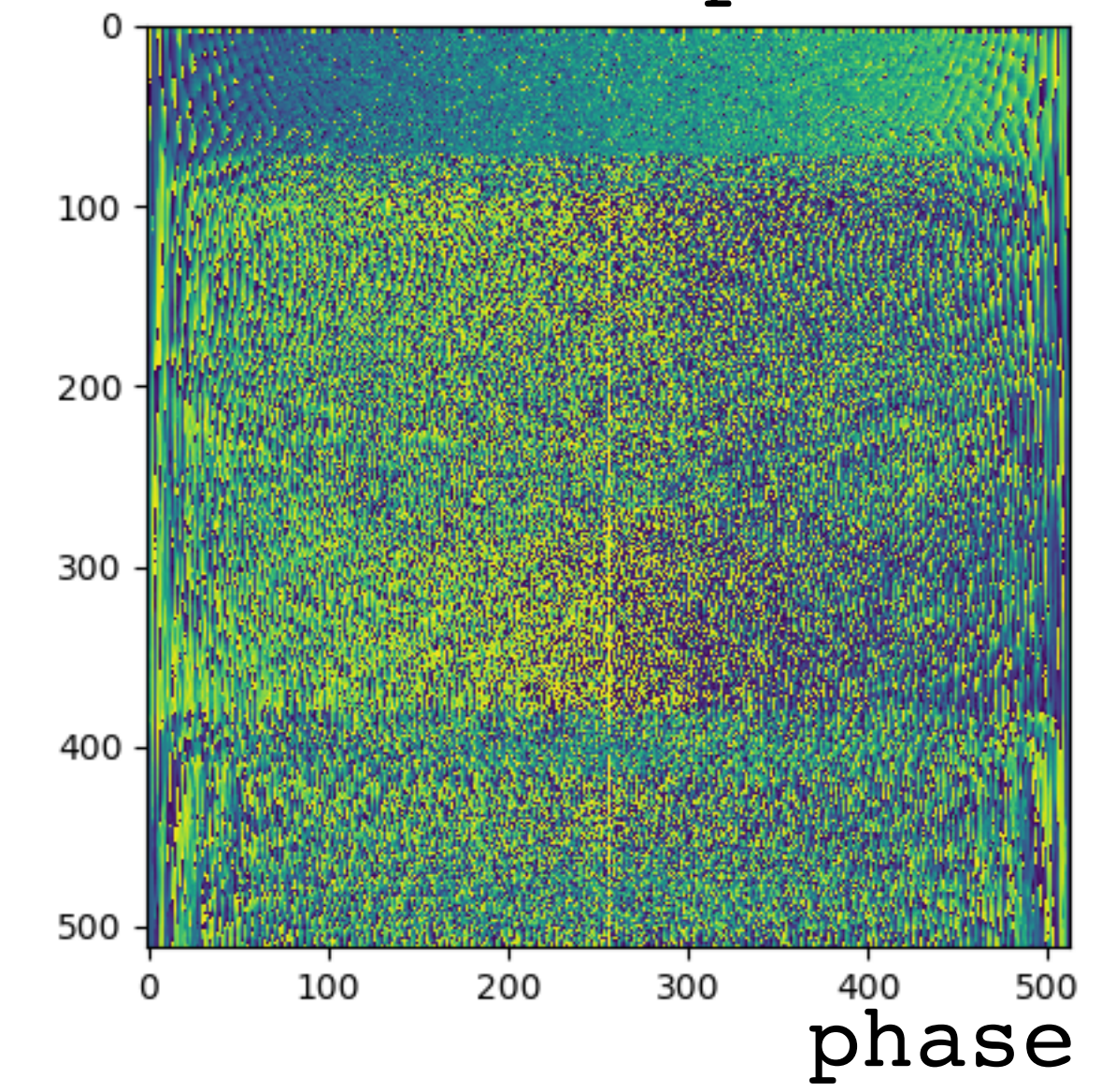
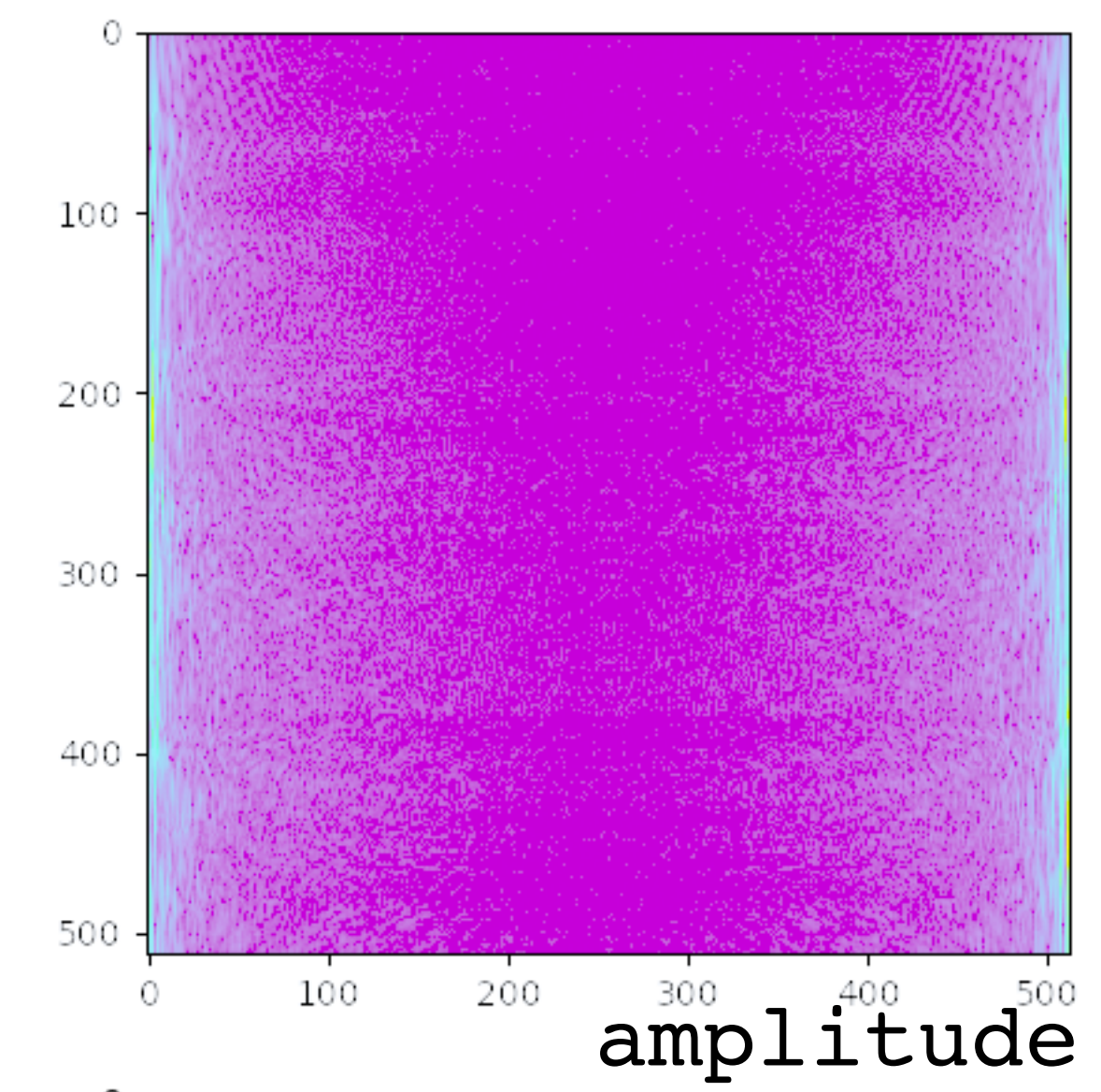
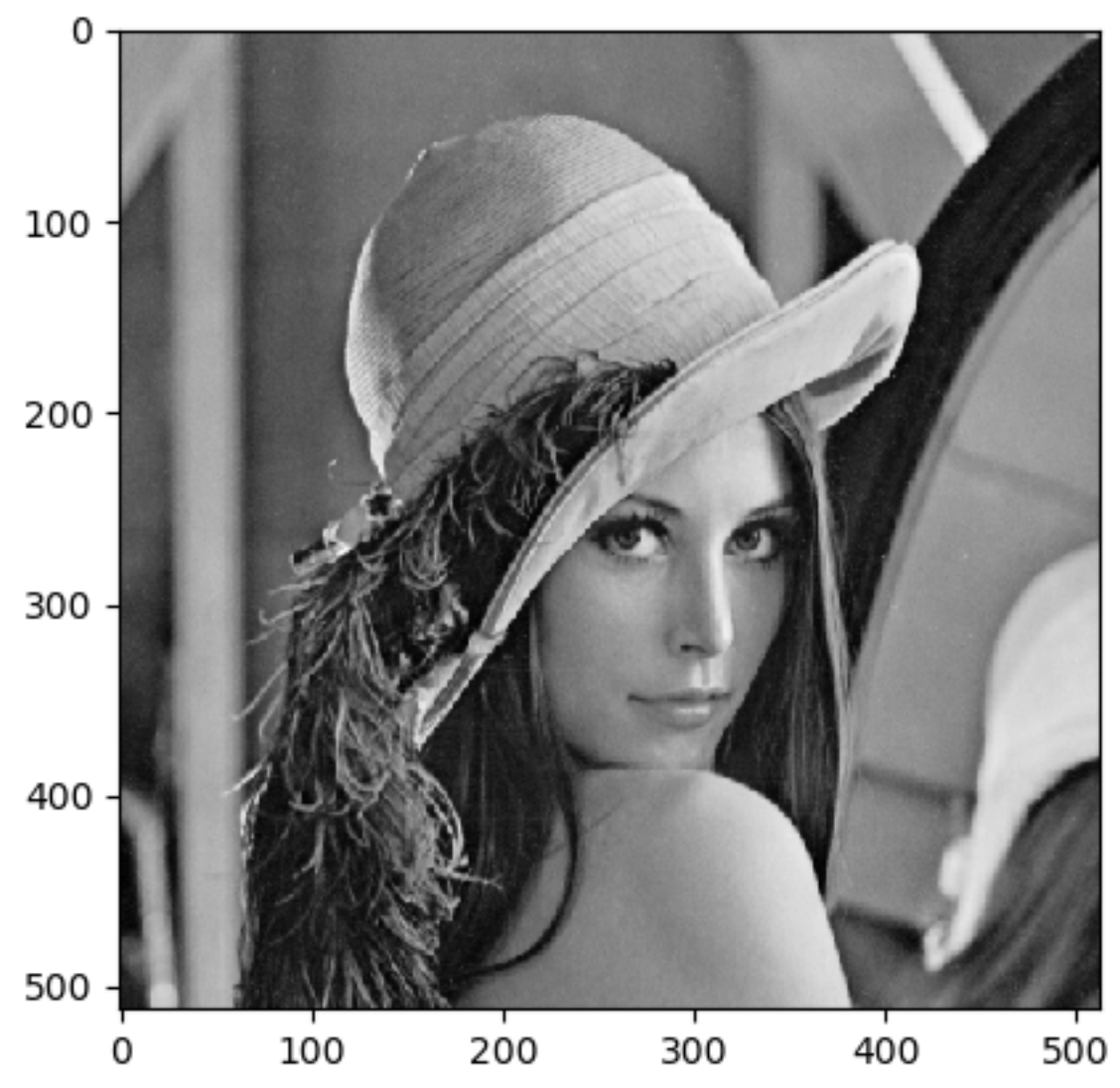
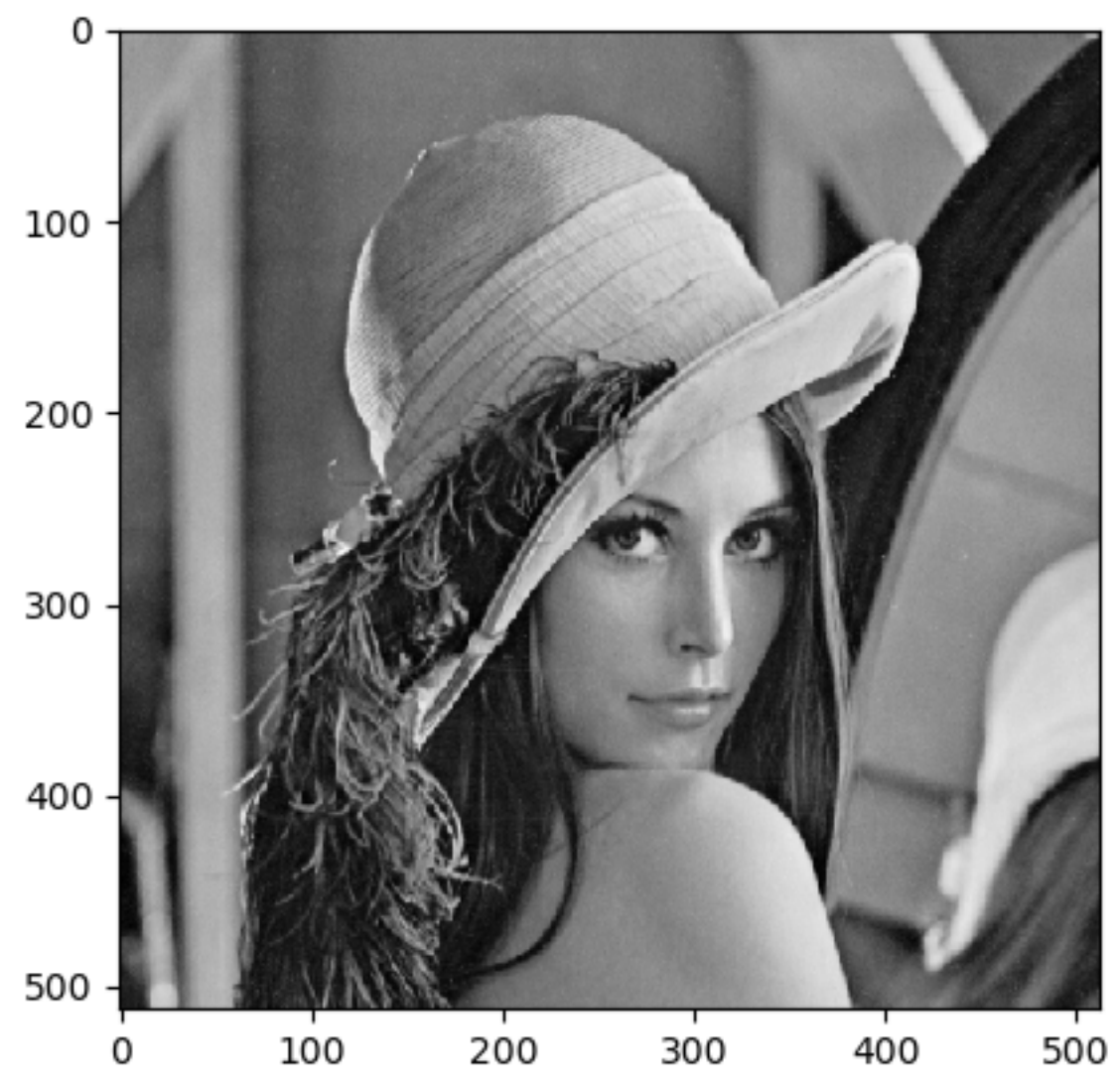
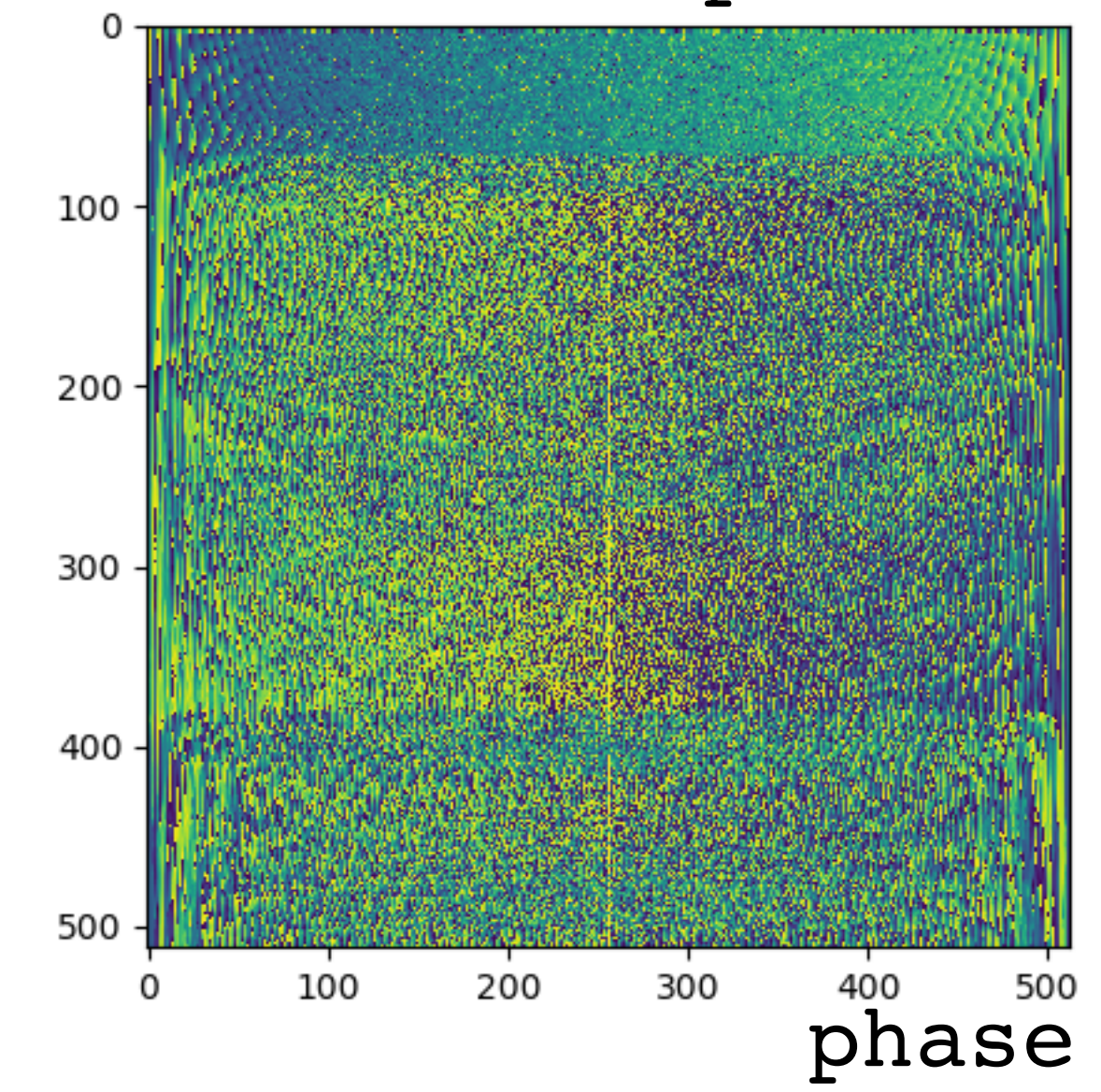
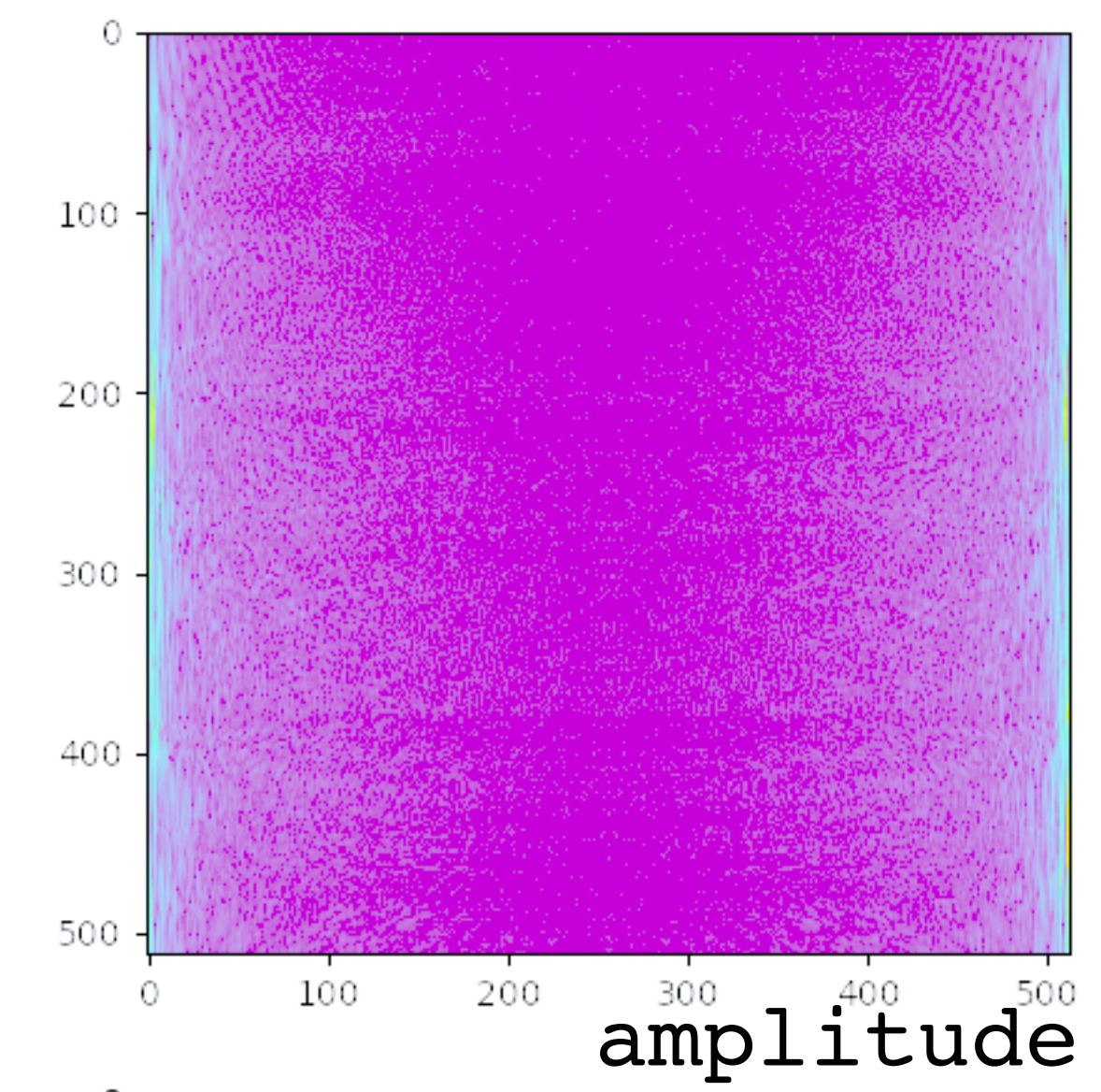


