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ANTON PANNEKOEK
INSTITUTE

The seconds timescale radio sky with AARTFAAC

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ASTRON

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LOFAR

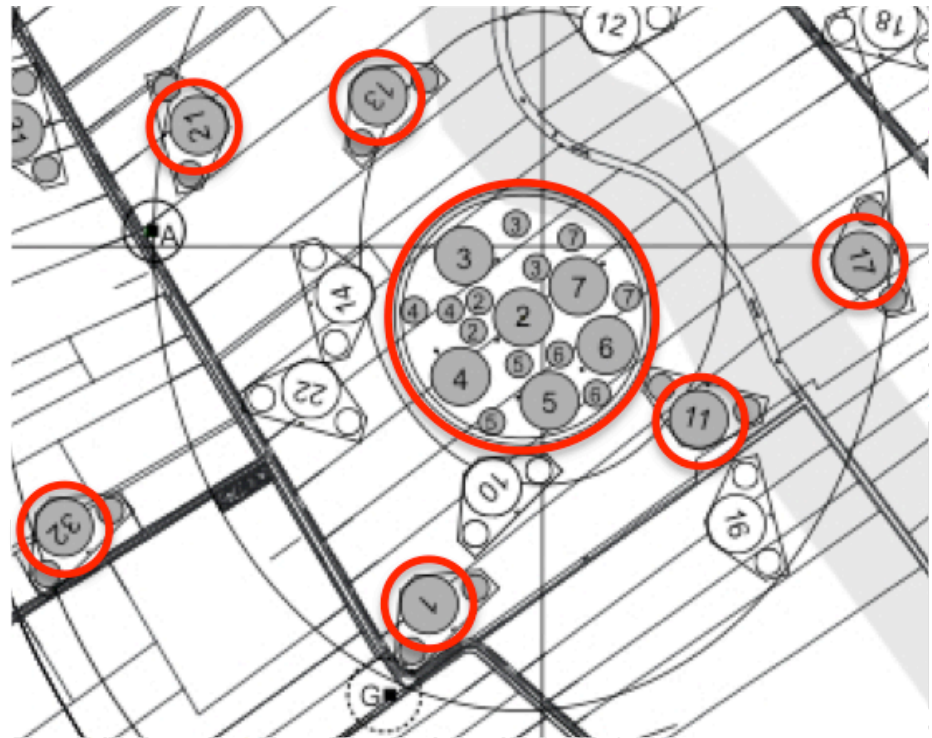
AARTFAAC-6 Specs

AARTFAAC

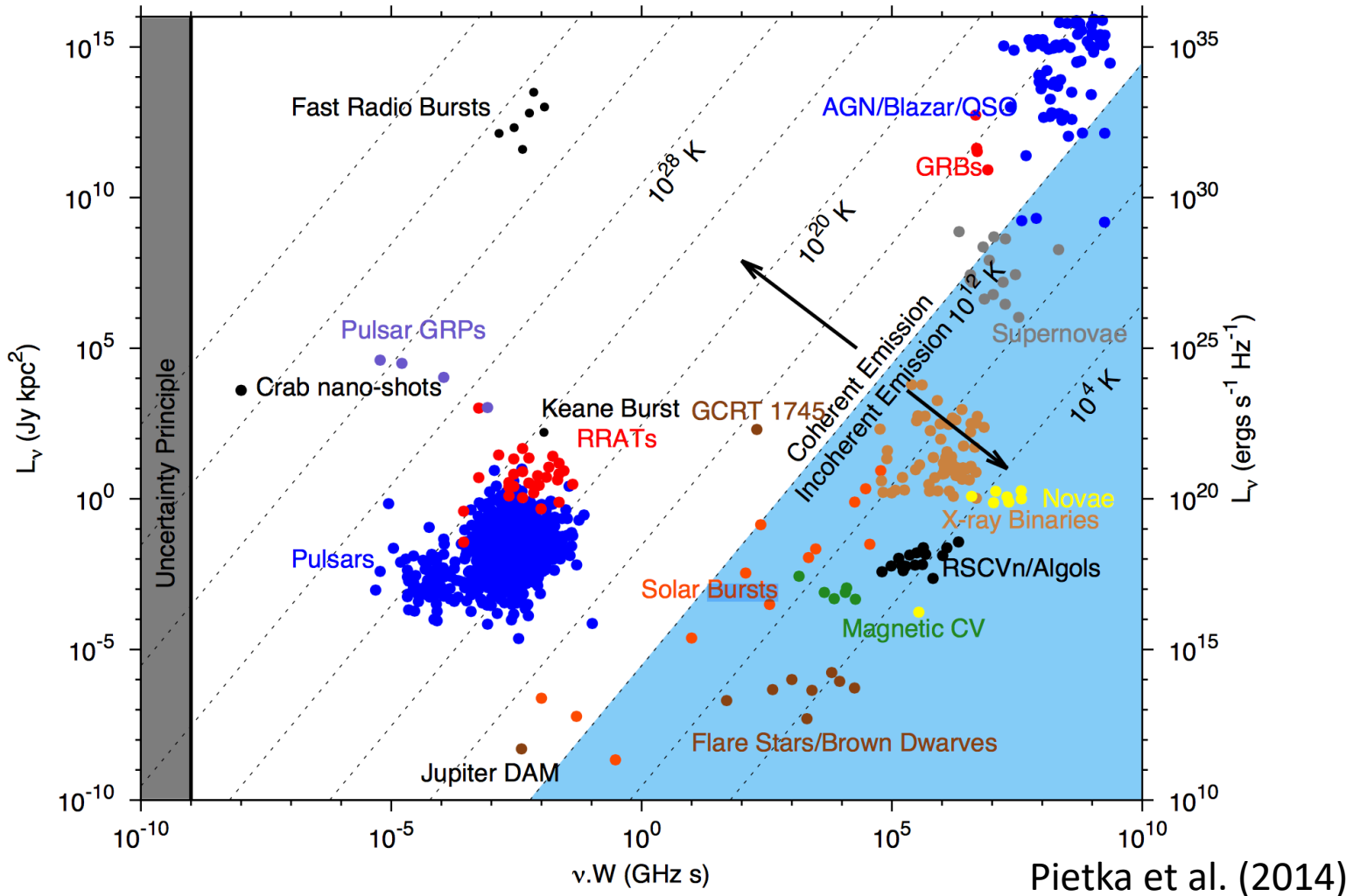


Array Elements	288 inverted V antennas
Freq. Range (MHz)	30-80
Field of View (sr)	π
Angular Resolution (arcmin)	60
Spectral Res. (kHz)	200 x 16
Temporal Res. (s)	1
Sensitivity (Jy)	6 – 10

Prasad et al. (2014)



