



The GMRT Archive Processing Project

Processing of interferometric GMRT data at sub GHz frequencies with SPAM to produce continuum images

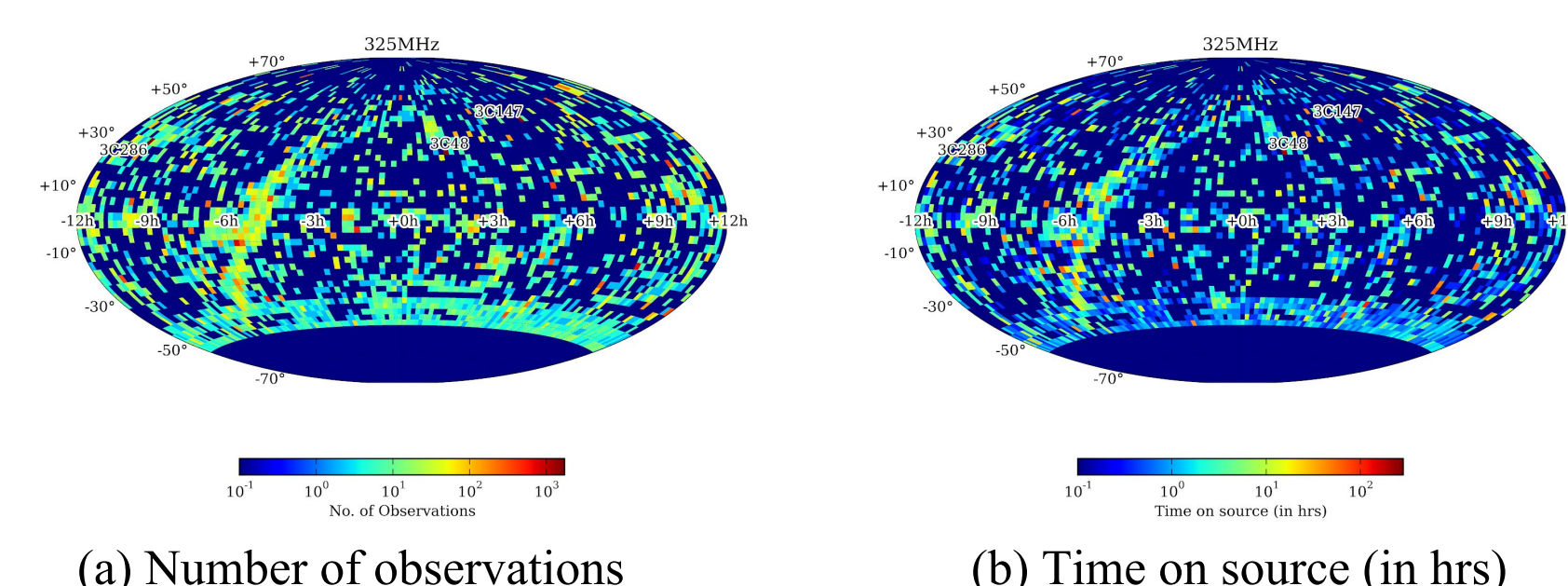
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Background