image domain

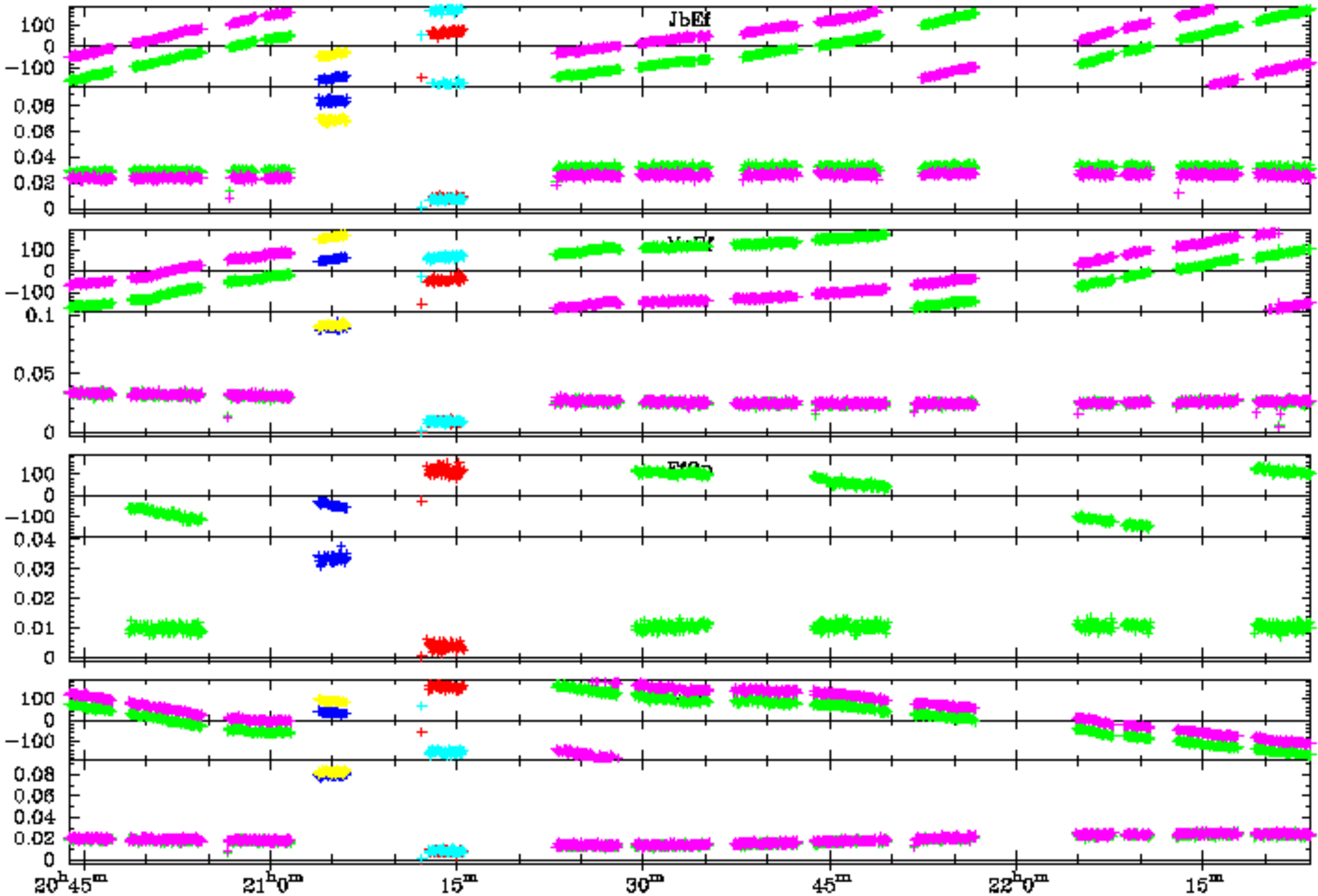
visibility domain  
(a.k.a. "u,v-plane")