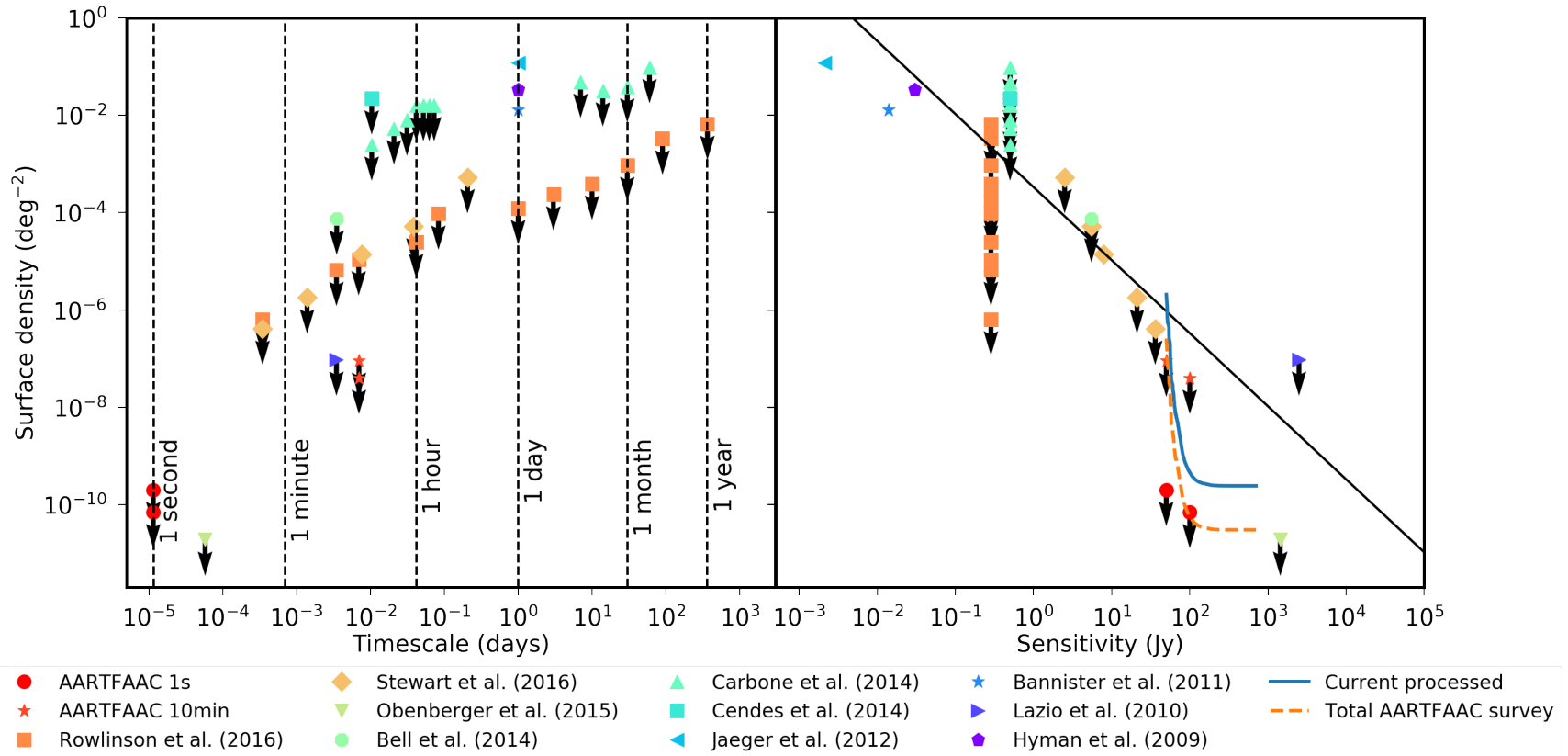
AARTFAAC project goal



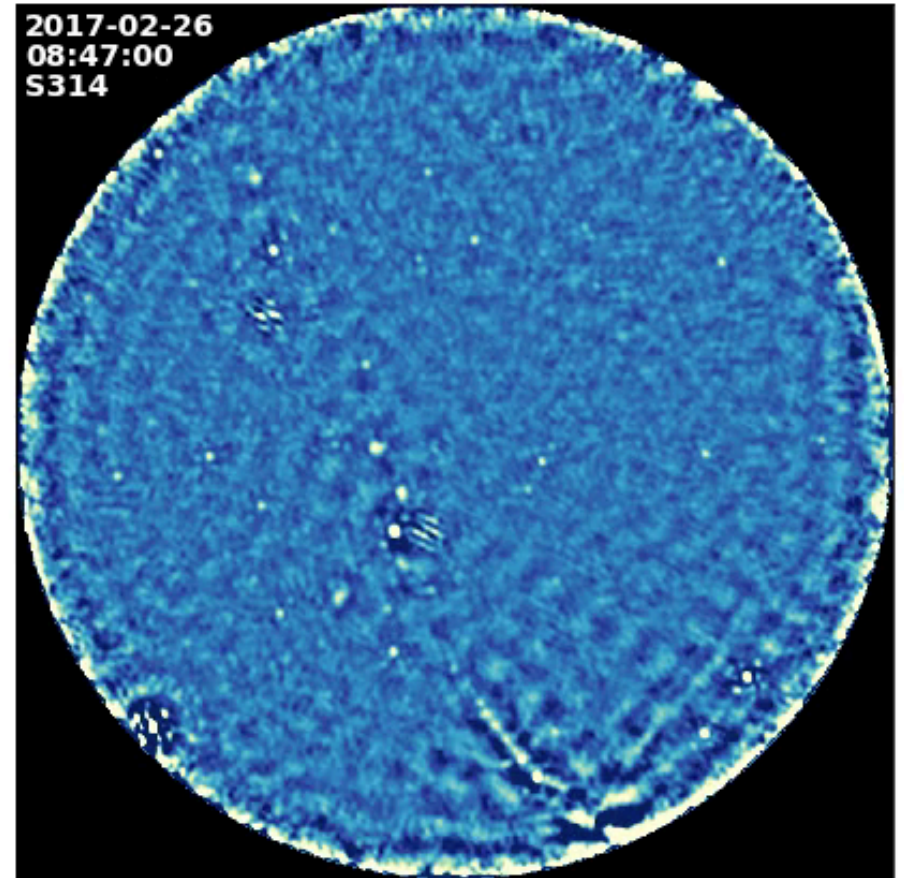
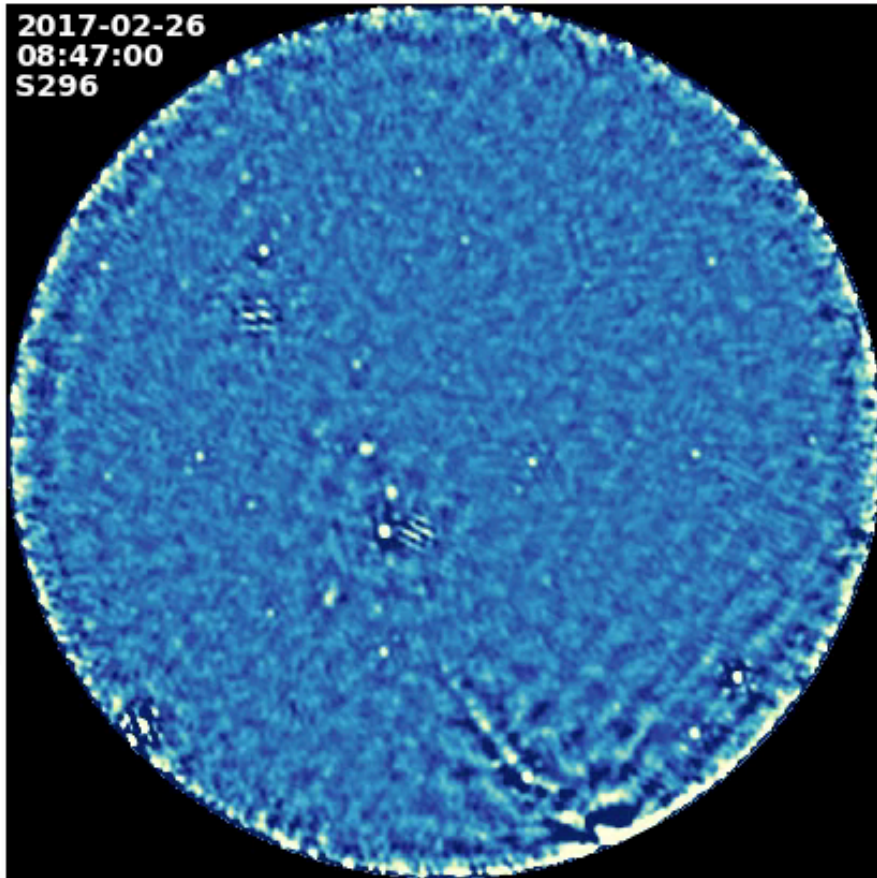
1st AARTFAAC Transient Survey

- 827 hours currently archived, August 2016 – February 2019

- 400 hours processed with TraP thus far.

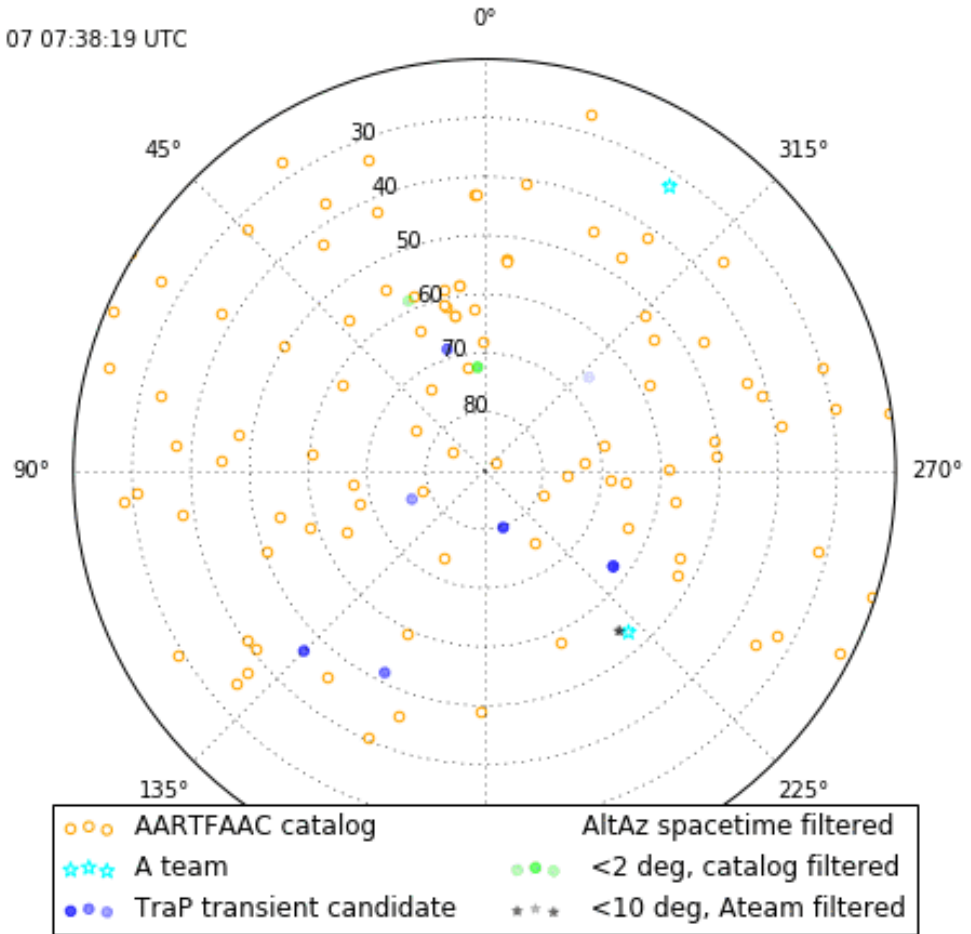
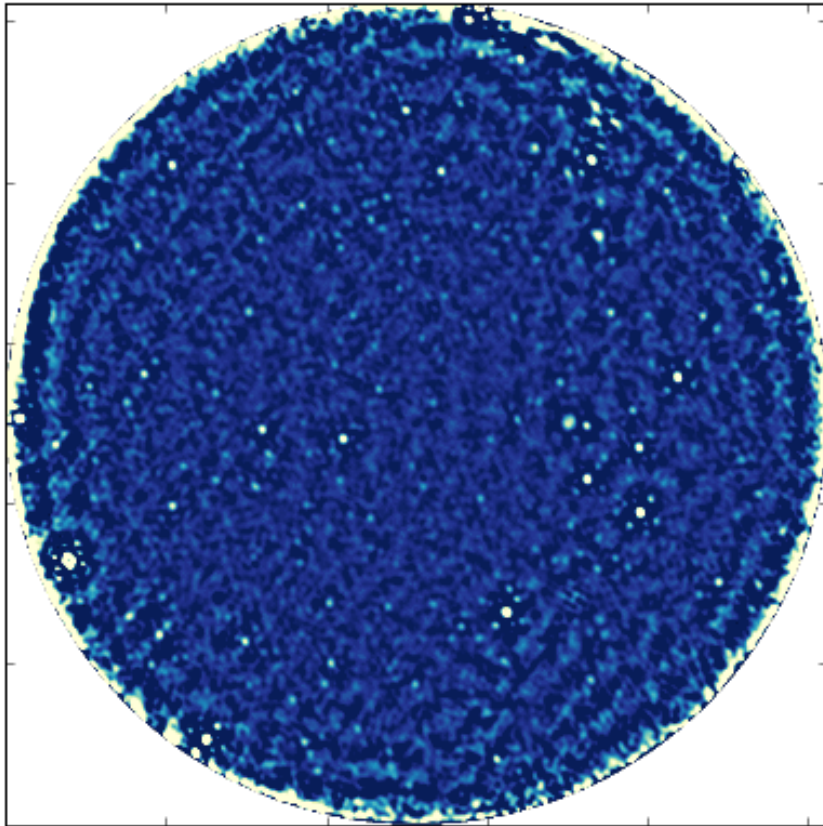