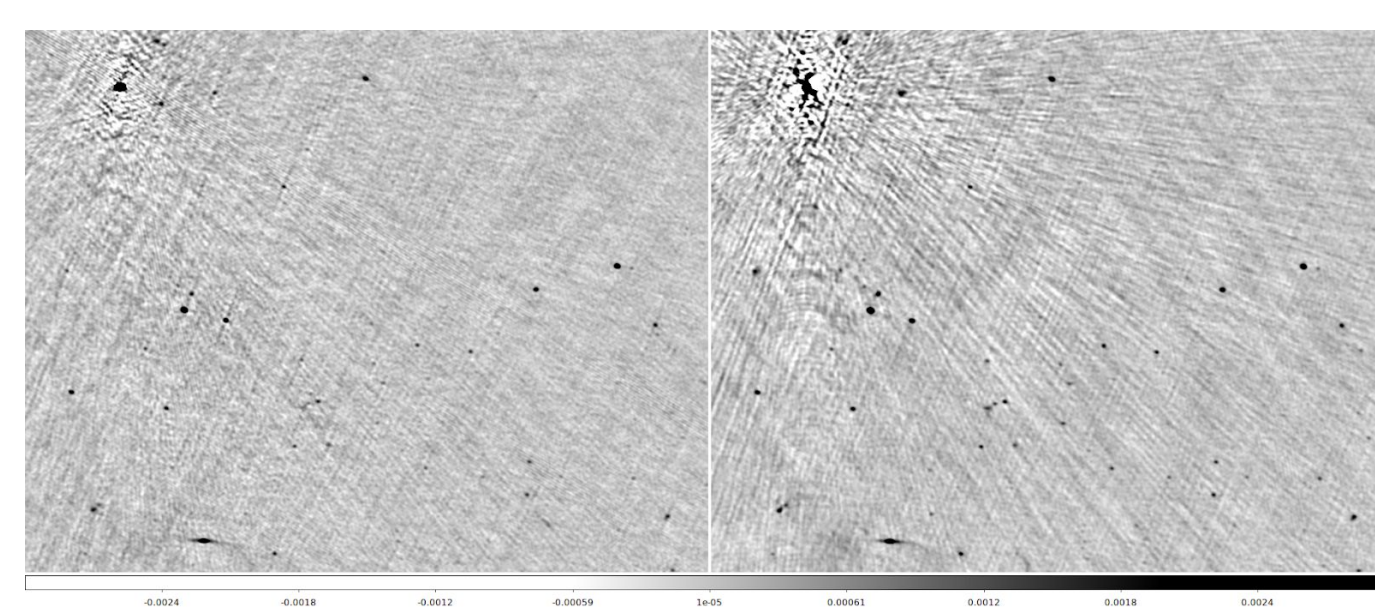
- The GMRT archive on NAPS hosts >120 TB of interferometric data which are being served to users as visibilities.
- We were looking to provide users with “first look” (worst case) and “science ready” (best case) images for all GMRT observations, along with metadata about quality.
- A pipeline optimised for GMRT data (SPAM by Huib Intema) is available. SPAM has been thoroughly tested for the GMRT ADR1 data release at 150 MHz and with other datasets at 235, 325, 610 MHz bands for GHB/GSB.



Implementation Details

SPAM:

- Python module that provides an interface to AIPS via ParselTongue and ObiTalk. Data reductions are carried out by scripts that execute AIPS tasks
- SPAM now also includes a fully automated pipeline for reducing legacy GMRT observations at 150, 235, 325 and 610 MHz.
- SPAM was used to process 150 MHz data over ~30,000 square degrees of sky from the TGSS survey carried out with GMRT.

