



# The LOFAR LBA Symposium

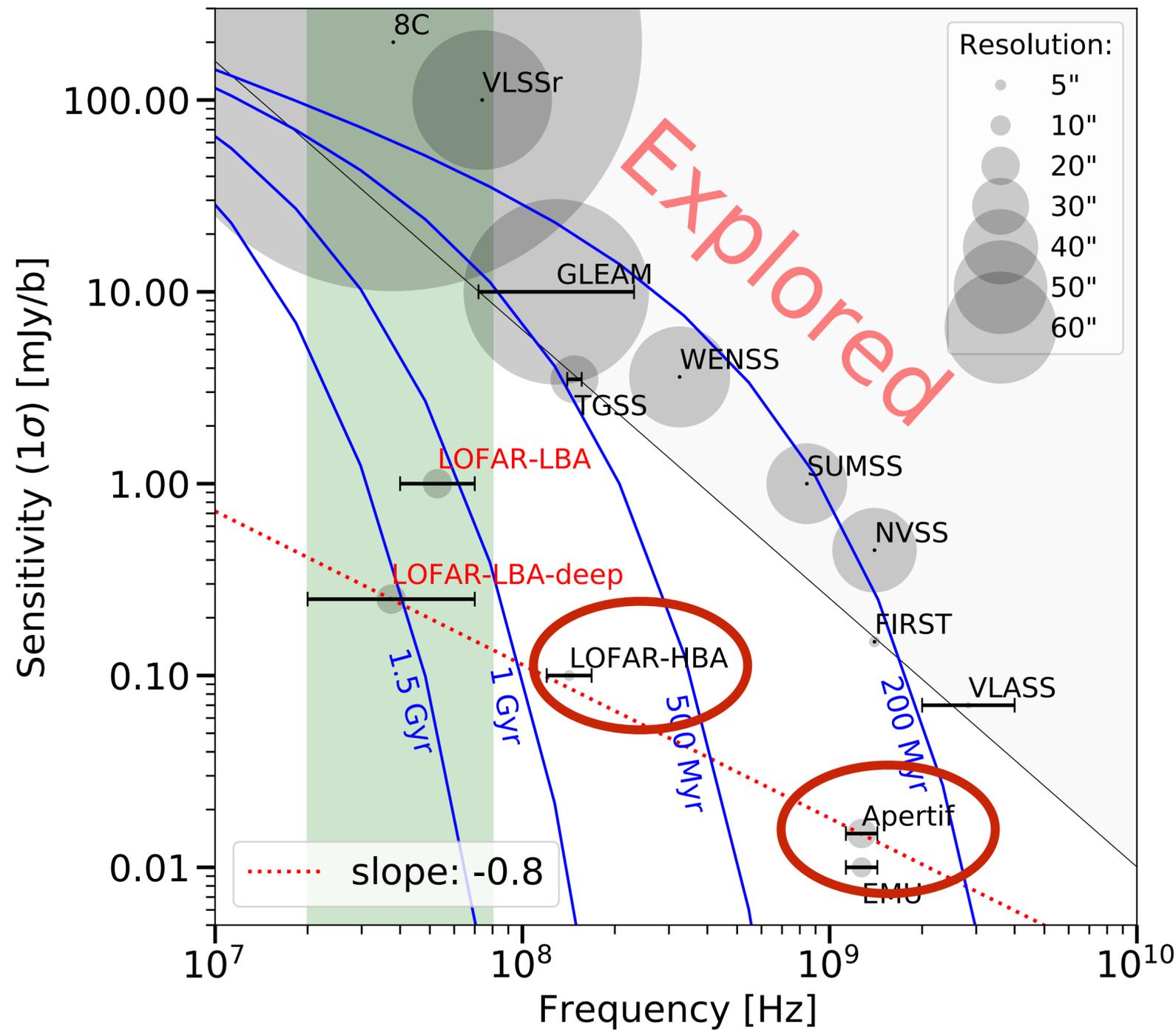
**Francesco de Gasperin**  
and the LOFAR Surveys KSP

