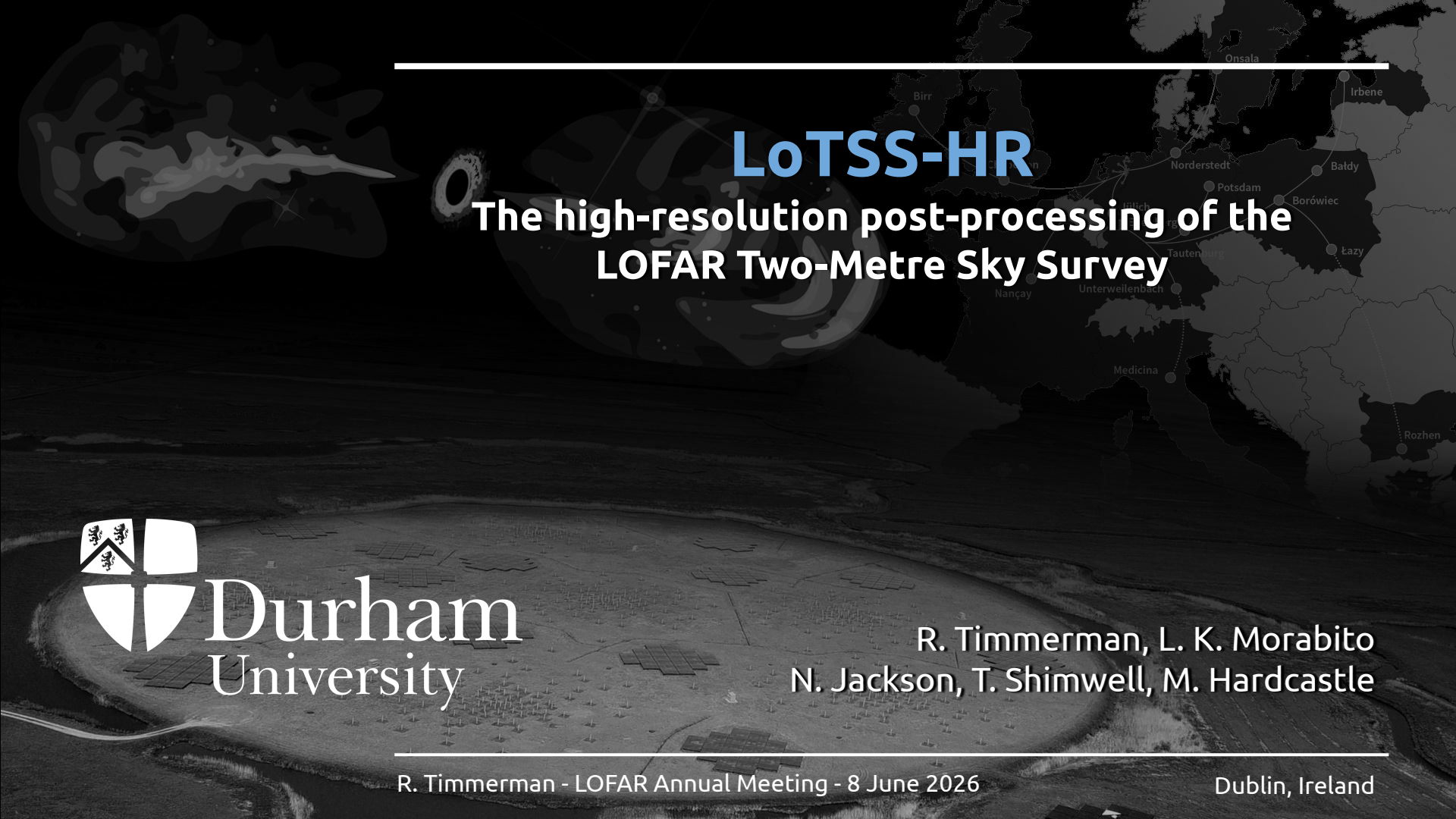




LoTSS-HR

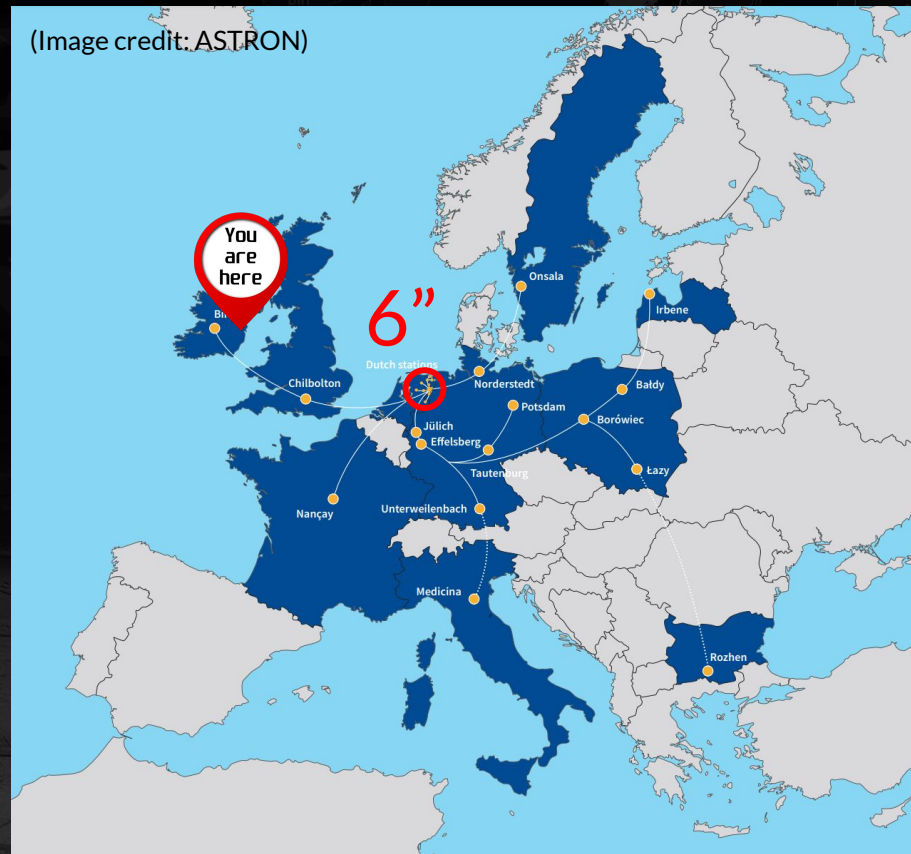
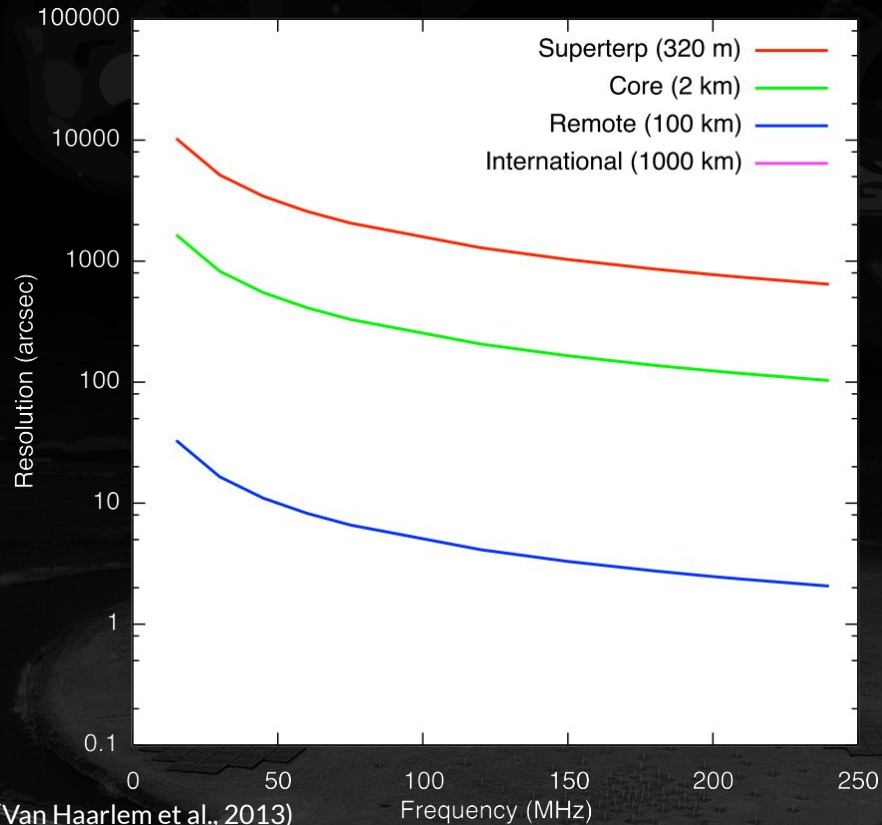
The high-resolution post-processing of the
LOFAR Two-Metre Sky Survey



