

LOFAR MSSS *Multifrequency Snapshot Sky Survey*

Update

George Heald (MSSS Project Leader)
(on behalf of the MSSS Team)
LSM, 21/8/2013



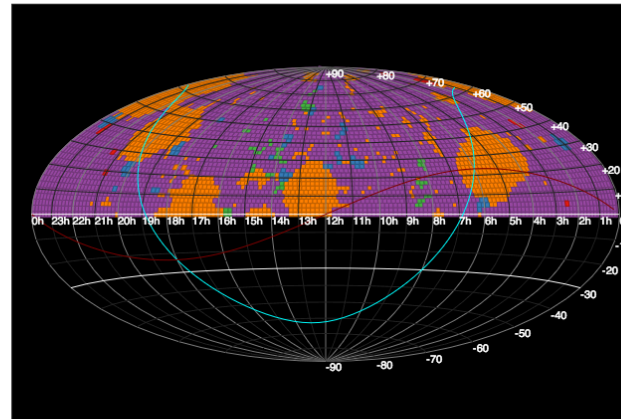
- MSSS-HBA started in February, and is almost 75% complete!

LOFAR Observation Database

MSSS HBA

Number of Targets	3616
Number of Calibrators	8
Start Date	8 Feb. 2013
Stop Date	16 Aug. 2013
Completed Fields	2646 (73.2%)
Information collected	19 Aug. 2013

[Show me the data >](#)



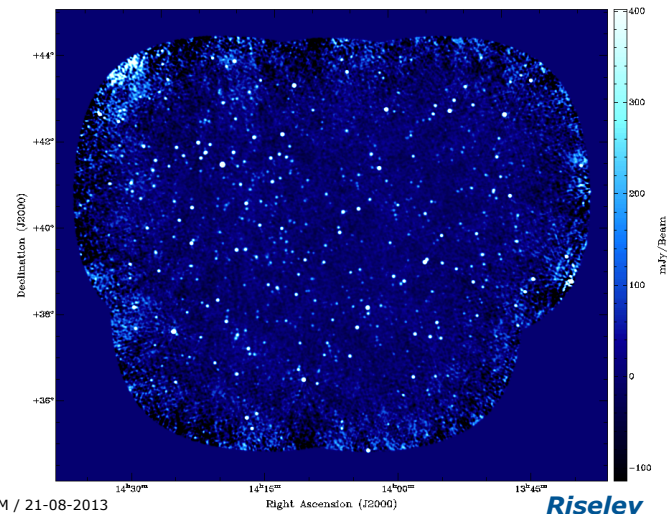
Swinbank

Hammer Projection

Map based on code from [this project](#).

- Data available on CEP (1.5%)
- Data archived (71.7%)
- Partial data available (1.7%)
- Data missing (0.3%)
- Not yet observed (24.8%)

- Most recent data: several stations offline due to heat
 - Data quality seems to still be good, at least in many cases
 - noise level somewhat higher than in full-array data ...



George Heald / LSM / 21-08-2013

Riseley

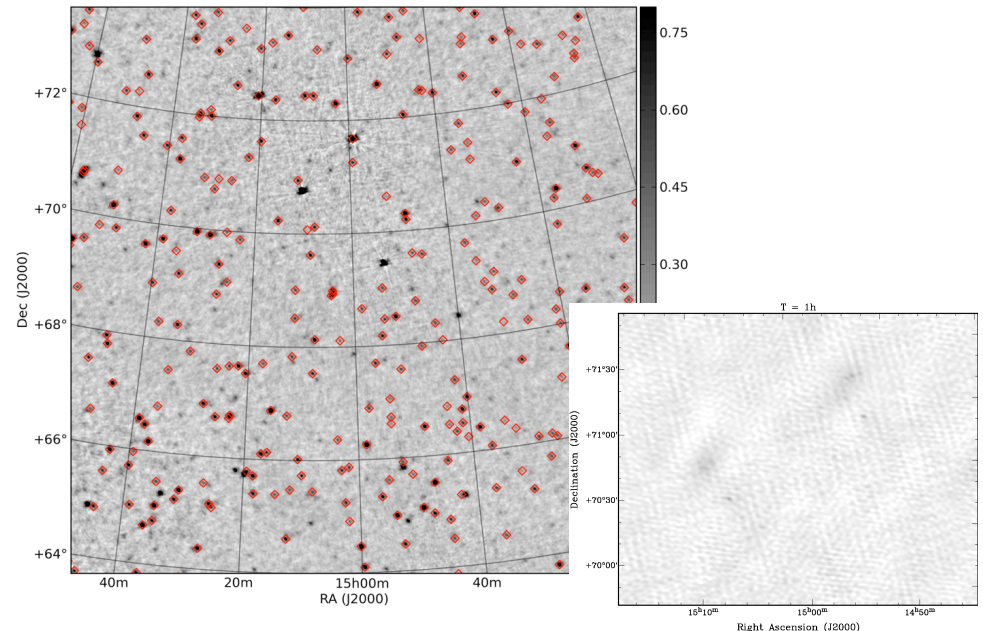
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- Need for demixing in MSSS-HBA checked by Andreas Horneffer