University of Hamburg  
9/3/2021



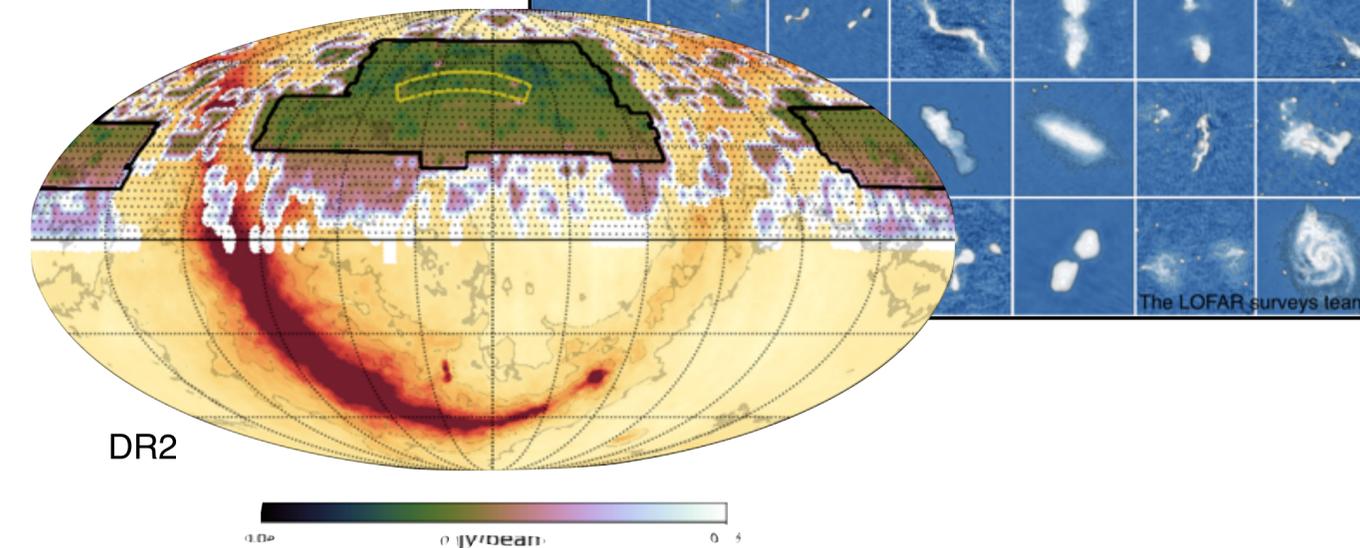


# Synergies



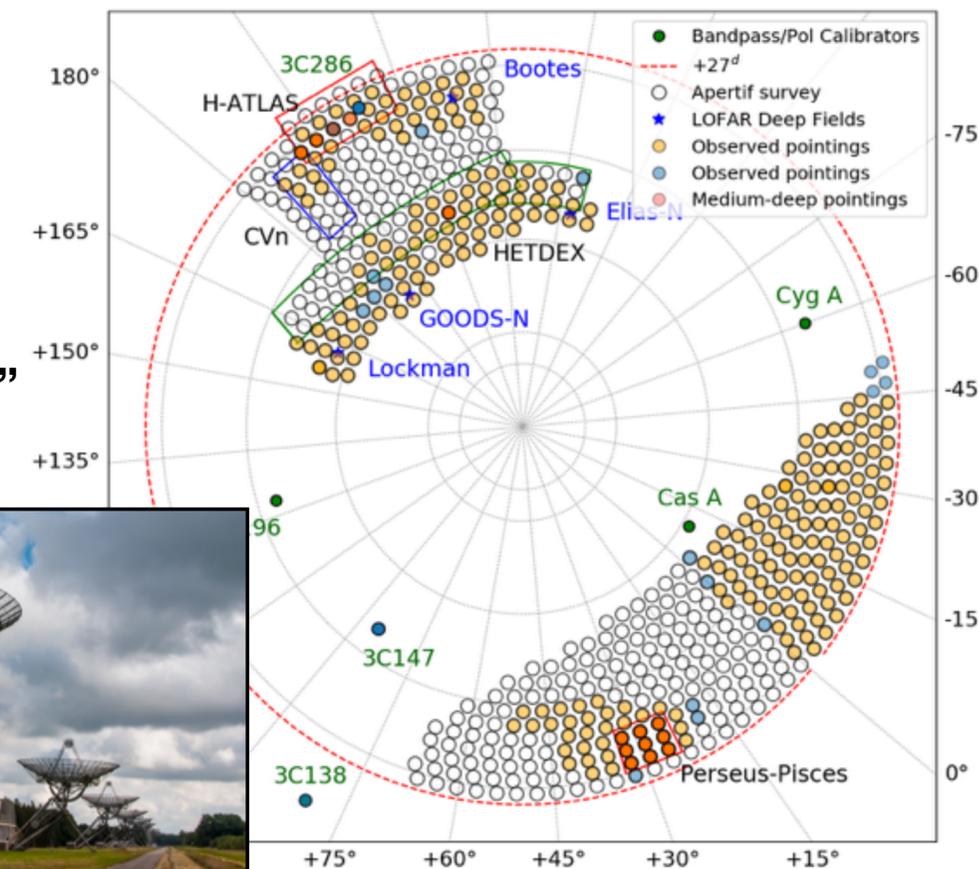
## LoTSS

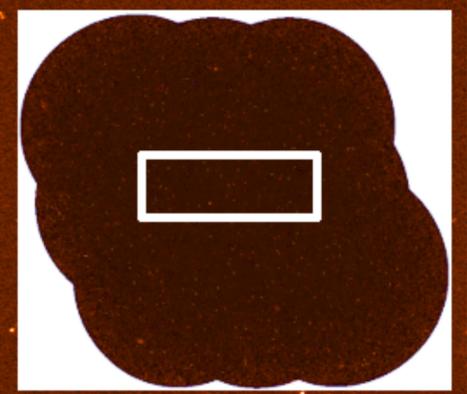
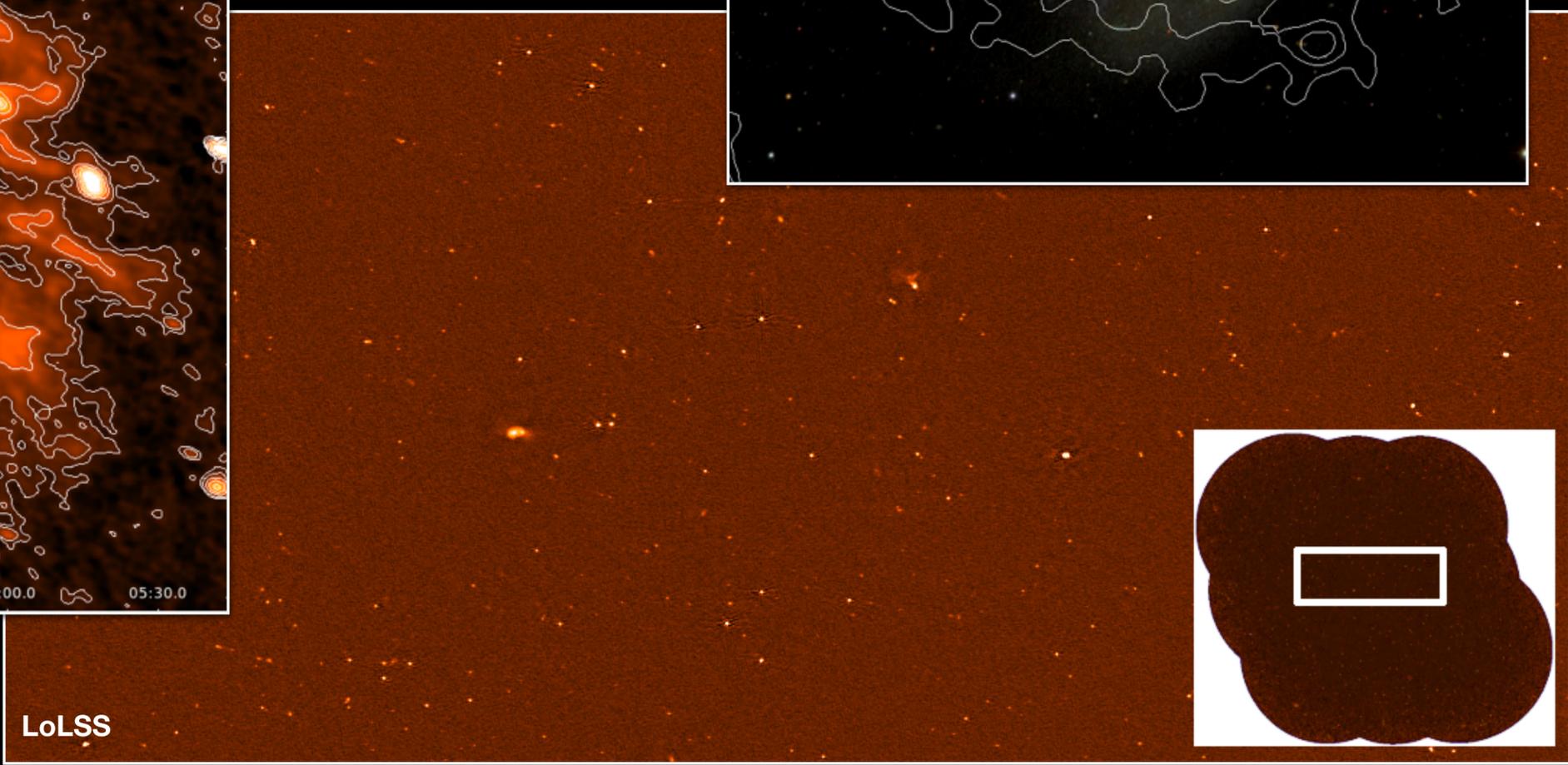
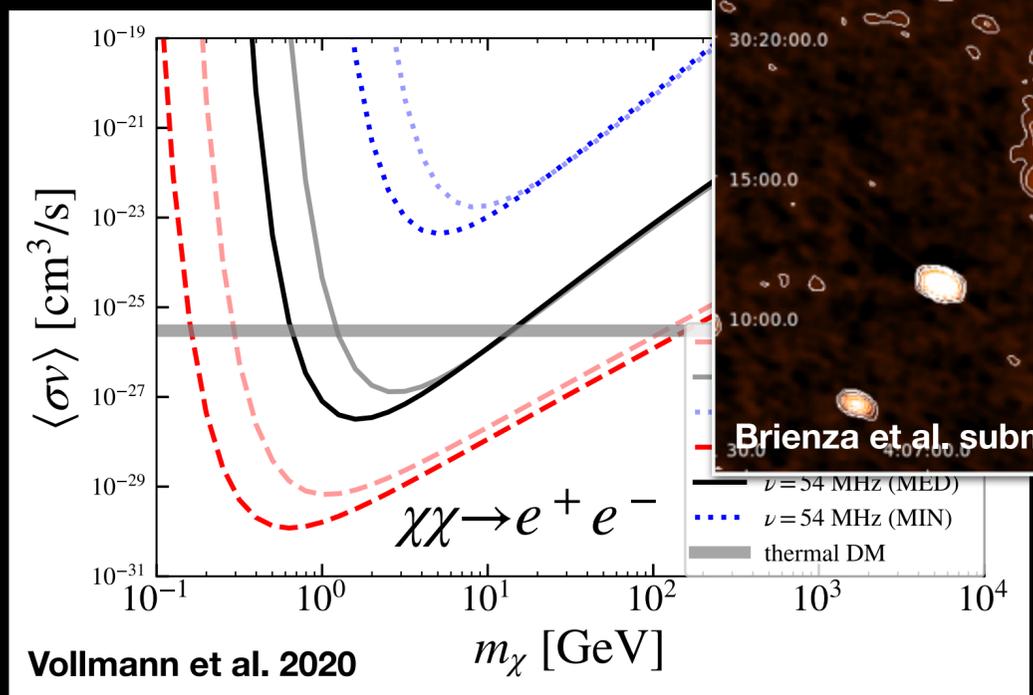