Durham
University

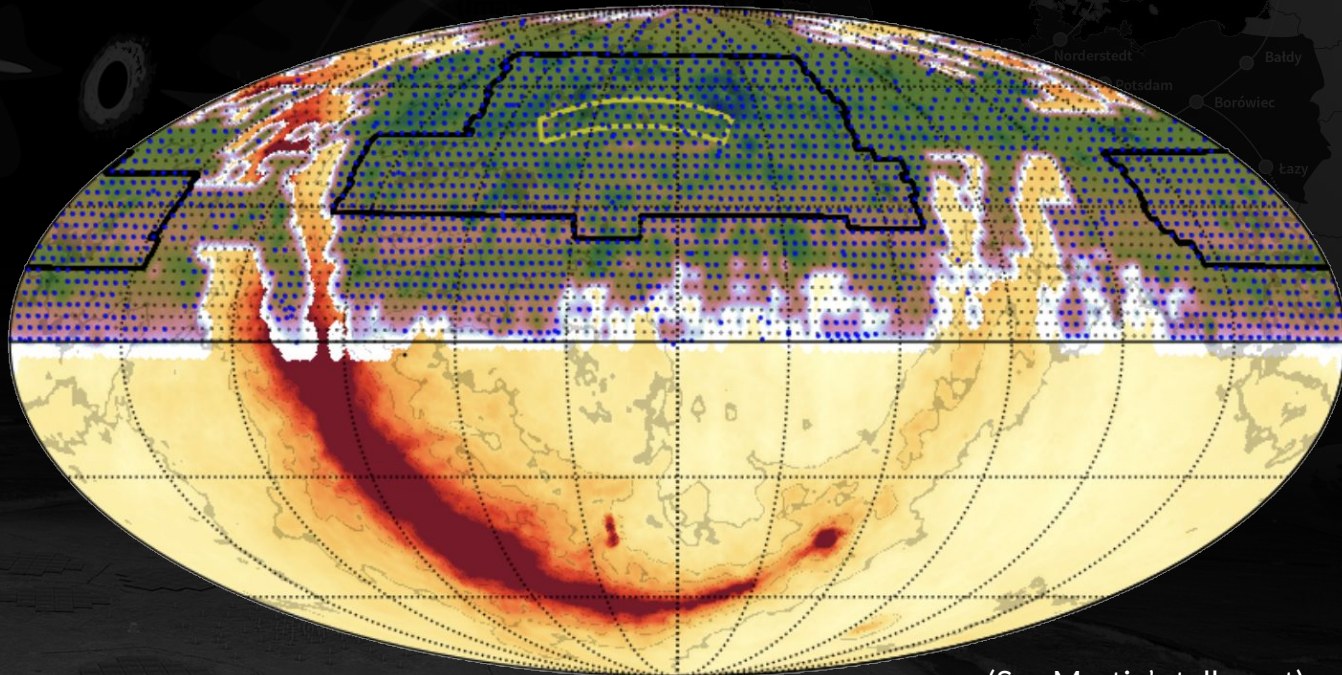
R. Timmerman, L. K. Morabito
N. Jackson, T. Shimwell, M. Hardcastle

The International LOFAR Telescope



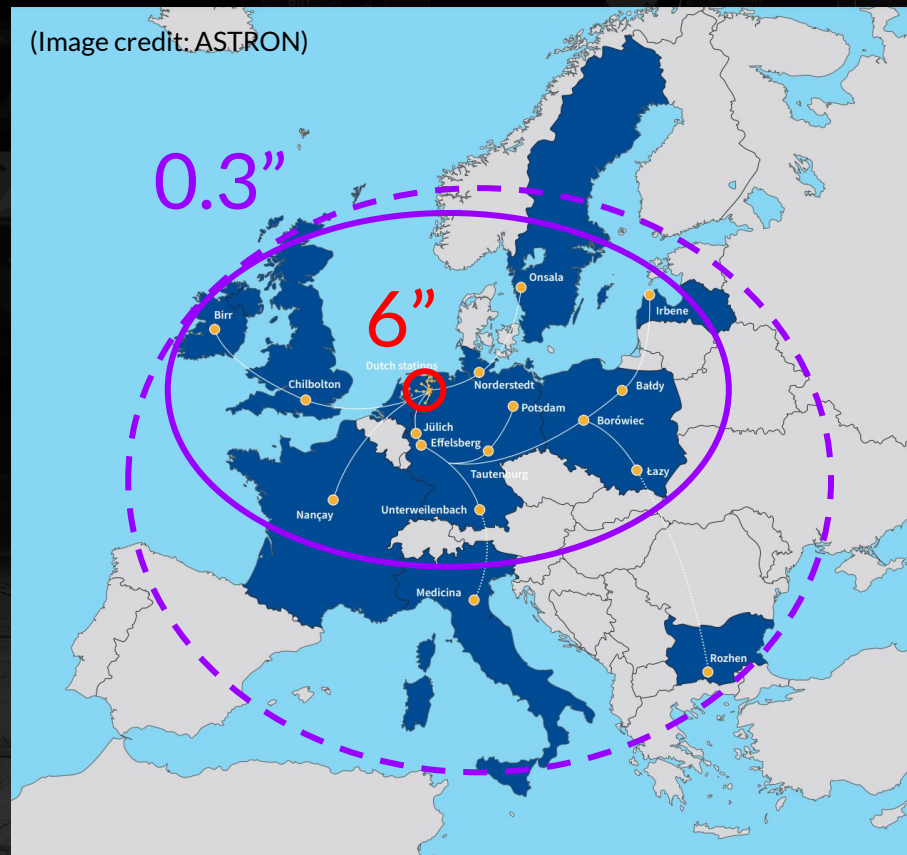
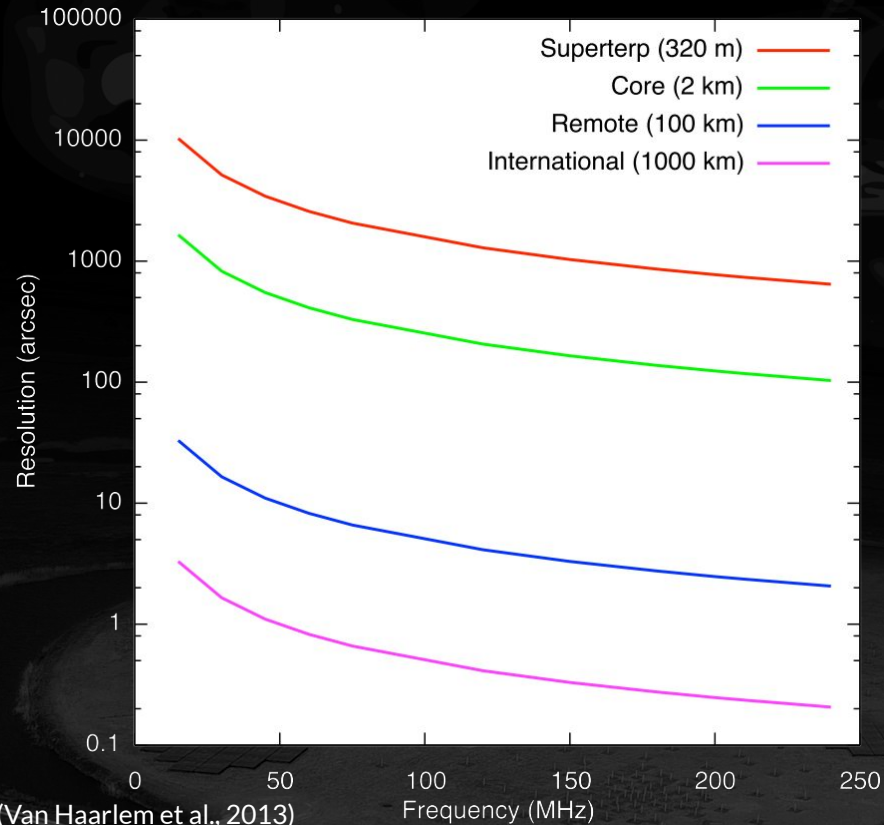
LoTSS: The LOFAR Two-Metre Sky Survey

- 2013 - Present
- 15,000 hours (currently)
- HBA: 120-168 MHz
- Primarily Northern sky
- 20 PB of data
- 6'' angular resolution
- 80 μ Jy/beam sensitivity
- >13 million sources (92% unresolved)
- International stations recorded but not processed

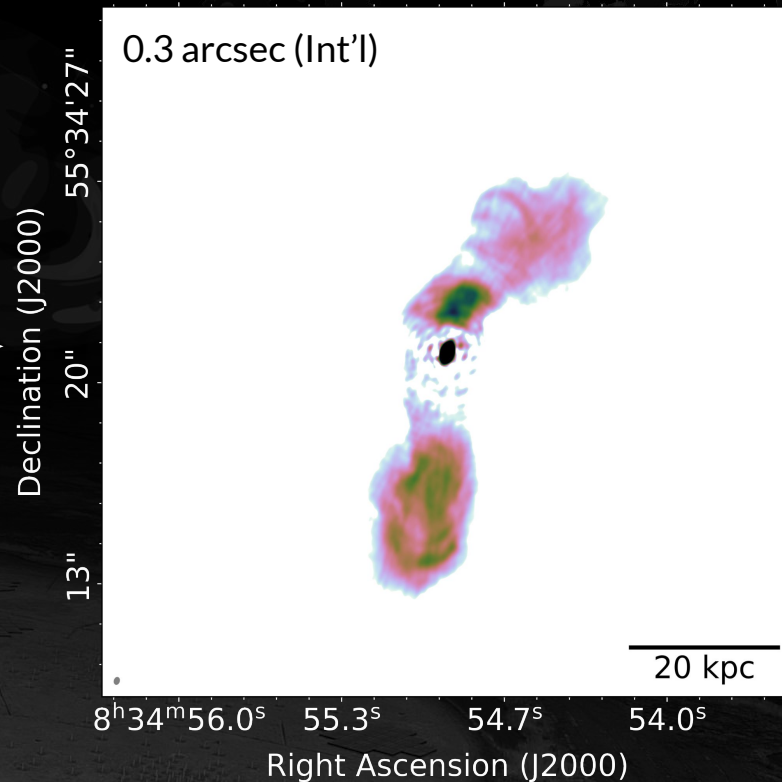
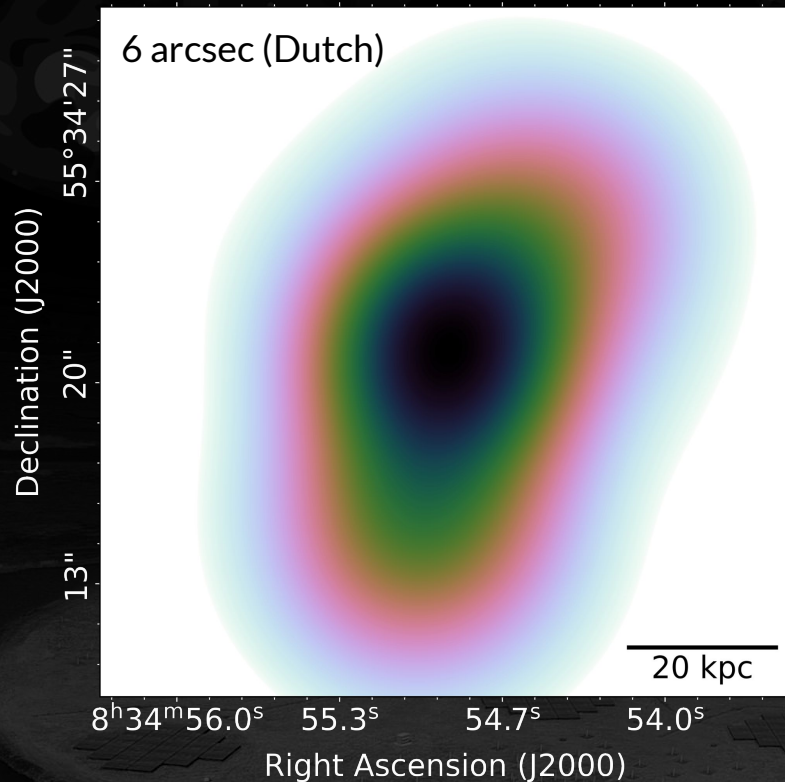