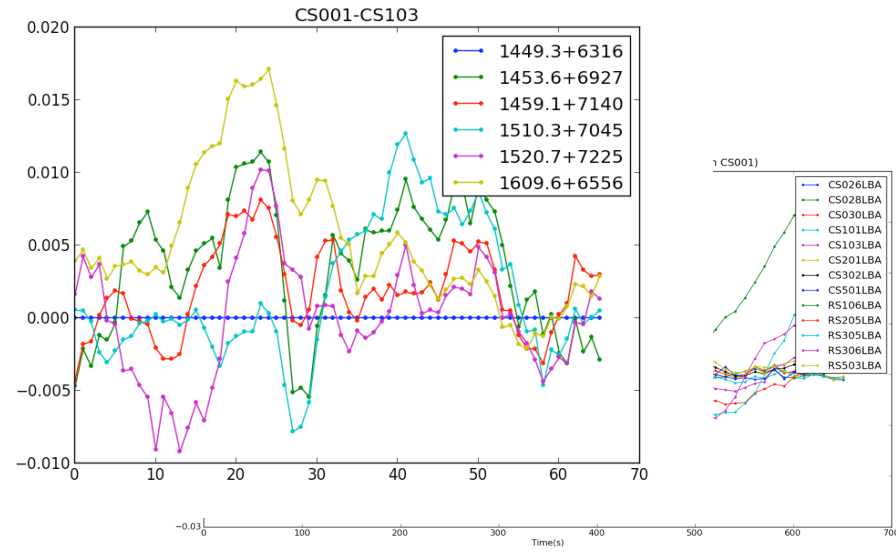
MSSS-Week 31/2013 HBA-demixing test results