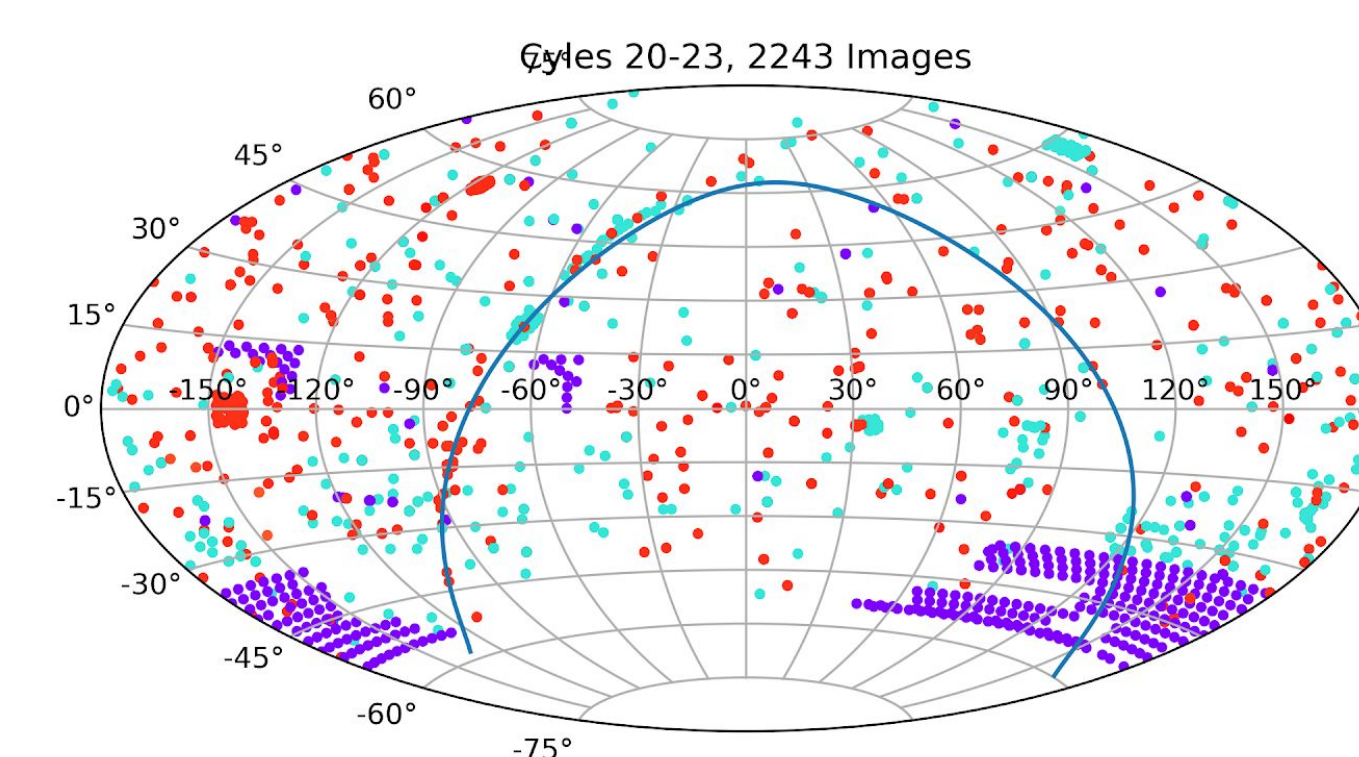