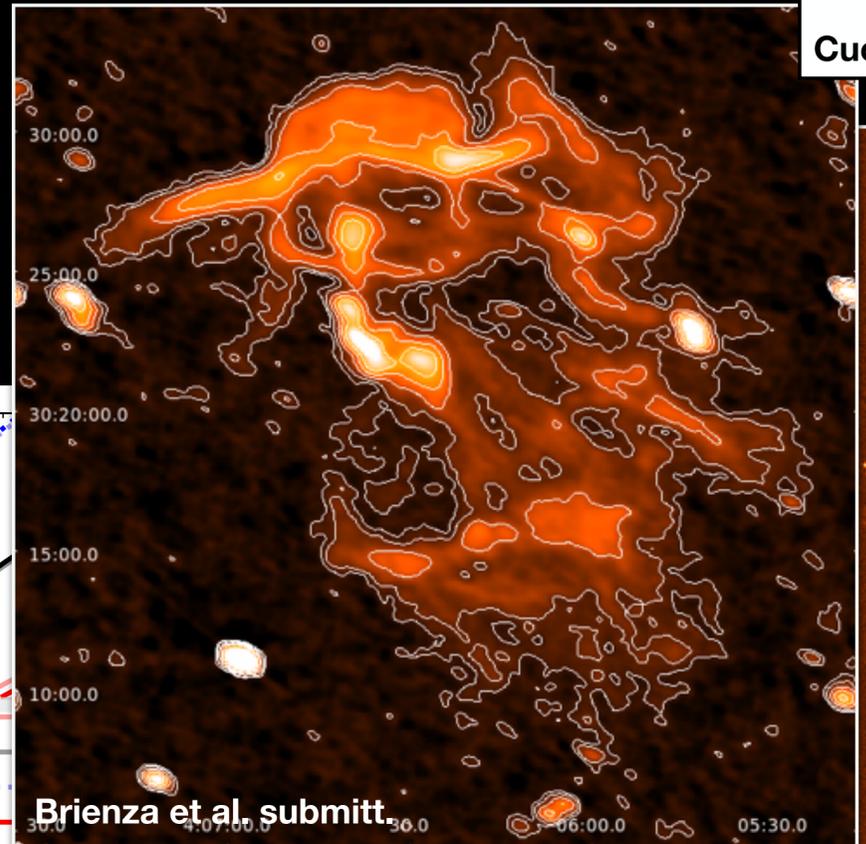
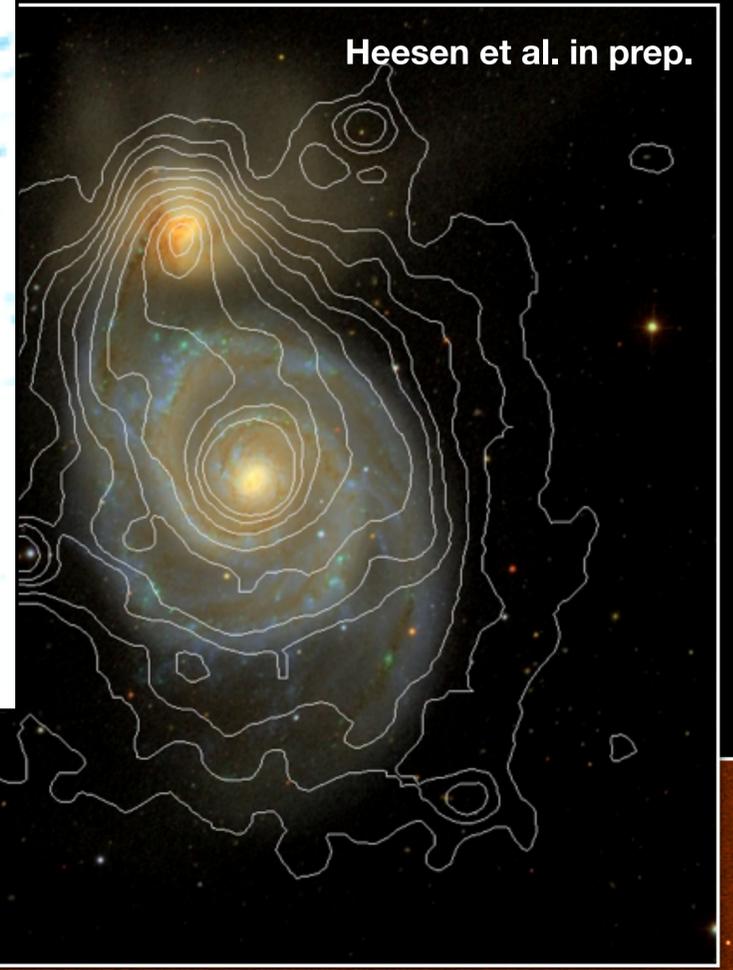
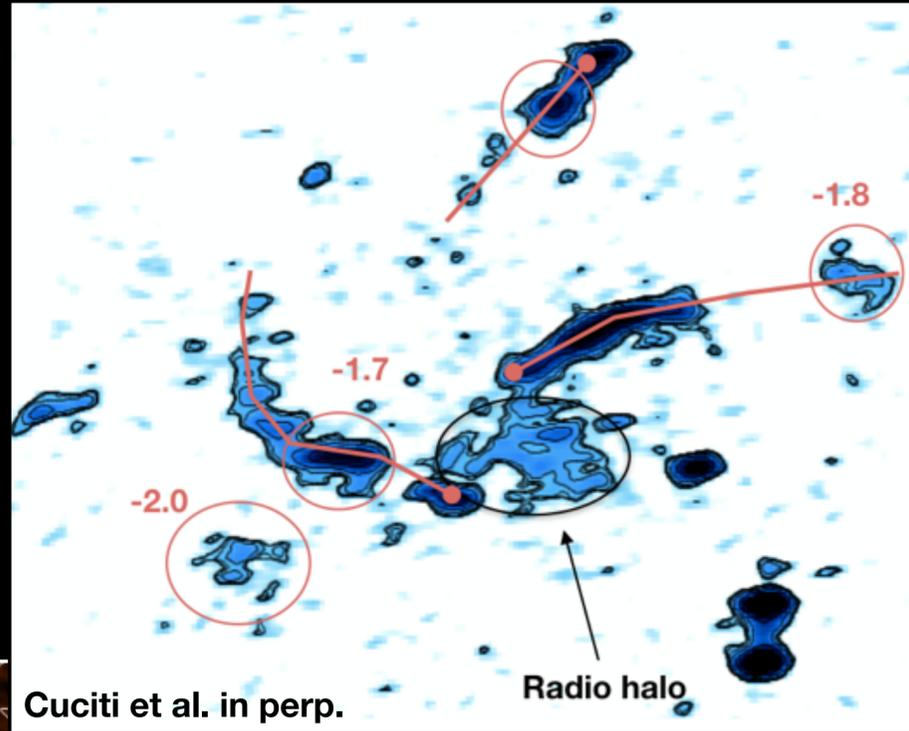
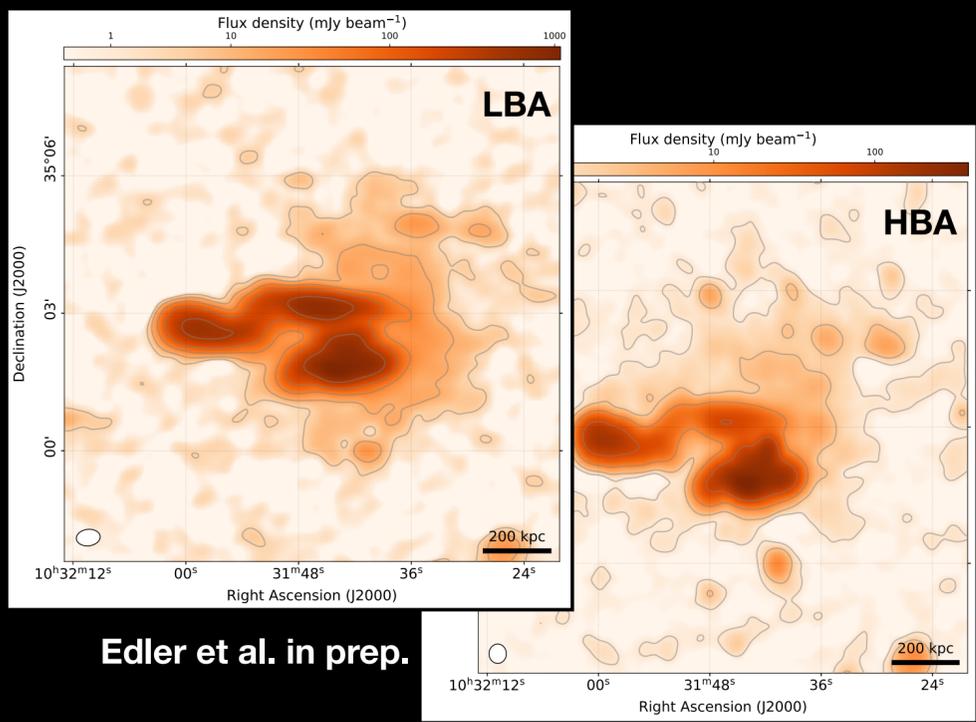
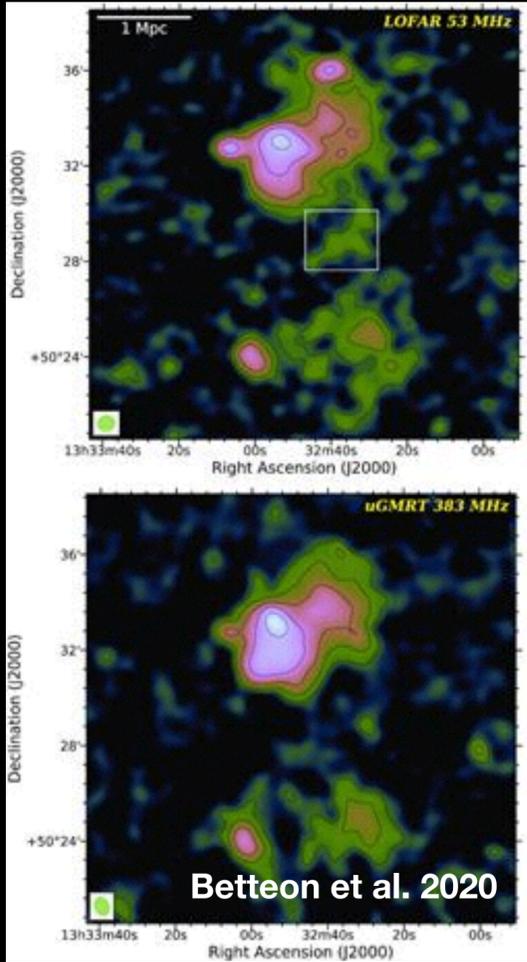
- freq: 120-168 MHz
- resolution: 6"
- rms: 100  $\mu$ Jy/b