Transient candidate filtering

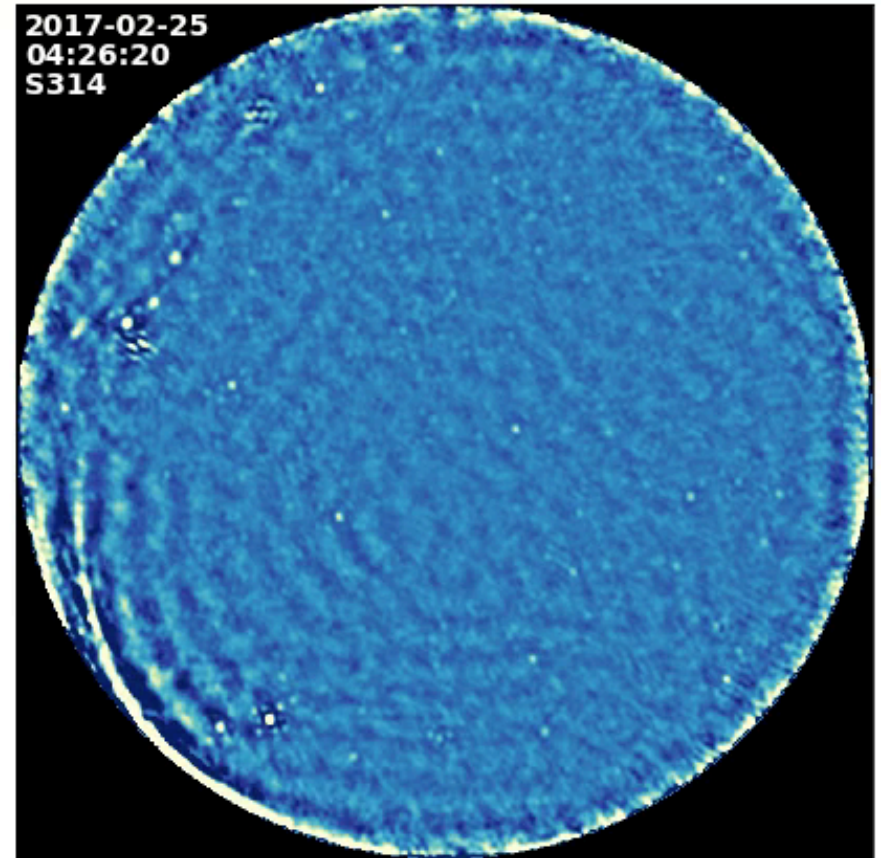
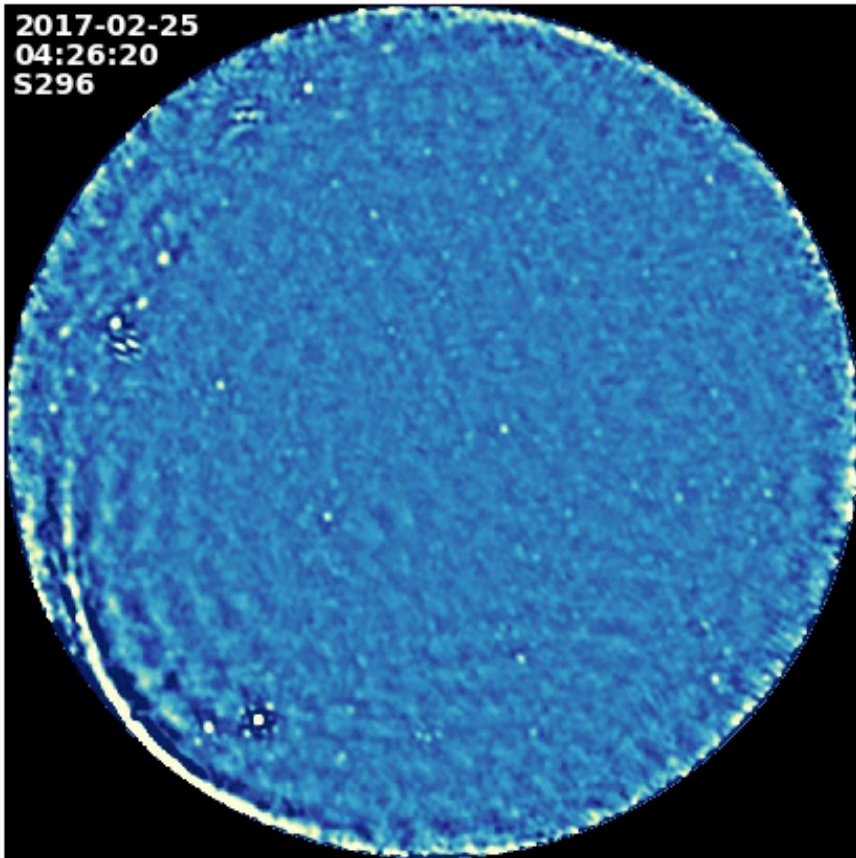


Transient candidate filtering

2016 09 07 07:38:19 UTC

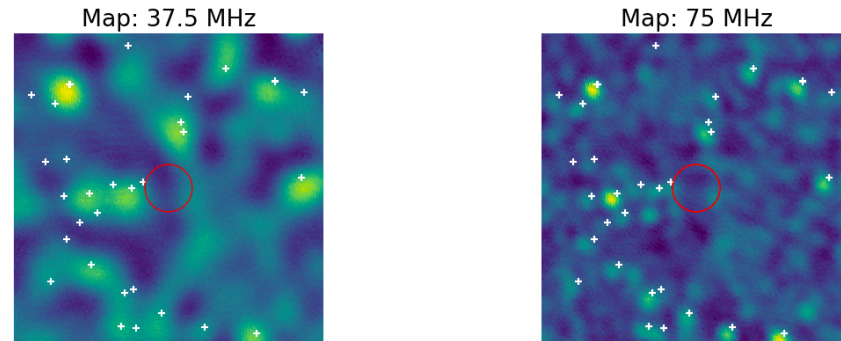


Transient candidate filtering

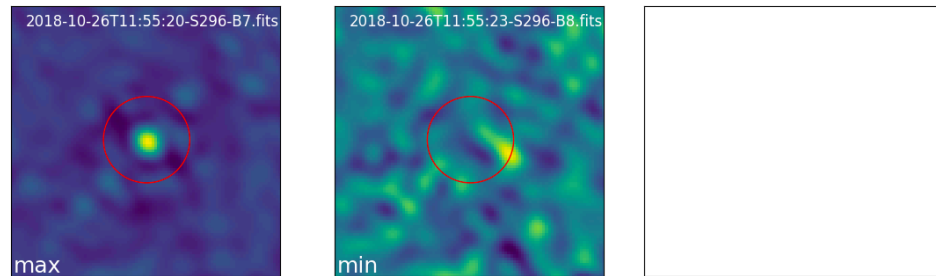


Follow up candidate inspection

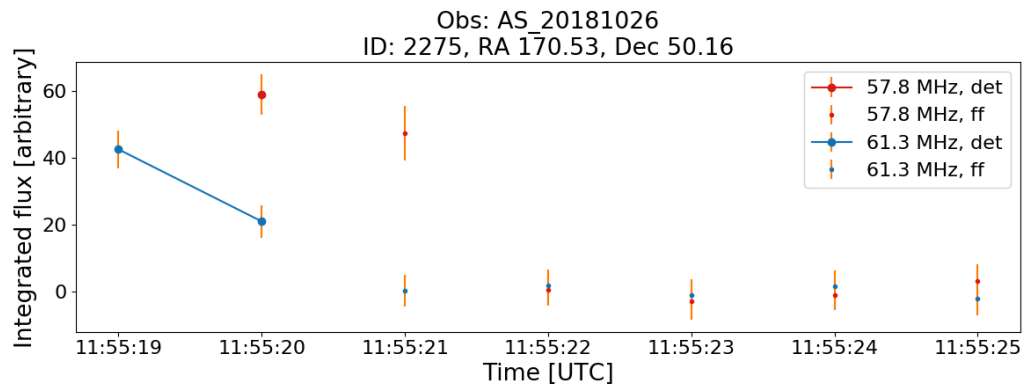
- Reference sky maps, VLSSr sources with flux greater than 5 Jy



- Transient image stamps from Max and Min

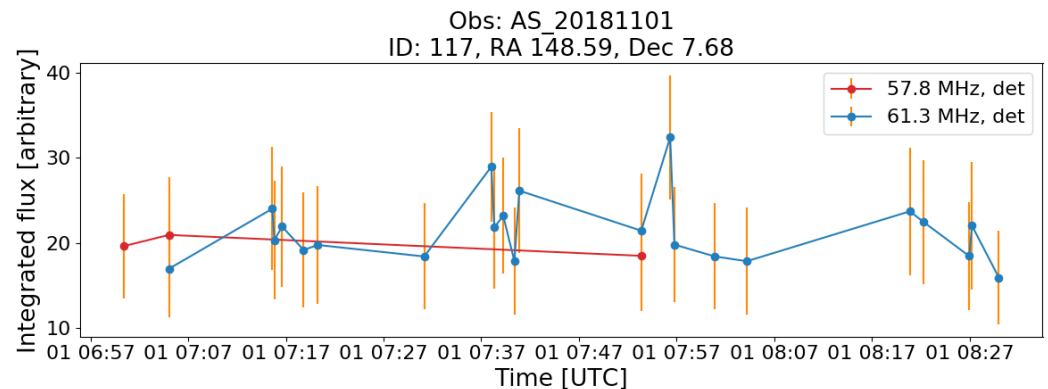
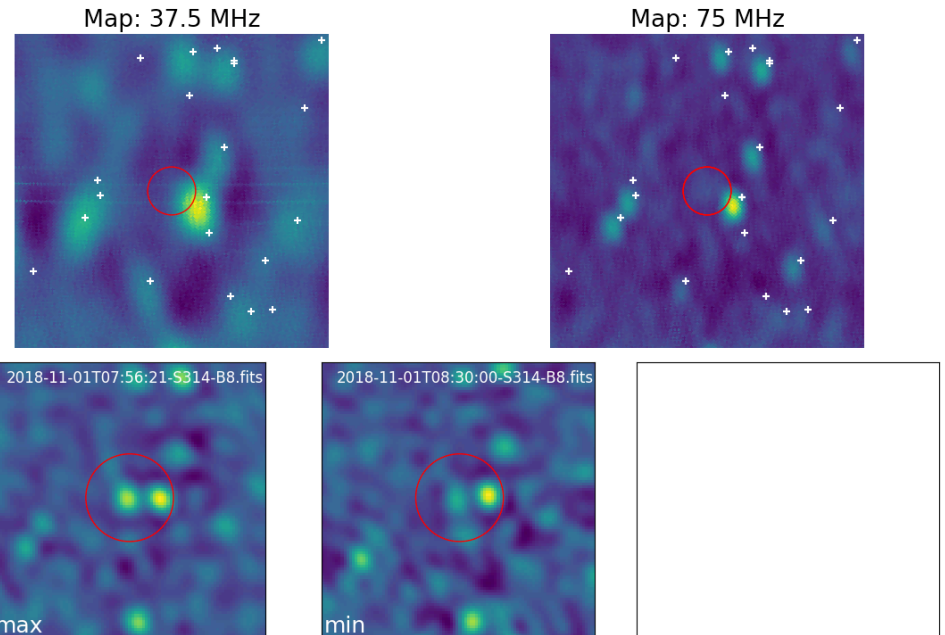