2-d FT



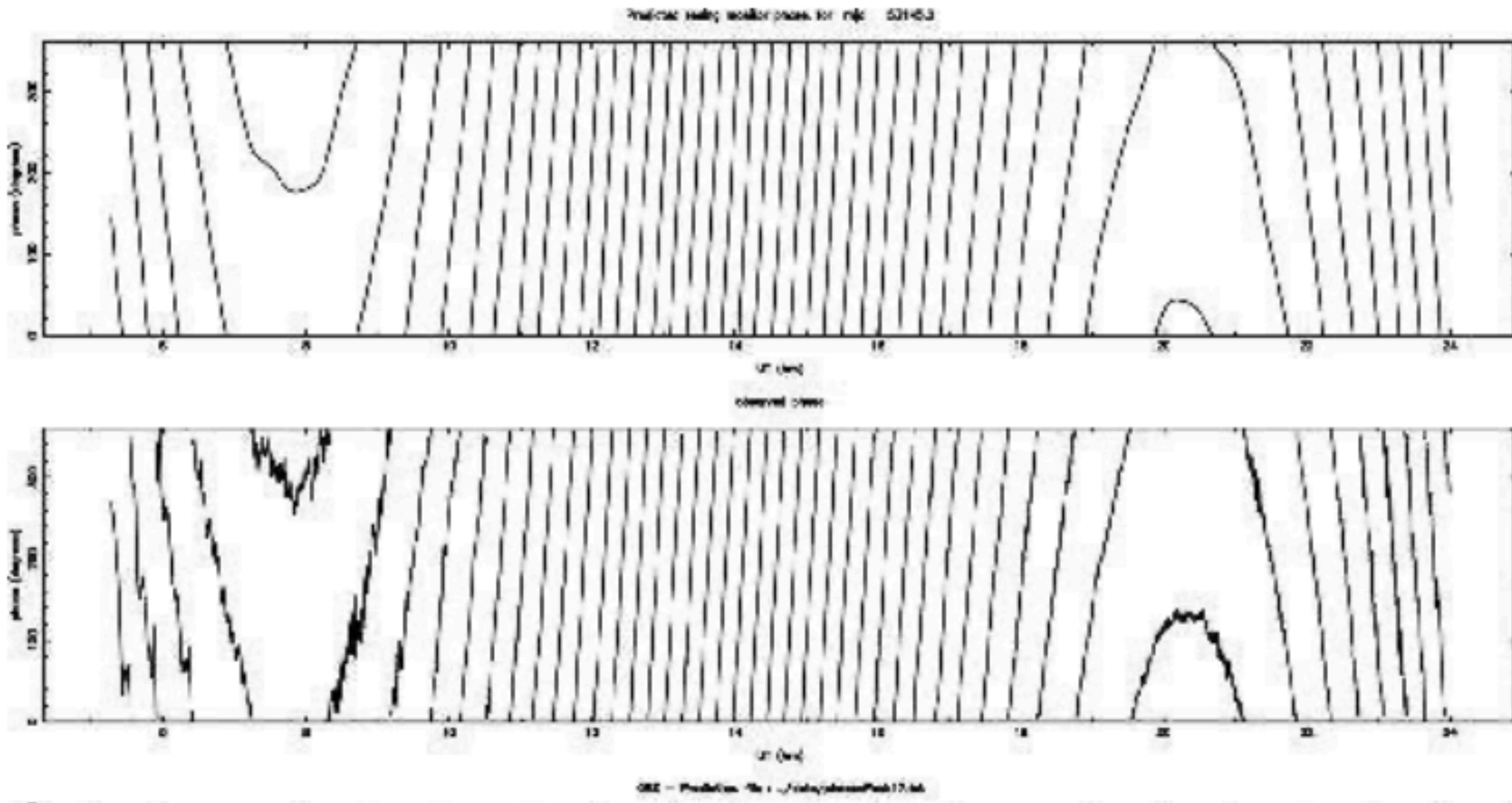
phase  
amplitude



→ time

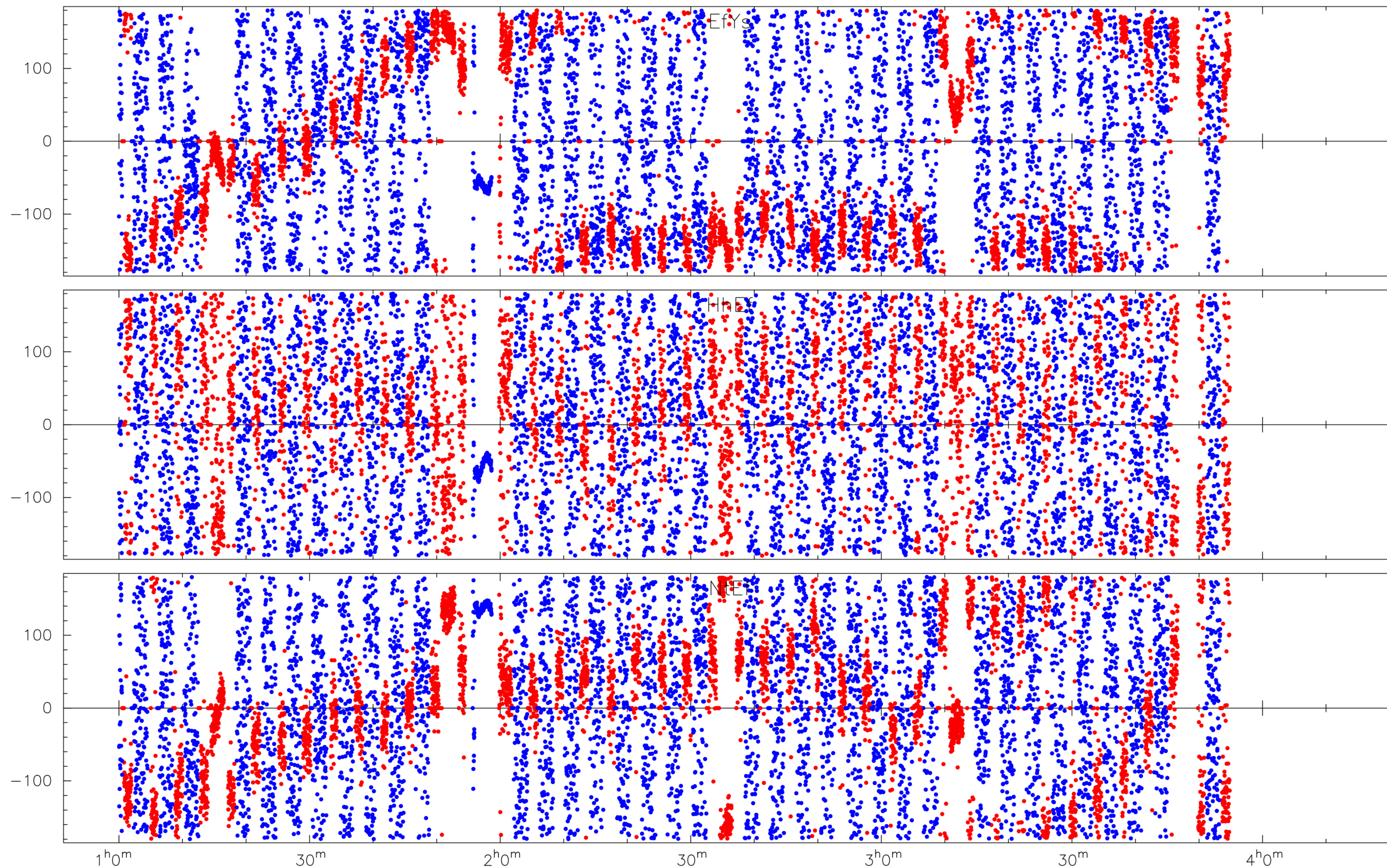


measured phase ↑



time →

↑  
measured phase



**Baseline:**  
Effelsberg (DE)  
Yebes (ES)

**Baseline:**  
Effelsberg (DE)  
Hartebeesthoek (SA)

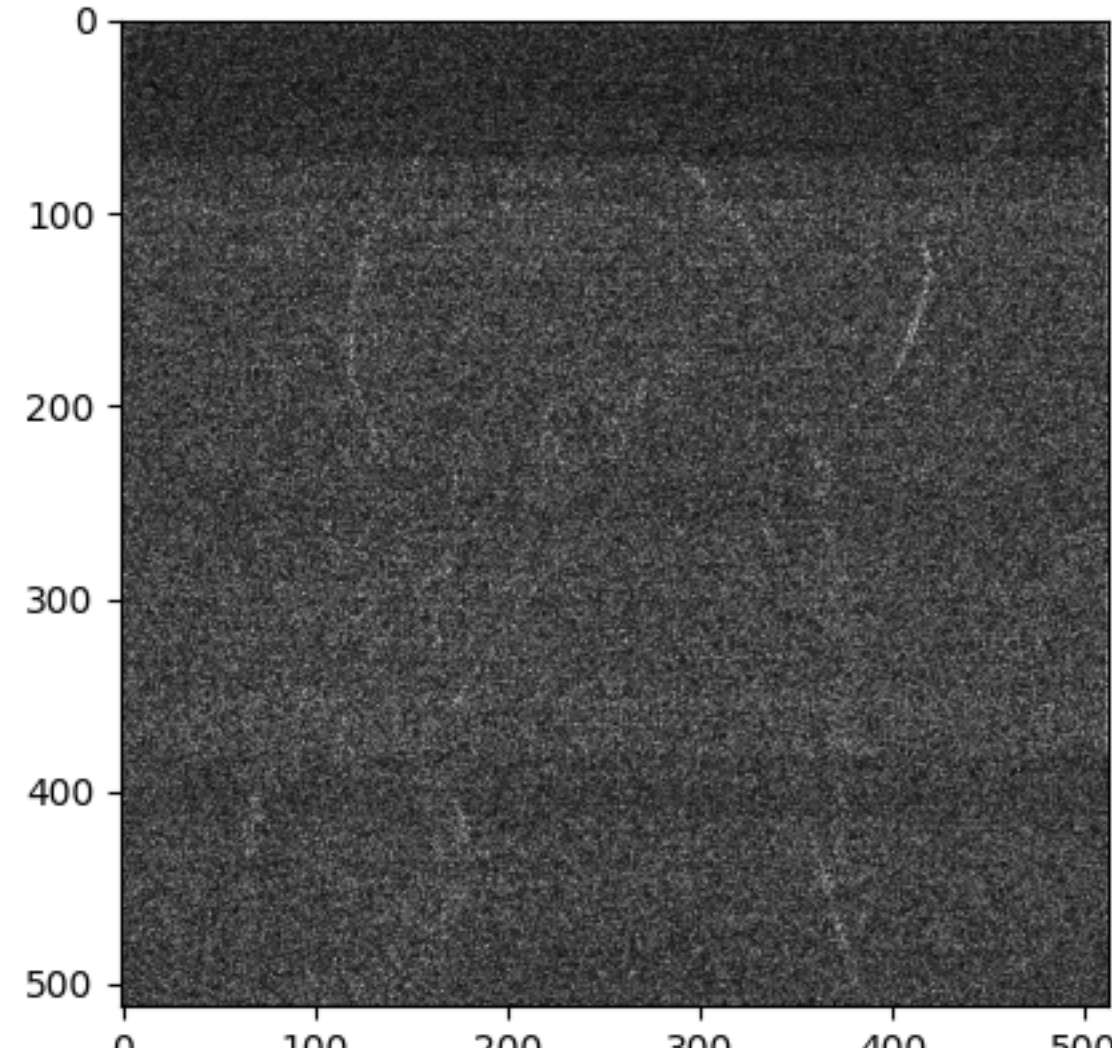
**Baseline:**  
Effelsberg (DE)  
Noto (IT)