## Apertif

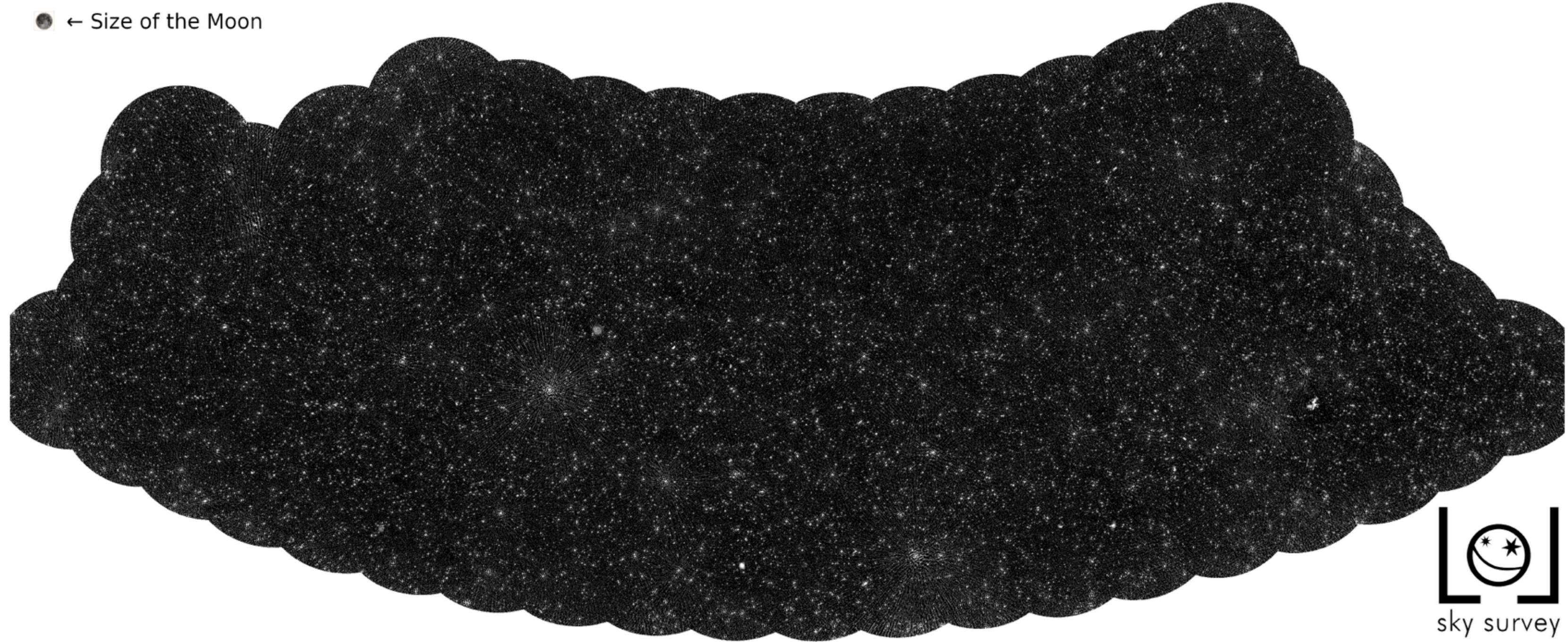
- freq: 1400 MHz
- band: 300 MHz
- resolution: 12"-14"
- rms: 20-30  $\mu$ Jy/b





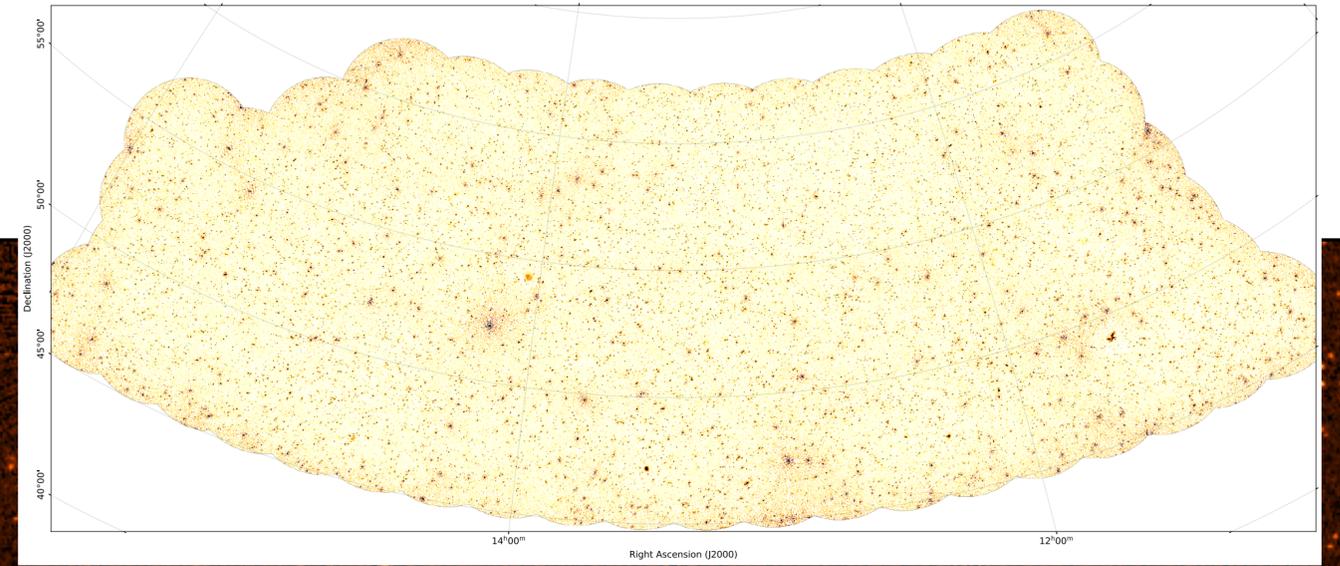
# The LOFAR LBA Sky Survey

● ← Size of the Moon



# LoLSS products

Preliminary release data are available on:  
[www.lofar-surveys.org/lba.html](http://www.lofar-surveys.org/lba.html)