(See Martin's talk next)

The International LOFAR Telescope



High-resolution imaging at low frequencies



4C+55.16

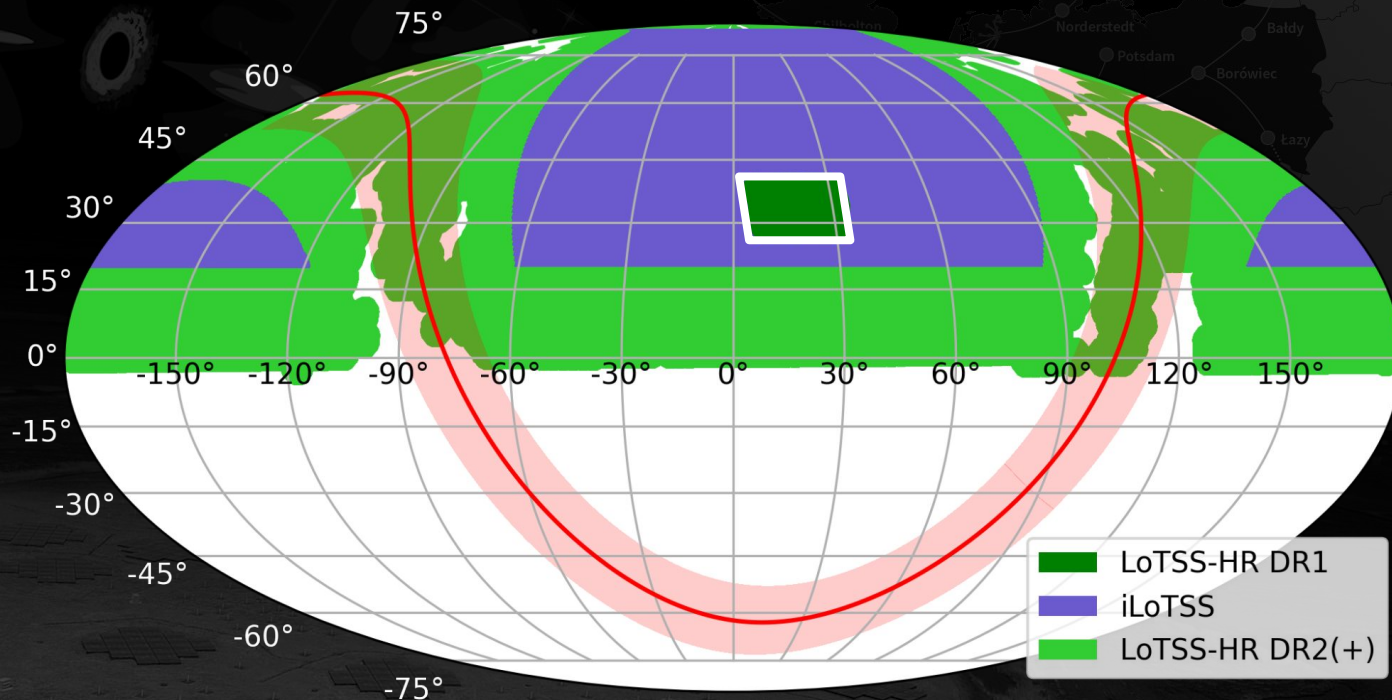
LoTSS-HR: The High Resolution LoTSS

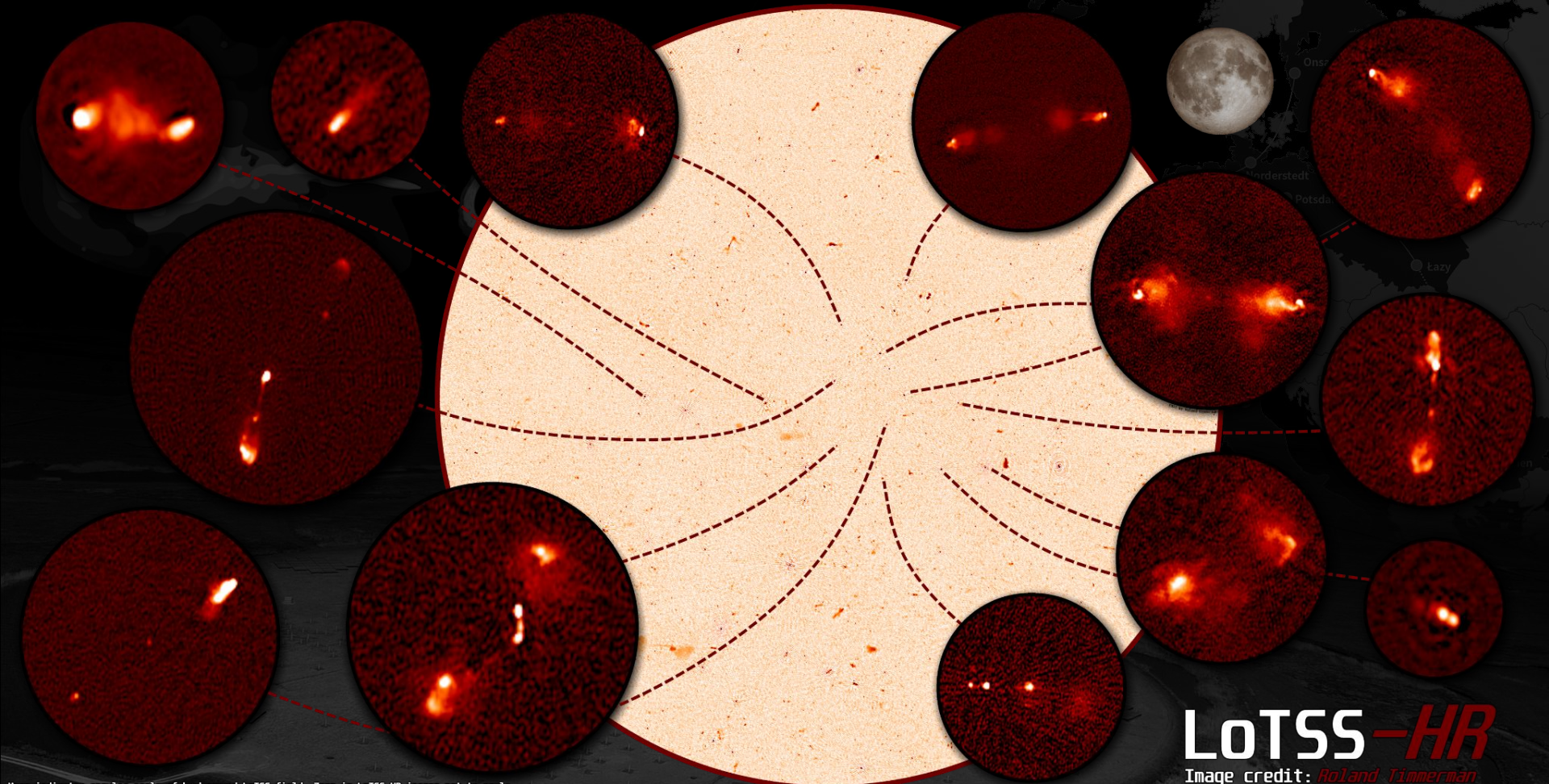
Reprocessing of
LoTSS using the **full**
international array

Multiple **data**
releases planned

Postage stamp
imaging of all
sources **>10 mJy** in
the field of view
(~150 sources per field)

Science-ready
high-resolution **0.3"**
images & derived
source **catalogues**





Moon indicates angular scale of background LoTSS field. Zoom-in LoTSS-HR images not to scale