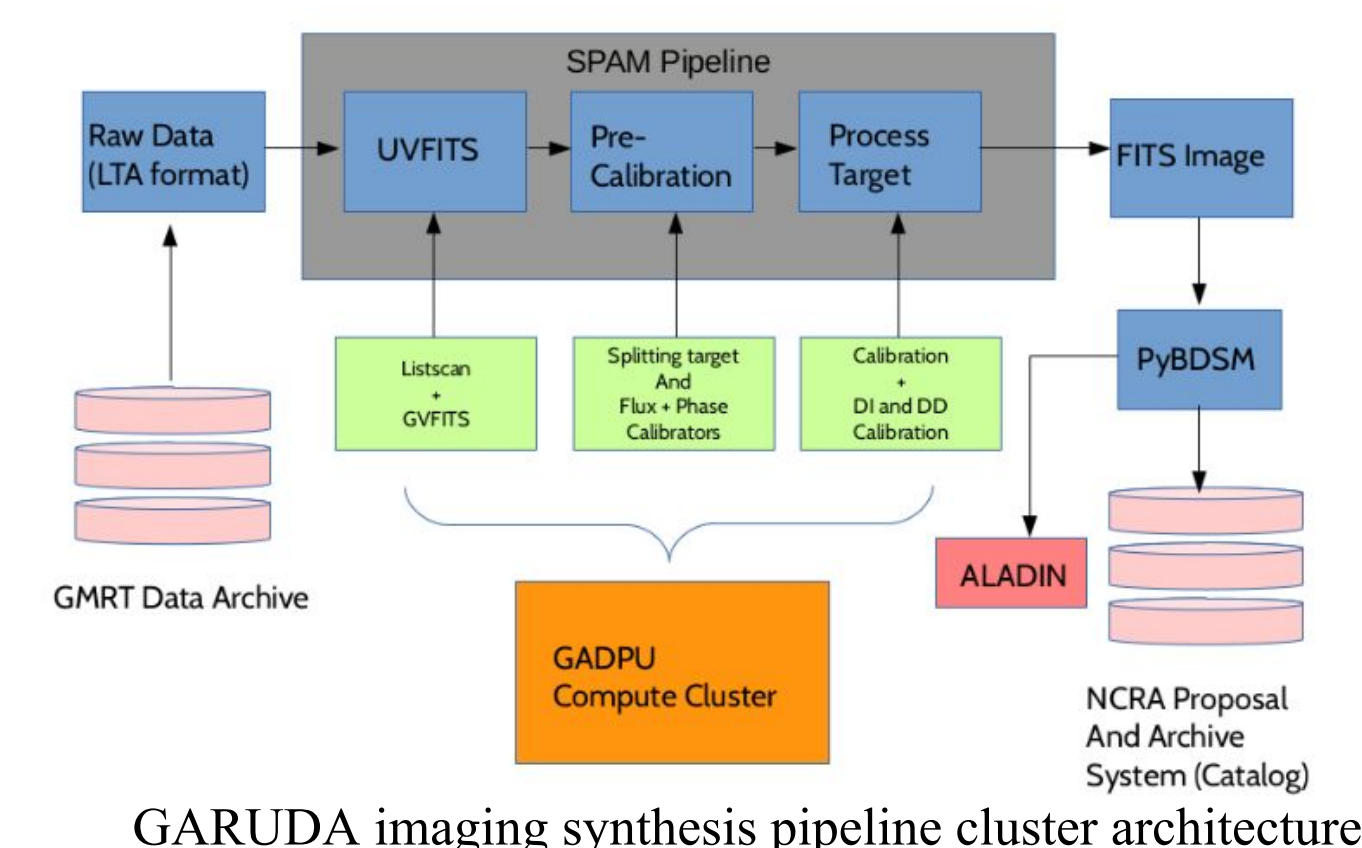