J1312-2350   J1311-2329   J1337-1257   EM170817   J1311-2329, J1303-2405   J1303-2405

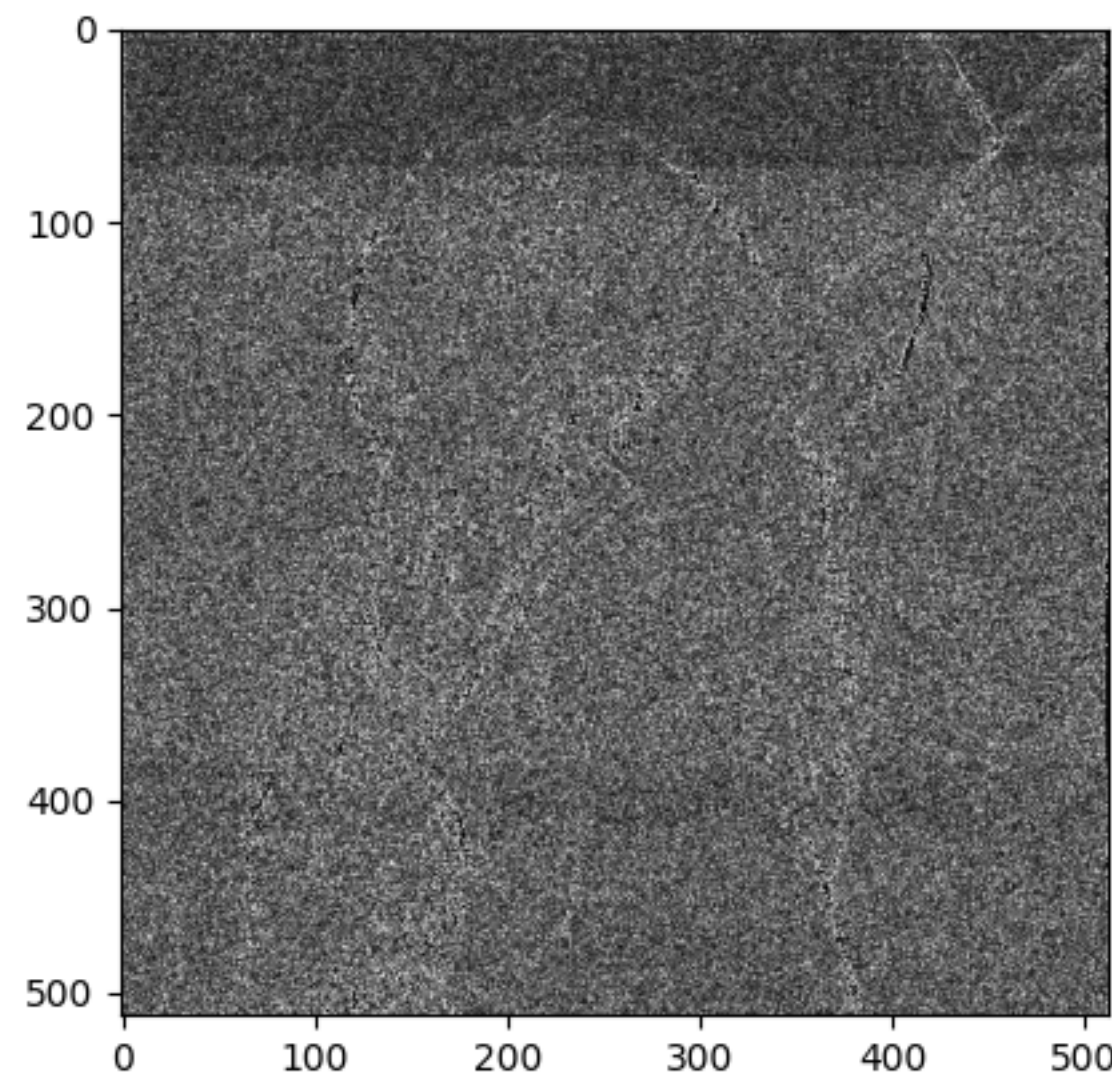
time (~3hr period spanned) →

image domain

visibility domain  
(a.k.a. "u,v-plane")

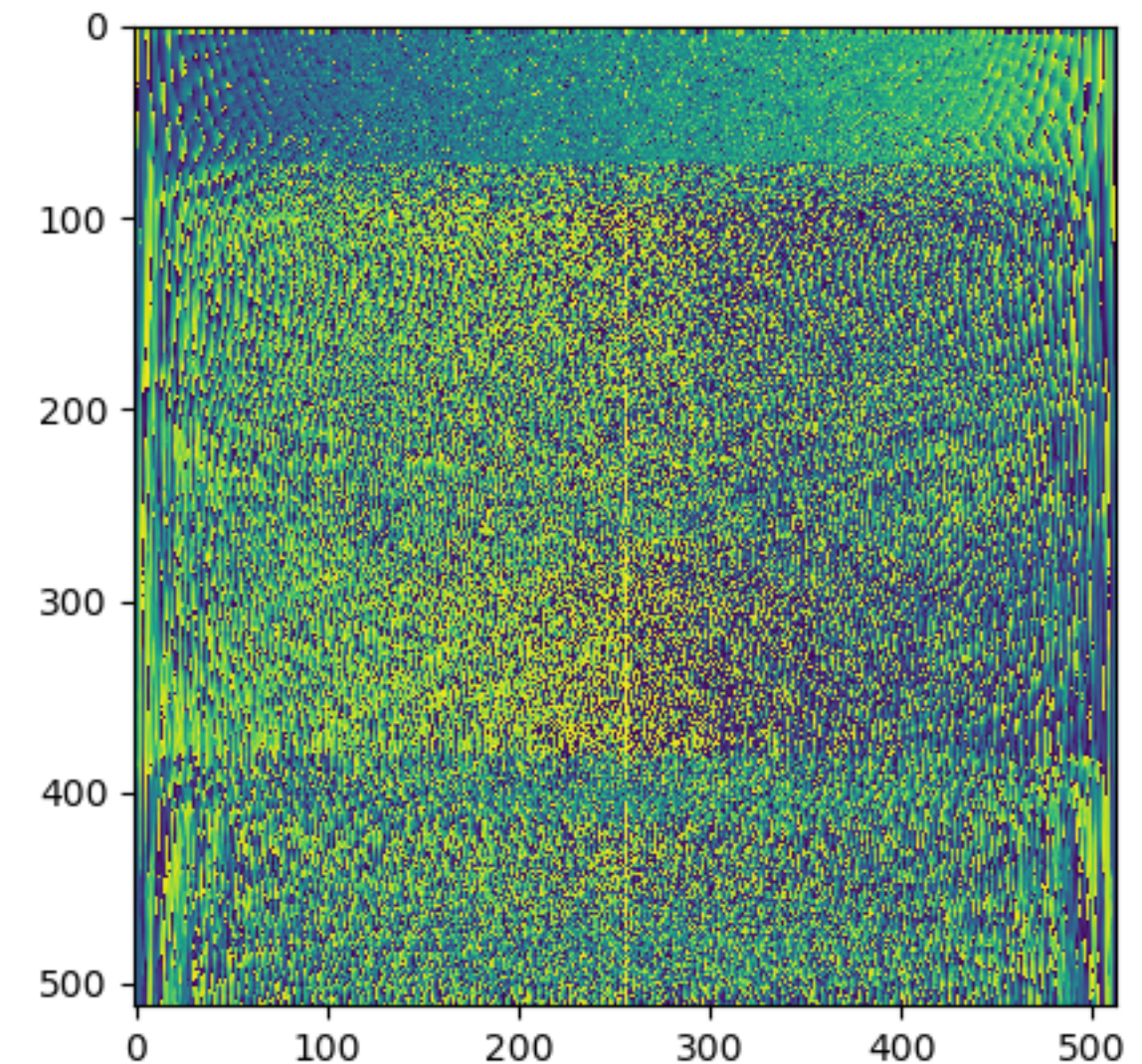


Method 1



Method 2

←  
2-d  $FT^{-1}$



Differences in imaging parameters, calibration, processing  
may result in different images ...

#####

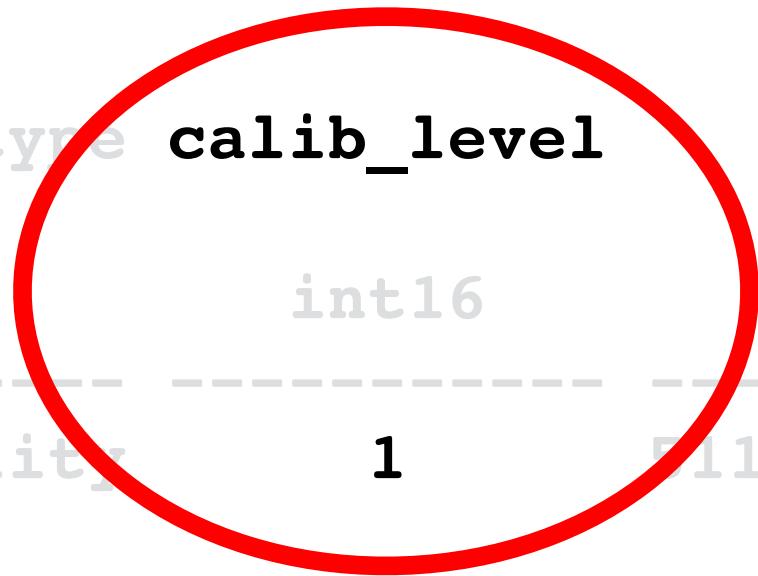
Asking service 'The VO @ ASTRON TAP service'

obs_id	dataprodect_type	calib_level	t_min d	target_name	s_ra deg	s_dec deg	obs_freq_mhz m
object	object	int16	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
sauron/ngc2549.Mom0.High.fits	image	2	53007.04466		124.7450	57.80194	--

#####

Asking service 'EVN Data Archive TAP service'

obs_id	dataprodect_type	calib_level	t_min d	target_name
object	object	int16	float64	object
-----	-----	-----	-----	-----
ES023	visibility	1	51139.81287326384	0016+7



**Level 0:** Raw instrumental data  
**Level 1:** Instrumental data in a standard format (FITS, V...  
**Level 2:** Instrumental data with the instrument...  
**Level 3:** Calibrated, science ready data with the instrum...  
**Level 4:** Enhanced data products like mosaics, resample...  
**Level 4:** Analysis data products generated after some .....

#####

Asking service 'Nobeyama Radio Telescope FITS Archive'

obs_id	dataprodect_type	calib_level [1]	t_min [1] d	target_name	s_ra [1]	s_dec [1] deg	obs_freq_MHz [1] deg
object	object	int32	float64	object	float64	float64	float64
-----	-----	-----	-----	-----	-----	-----	-----
FGN00000003	cube	3	0.0	01100+0000 (2x2)	272.45757353	-19.41493744	110314.4162485902

Private < > A A Not Secure — archive.jive.nl/scripts/arch.php?exp=ES023

iptables - Fai... - Server Fault SFXC Real-Time Fringe Plot INFRA-TECH P...oogle Drive ESCAPE plan... Documenten Overview - ...REDMINE OSU VLBI and PFB - Google Docs Joint R&D an...Group topics JIVE ZoomRoom#1 JIVE ZoomRoom#2 >>

The EVN MkIV Data Processor at JIVE archive.jive.nl/scripts/arch.php?exp=ES023

## EVN fitsfiles of experiment ES023

Access status: public

Download: Use right mousebutton -> Save target.