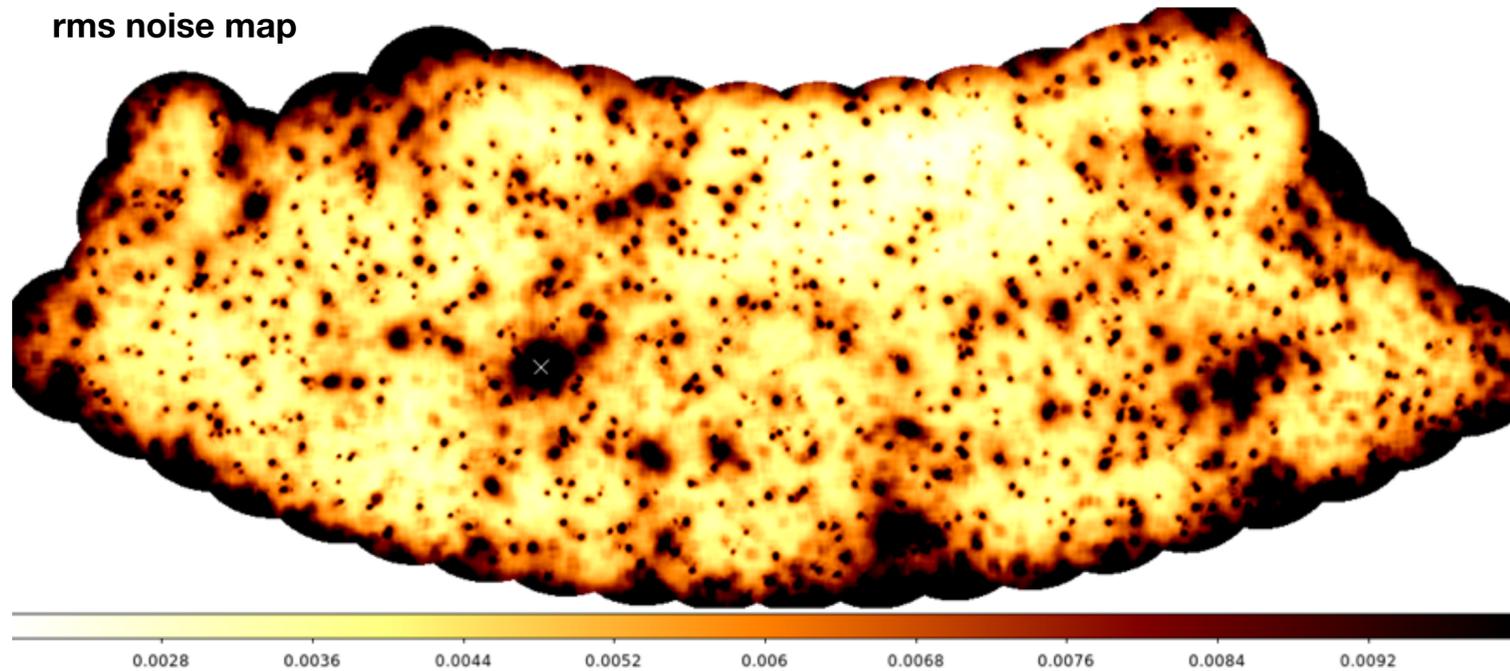


RA (°)	$\sigma_{RA}$ (")	DEC (°)	$\sigma_{DEC}$ (")	$S_{peak}$ (mJy/beam)	$\sigma_{S_{peak}}$ (mJy/beam)	$S_{int}$ (mJy)	$\sigma_{S_{int}}$ (mJy)	rms noise (mJy/beam)	Type	Source name
236.540	1.4	52.575	1.5	114.5	12.5	104.7	6.8	7	S	LOLpJ154609.6+523430
240.180	2.5	55.970	2.6	269.9	29.3	116.9	9.3	9	S	LOLpJ160043.3+555811
231.550	2.5	46.072	3.3	81.4	13.8	53.5	5.9	6	S	LOLpJ152611.9+460421
232.710	4.2	47.835	5.3	25.2	7.7	19.9	3.7	4	S	LOLpJ153050.4+475005
234.225	3.7	49.894	3.7	48.3	10.6	31.4	4.6	4	S	LOLpJ153654.0+495337
231.642	5.5	46.241	2.2	284.1	22.8	76.9	5.1	5	M	LOLpJ152634.2+461428
233.540	5.8	49.005	6.0	30.1	8.6	21.1	3.7	4	S	LOLpJ153409.7+490018
238.160	6.0	54.218	4.9	139.3	20.9	36.4	4.4	4	S	LOLpJ155238.4+541304
236.817	2.0	52.880	2.2	83.6	12.5	71.8	6.5	6	S	LOLpJ154716.1+525247
233.049	4.2	48.339	4.8	29.4	8.6	22.0	4.1	4	S	LOLpJ153211.8+482021
237.085	3.1	53.154	3.1	33.8	9.3	36.6	5.7	6	S	LOLpJ154820.4+530914
237.899	5.6	53.964	5.9	62.4	16.3	29.0	5.4	5	S	LOLpJ155135.8+535749
236.157	0.1	52.216	0.1	12009.1	70.0	9332.4	34.0	32	S	LOLpJ154437.7+521257
239.015	1.0	55.014	0.9	444.5	30.0	204.9	6.1	6	M	LOLpJ155603.6+550051
235.503	2.2	51.467	2.3	60.3	9.4	49.8	4.7	5	S	LOLpJ154200.7+512801
240.170	1.5	56.012	1.4	289.8	23.0	175.2	9.4	9	S	LOLpJ160040.9+560045
232.316	1.5	47.316	1.5	88.9	8.8	65.3	4.1	4	S	LOLpJ152915.8+471900
237.406	2.3	53.514	2.0	122.4	14.9	77.1	6.2	6	S	LOLpJ154937.6+533051
239.425	5.9	55.371	5.3	93.9	25.5	48.0	9.2	8	S	LOLpJ155741.9+552215
232.562	1.7	47.695	1.8	100.1	9.9	64.1	4.2	4	S	LOLpJ153014.9+474142

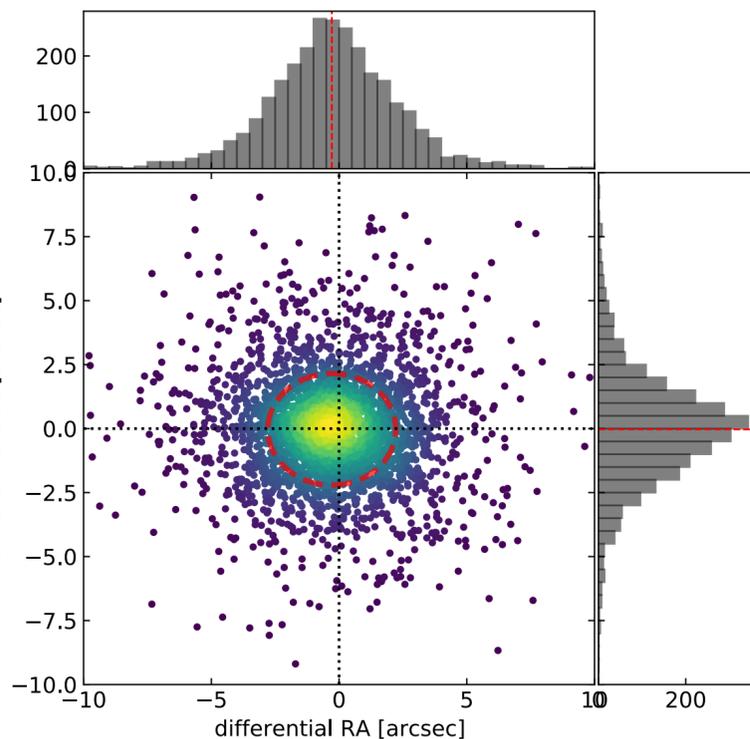
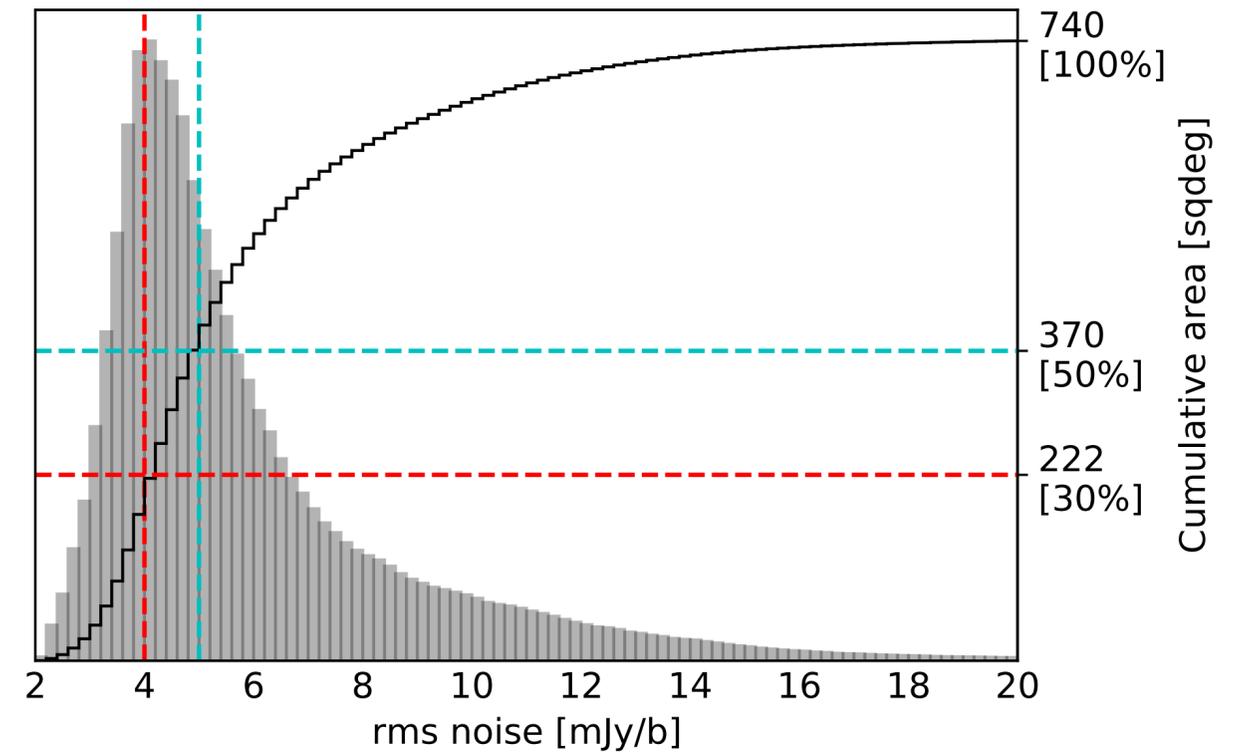
- A mosaic image (I-Stokes) of the covered region
- A catalogue of 25,247 sources

# LoLSS-pre properties

rms noise map



- Average sensitivity 5 mJy/b
- 30% of the field is at < 4 mJy/b



The avg astrometric errors:

RA =  $-0.28''$   
Dec =  $-0.03''$

Relative standard deviations:

RA =  $2.50''$   
Dec =  $2.18''$

Flux scale accuracy:

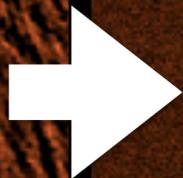
$$\sqrt{2\%{}^2 + 5\%{}^2 + 4\%{}^2} \sim 7\%$$