LoTSS-HR
Image credit: *Roland Timmerman*

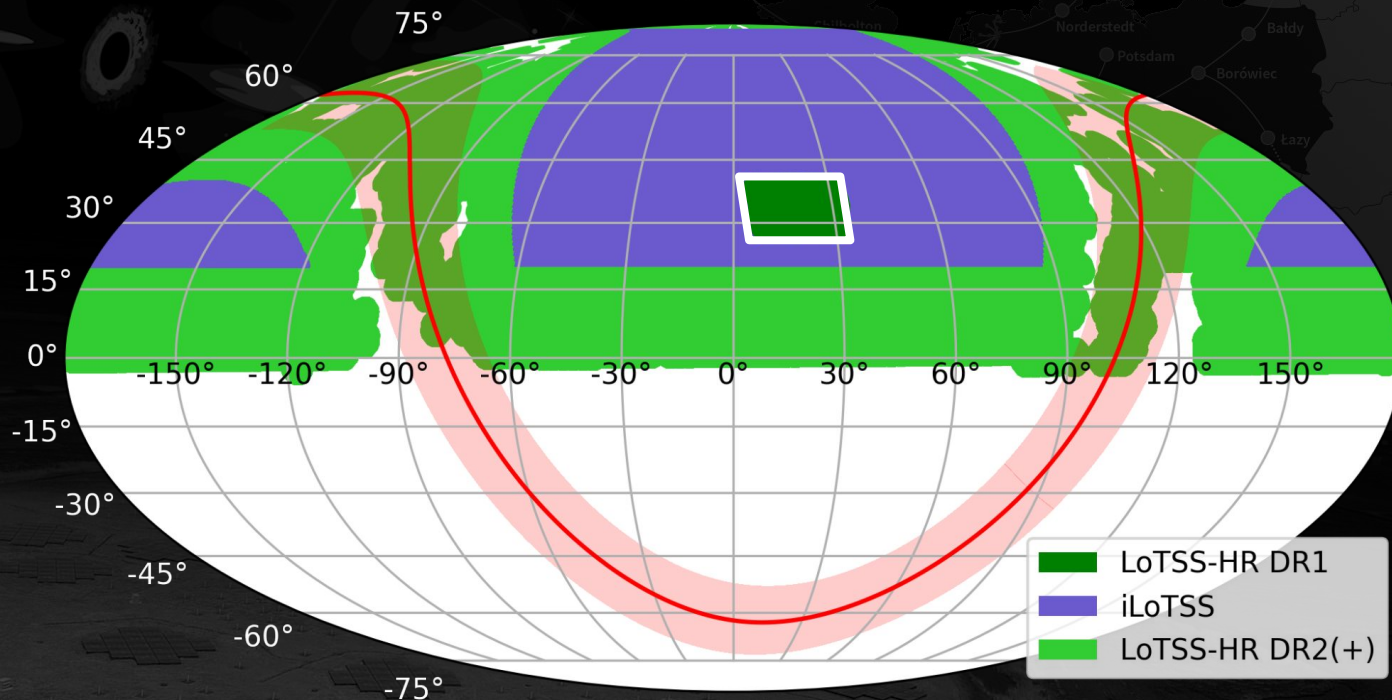
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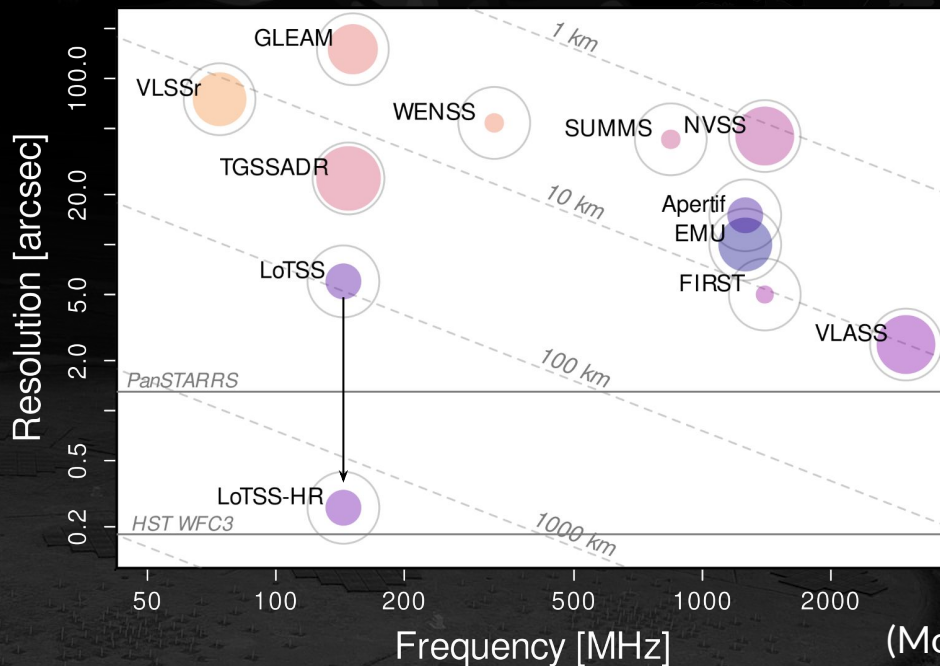
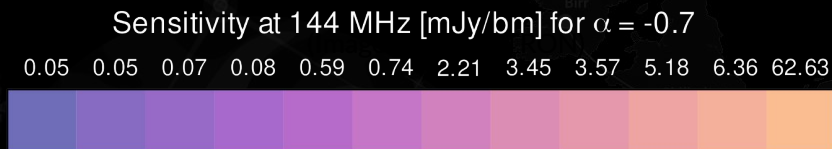
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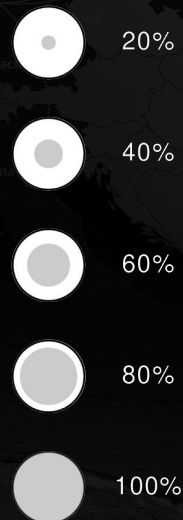
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Sky coverage



(Morabito et al., 2022)