(a) XMM-LSS field, 325 MHz, Cycle 20, PI: Wadadekar

- (a) SPAM processing, main advantage of which is the direction dependent calibration, which greatly reduces artifacts around bright sources.
- (b) Normal processing through AIPS

Beowulf Cluster:

- Cluster of COTS machines /w 16GB RAM, 128GB SSD, and 8-core i7-2600 CPU @ 3.40GHz
- Master node acts as file server for the compute stack - AIPS, SPAM, ObiT, Parseltongue (NFS exported to compute nodes)
- Book keeping database designed with a suitable schema that provides an accurate snapshot of the processing status and provide insight about potential failures (either due to poor data quality or pipeline limitations)

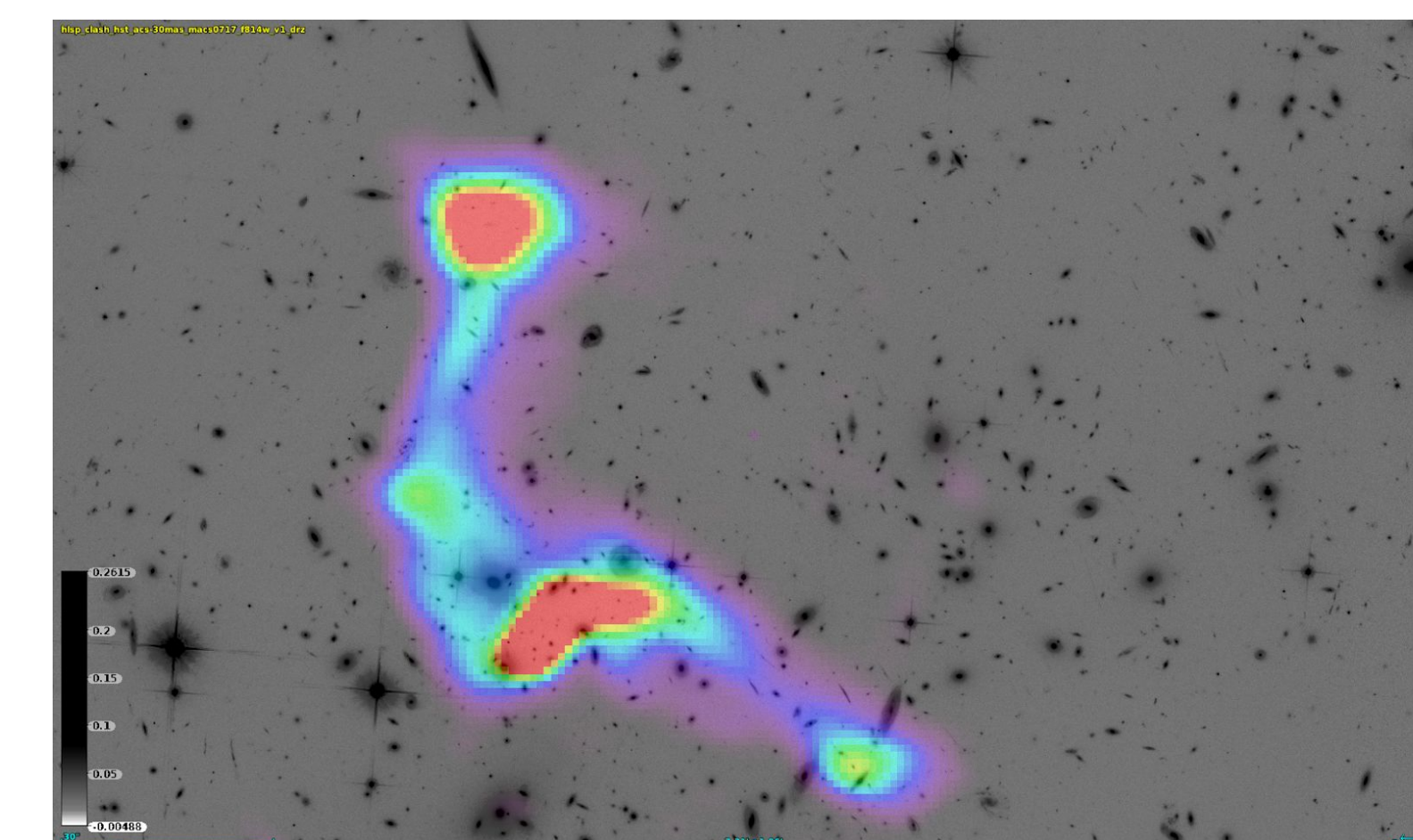


Aitoff projection in equatorial coordinates (curve represents the galactic plane)
Purple=150 MHz, Cyan=325 MHz, Red=610 MHz