- TraP Light curve



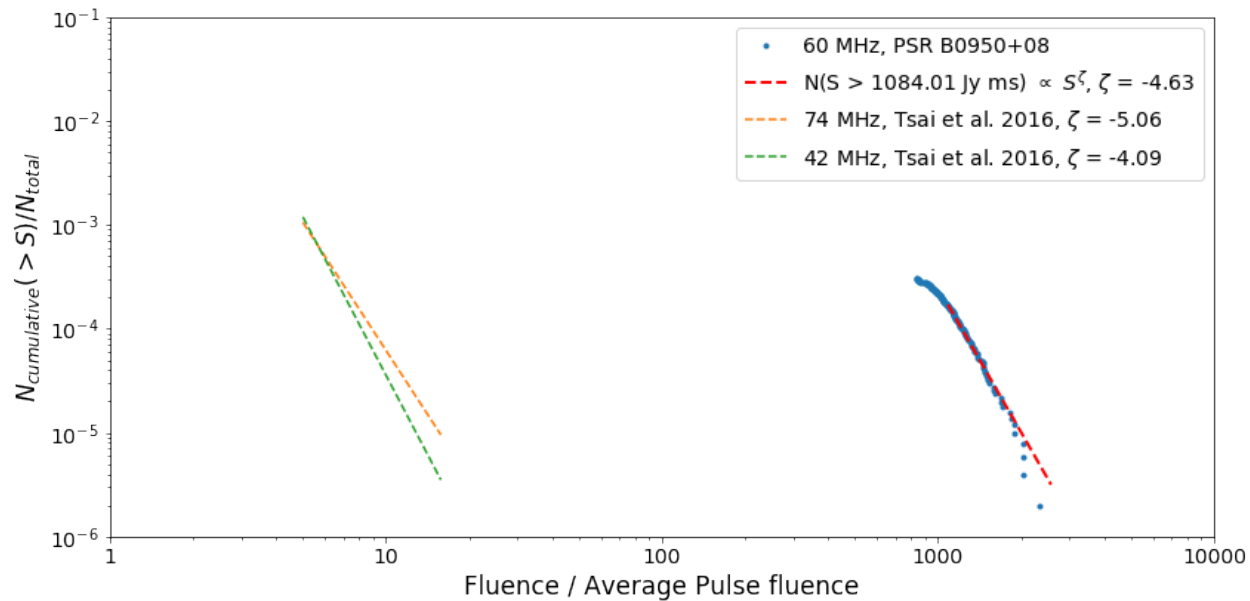
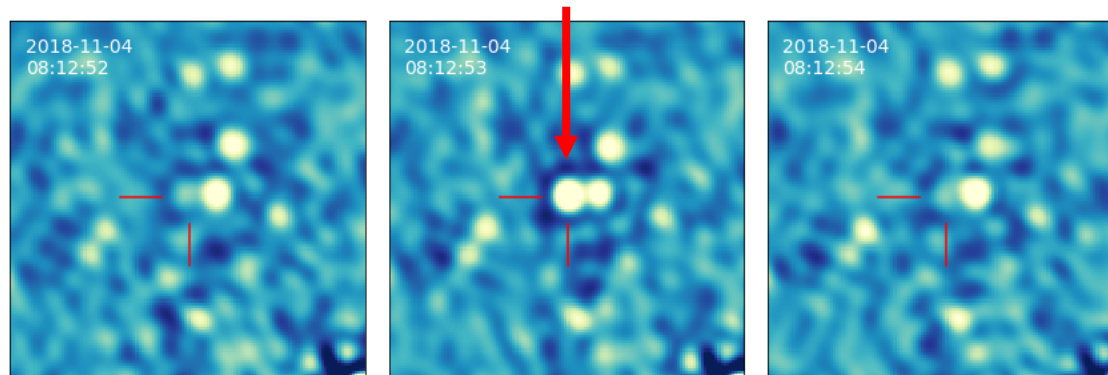
PSR B0950+08 Giant Pulses

- DM 2.99
- Period 0.25 s
- Previously observed giant pulses
 - Singal et al. 2012
 - Smirnova 2012
 - Tsai et al. 2015/2016



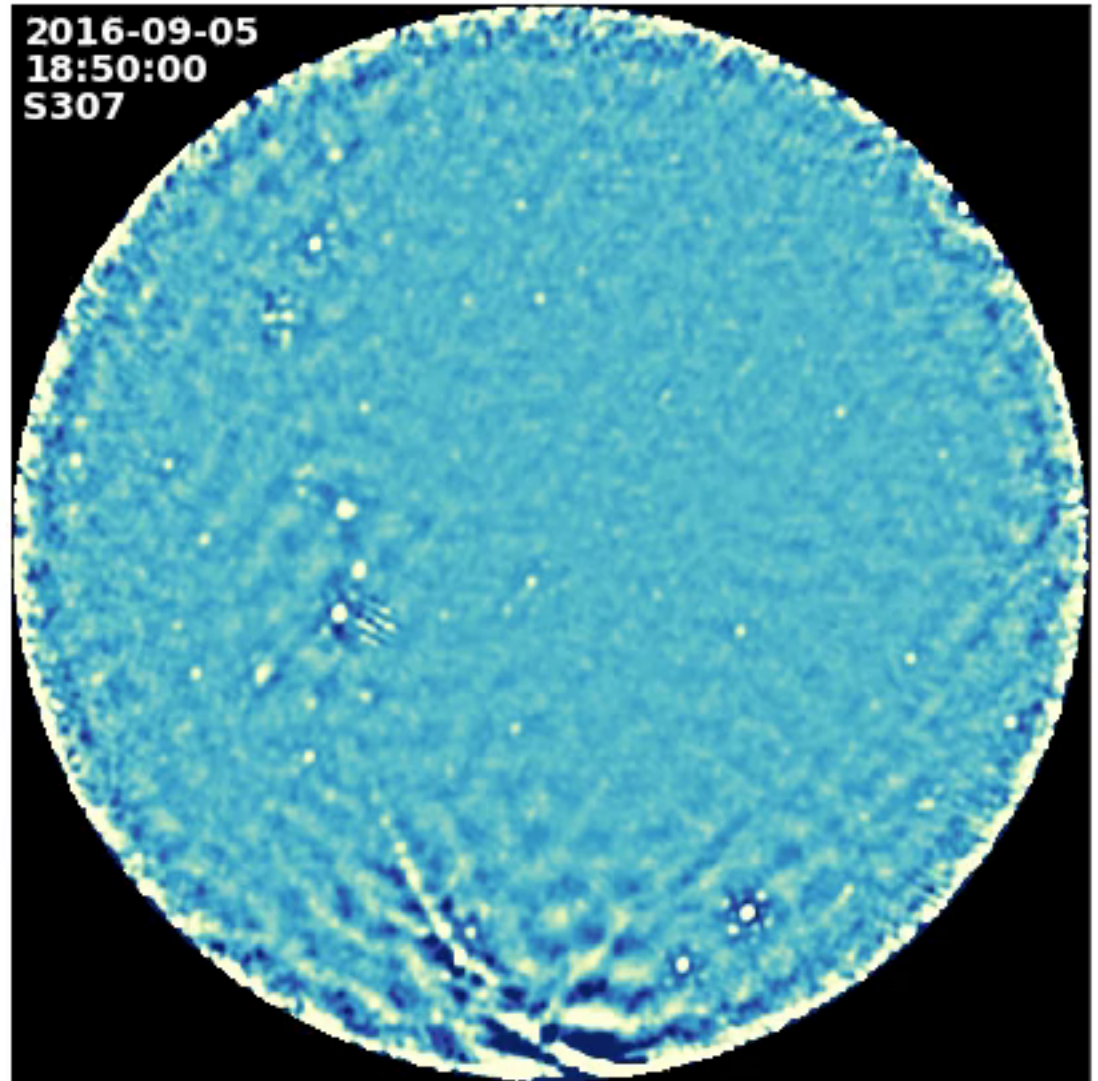
PSR B0950+08 Giant Pulses

Max pulse: 140,000 Jy ms!



Transient Candidate 1

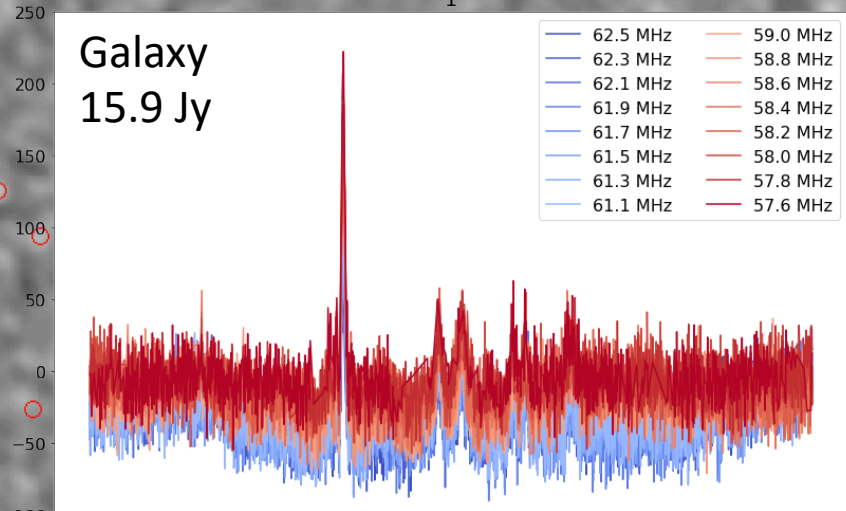
- Isolated source
- 200 Jy peak flux density
- 20 second duration