If the connection is slow, try [GNU wget. \(manual\)](#).  
It can be obtained from the web, if not available.

A file selection can be made by filling in the wildcard after the -A option.  
To get all fitsfiles of ES023 copy next line to your commandwindow:

```
wget -t45 -l1 -r -nd http://archive.jive.nl/exp/ES023_981124/fits -A "es023**"
```

The checksum file can be used to verify the checksum of all datafiles using:  
**md5sum -c es023.checksum** (on unix systems).

Filename	Length x 10 <sup>9</sup> bytes
<a href="#">es023.checksum</a>	0.000000043
<a href="#">es023_1_1.IDI1</a>	0.513987840

FITS Interferometry Data Interchange (FITS-IDI) Convention  
<https://fits.gsfc.nasa.gov/registry/fitsidi.html>

wget -t45 -l1 -r -nd http://archive.jive.nl/exp/ES023\_98112

### Pipeline products of experiment ES023

- Pipeline plots
- [AIPS calibration. tables \(FITS Format\)](#)
- [AIPS history file.](#)
- [Short summary of CL/SN table contents.](#)
- [Input parameters for script.](#)
- [Associated EVN calibration.](#)
- [Associated VLBA/ VLA/ GBT file.](#) (Not available)
- [UVFLG flagged data.](#) (Not available)
- [UVFLG Band-edge Flagging.](#)
- [The pipeline logfile.](#) (Not available)
- [Pipeline-calibrated UV FITS files.](#) (Not available)

### Archive Info

### Station Feedback

### Station Logfiles

### Standard plots

### Pipeline calibration

### Fitsfiles

### Abstract

The target: Up to 250 Jy at 10M lambda. Detected up to 141M lambda.

[u,v coverage for 0016+731.](#)

[u,v coverage for 1328+307.](#)

[u,v coverage for DA193.](#)

### Comments.

0016+731: A central condensation elongated in the NE-SW direction up to 35M lambda, and (u,v) data points in the north-south direction around 120M lambda.

1328+307: Sparse distribution up to 12M lambda.

DA193: A central condensation elongated in the north-south direction up to 40M lambda, and (u,v) data points in the NE-SW direction around 120M lambda.

The target: A central condensation elongated in the north-south direction up to 40M lambda, and (u,v) data points in the NE-SW direction at 110-130M lambda.

[Crude map of 0016+731 from the pipeline.](#)

[Crude map of 1328+307 from the pipeline.](#)

[Crude map of DA193 from the pipeline.](#)

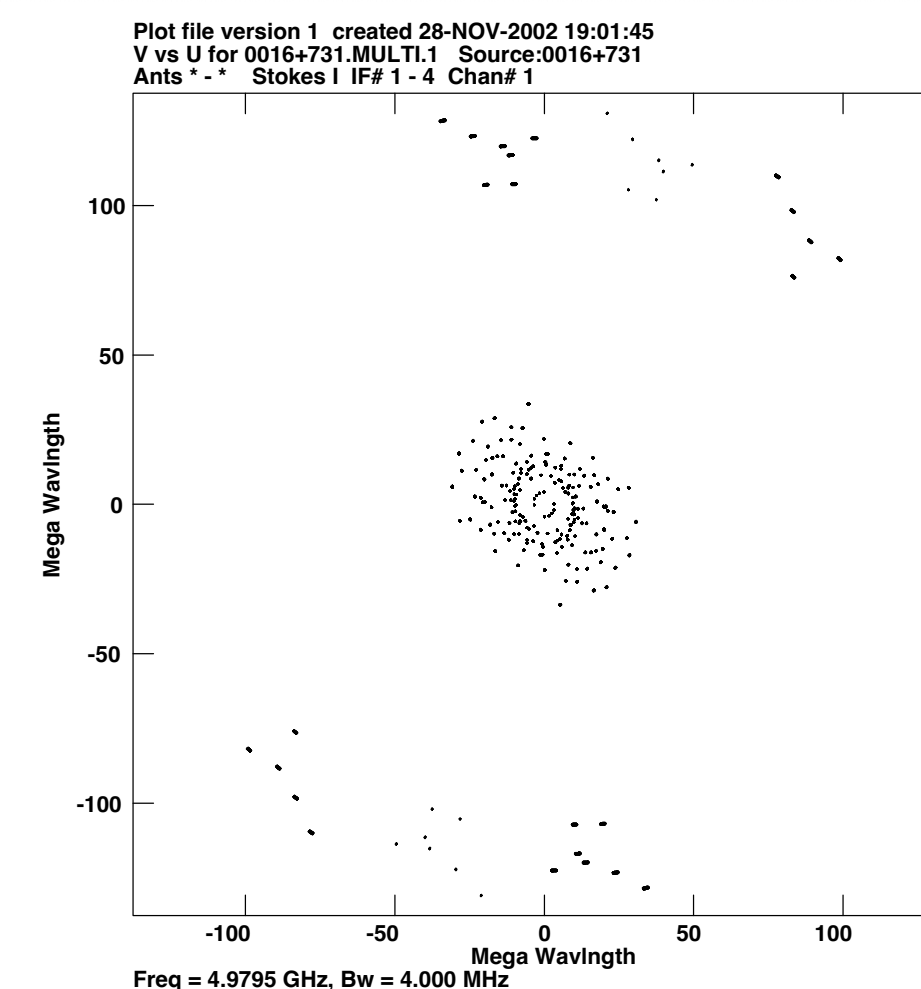
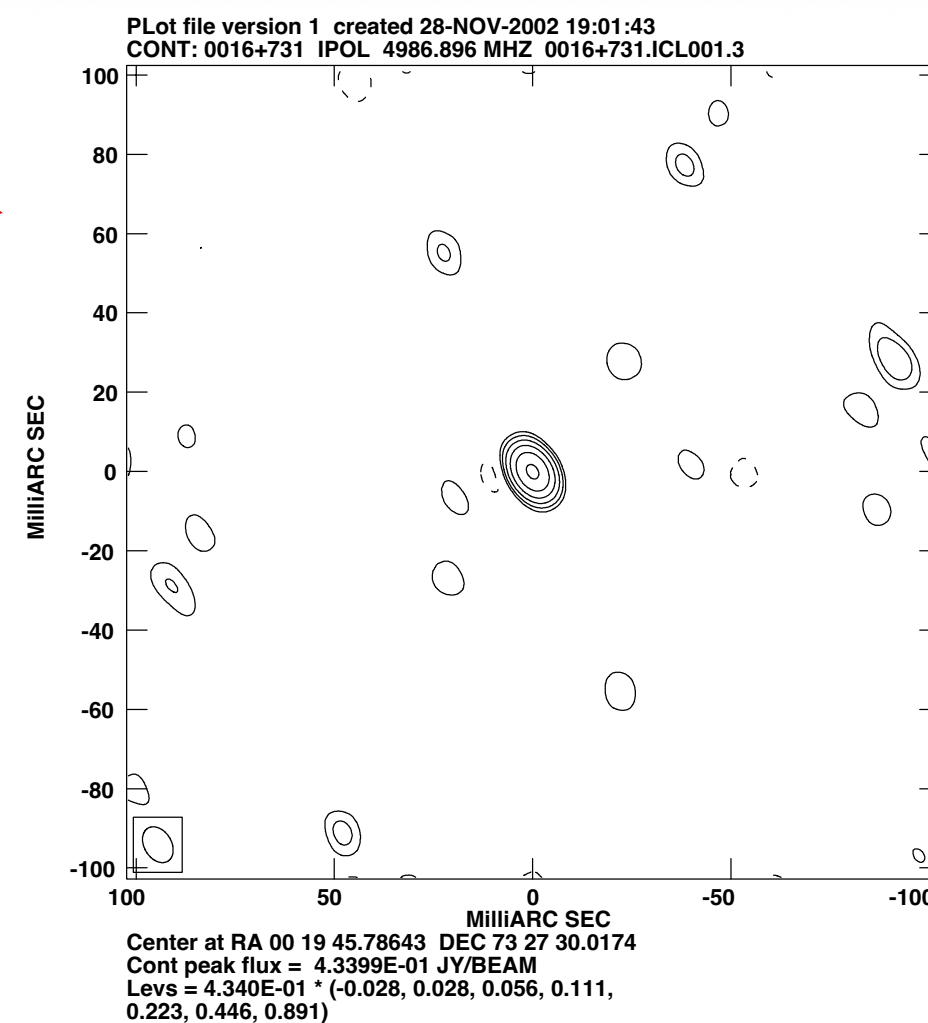
### Comments.

0016+731: An unresolved component.

1328+307: Out of the field of view.

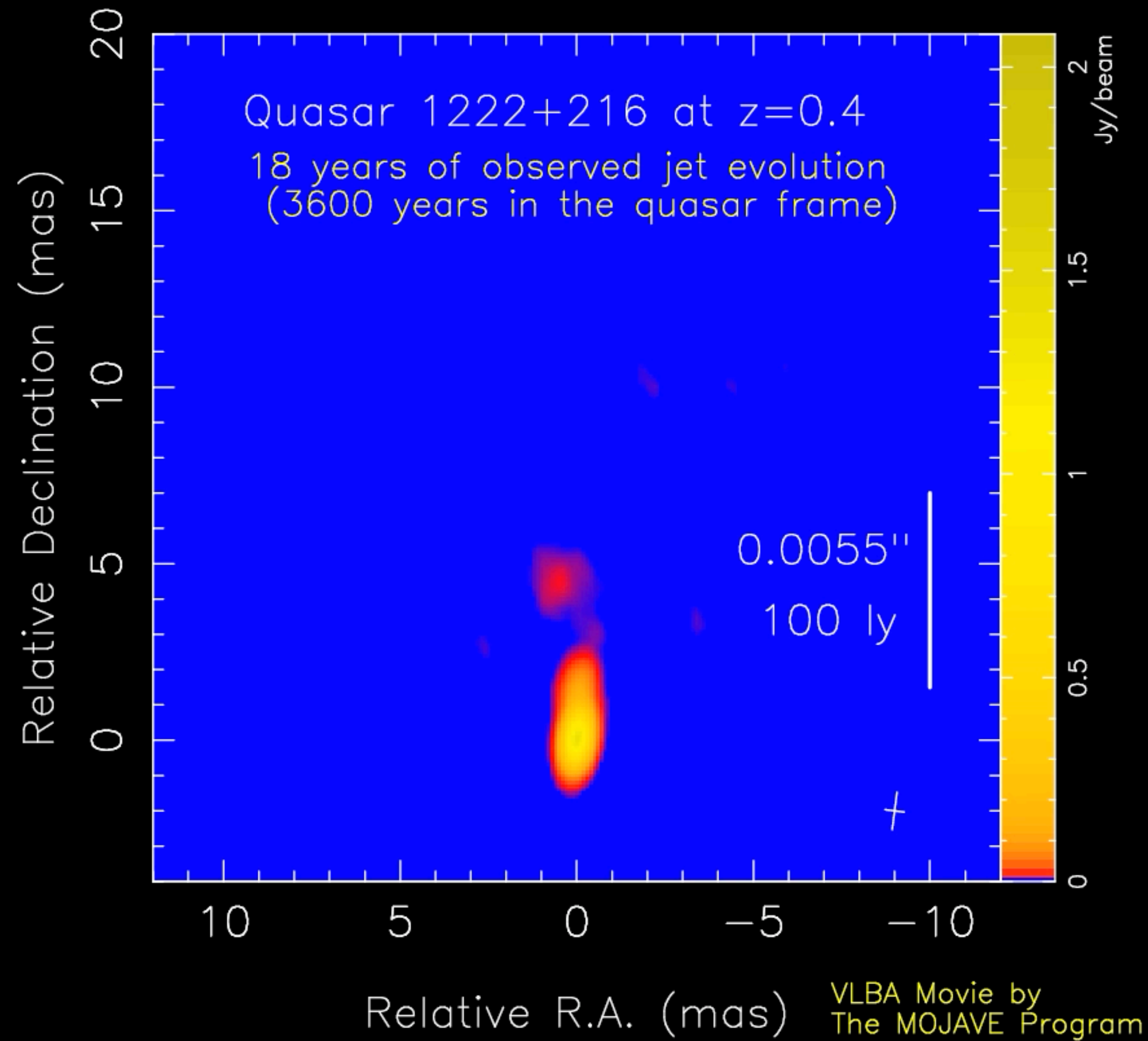
DA193: An unresolved component. Bright side lobes still exist.