Precision from  
3c295
Accuracy from  
double cal
Nominal S&H  
flux scale

# Preliminary

## Preliminary release:

- rms noise: 4-5 mJy/b
- max resolution: 47"
- I Stokes
- Low-resolution



# Final

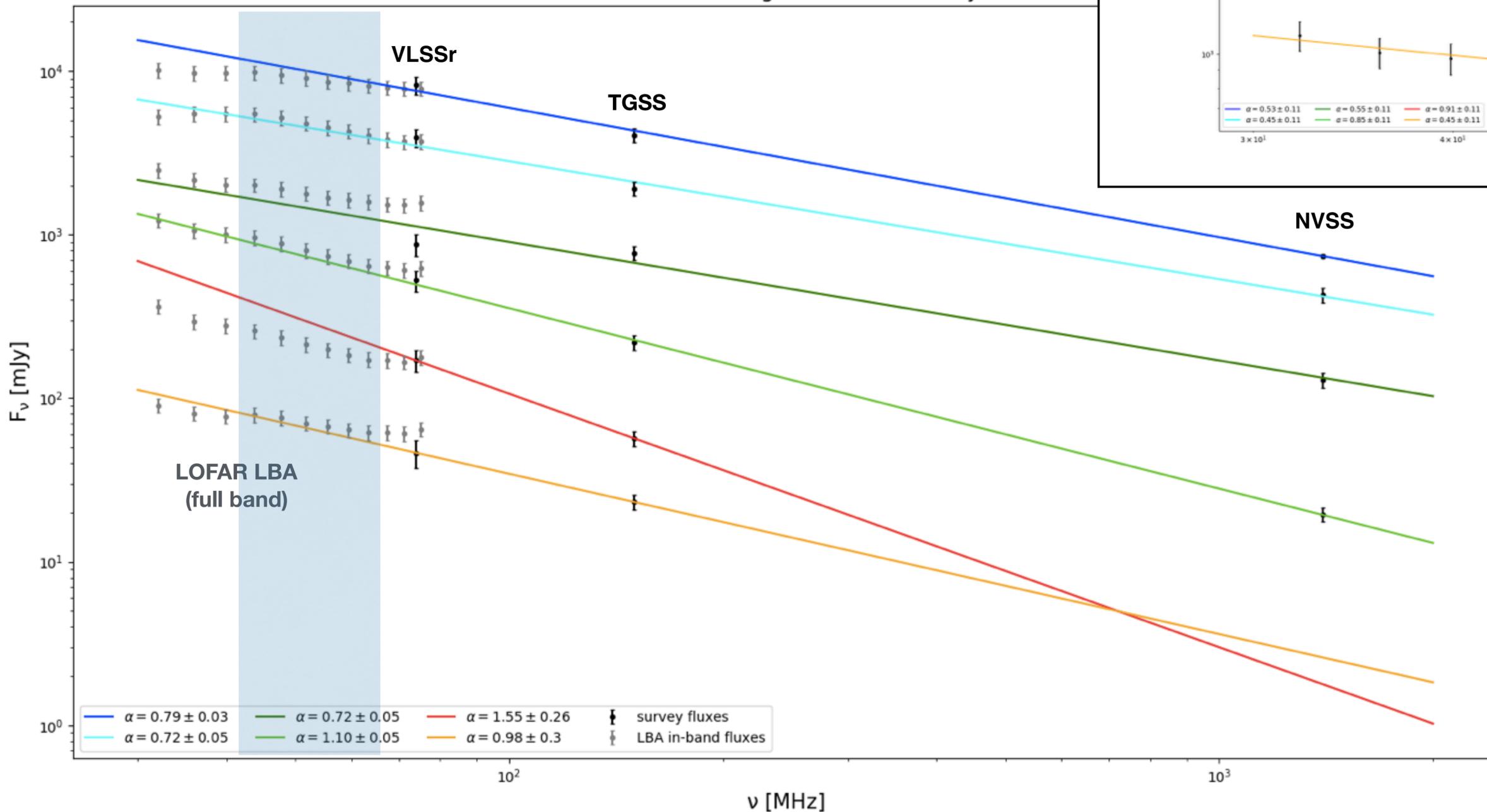
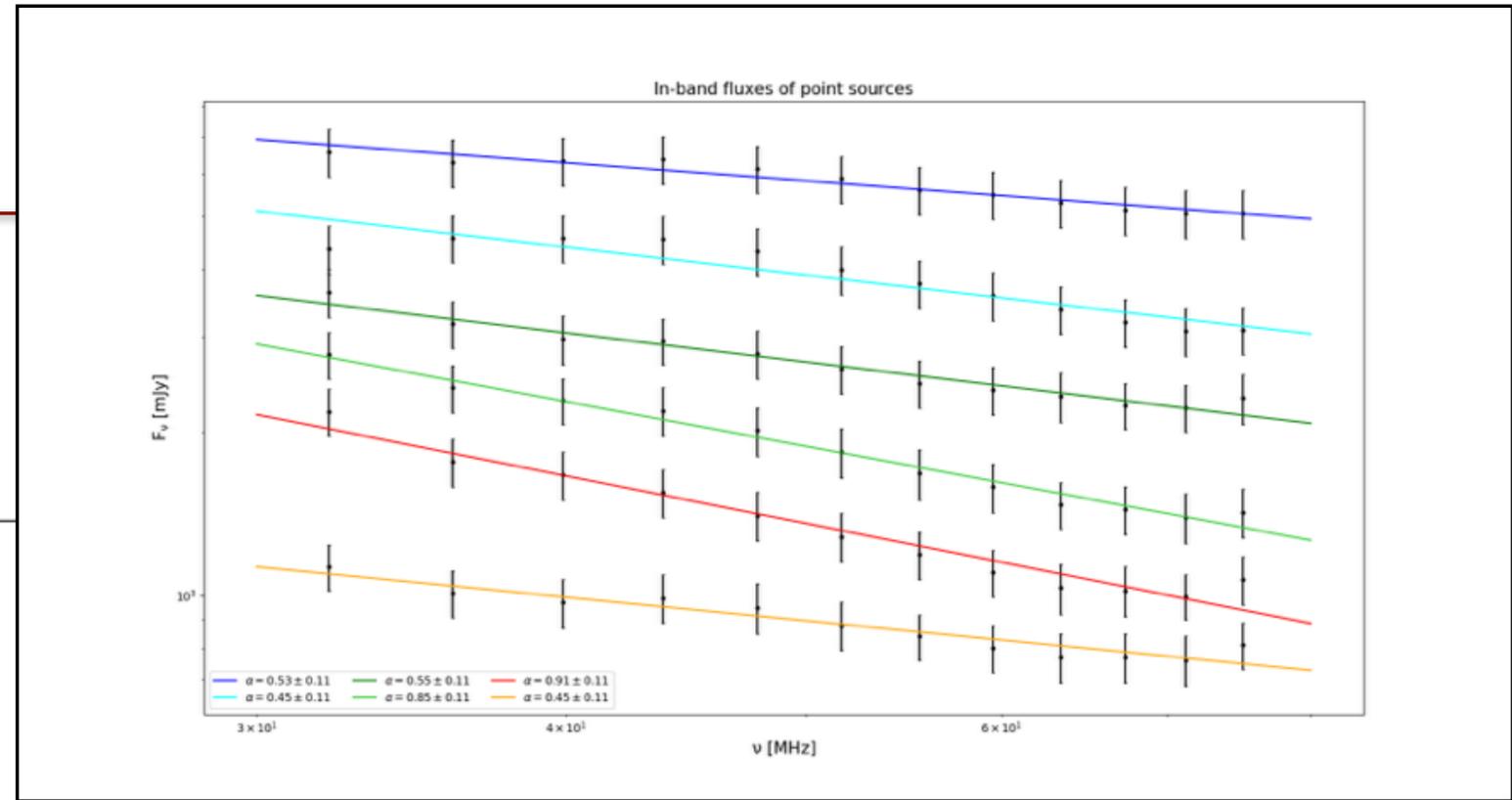
Projects? Write them in the SKSP wiki!

## First release:

- rms noise: 1 mJy/b
- max resolution: 15"
- IQUV Stokes
- High-, low- and ultra low-resolution
- Images at 44, 48, 52, 56, 60 and 64 MHz