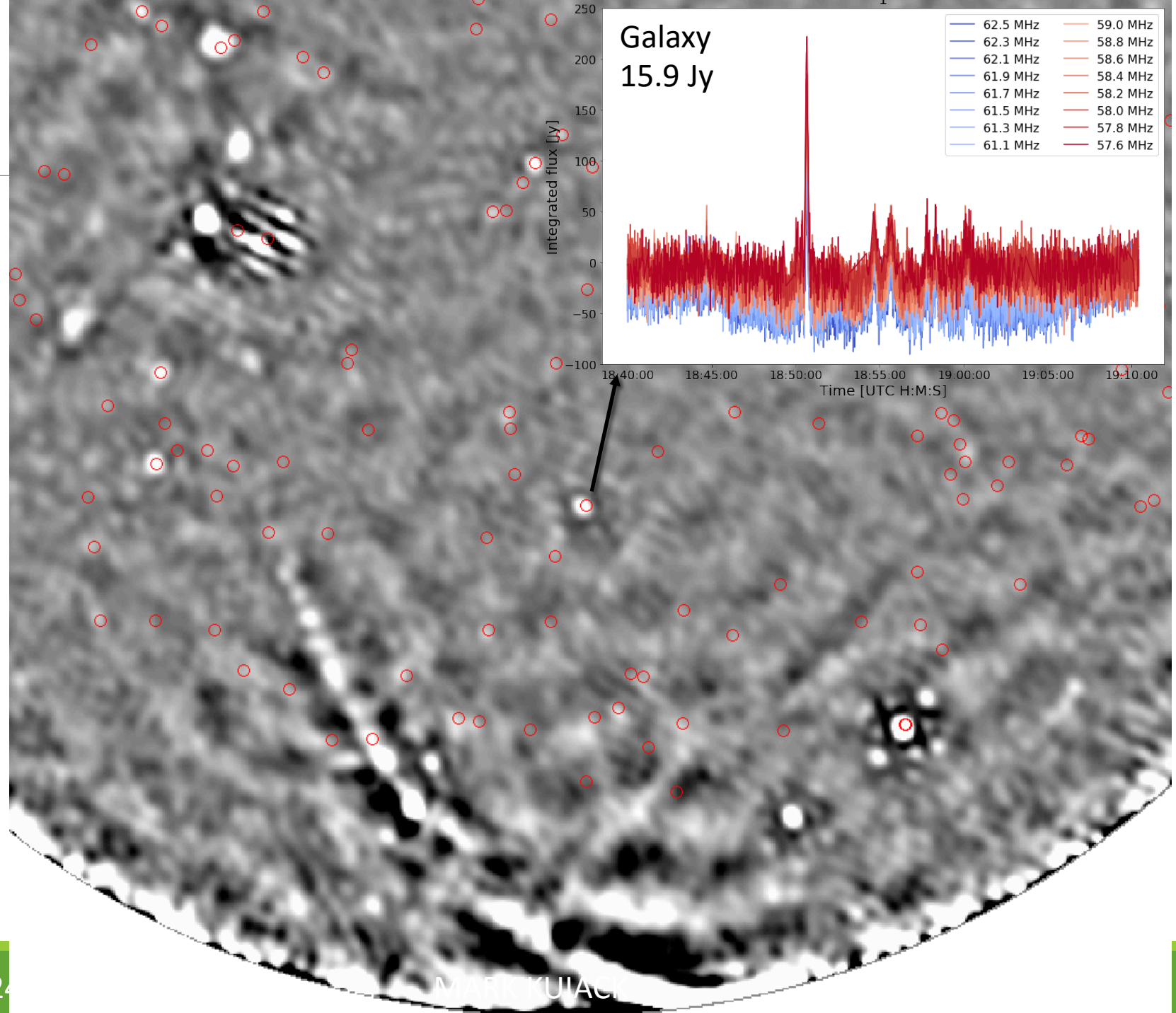
Galaxy
15.9 Jy

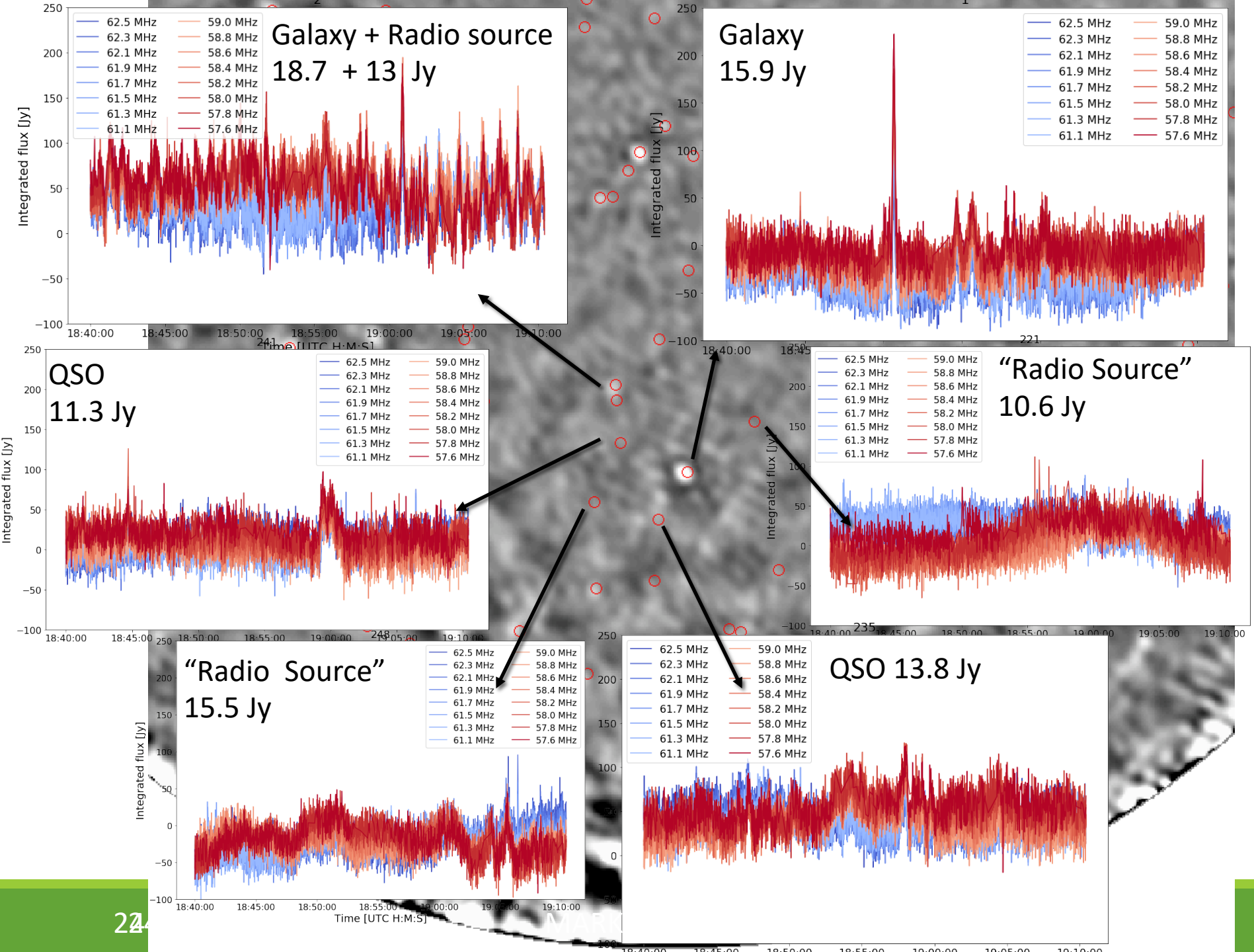
62.5 MHz	59.0 MHz
62.3 MHz	58.8 MHz
62.1 MHz	58.6 MHz
61.9 MHz	58.4 MHz
61.7 MHz	58.2 MHz
61.5 MHz	58.0 MHz
61.3 MHz	57.8 MHz
61.1 MHz	57.6 MHz

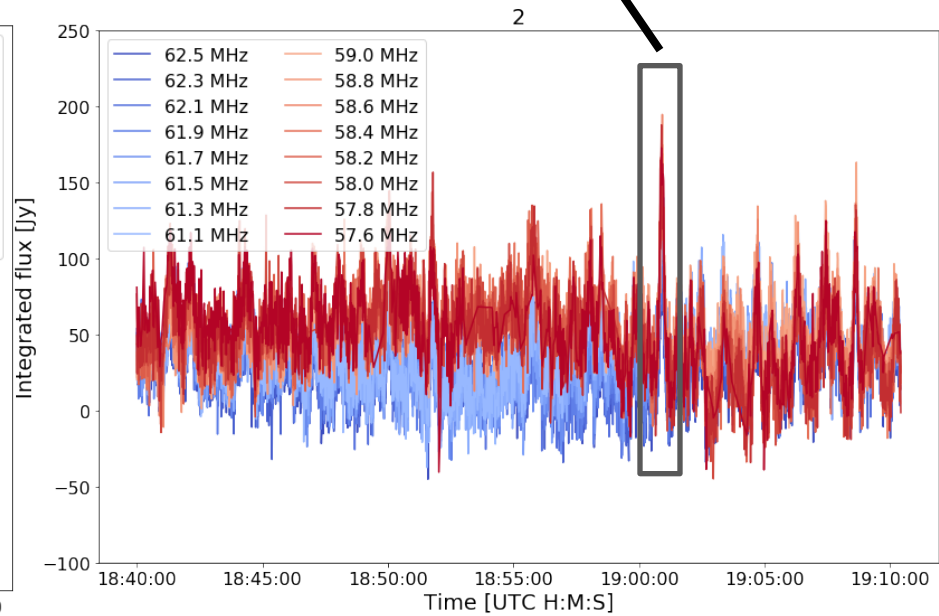
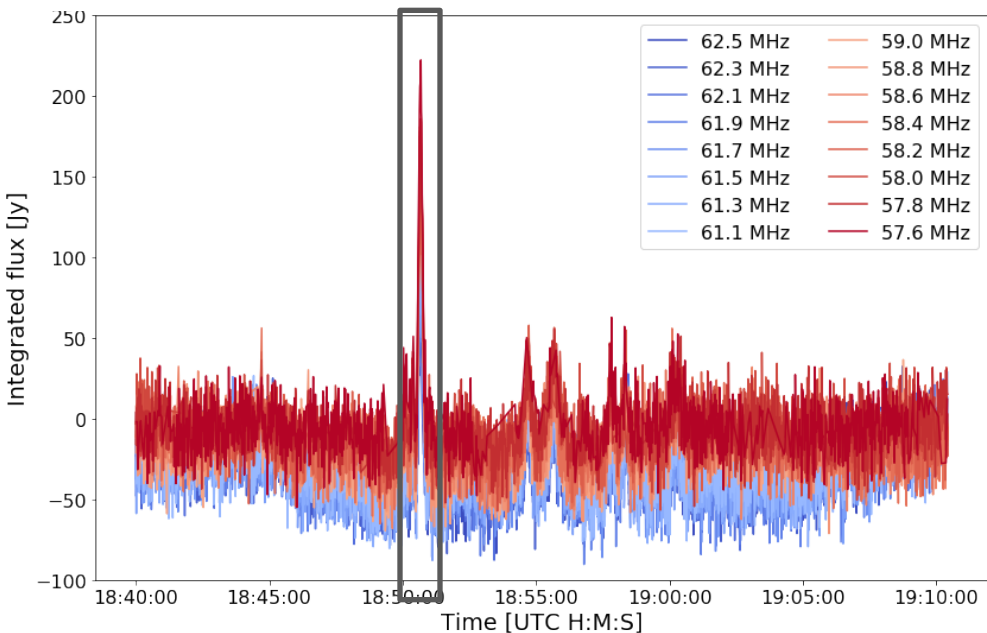
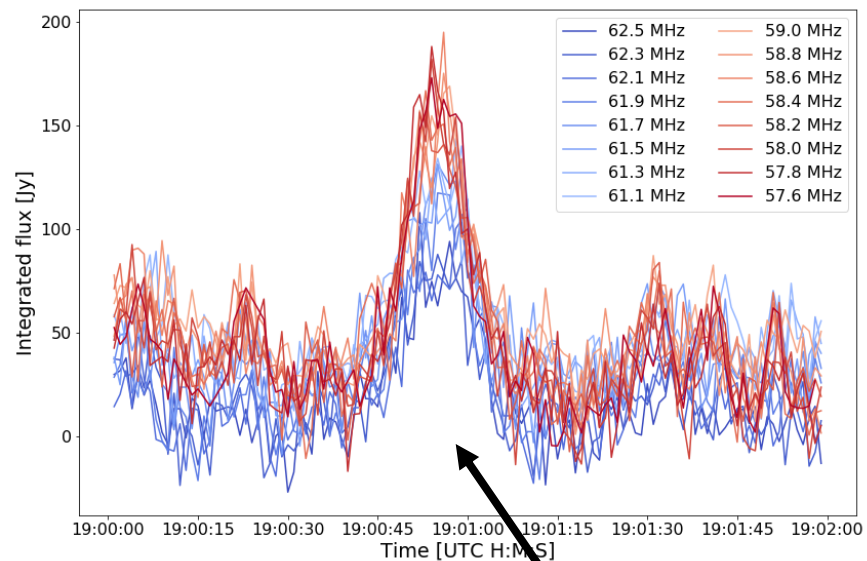
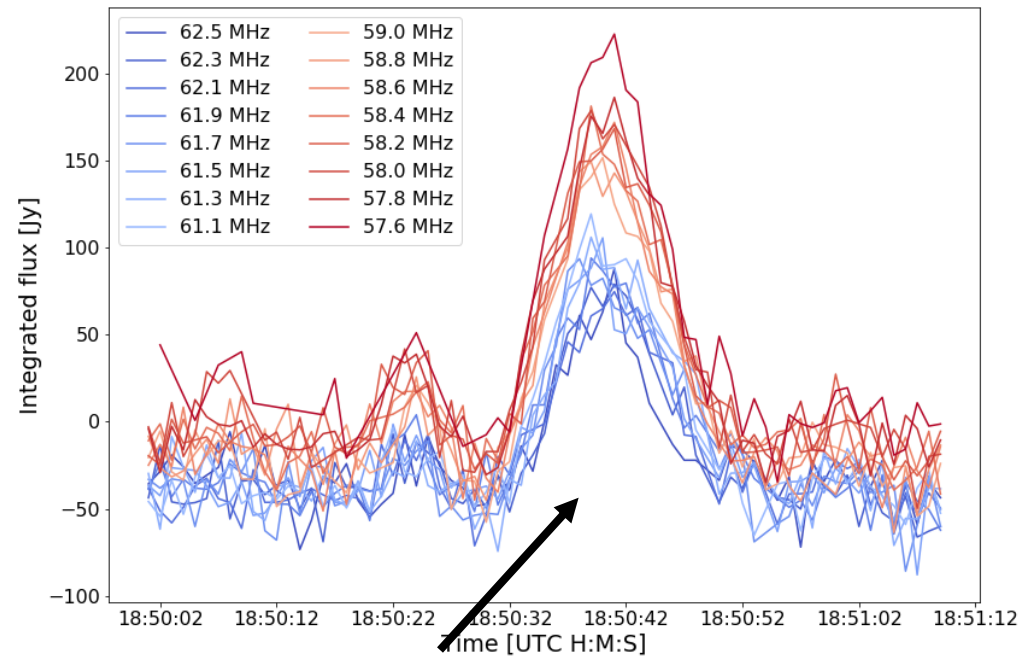
Integrated flux [Jy]