The target: A couple of components.



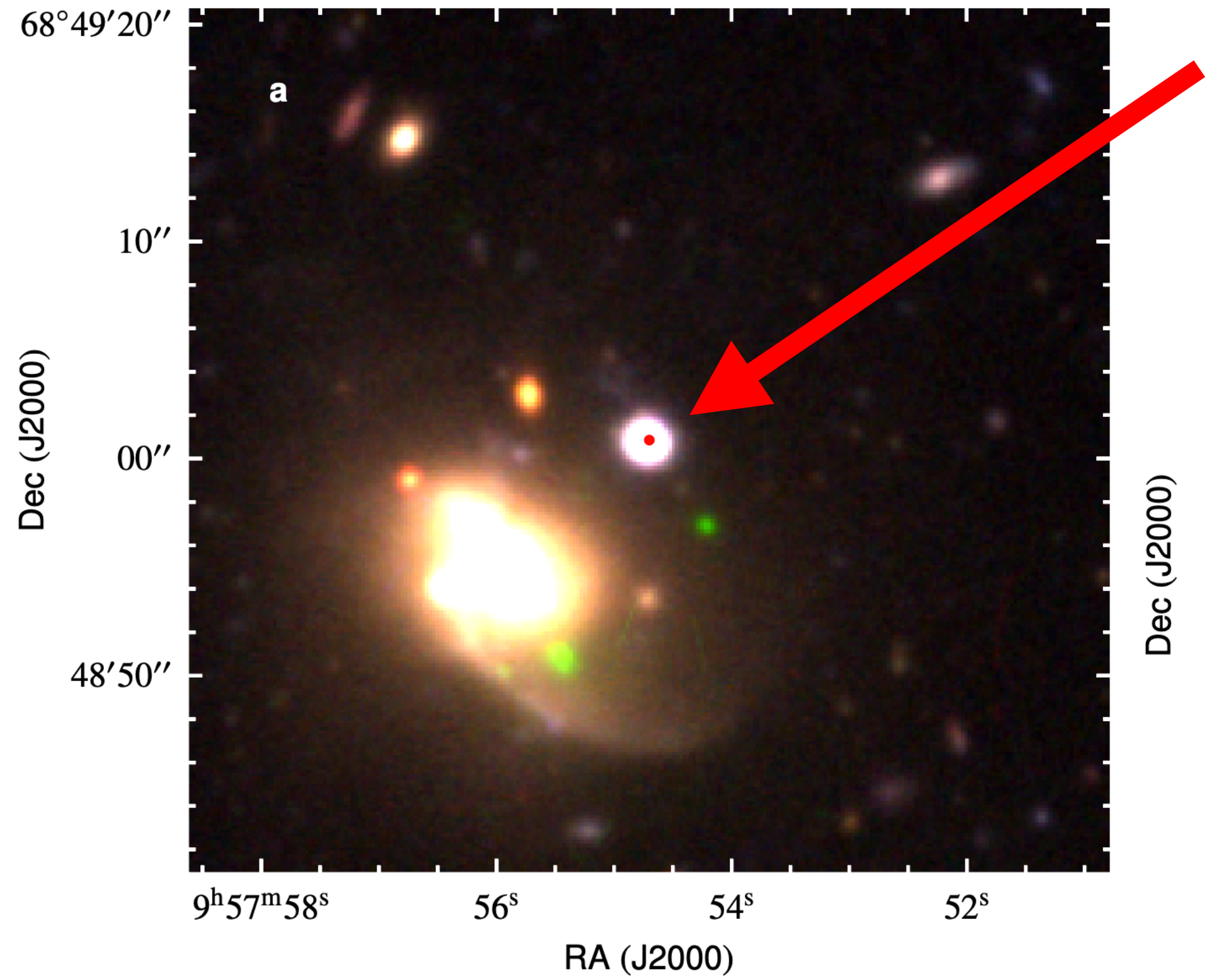
Why add VLBI  
to the VO then?

# 2 cm VLBA Tracking of Relativistic Jets from Supermassive Black Holes



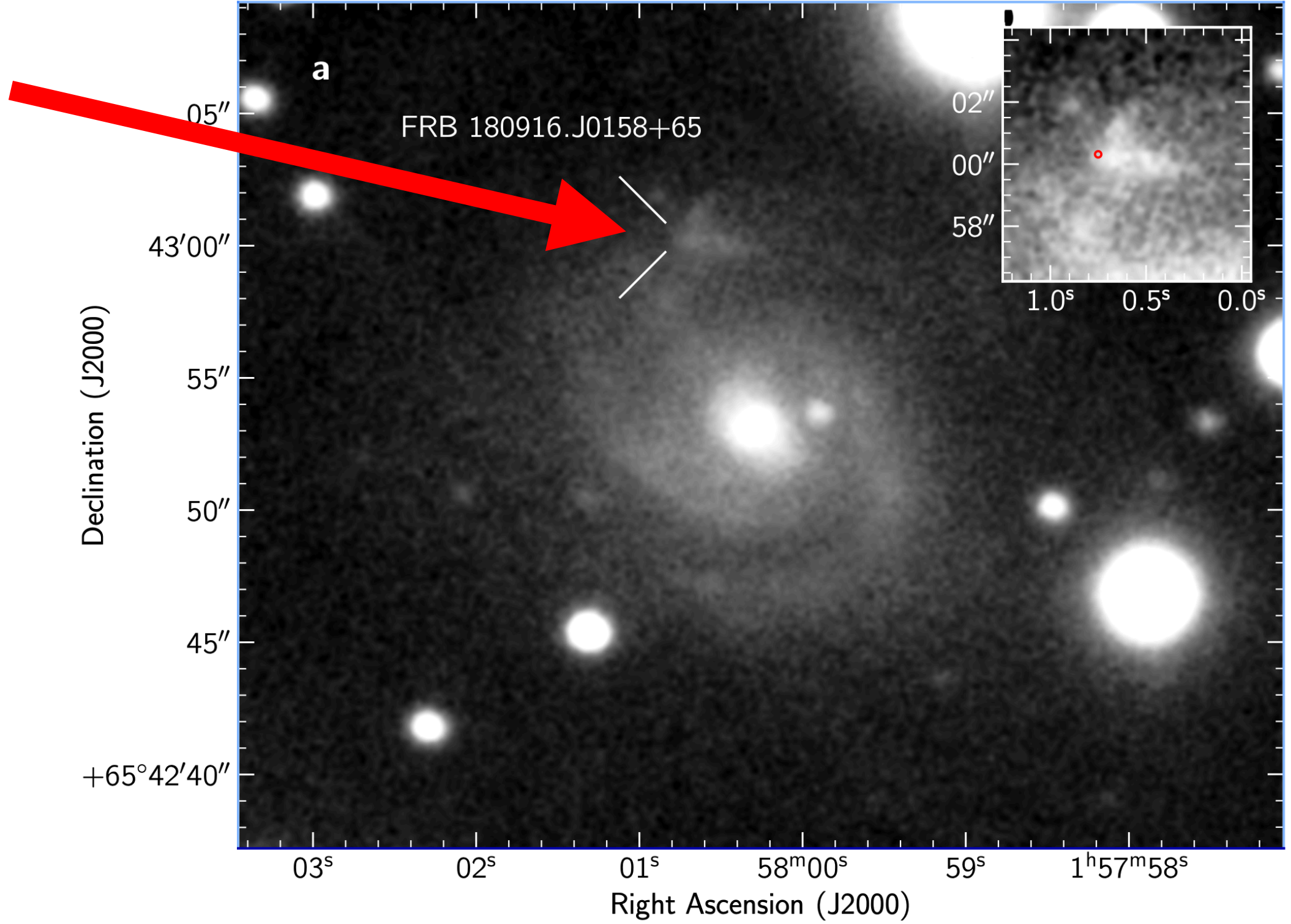
Lister et al., 2018, *ApJS*, 234, 12  
<http://adsabs.harvard.edu/abs/2018ApJS..234...12L>





FRB localised to globular cluster

Kirsten, F., Marcote, B., Nimmo, K. et al. A repeating fast radio burst source in a globular cluster. *Nature* 602, 585–589 (2022).  
<https://doi.org/10.1038/s41586-021-04354-w>



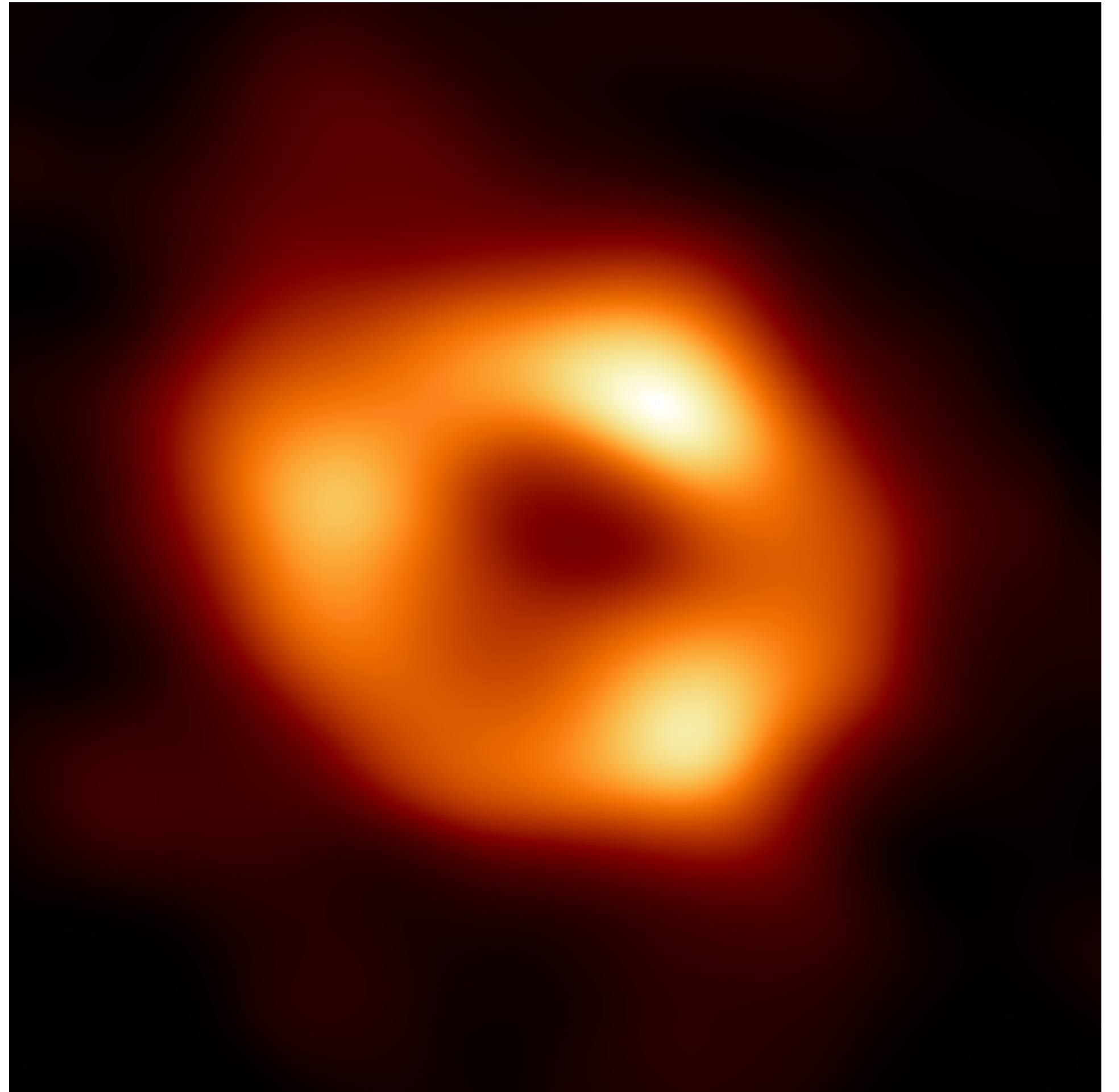
FRB localised to starforming region

Marcote, B., Nimmo, K., Hessels, J.W.T. et al. A repeating fast radio burst source localized to a nearby spiral galaxy. *Nature* 577, 190–194 (2020).  
<https://doi.org/10.1038/s41586-019-1866-z>



This image reveals the black hole at the center of Messier 87, a massive galaxy in the nearby Virgo galaxy cluster. The black hole resides 55 million light-years from Earth and has a mass 6.5 billion times that of the sun.