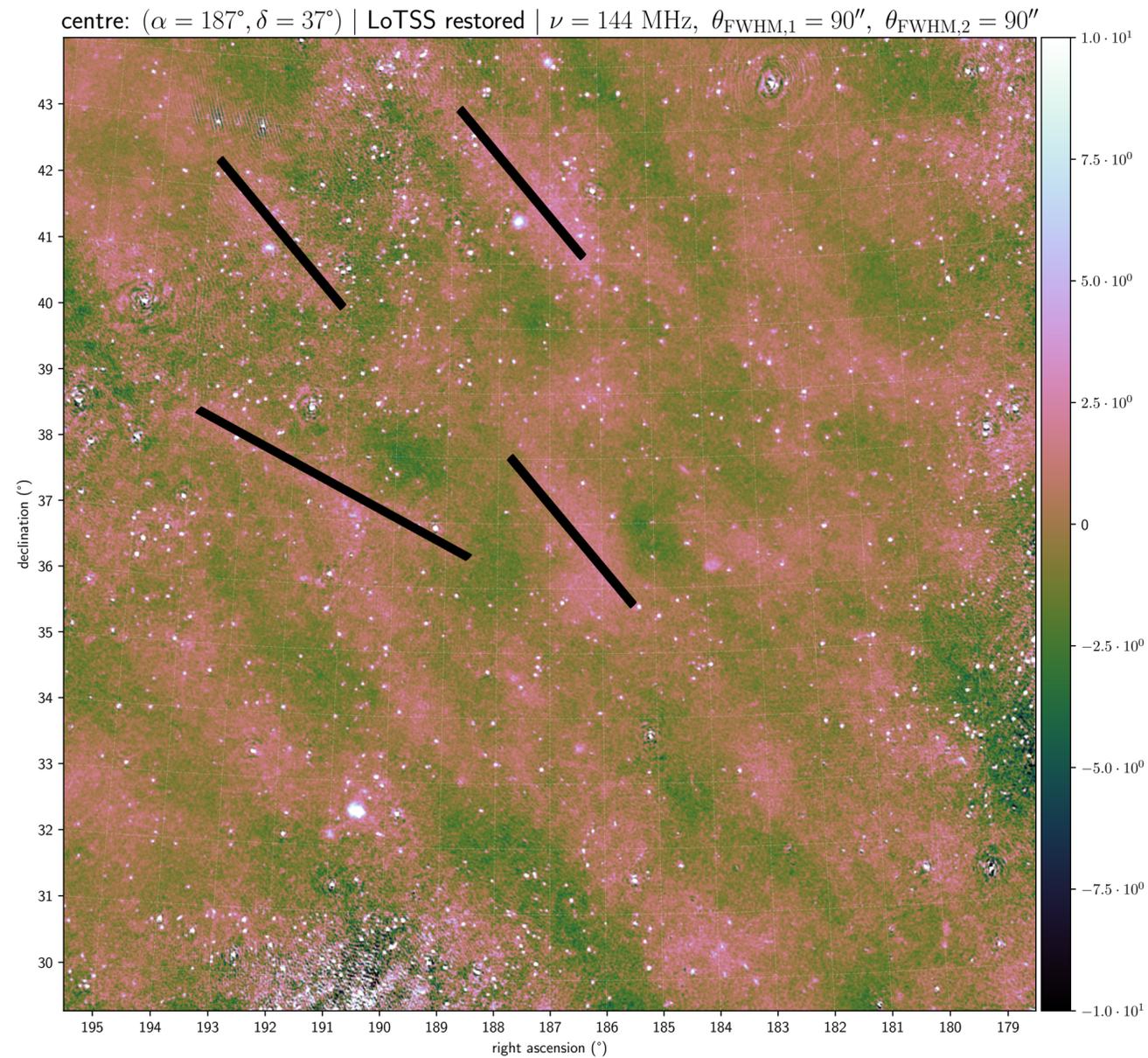
# LBA in-band spectra

Point sources: linear regression from survey fluxes

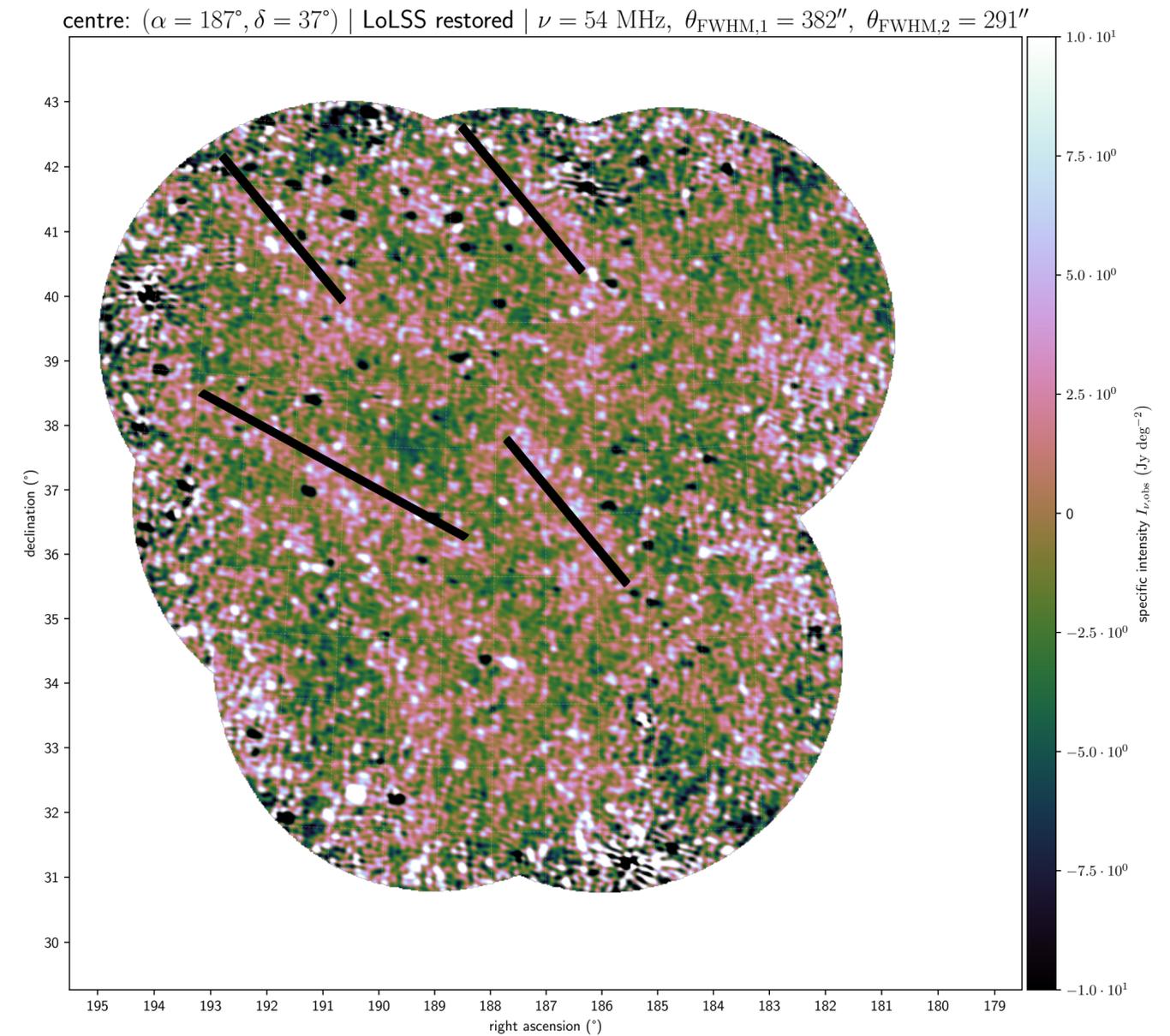


# LoLSS very low-resolution imaging

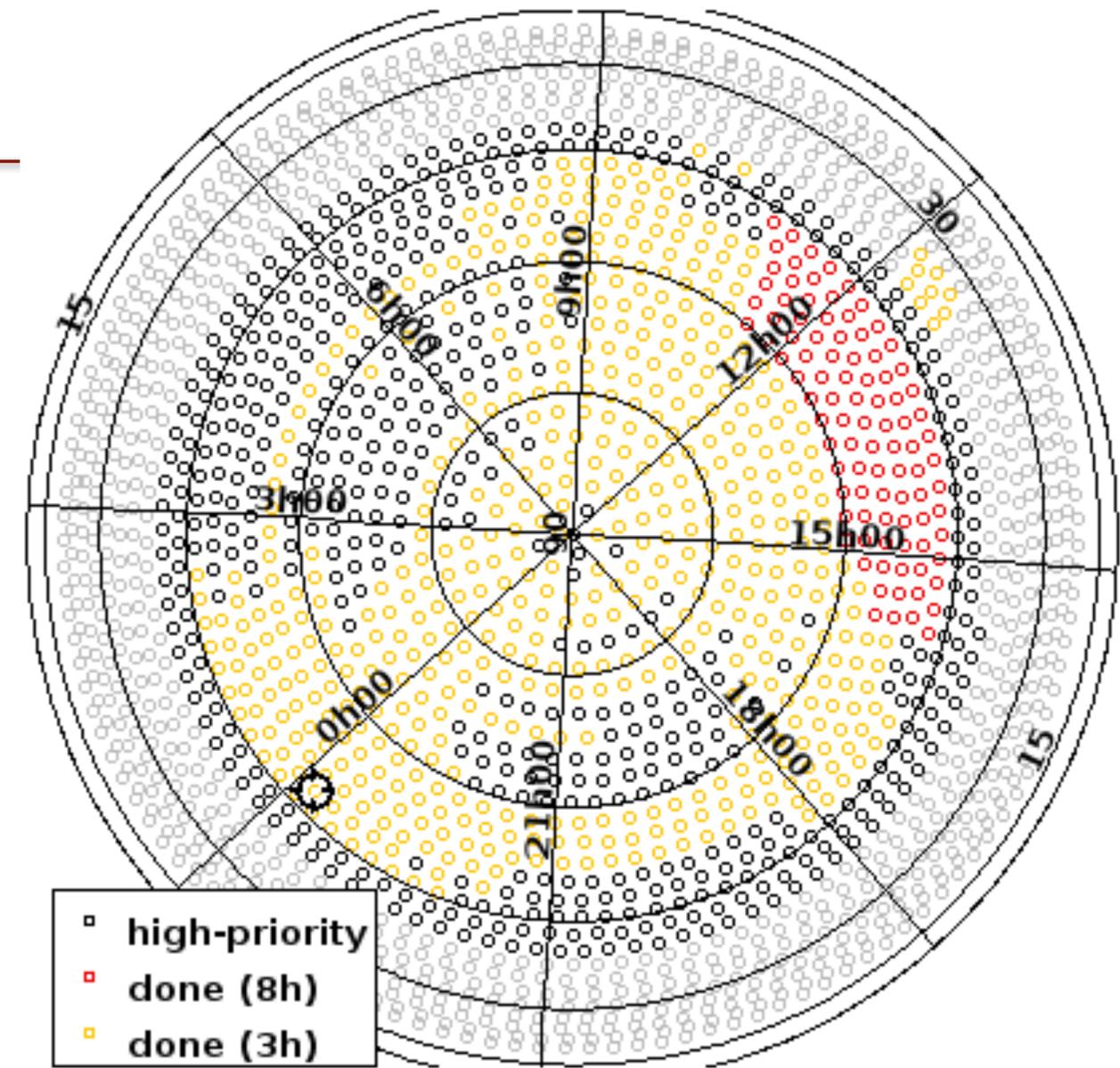
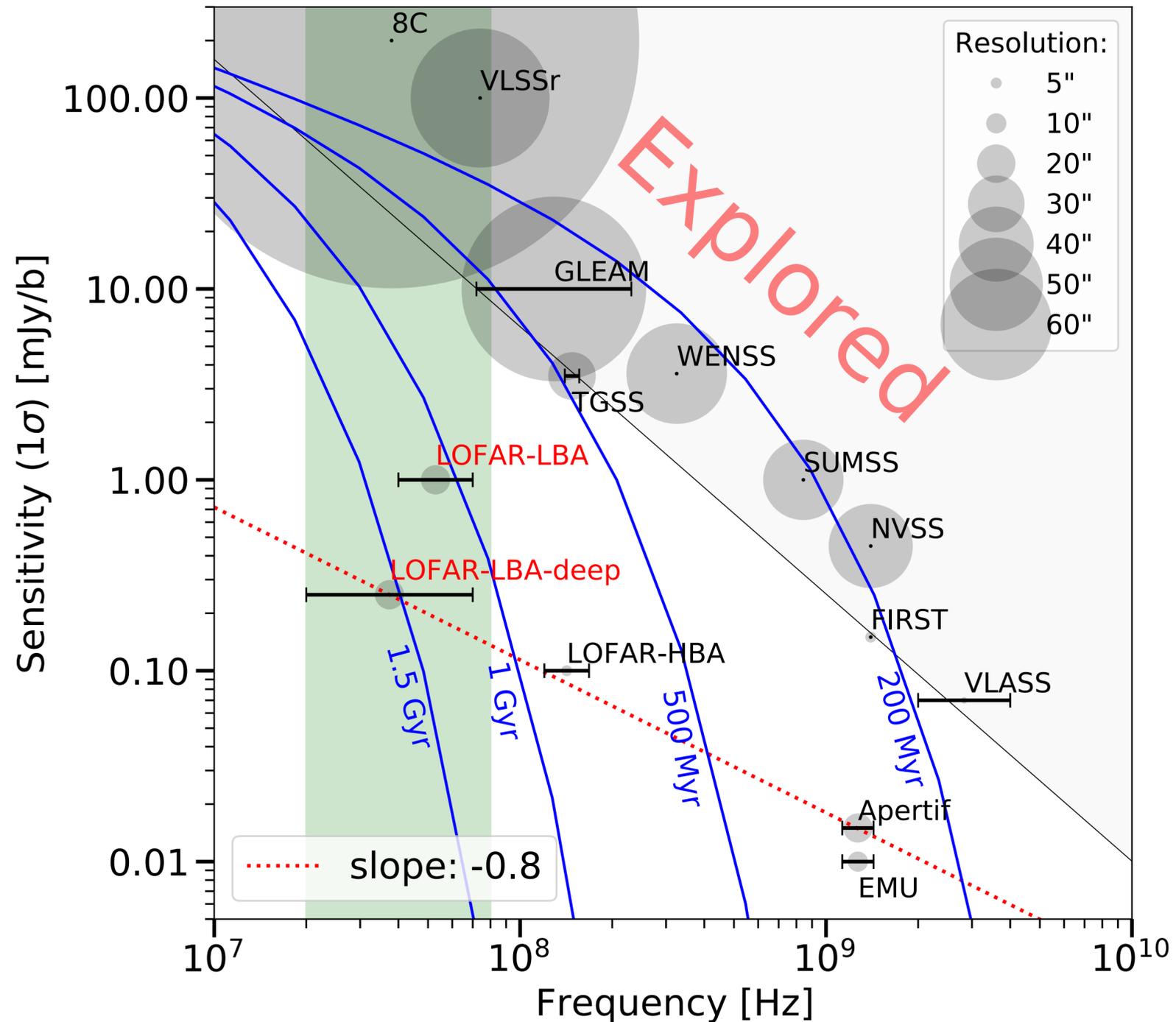
## HBA