Time [UTC H:M:S]

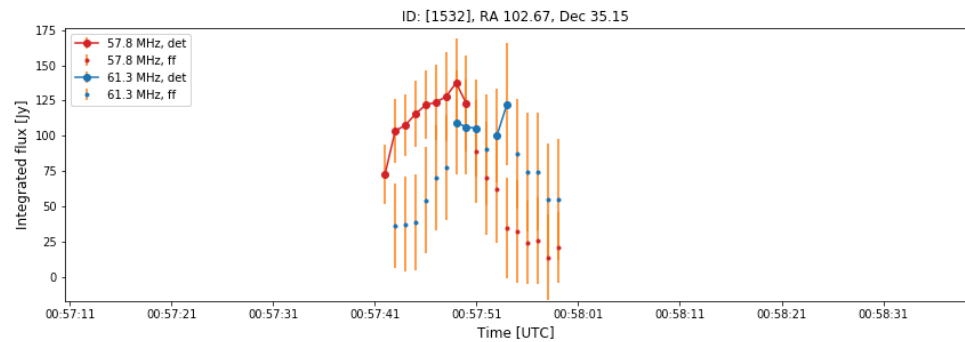
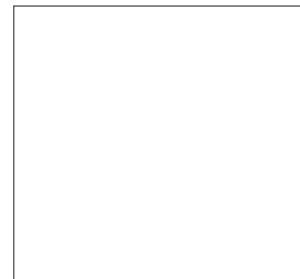
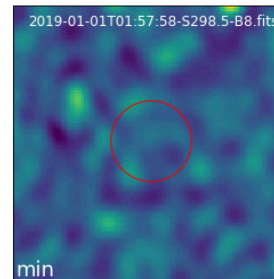
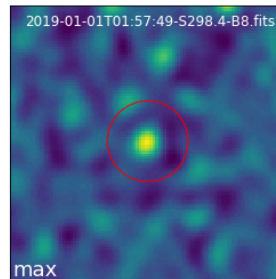
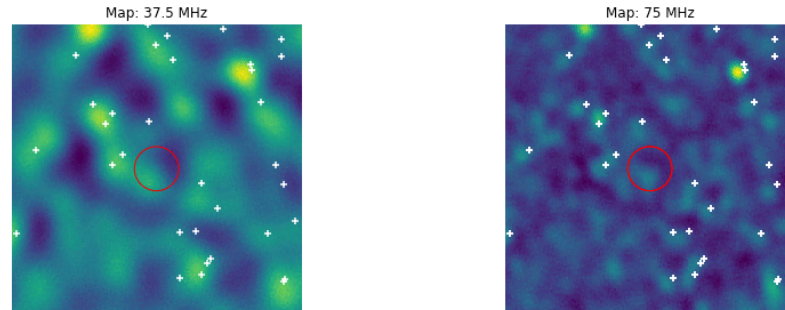




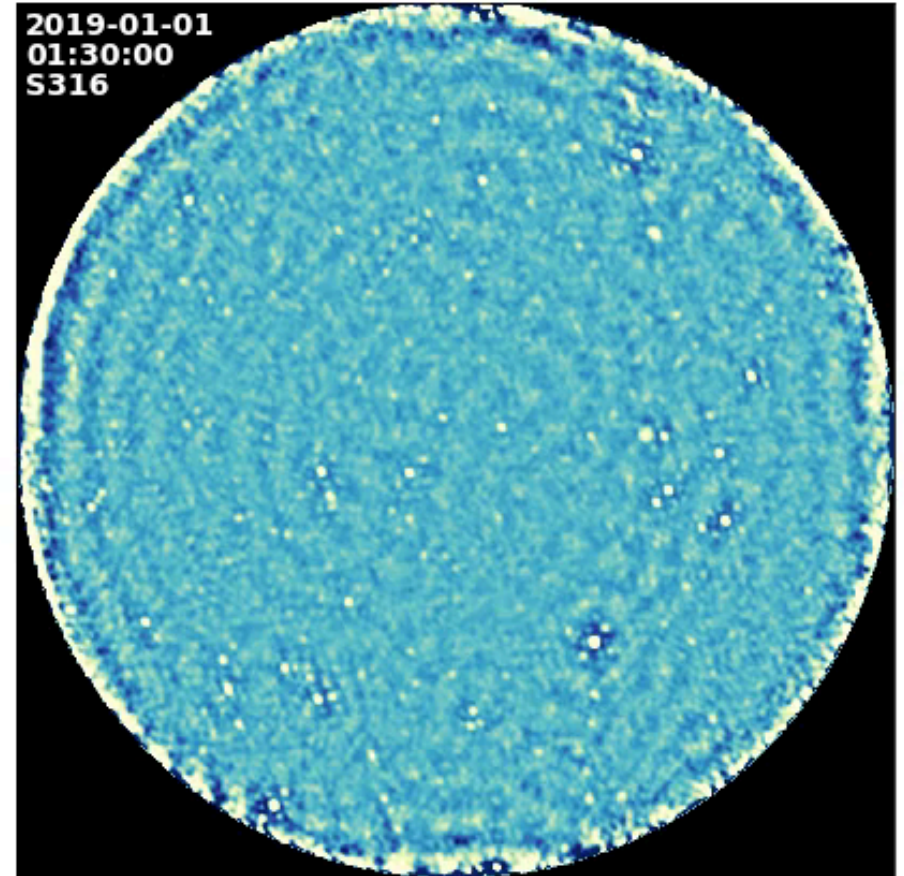
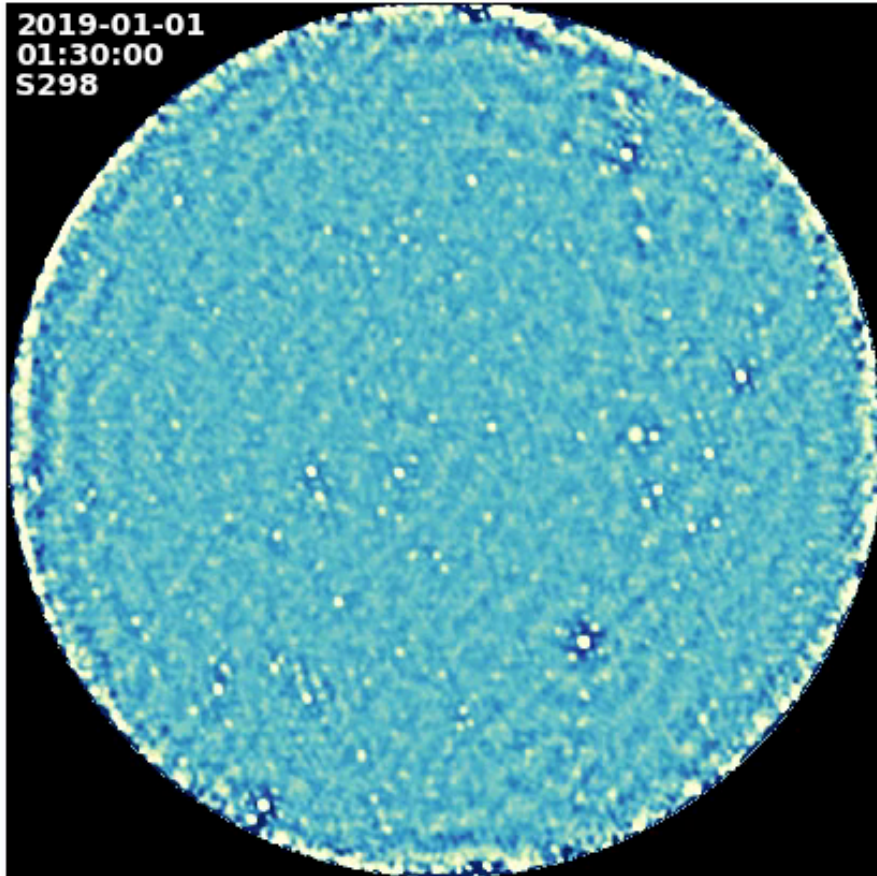