The LoTSS-HR workflow

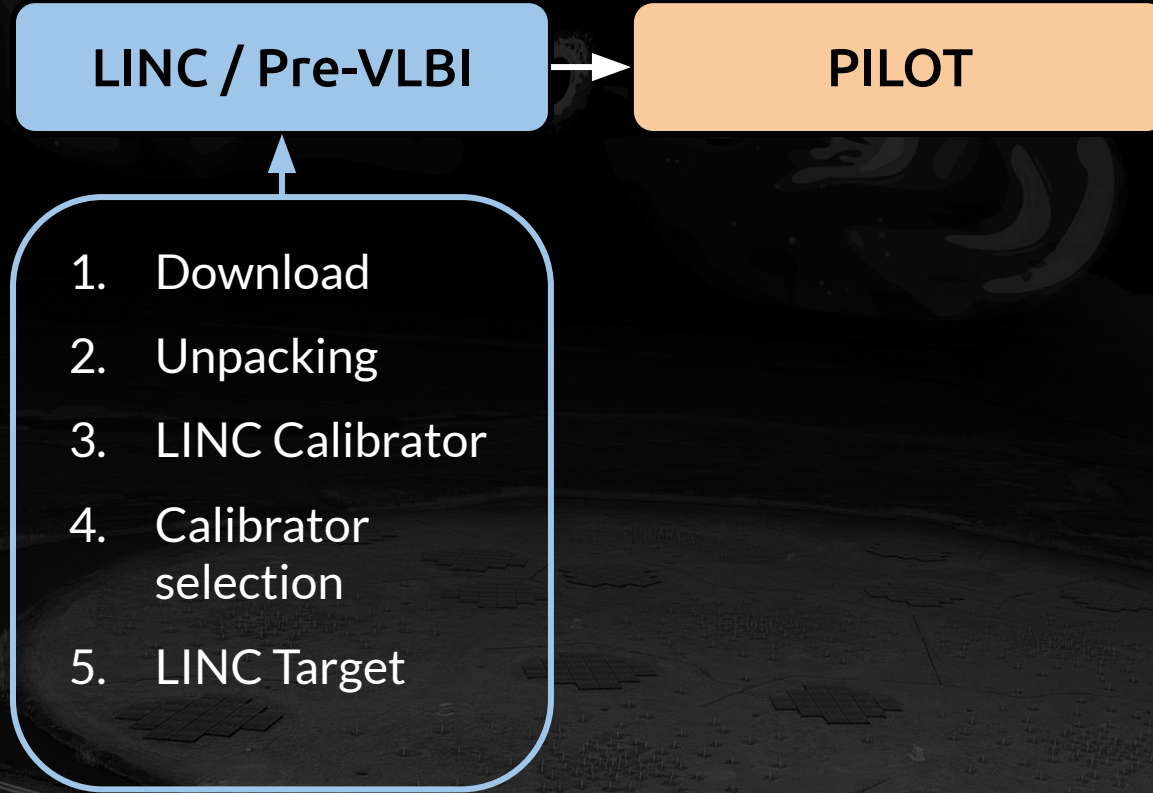
LINC / Pre-VLBI

The LoTSS-HR workflow

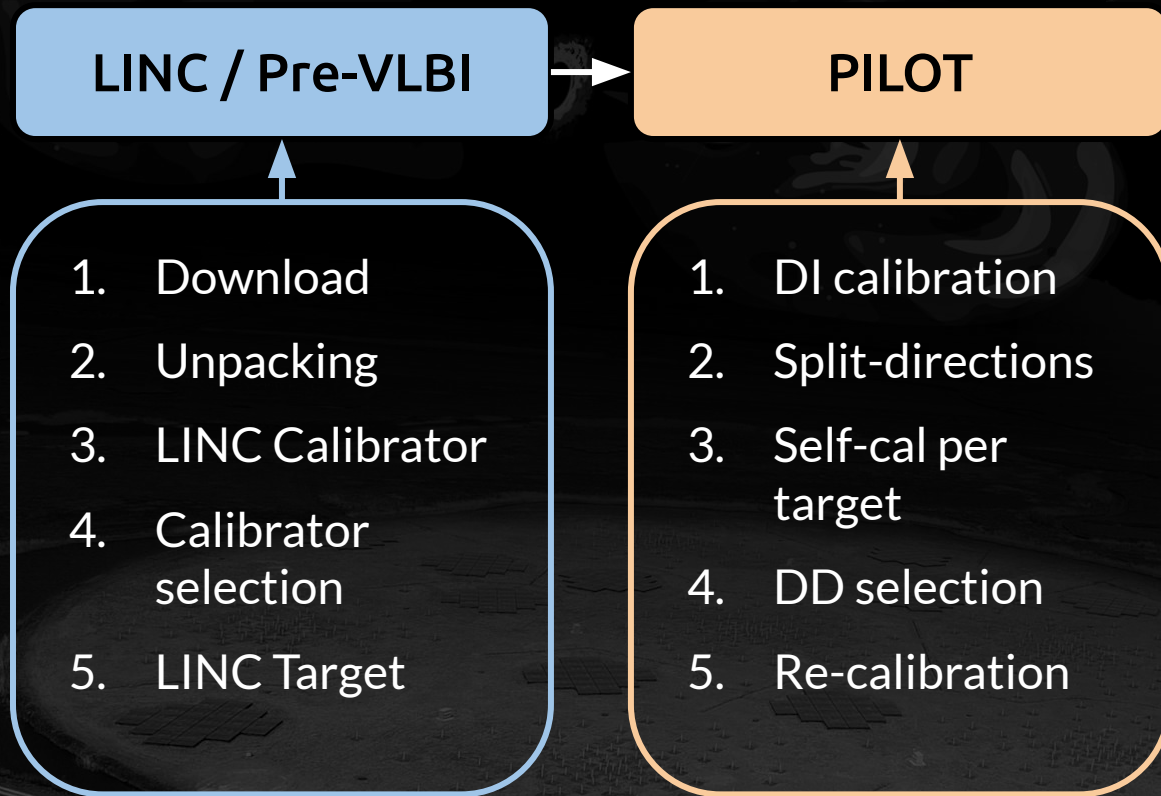
LINC / Pre-VLBI

1. Download
2. Unpacking
3. LINC Calibrator
4. Calibrator selection
5. LINC Target

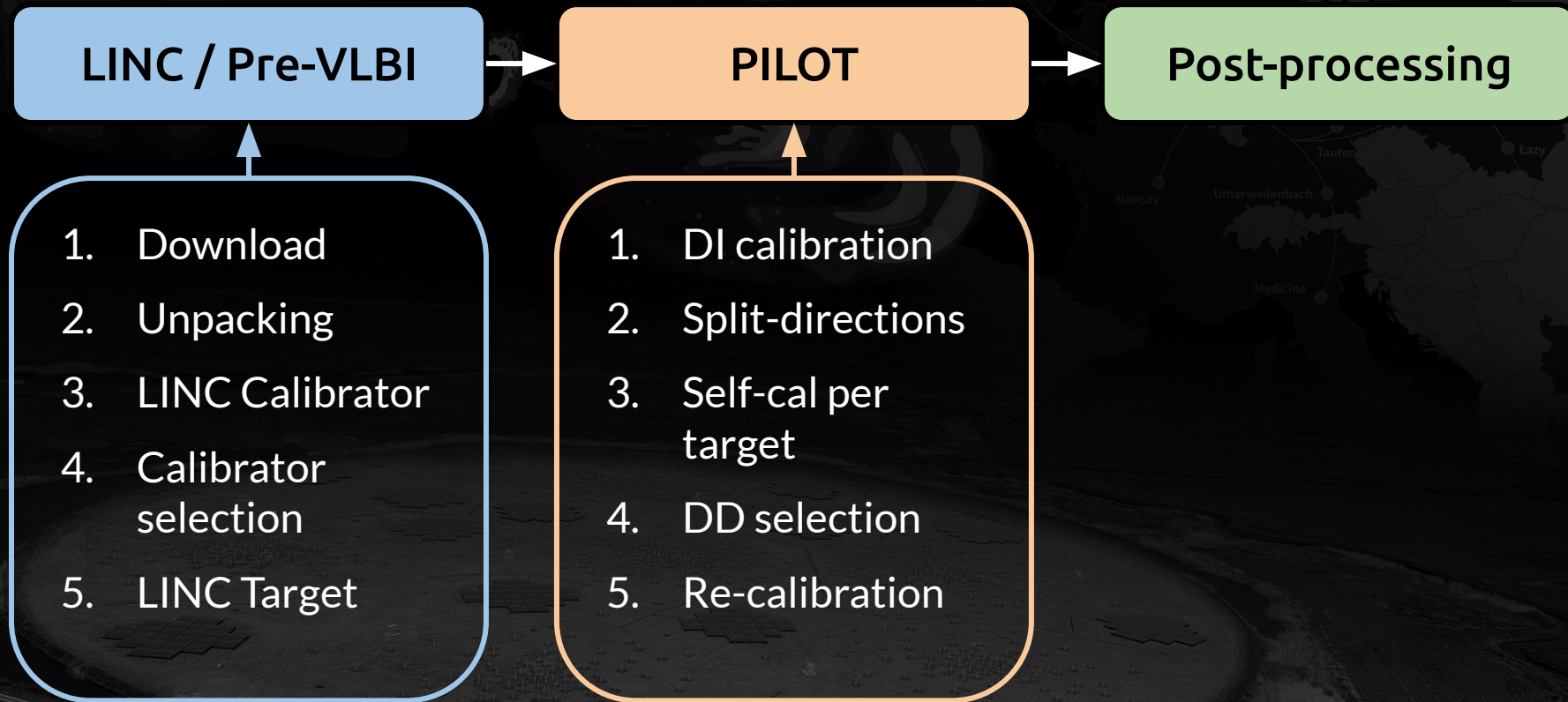
The LoTSS-HR workflow



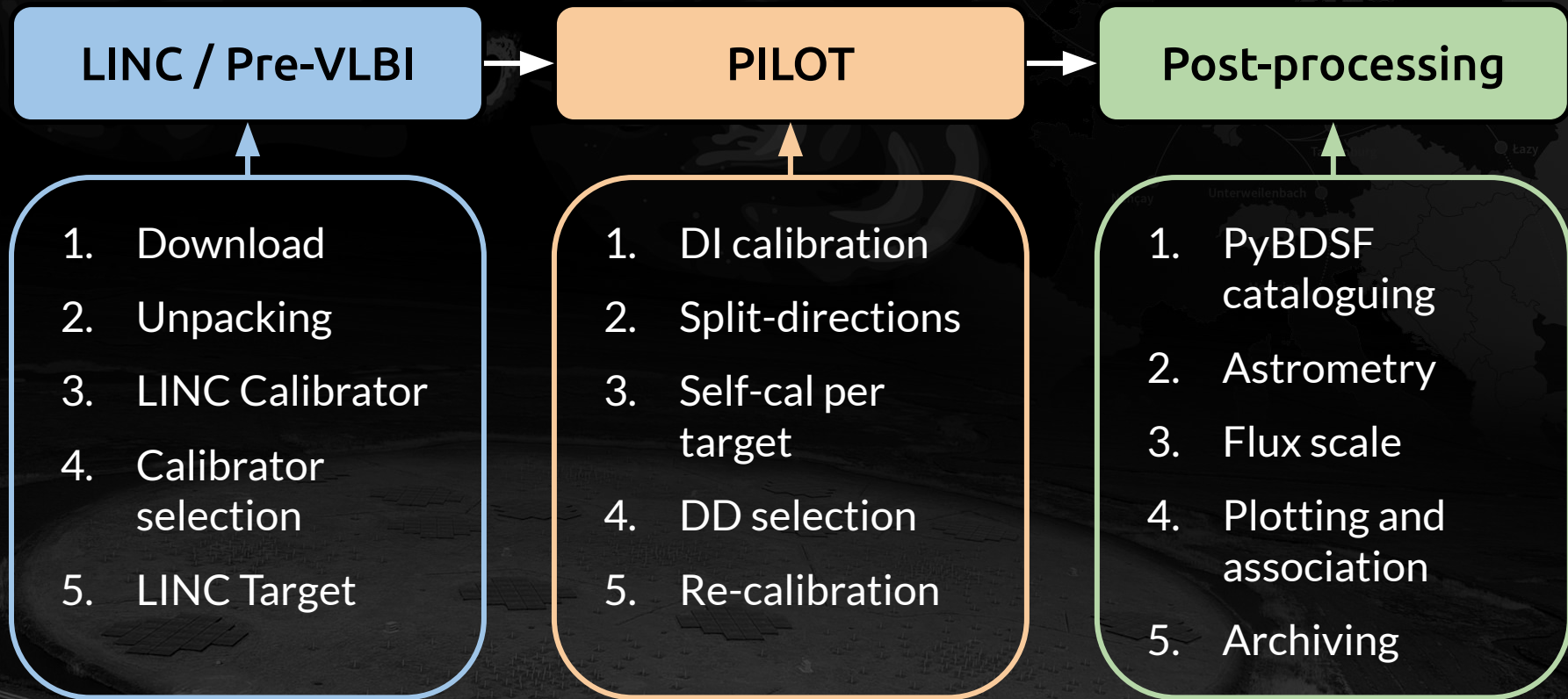
The LoTSS-HR workflow



The LoTSS-HR workflow



The LoTSS-HR workflow



LoTSS-HR Data Release 1

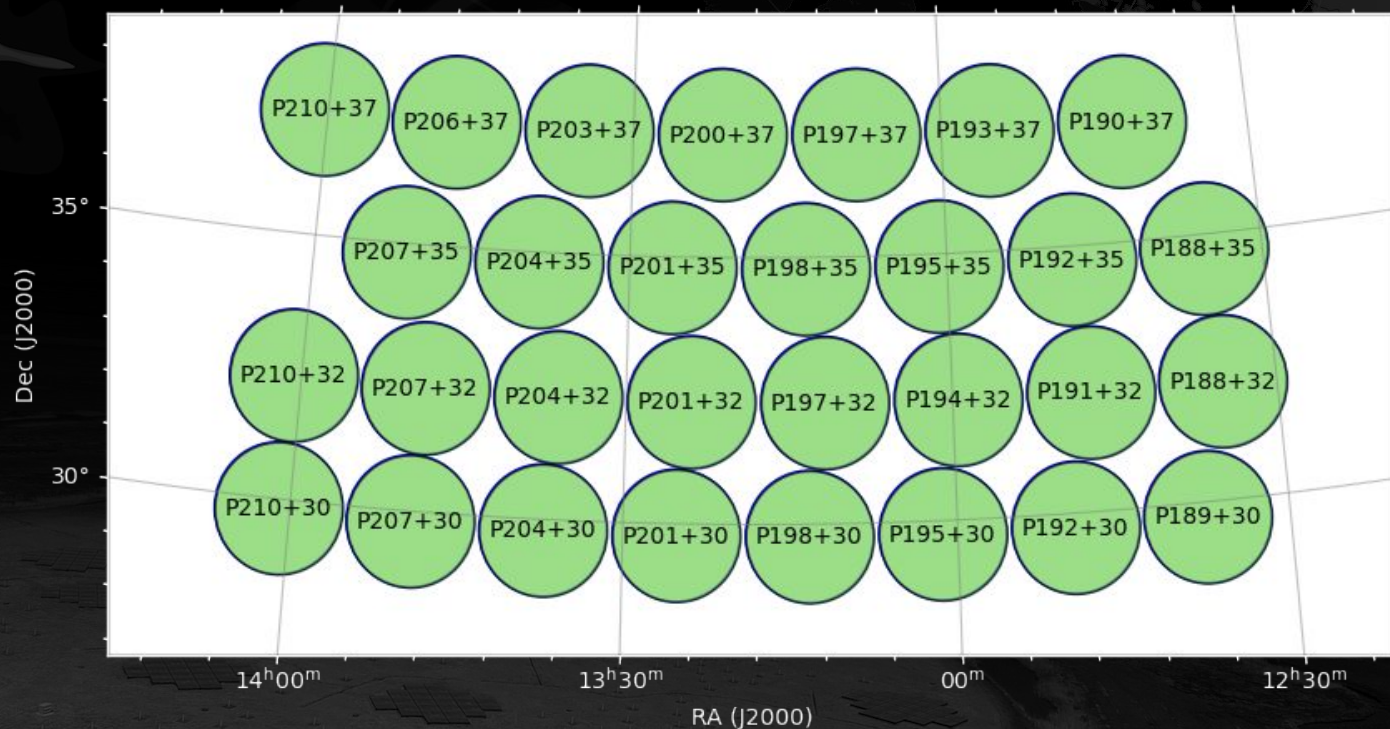
DR1: 30 fields in the
H-ATLAS area

Over **4000** calibrated
high-resolution .fits
images

Quick-look
inspection images

Source-associated
PyBDSF **catalogues**

Astrometry and
absolute **flux scale**
tied to LoTSS



LoTSS-HR Data Release 1