EVENT HORIZON TELESCOPE COLLABORATION ET AL.



First image of Sagittarius A\*, the black hole at the center of the Milky Way galaxy.

Credit: EHT Collaboration

# Virtual Observatory use cases

- ▶ Historic data (“before picture”) for high-res follow-up of:
  - Gravitational Wave events
  - Gamma Ray Bursts
  - Fast Radio Bursts
- ▶ Field-of-view in data set is larger than primary science goal
  - possibility to reprocess Level 1 data for other science
  - apply new(er) calibration algorithms to improve
- ▶ Standardized access to archive data for science platform
  - JupyterLab environment
  - both human and machine accessible
  - not just the Level 1 data

# Applicable protocols:

## ObsCore

*“defines the core components of the Observation data model that are necessary to perform data discovery when querying data centers for astronomical observations of interest.”*

<https://ivoa.net/documents/ObsCore/20170509/index.html>

## DataLink

*“linking of data discovery metadata to access to the data itself, further detailed metadata, related resources, and to services that perform operations on the data.”*

<https://ivoa.net/documents/DataLink/20150617/index.html>

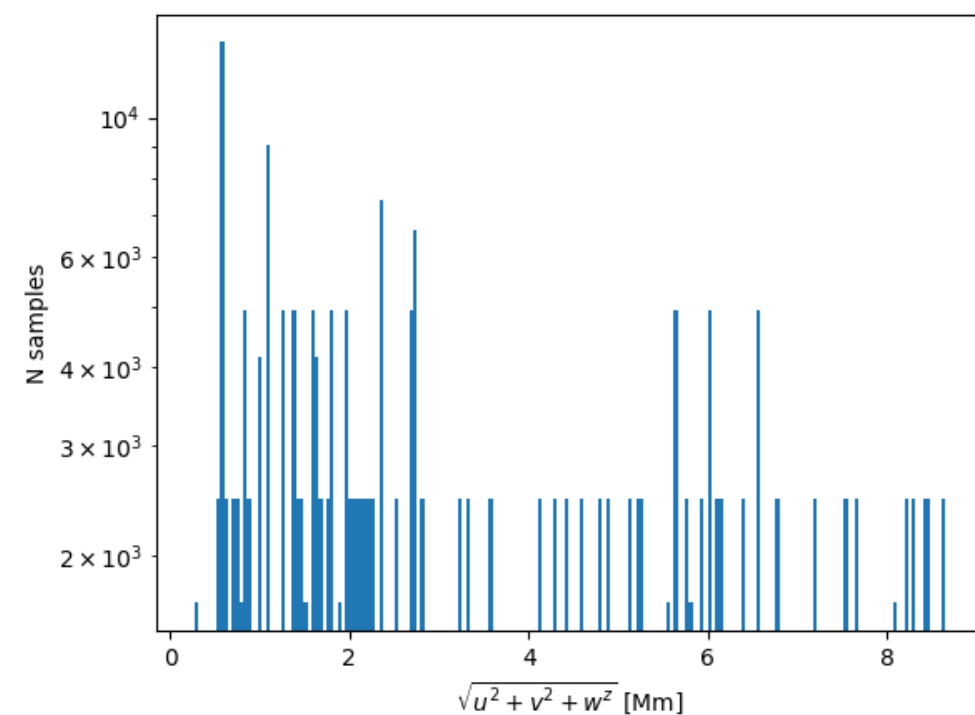
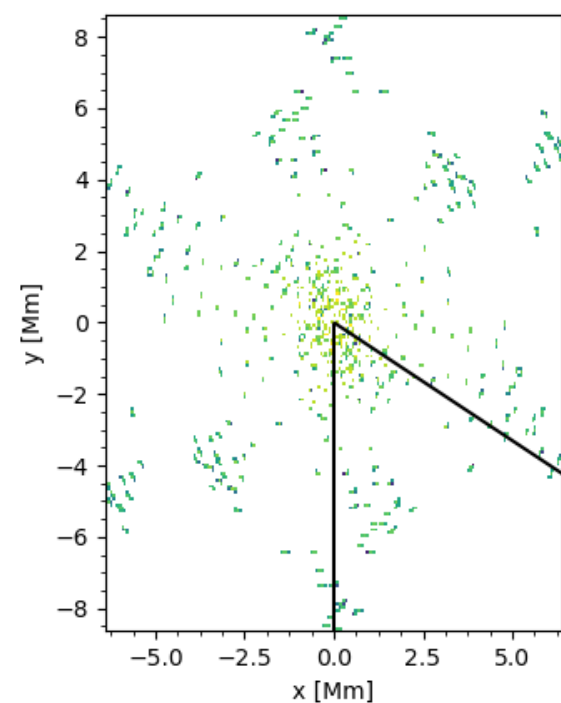
# ESCAPE WP4 enabled:

Visibility support in ObsCore

- JIVE participation in IVOA Radio SIG
- extend ObsCore data model w/  $u, v$ -plane values
- experimental  $u, v$ -plane characterisation

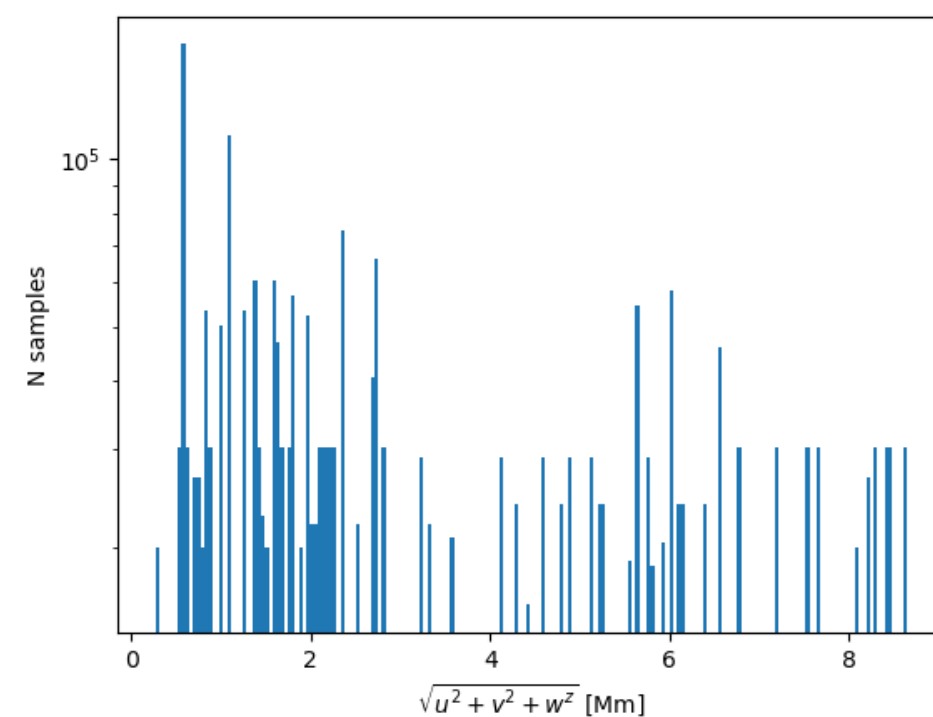
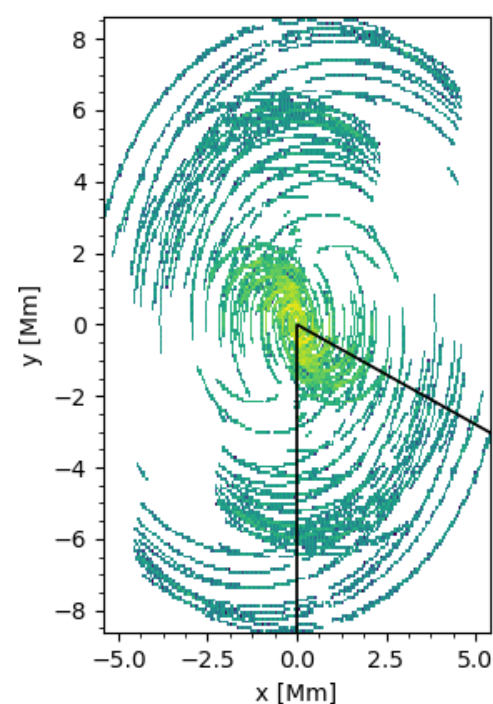
# u, v-plane characterisation

Plots derived from software developed by Mattia Mancini (ASTRON)



$e = 0.74$   
 $f = 0.03$

calibrator source



$e = 0.63$   
 $f = 0.25$

target source

$e$  = ellipticity  
 $f$  = filling factor

# ESCAPE WP4 enabled:

Visibility support in ObsCore

- JIVE participation in IVOA Radio SIG
- extend data model
- experimental  $u,v$ -plane characterisation

ObsTAP service at JIVE:

- design mapping of FITS-IDI content to ObsCore
- develop s/w to analyse 100 TB of FITS-IDI
- hardware to host <https://evn-vo.jive.eu>



Help  
Service info

Related  
[Tables available for ADQL](#)

Metadata  
Identifier  
ivo://jive.eu/\_\_\_system\_\_\_  
Cite this  
[Advice on citing this re](#)

Description  
An endpoint for submit

Keywords  
[Virtual observatories](#)

Creator  
Mark Kettenis

Created  
2008-09-20T12:00:00Z

Data updated  
2020-12-15T16:41:59Z

Metadata updated

### Parameters

- ADQL query: `SELECT obs_id, t_min, target_name, s_ra, s_dec, (3e8/em_min)/1e6 as obs_freq_MHz FROM ivoa.obscore WHERE 1 = CONTAINS( POINT('ICRS', s_ra, s_dec), CIRCLE('ICRS', 4.9375, 73.4583, 0.09999999) ) ORDER BY t_min`

### Result

Matched: 12

Send via SAMP Quick Plot

Obs_id	T_min	Target_name	S_ra [deg]	S_dec [deg]	Obs_freq_mhz [m]
ES023	1998-11-22T19:30:32Z	0016+731	4.940776791666668	73.45833816666666	4998.948305764251
N05L4	2005-06-08T04:46:00Z	J0019+7327	4.940776733333333	73.45833819166667	1667.643687020306
EP049C	2005-06-13T04:20:27Z	J0019+7327	4.940776666666667	73.45833819444447	5057.989150614334
GB063A	2007-10-31T01:34:16Z	0019+732	4.940776779166668	73.45833818055554	6703.627614274413
EZ020A	2010-06-03T19:35:08Z	0019+732	4.940776779166668	73.45833818055554	6703.627614274413
EG061A	2012-02-29T06:37:46Z	J0019+73	4.940776612500001	73.45833819444447	22424.003074820543
	2014-06-				



### Preview of http://evn-vo.jive.eu/evn/q/dl/dlmeta?ID=ivo%3A//jive.eu/~%3FES023\_981124\_1\_1\_1328%252B307\_4979.49MHz

#### Links for ivo://jive.eu/~?ES023\_981124\_1\_1\_1328%2B307\_4979.49MHz

▼ **the data itself**

*the primary (as opposed to related) data of the identified resource*

[FITS-IDI](#)

▼ **Applicable Calibration**

*Data products that can be used to remove instrumental signatures from #this. Note that the calibration steps such data products feed have not been applied to #this yet.*

[UVFLG](#)

[ANTAB](#)

Tap Nodes

- jiveeu-ta
- tap\_sch
- ivoa
- evn
- Goodies (n

dec	s_fc
0.509155	0.00
3.458338	0.00
9.813657	0.00
1.641231	0.00
9.810276	0.00
6.9839262	0.00
9.810276	0.00
6.9839262	0.00