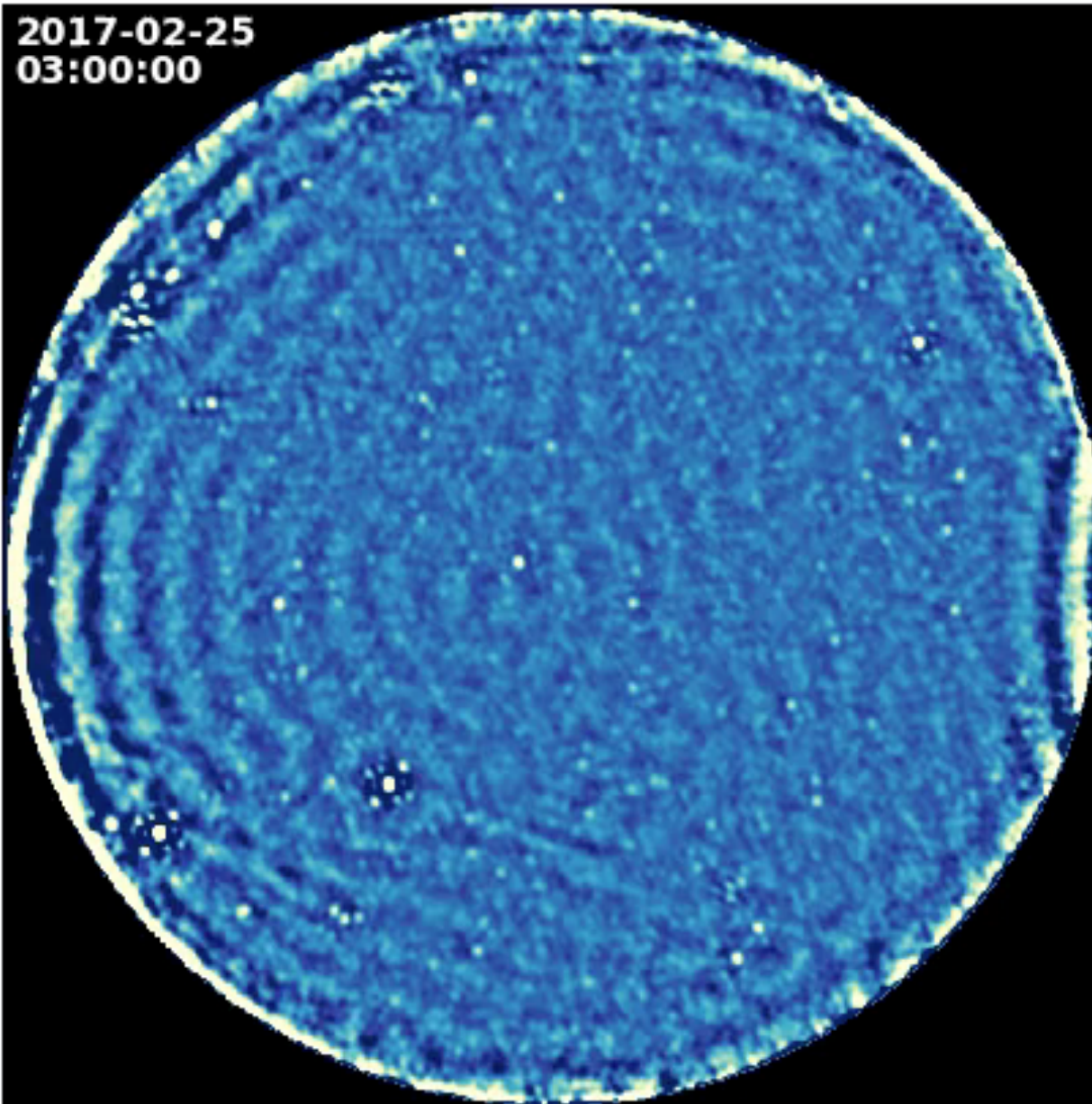
Transient Candidate 2

- ~125 Jy peak, 20 seconds
- Nearest VLSSr sources
- ~ 0.5 Jy



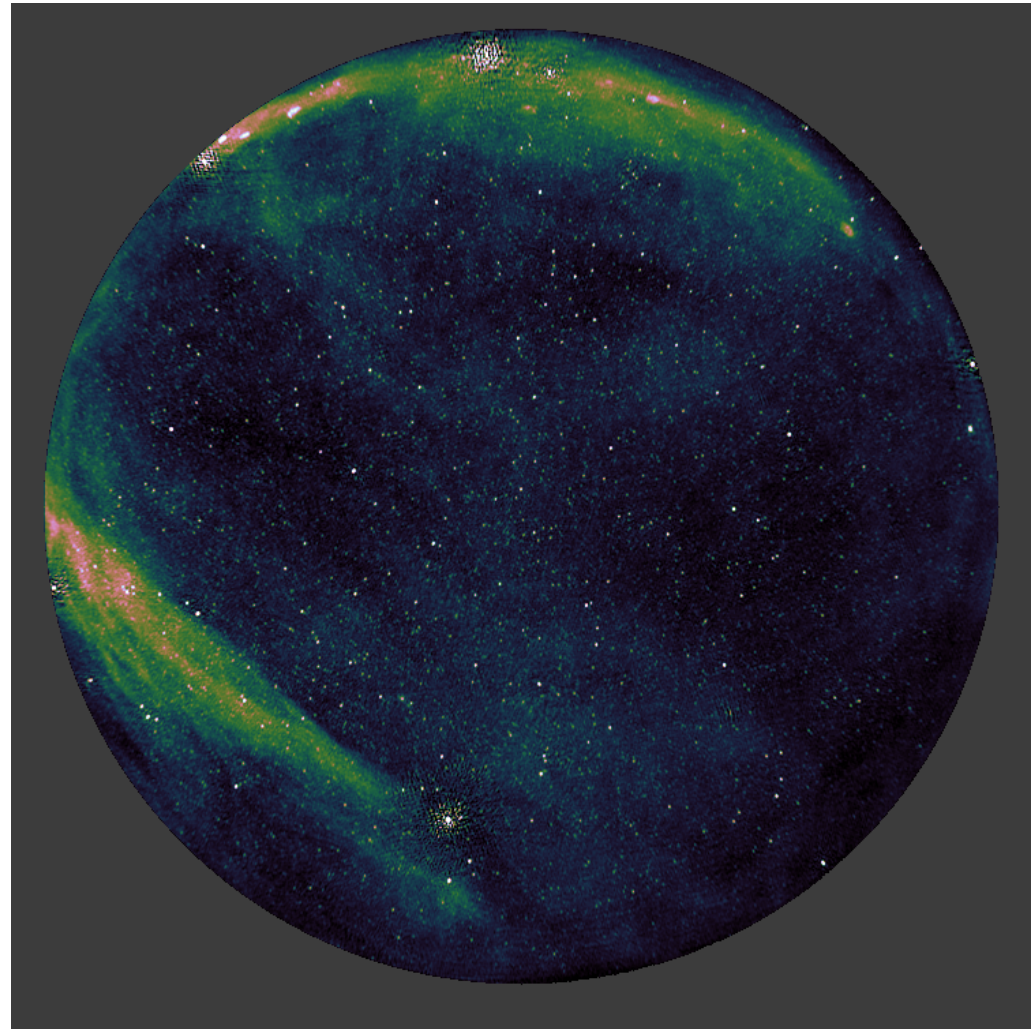
Extreme scintillation





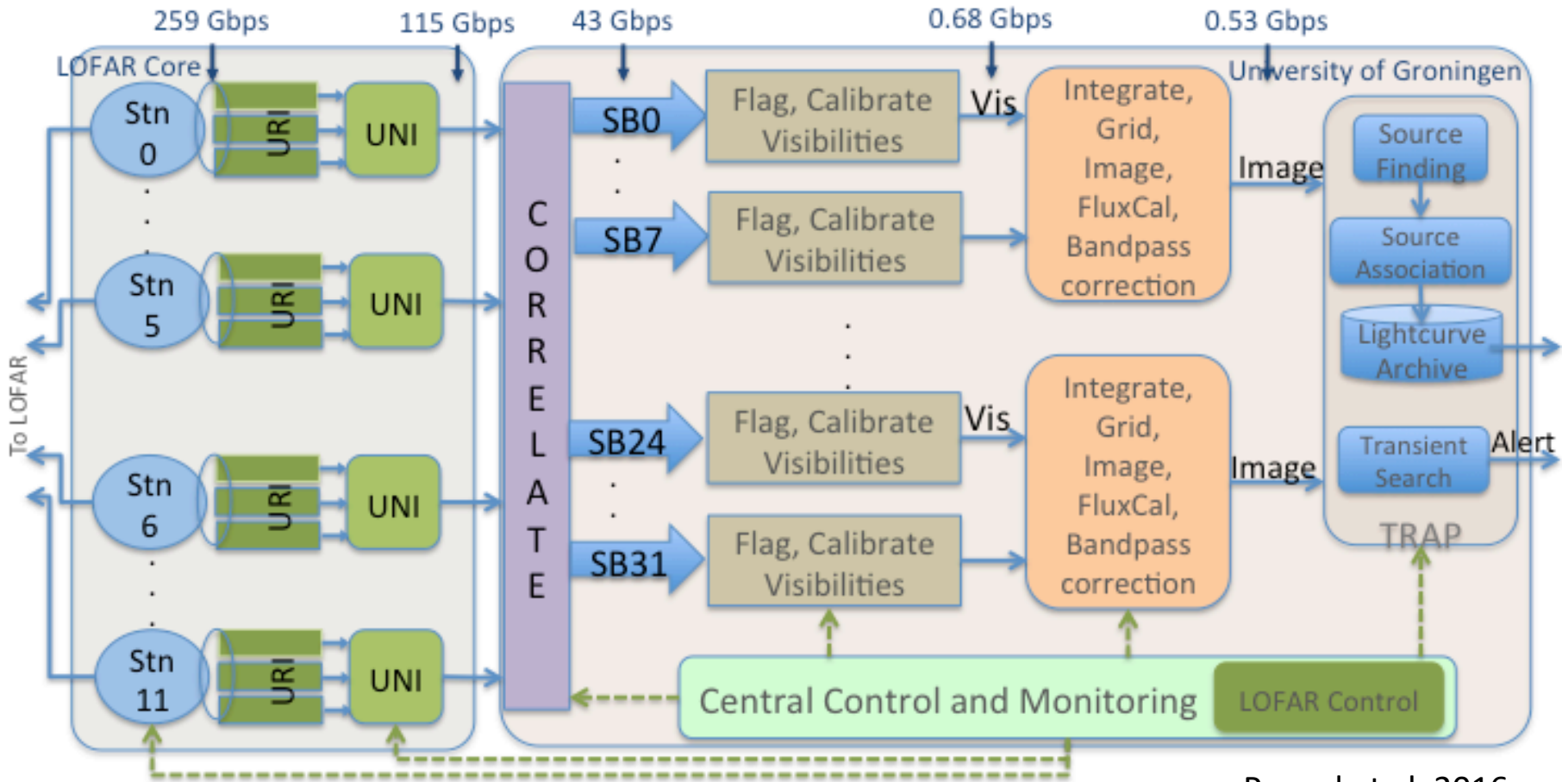
Looking forward

- AARTFAAC 12
 - 1 Jy/beam in 1s
 - 0.1 Jy/beam thermal
 - 12' resolution
 - 4 polarizations
- LOFAR 2.0
 - AARTFAAC 12 +
 - 24/7 observing
 - Simultaneous HBA/LBA
 - Larger bandwidth