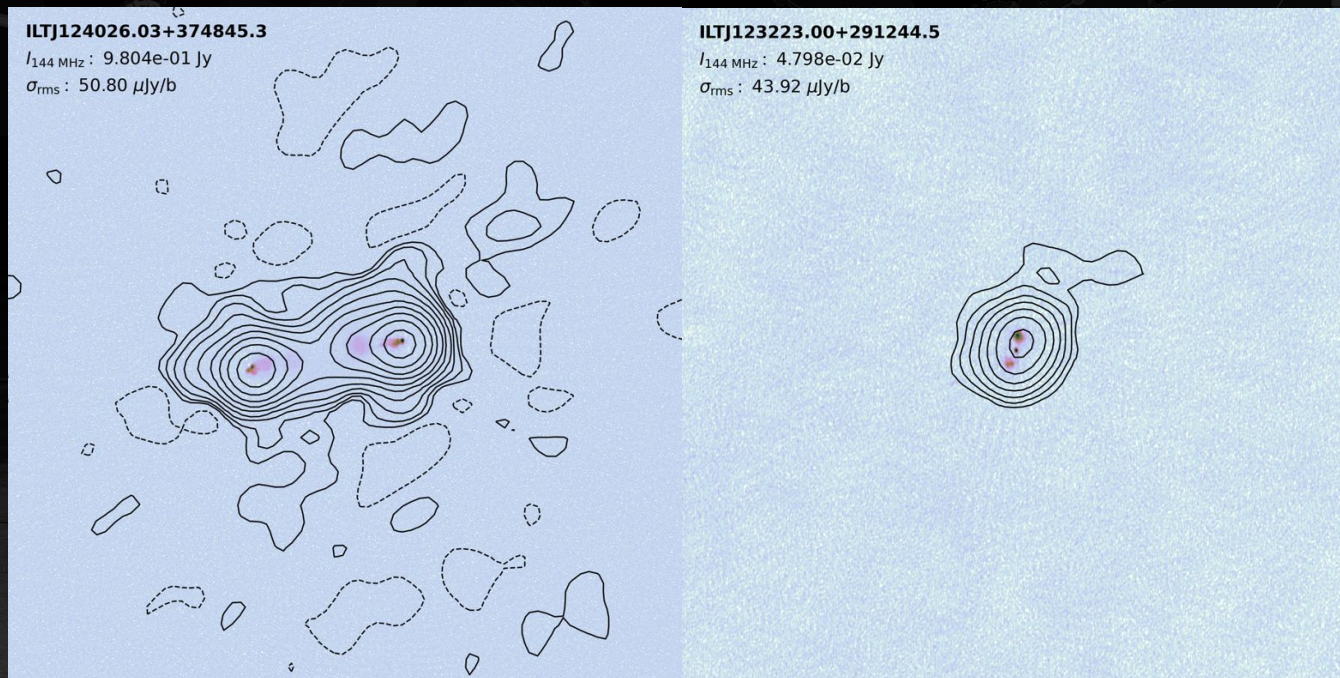
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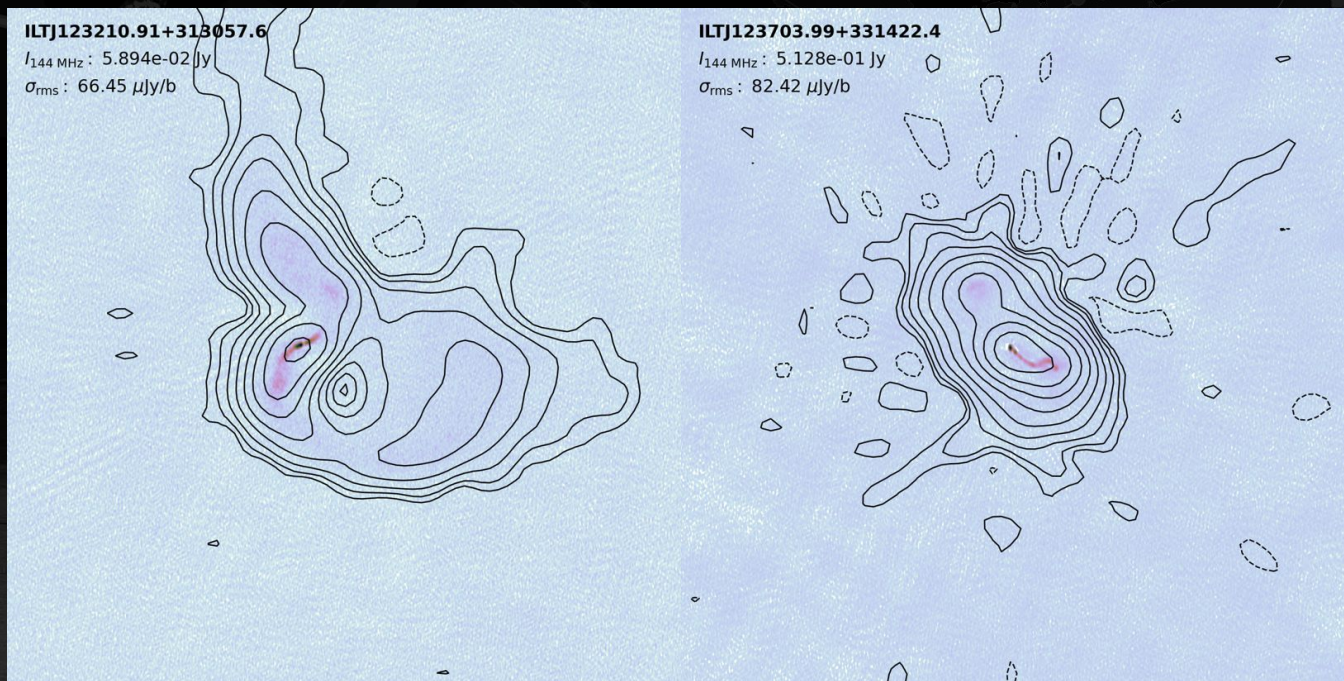
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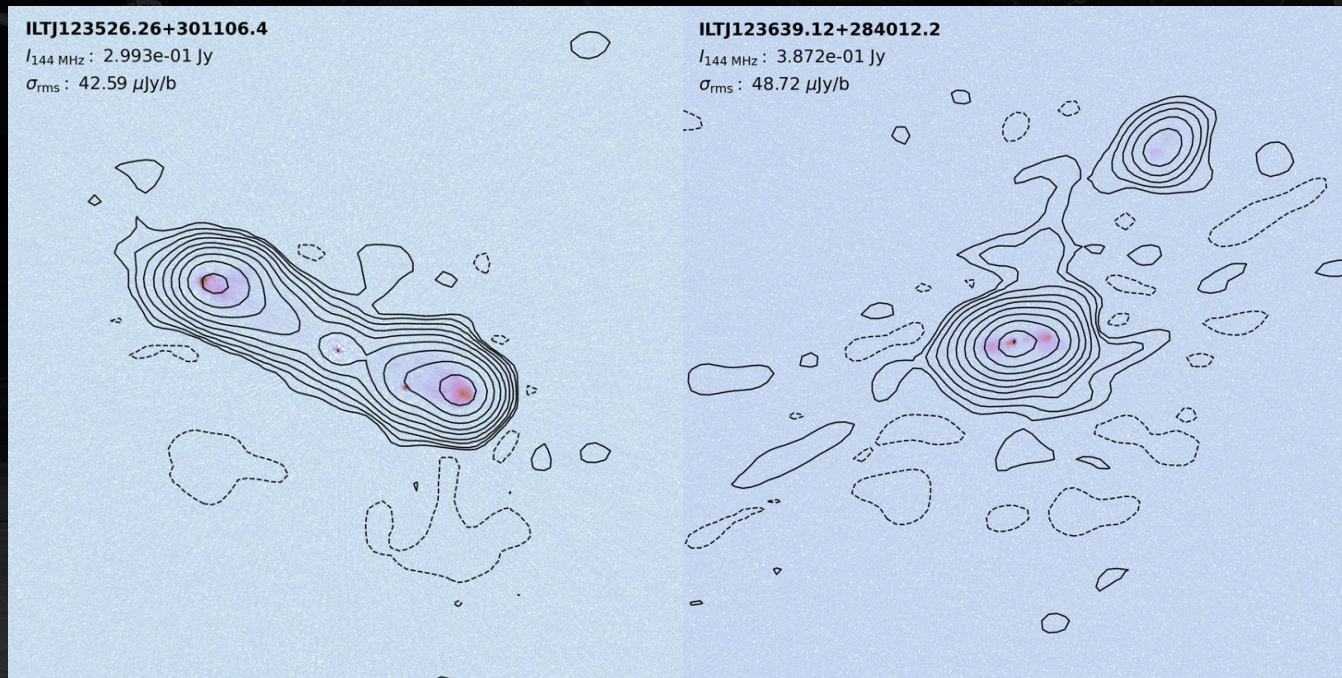
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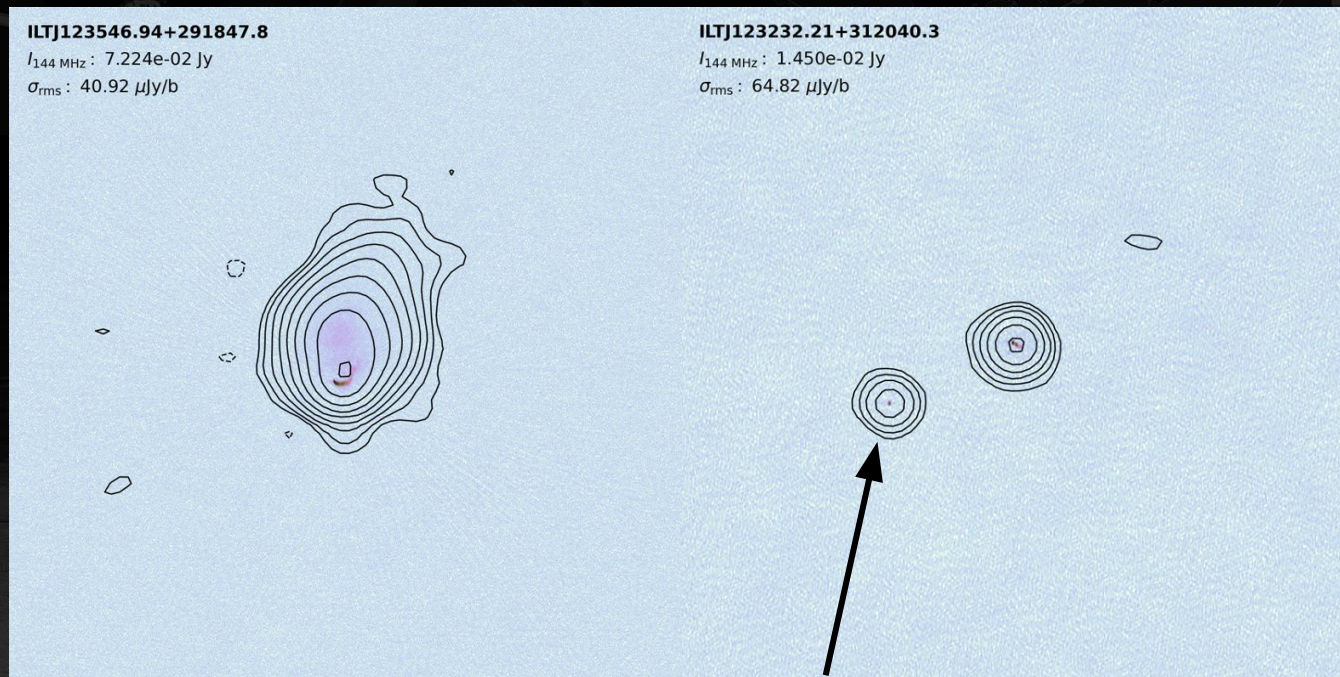
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Serendipitous detection

LoTSS-HR Data Release 1

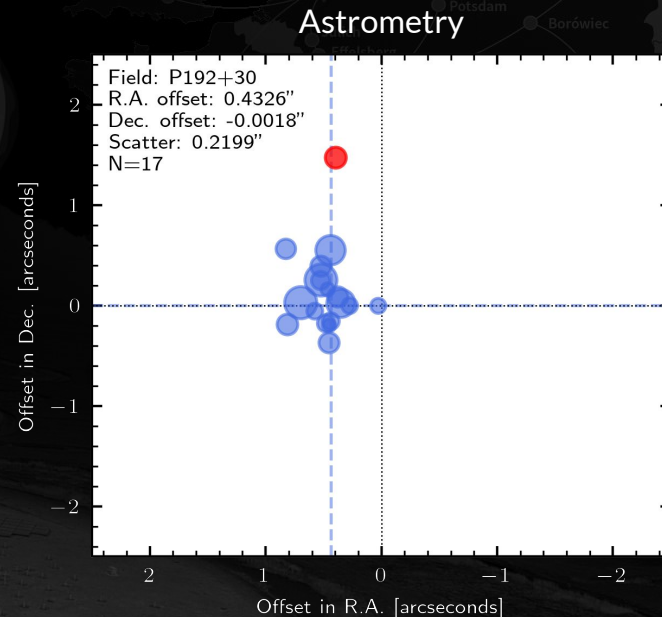
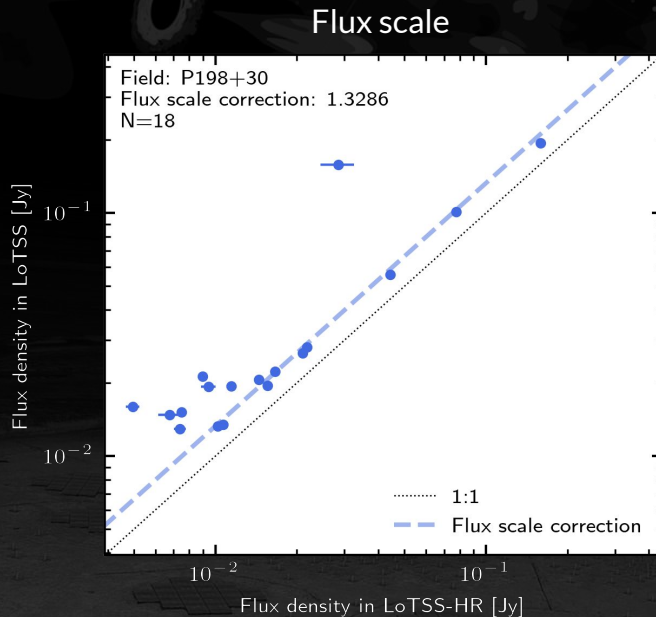
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LOFAR SURVEYS

LoTSS-HR DR1 internal release

This is the first data release for the LoTSS High Resolution (LoTSS-HR) survey. It includes thirty pointings in the H-ATLAS area. Sources were selected to be: (1) within 1.25 deg of the phase centre of each of these pointings, and (2) have a total flux density equal or greater than 10 mJy in the LoTSS catalogue. The flux density selection reflects the WEAVE-LOFAR selection, and limits the computation cost of processing the entire field. In general there are approximately 150 sources per field. For these sources we made postage stamp images at 0.3 arcsec resolution using the full international area. From these we have generated a consistent catalogue containing all targeted sources, and serendipitous sources detected in the postage stamp fields of view. Please see the README file for how to identify these in the catalogue.