Tap Nodes  
jiveeu-tap SJAU  
tap\_schema  
ivoa  
evn  
Goodies (not used yet)

```
SIMPLE = T /Yep! It's a FITS file... BITPIX = 8
0 EXTEND = T GROUPS =
GCOUNT = 0 PCOUNT = 0
XTENSION= 'BINTABLE' BITPIX = 8
2 /A table is a matrix isn't it? NAXIS1 = 64 NAXIS2 =
PCOUNT = 0 GCOUNT = 1
7 /Number of columns in each row EXTNAME = 'ARRAY_GEOMETRY' EXTVER =
TTYPE1 = 'ANNNAME' /The antennaname TFORM1 = '8A'
' TFORM2 = '3D' TUNITS =
TTYPE3 = 'DERXYZ' TFORM3 = '3E' TFORM4 = '3E' TFORM5 = '3E'
' TTYPE4 = 'ORBPARM' /Orbital parameters TFORM6 = '1J'
TTYPE5 = 'NOSTA' /Antenna number TFORM7 = '1J' TUNIT7 = 'METERS'
' /Mount
offset TFORM7 = '3E'
TABREV = 1 OBSCODE = 'JIVE'
4 STK_1 = -1 NO_BAND =
NO_CHAN = 16 REF_FREQ= 4.979490000000E+09
2.500000000000E+05 REF_PIXL= 1.0000000E+00
FRAME = 'GEOCENTRIC' ARRAYX = 0.000000000000E+00
0.000000000000E+00 ARRAYZ = 0.000000000000E+00
DEGPDY = 3.609856422982E+02 FREQ = 4.979490000000E+09
11-22' POLARX = 4.931838513442E+00
UT1UTC = -2.370471954346E-01 IATUTC = 3.100000000000E+01
' ARRNAM = 'EVN' END
JB AM*^sÁEQû~'QASg z¹öZ<I...ðON AI·ëç3æA%†Söz'AThH-Ûè@™šNT ARòèÀ% A4(ñNÑ·AM ANÉÍ¹ÇySA
3<I...ðON AI·ëç3æA%†Söz'AThH-Ûè@™šNT ARòèÀ% A4(ñNÑ·AM ANÉÍ¹ÇySA
Š@ÁTE?èQTR AKÂ=fİBA2¥QÀHðAS^1@~(SH ÁEšf~$Ý/AQÖ%j&€AHÝÖVÖĐ
AMèð[K]î@fÛû~'QAS Ä[]êK?ÀbNWB AM5nÑ@OA,ž†_oÒASR6ehr°[]@žff
XTENSION= 'BINTABLE' BITPIX = 8
2 /A table is a matrix isn't it? NAXIS1 = 84 NAXIS2 =
PCOUNT = 0 GCOUNT = 1
5 /Number of columns in each row EXTNAME = 'FREQUENCY' EXTVER =
TTYPE1 = 'FREQID' TFORM1 = '1J'
'BANDFREQ' TFORM2 = '4D'
TTYPE3 = 'CH_WIDTH' TFORM3 = '4E'
' TTYPE4 = 'TOTAL_BANDWIDTH' TFORM4 = '4E'
TUNIT4 = 'HZ' TTYPE5 = 'SIDE BAND' TFORM5 = '4E'
' TABREV = 1 TUNIT5 = 'HZ'
NO_STKD = 4 STK_1 = -1
4 NO_CHAN = 16 REF_FREQ= 4.979490000000E+09
CHAN BW = 2.500000000000E+05 REF_PIXL= 1.0000000E+00
AN,,€A^,€Afâ`Ht$Ht$Ht$Ht$Jt$Jt$Jt$Jt$[][][]
XTENSION= 'BINTABLE' BITPIX = 8
2 /A table is a matrix isn't it? NAXIS1 = 268 NAXIS2 =
PCOUNT = 0 GCOUNT = 1
22 /Number of columns in each row EXTNAME = 'SOURCE' EXTVER =
```

# More ESCAPE impact!

ESCAPE WP3 (open source repository)

- improve VLBI/radio data reduction tools
- provide Jupyter kernel w/ data reduction s/w

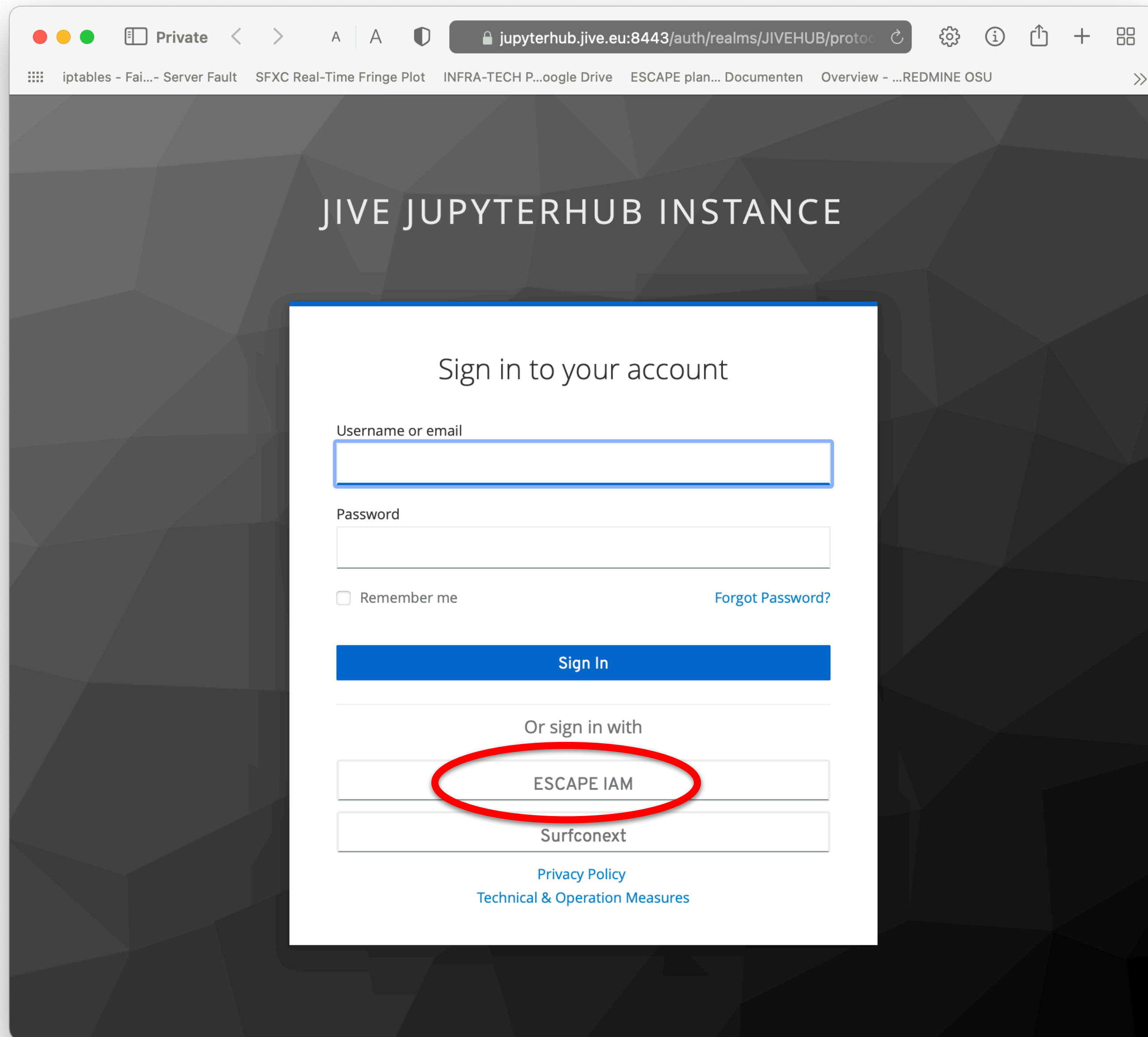
# More ESCAPE impact!

ESCAPE WP3 (open source repository)

- improve VLBI/radio data reduction tools
- provide Jupyter kernel w/ data reduction s/w

ESCAPE WP5 (science analysis platform)

- provide Jupyterhub hardware (compute+storage)
- development of Jupyterhub plugins:
  - EVN archive search w/ notebook deployment
  - version controlled notebooks (provenance)



<https://jupyterhub.jive.eu>

Private | jupyterhub.jive.eu/user/verkouter/lab

File Edit View Run Kernel Tabs Settings Help

Filter files by name

Name	Last Modified
GV021	6 months ago
VO_notebo...	3 months ago

Python File

Show Contextual Help

EVN Archive

EVN Archive

Simple 0 \$ 0 Launcher

Browser: jupyterhub.jive.eu/user/verkouter/lab

Menu: File Edit View Run Kernel Tabs Settings Help

File Explorer: Filter files by name

- ES023 (3 minutes ago)
- GV021 (a minute ago)
- VO\_noteb... (3 months ago)

Experiment selection interface:

Experiment: Experiment code

Source: Source name

Observing Band: Band L, C, X, etc.

SEARCH

Right Ascension: 00:19:45.8

Declination: 73:27:30.0

Radius [arcseconds]: 36

SEARCH

Search results:

Actions	Experiment	Source	Dec	Exp. time [s]	Distance [deg]
↓	ES023	0016+731	00h19m45.786s	908	0.000016808050437962152
Open notebook	EZ020A	0019+732	00h19m45.786s	180	0.000016815457395087267
↓	GB063A	0019+732	00h19m45.786s	88	0.000016815457395087267
↓	GP051D	0019+732	00h19m45.786s	90	0.000016815457410190017
↓	N05L4	J0019+7327	00h19m45.786s	1813.5	0.0000168311570963371

Annotation: Uses WP 4 EVN VO ObsTAP service to query!

Browser: jupyterhub.jive.eu/user/verkouter/lab

Menu: File Edit View Run Kernel Tabs Settings Help

File Explorer: Filter files by name

- ES023 (3 minutes ago)
- GV021 (a minute ago)
- VO\_noteb... (3 months ago)

Launcher: Experiment selection

Experiment code: [dropdown] Source name: [dropdown] Observing Band: Band L, C, X, etc. [dropdown]

SEARCH

Right Ascension: 00:19:45.8 Declination: 73:27:30.0 Radius [arcseconds]: 36

SEARCH

Search results

Source	Ra	Dec	Exp. time [s]	Distance [deg]
ES023	0016+731	00h19m45.786s 73d27'30.017"	908	0.000016808050437962152
	0019+732	00h19m45.786s 73d27'30.017"	180	0.000016815457395087267
	0019+732	00h19m45.786s 73d27'30.017"	88	0.000016815457395087267
GP051D	0019+732	00h19m45.786s 73d27'30.017"	90	0.000016815457410190017
N05L4	J0019+7327	00h19m45.786s 73d27'30.017"	1813.5	0.0000168311570963371

Open notebook

Simple 0 \$ 2 Experiment selection



Private < > A A jupyterhub.jive.eu/user/verkouter/lab/tree/ES023/evn\_continuum\_ES023.ipynb

iptables - Fai... - Server Fault SFXC Real-Time Fringe Plot INFRA-TECH P...oogle Drive ESCAPE plan... Documenten Overview - ...REDMINE OSU VLBI and PFB - Google Docs Joint R&D an...Group topics JIVE ZoomRoom#1 JIVE ZoomRoom#2 Private Zoom >>

File Edit View Run Kernel Tabs Settings Help

Filter files by name

Name	Last Modified
/	
ES023	seconds ago
GV021	6 months ago
VO_notebo...	3 months ago

Launcher Experiment selection evn\_continuum\_ES023.ipynk

Markdown Casa

```
once!  
[ ]: from evn_tools.evn_import_exp import evn_import_exp  
      expname = "ES023"  
      evn_import_exp(expname)
```

### Experiment information

Note that the path setting is the path in the virtual container. The default path is `/home/evn_import_exp(...)` uses VO DataLink to download FITS-IDI and calibration data!  
When launching the virtual container you can set this with the `-v` option for Docker. If you choose a different path, make sure to adjust the entire `mypath` variable below.

```
[ ]: # If your data is in a non-standard location then point the mypath variable to  
      mypath=''  
      if mypath != '':  
          sys.path.append(mypath)  
  
      # Observation ID in the EVN archive. This is always in small caps, e.g. n14c3  
      obsid = 'es023'
```

Simple 0 \$ 1 Casa | Idle Mode: Command Ln 1, Col 1 evn\_continuum\_ES023.ipynb

Aladin v11.0

Available data → 27764    Command     Frame Gal    Projection Aitoff

DSS PanSTARRS SDSS 2MASS GALEX Gaia Simbad NED +

tap

360° x 180°

Search

select evn  
from -- all collections --

coll. sort view scan filter

0 sel / 22195 src 418Mb

ALADiN

Welcome to Aladin,  
your professional sky atlas.

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- Compare them with your own data.
- Prepare your observation missions.

To start, type any object name, such as M1, and press ENTER...

Or easier, clic in the main frame and enjoy the sky...

select  
pan  
dist  
phot  
draw  
tag  
moc  
spect  
filter  
cross  
x-y  
rgb  
J2000  
size  
dens.  
opac.  
zoom  
cont  
pixel  
prop  
del

CDS / I / 350 / gaiaed  
jive.eu / tap

All EVN VLBI  
observations  
since ~2000  
archived at JIVE