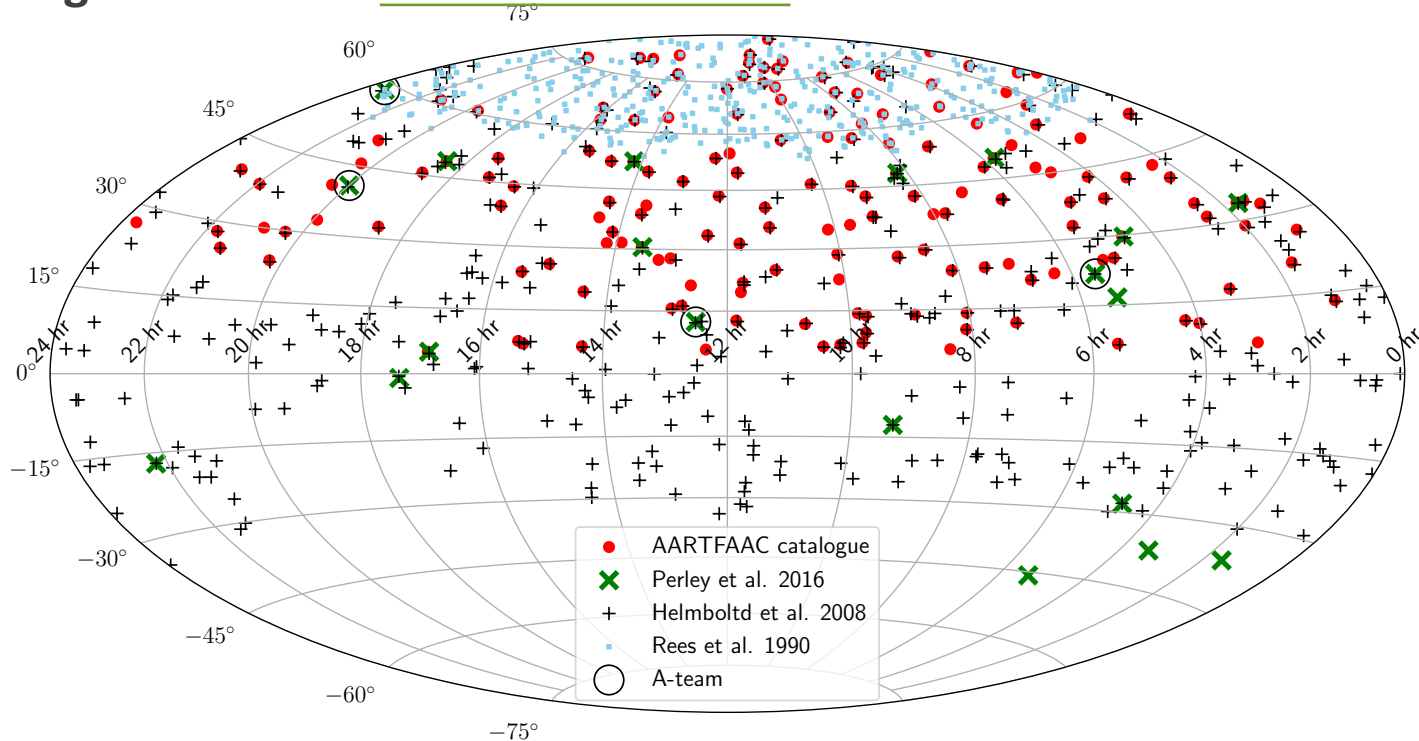
Shulevski et al. in prep

Dipoles to Databases



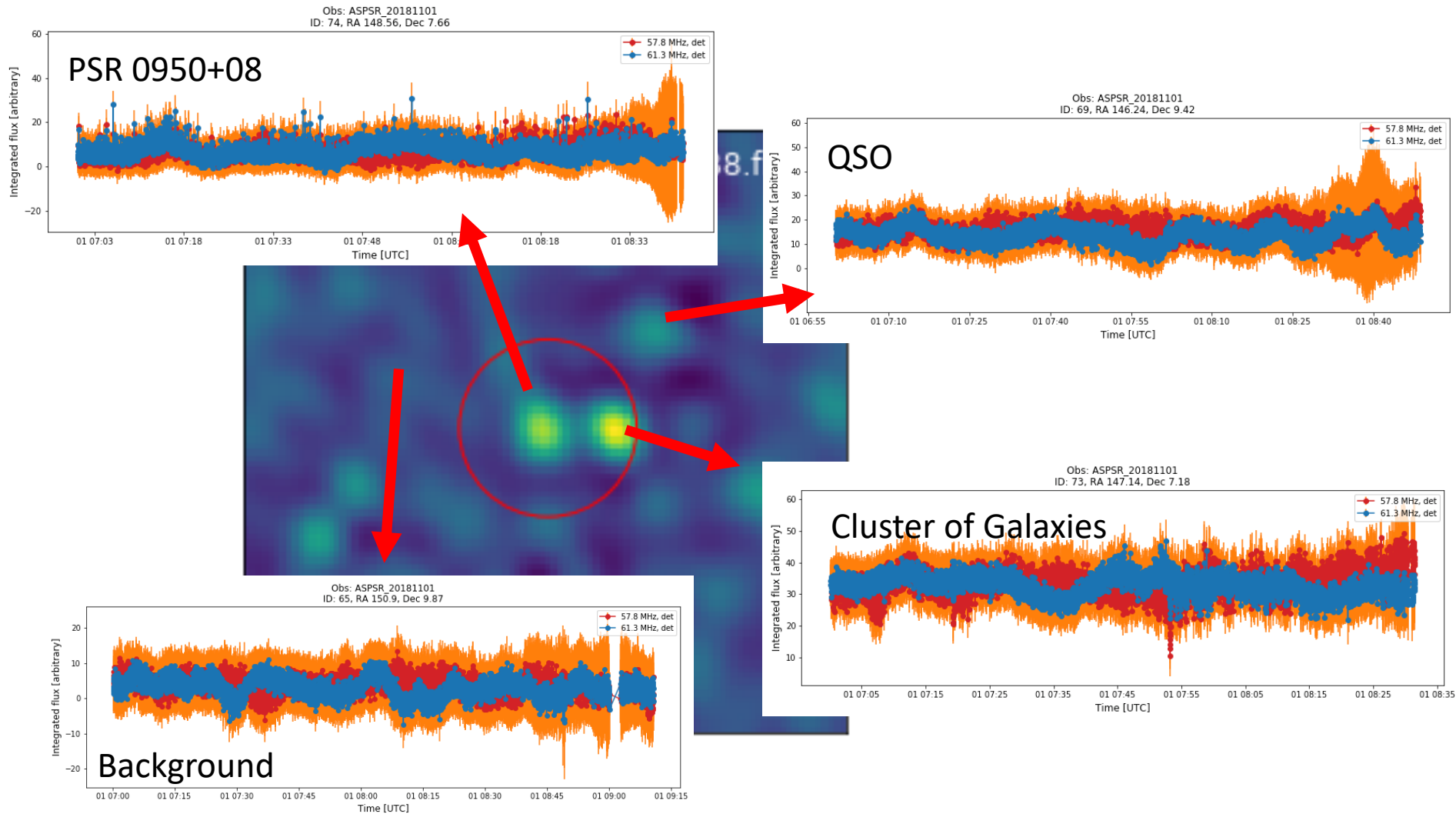
First AARTFAAC science results!

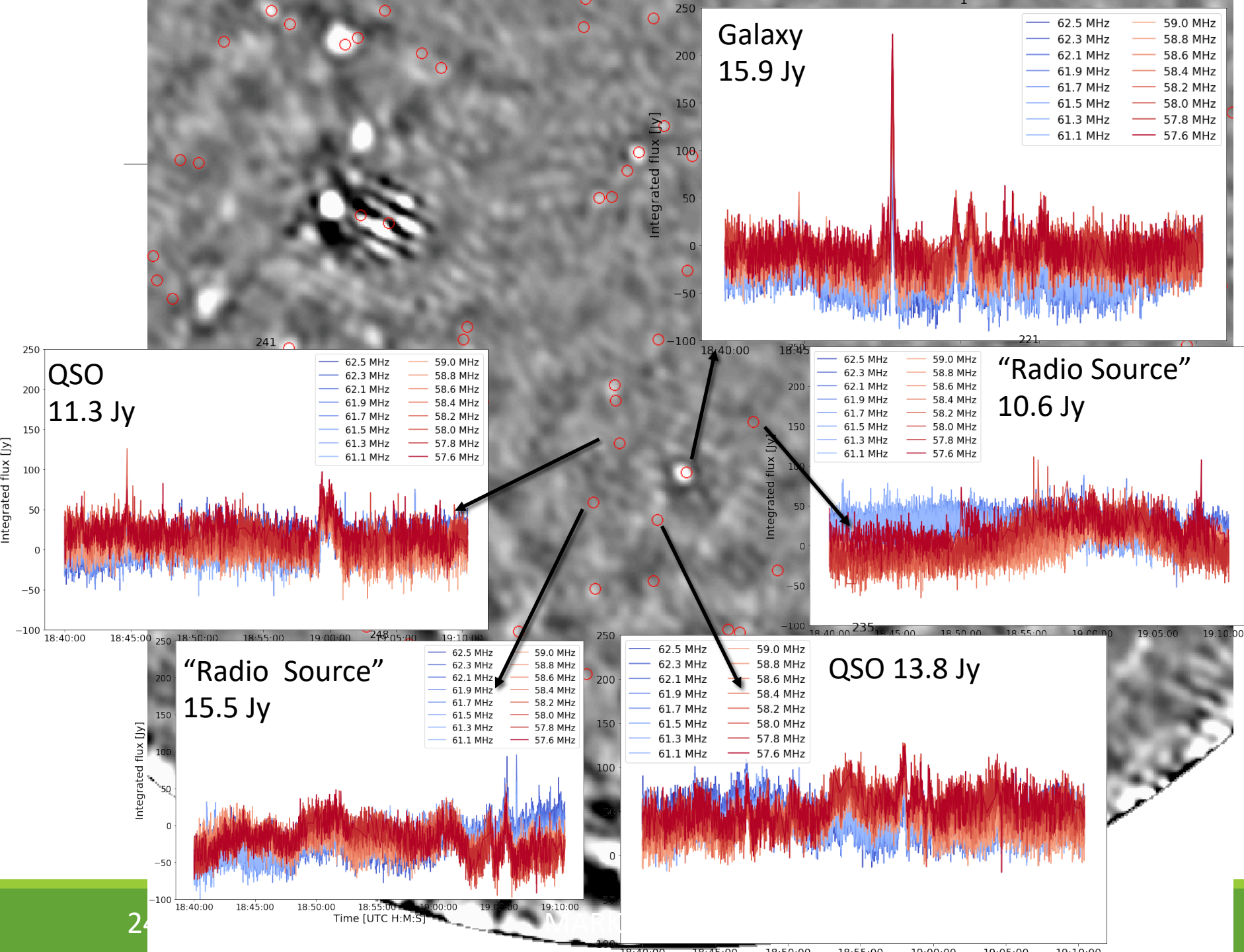
AARTFAAC Flux Density Calibration and Northern Hemisphere Catalogue at 60 MHz [arXiv:1810.06430](https://arxiv.org/abs/1810.06430)



167 source, the with accurate flux density measurements for streaming calibration of AARTFAAC images

PSR B0950+08 Giant Pulses





LOFAR -> AARTFAAC



LOFAR

AARTFAAC@YouTube

+

Transient detection

Pipeline