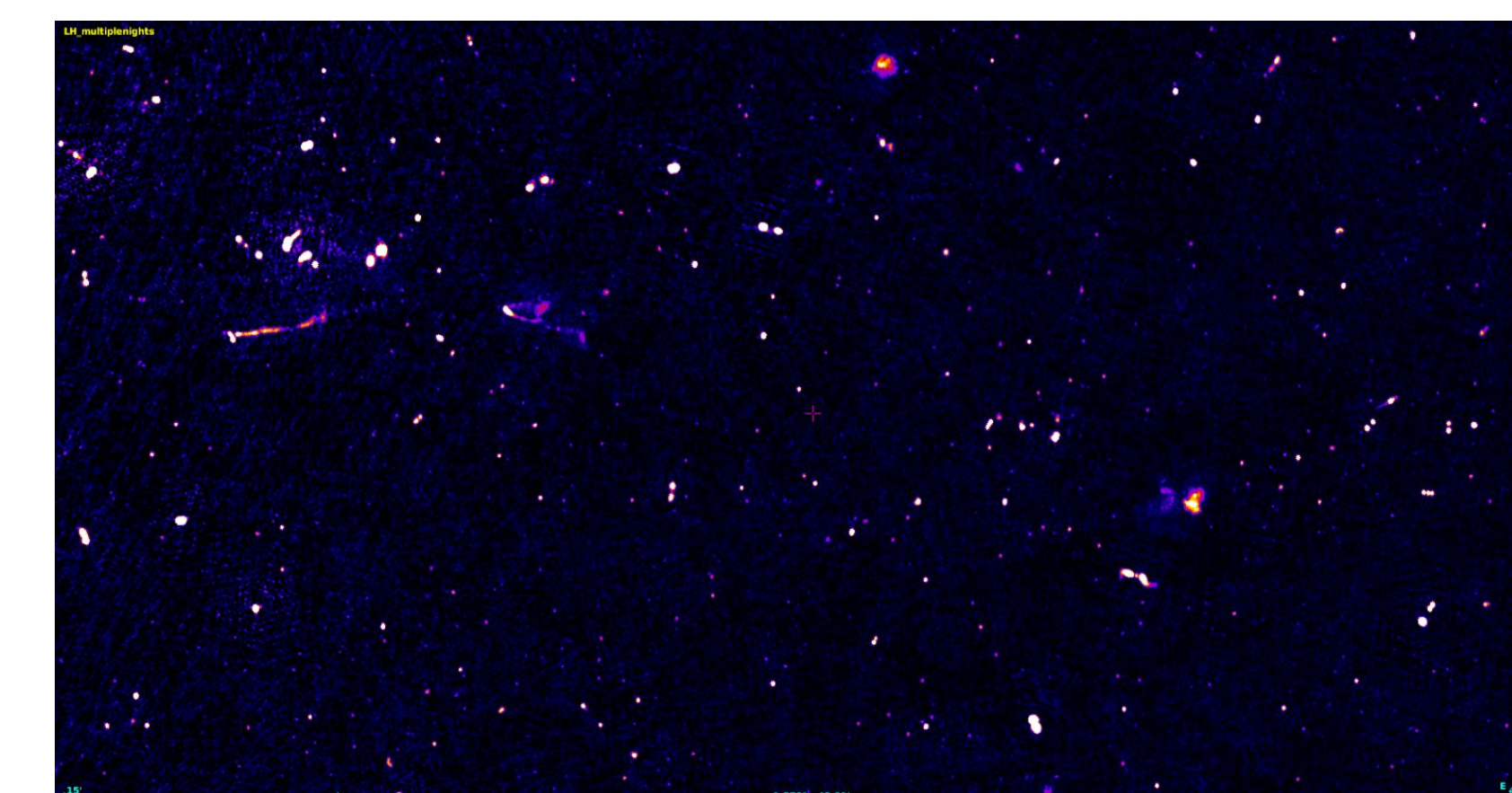
Results:



ELAIS-N1, Cycle 20, 610 MHz, 30 microJy/beam RMS, PI: Taylor



MACS 0717 (HST F814W) with 610 MHz image overlaid. 4 colliding clusters at $z \sim 0.55$, radio image RMS 29 microJy/beam, PI: Mamta Pandey-Pommier, Noise is 48 microJy/beam in the previously published image.



Portion of a 325 MHz Lockman Hole image, rms 60 micro-Jy/beam. >5000 radio sources seen over ~12 deg² (PI: Wadadekar)

Future Work:

Medium term plan:

- Image GMRT data right after observation.

Characterize our telescope and ionosphere:

- Since SPAM does direction dependent calibration, it produces a ionospheric phase screen model along different lines of sight.
- The thousands of logs that our pipeline generates can be used to answer questions such as:
 - How has the RFI environment changed in the last 15 years in each band?
 - How strong is the diurnal variation?

Pipeline extensions:

- Developing automated quality control with flags to warn users, and
- Integrate all outputs into NAPS with a searchable and usable interface.

Our first data release is expected in the first quarter of 2019 (<http://naps.ncra.tifr.res.in/goa>)