NB and caveats:

- Flux density scales and astrometry have been corrected per pointing. There are not enough sources to robustly do this at a finer level.
- Intermediate images are not included in the data release, but final calibrated measurement sets are available on request.
- Not every targeted source will have a detection in the high resolution imaging. In some cases the automated calibration may have failed; these can be re-done if necessary.

Please let Roland Timmerman (roland.timmerman@durham.ac.uk) and Leah Morabito (leah.k.morabito@durham.ac.uk) know if you find any discrepancies or issues with any of the data products, or have further questions or needs beyond what is provided.

Tables

- [README](#)
- [Source catalogue](#)
- [Gaussian catalogue](#)
- [Serendipitous source catalogue](#)
- [Serendipitous Gaussian catalogue](#)

HIPS

- [HIPS](#) image of all the FITS images, usable directly or through Aladin desktop

Source downloads

Show entries

Search:

Name	Pointing	RA [deg]	DEC [deg]	Total flux (Jy)	Flagged	PNG image	FITS download
ILTJ122948.24+320823.5	P188+32	187.451	32.1402	0.03816	False	Image	Download
ILTJ122953.87+324124.9	P188+32	187.474	32.6902	0.01564	False	Image	Download
ILTJ122957.67+343848.8	P188+35	187.49	34.6469	0.01258	False	Image	Download
ILTJ122959.58+350529.9	P188+35	187.498	35.0925	0.04209	False	Image	Download

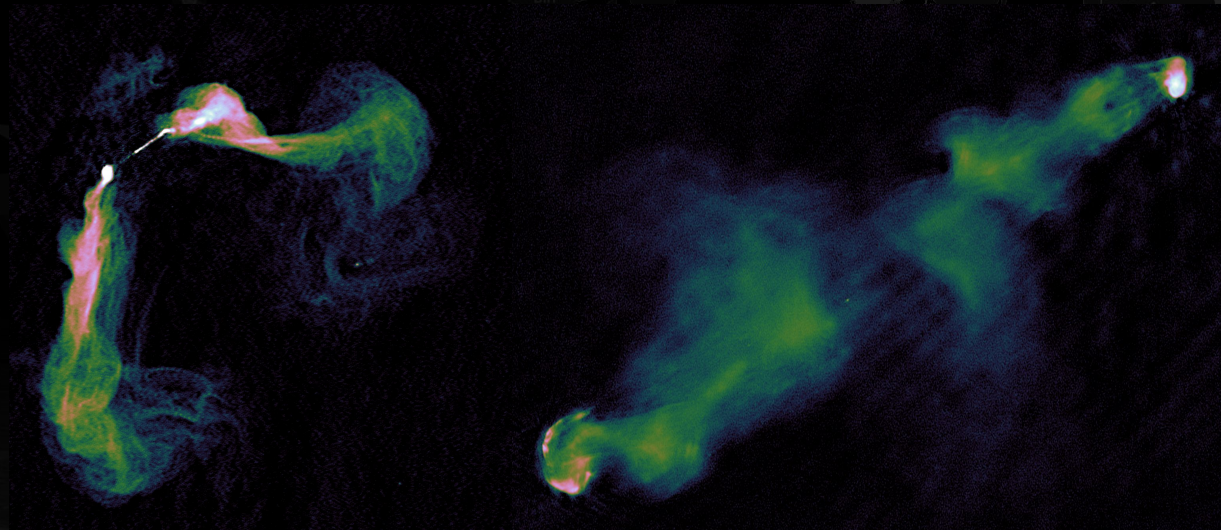
Scientific prospects



(Credit: Morabito)

Obtain precise host
identifications of radio
sources

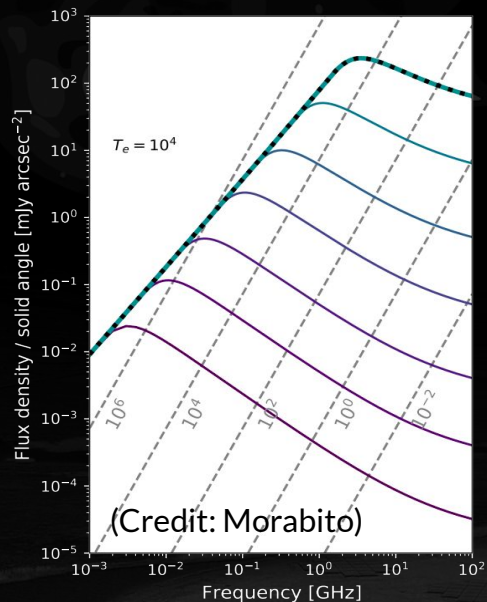
Scientific prospects



Obtain precise host
identifications of radio
sources

Reveal detailed (sub)structure in radio jets,
lobes, SF regions, gravitational lenses, etc...

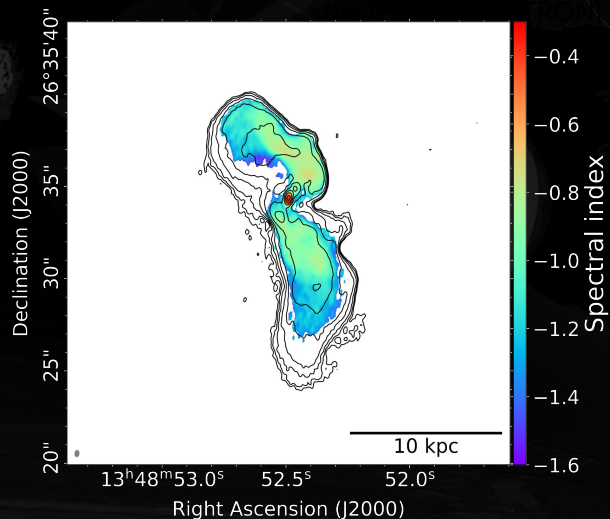
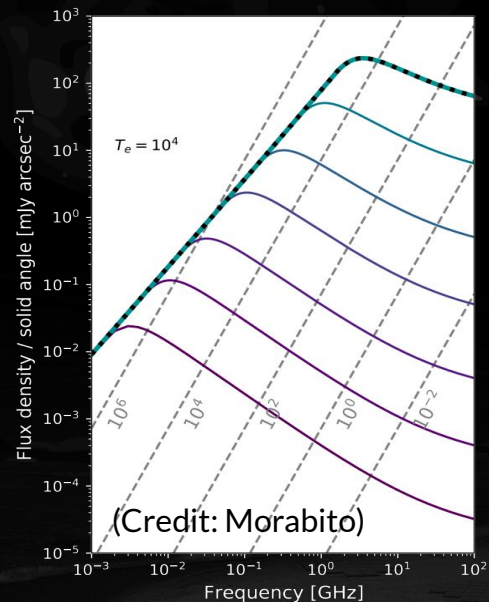
Scientific prospects



Differentiate between
AGN activity and SF
through brightness temps

(See Leah's talk on Wednesday)

Scientific prospects



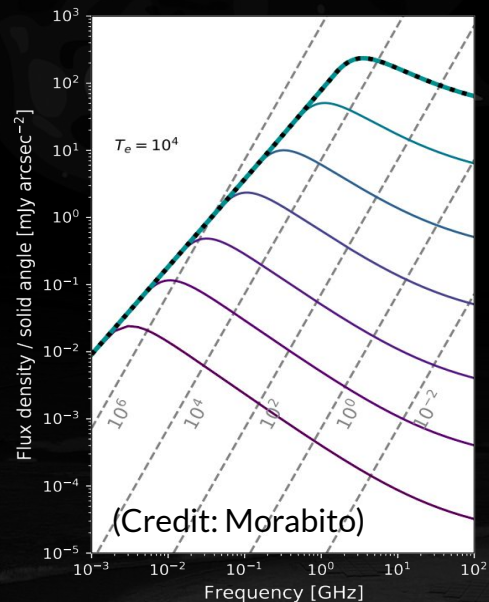
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Enable high-resolution
spectral index mapping at
low frequencies

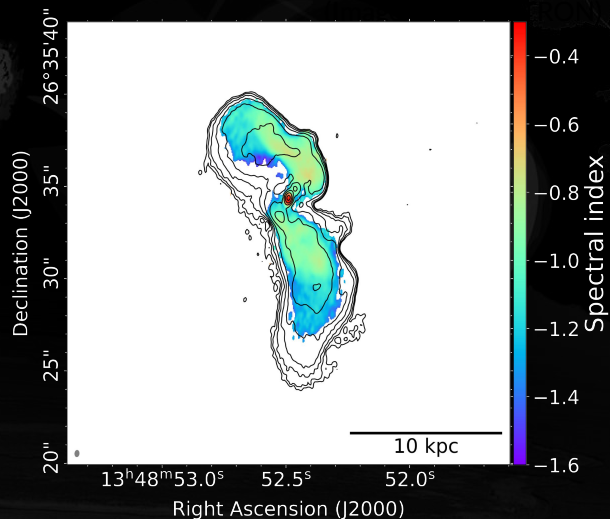


Scientific prospects



Differentiate between
AGN activity and SF
through brightness temps

(See Leah's talk on Wednesday)



Enable high-resolution
spectral index mapping at
low frequencies

Your science
case here

Take-home messages

1. The LoTSS-HR project expands upon LoTSS by post-processing all data including the international LOFAR stations
2. The LoTSS-HR project is currently working towards imaging all reasonably bright (>10 mJy) sources in the Northern hemisphere at $0.3''$ resolution at 144 MHz
3. DR1 contains the first 30 LoTSS fields, containing over 4000 sources. After that, DR2 will continue with a larger sample of field outside of ILoTSS.
4. DR1 is here!