## LBA



# LoLSS status and plans



**Deep Fields**, selected regions of the sky (Boötes, ELIAS N1, Lockman hole, NEP) where the depth will be 5 times higher than the all-sky survey.

(see Wendy's talk)

# Pipeline for LOFAR LBA (PiLL)

Wrapper for the pipeline's steps (**PiLL**)

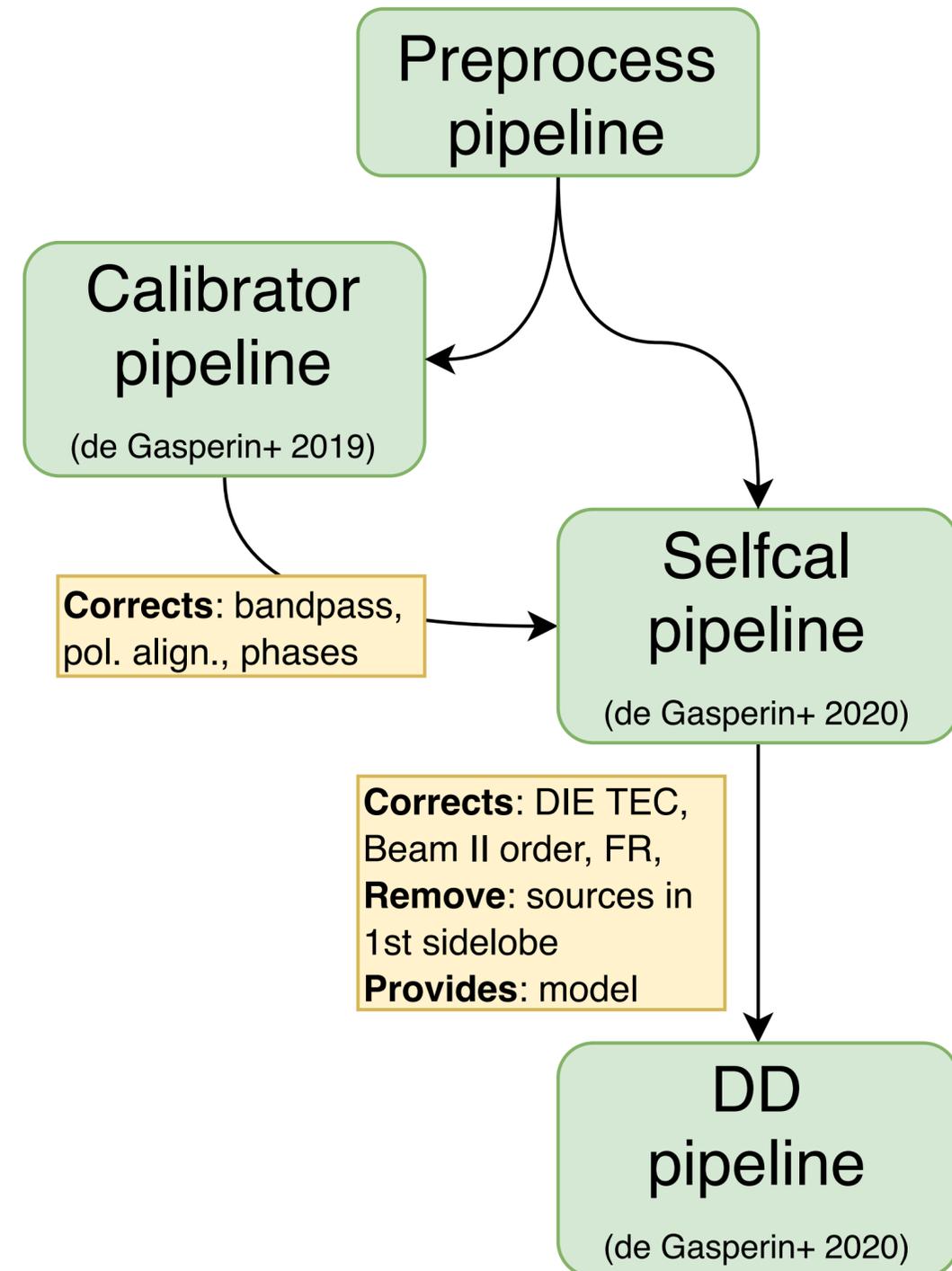
- Git: <https://github.com/revoltek/LiLF/>

3+2 steps pipeline:

- Preprocessing
- **Calibrator**
- Timesplit (apply solution)
- **Selfcal**
- **DD-cal**

**Singularity** image (on Ubuntu 20.04)

- With Claudio Gheller and Fabio Vitello
- Dockerfile: <https://github.com/revoltek/LiLF/tree/LBAdevel/container>
- Tests in: Hamburg, Bologna, Hertfordshire, Leiden



# Program

## Session 1 (50m)

14:10 **Marisa Brienza** (15m)

A unique snapshot of the oldest AGN feedback phases

14:25 **Wendy Williams** (15m)

LBA deep fields: Bootes and next steps

14:40 **Lukas Böhme** (SNEAK PREVIEW - 5m)

Cross-matching LoLSS+LoTSS+NVSS with morphological considerations

14:45 **Christian Groeneveld** (SNEAK PREVIEW - 5m)

Sub-arcsecond resolution images below 80 MHz

14:50 **Irene Polderman** (SNEAK PREVIEW - 5m)

Galactic HII region detection

14:55 **Erik Osinga** (SNEAK PREVIEW - 5m)

Investigating particle acceleration in A2256 at the lowest frequencies

## Session 2 (60 m)

15:00 **Andrea Botteon** (15m)

Radio bridges and emission on scales larger than clusters

15:15 **Virginia Cuciti** (15m)

The megahalo in the galaxy cluster ZwCl 0634.1+4750

15:30 **Henrik Edler** (15m)

Gentle re-energization and a low-frequency halo in A1033

15:45 **Nadia Biava** (15m)

The ultra-steep diffuse emission observed in the cool-core cluster RXCJ 1720.1+2638 at low frequencies

## Discussion

- Survey exploitation and project ideas
- Questions/ideas on how to reduce LBA data
- Questions/ideas on how to make LBA observations

Mosaic 9 pointings (14°x14°)  
Integration: 3 hr per pointing  
Mode: SPARSE  
Rms noise (centre): ~1.3 mJy/b  
Resolution: 15"