Field-Name	Why Comment	Distance to		Mean noise		Band0 noise		Band1 noise		Band2 noise		Band3 noise		Band4 noise		Band5 noise		Band6 noise		Band7 noise	
		CasA	CyGA	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after	before	after
H288+31	high noise, close to CyGA	50.0 deg	13.7 deg	160.4 mJy	72.0 mJy	196 mJy	91 mJy	233 mJy	85 mJy	209 mJy	85 mJy	174 mJy	78 mJy	152 mJy	65 mJy	117 mJy	64 mJy	98 mJy	58 mJy	104 mJy	50 mJy
H318+48	subjective image quality improved, one source has a "jet" in the non-demixed images	22.1 deg	14.8 deg	127.1 mJy	93.8 mJy	146 mJy	96 mJy	137 mJy	93 mJy	129 mJy	93 mJy	123 mJy	91 mJy	123 mJy	96 mJy	109 mJy	87 mJy	136 mJy	101 mJy	114 mJy	93 mJy
H344+12	high noise, close to CasA, CyGA	47.1 deg	48.1 deg	168.9 mJy	167.2 mJy	150 mJy	150 mJy	207 mJy	208 mJy	220 mJy	226 mJy	162 mJy	178 mJy	157 mJy	169 mJy	191 mJy	194 mJy	123 mJy	105 mJy	141 mJy	108 mJy
H344+12	subjective image quality improved																				
H343+39	high noise, away from CasA, CyGA (UVmin=0.1) all bands are rather noisy, band6: flux in sources 20-30% higher after demix, other bands: not much difference between demix and no demix	20.4 deg	32.8 deg	205.6 mJy	191.4 mJy	231 mJy	215 mJy	212 mJy	196 mJy	213 mJy	196 mJy	210 mJy	196 mJy	215 mJy	200 mJy	199 mJy	187 mJy	214 mJy	201 mJy	151 mJy	140 mJy
H343+39	high noise, close to CasA																				
H018+02	high noise, low dec, away from CasA, CyGA (max need to demix 5.1%, UVmin=0.1) slightly better image quality	60.1 deg	78.2 deg	175.6 mJy	164.3 mJy	196 mJy	179 mJy	185 mJy	169 mJy	156 mJy	153 mJy	156 mJy	154 mJy	209 mJy	212 mJy	175 mJy	137 mJy	157 mJy	147 mJy	171 mJy	163 mJy
H109+46	low noise, mid DEC (marginal need to demix max 4.1%) not much difference between demix and no demix	63.5 deg	92.7 deg	58.3 mJy	64.6 mJy	68 mJy	76 mJy	67 mJy	74 mJy	63 mJy	69 mJy	57 mJy	64 mJy	56 mJy	62 mJy	55 mJy	59 mJy	51 mJy	57 mJy	49 mJy	56 mJy
H191+77	low noise, high DEC (demixing done in all Bands), essentially identical	43.6 deg	54.5 deg	38.9 mJy	38.6 mJy	51 mJy	51 mJy	49 mJy	47 mJy	48 mJy	47 mJy	39 mJy	39 mJy	36 mJy	36 mJy	31 mJy	31 mJy	30 mJy	30 mJy	26 mJy	26 mJy
H155+44	90deg from CyGA (marginal need to demix max 3.1% in BAND5) essentially identical	76.4 deg	89.6 deg	75.1 mJy	75.1 mJy	85 mJy	85 mJy	82 mJy	82 mJy	80 mJy	80 mJy	74 mJy	74 mJy	71 mJy	71 mJy	70 mJy	70 mJy	71 mJy	71 mJy	68 mJy	68 mJy
H137+27	90deg from CasA essentially identical	89.7 deg	110.4 deg	52.3 mJy	52.7 mJy	72 mJy	72 mJy	66 mJy	67 mJy	60 mJy	60 mJy	54 mJy	54 mJy	47 mJy	47 mJy	45 mJy	45 mJy	40 mJy	41 mJy	36 mJy	36 mJy
H048+44	mid high noise, away-ish from CasA, CyGA essentially identical	37.2 deg	73.5 deg	101.7 mJy	101.5 mJy	149 mJy	149 mJy	105 mJy	105 mJy	104 mJy	104 mJy	93 mJy	93 mJy	92 mJy	92 mJy	92 mJy	92 mJy	88 mJy	88 mJy	88 mJy	88 mJy
H167+22	mid high noise, away from CasA, CyGA (Band7, CyGA: 14% „contaminated“) essentially identical	99.1 deg	103.5 deg	52.0 mJy	51.7 mJy	68 mJy	68 mJy	62 mJy	62 mJy	58 mJy	58 mJy	52 mJy	52 mJy	47 mJy	47 mJy	47 mJy	47 mJy	42 mJy	42 mJy	40 mJy	38 mJy

- Short summary: demixing provides a substantial improvement in some fields, and minimal degradation in fields where it is not needed (if no demixing where 5Jy A-team flux in <1% of data)
- Recommendation is to enable demixing for remaining fields (close to A-team sources)



- Direction dependent gains obtained by Adam Stewart via “peeling” procedure
 - 5 sources, which in the current scheme change based on frequency band (i.e. field of view)
 - Future: mosaic at higher frequencies? shape beams??
- Bas van der Tol is inspecting solutions and using ***differential*** direction dependent gain phases to constrain phase screens



- Direction dependent gains obtained by Adam Stewart via “peeling” procedure
 - 5 sources, which in the current scheme change based on frequency band (i.e. field of view)
 - Future: mosaic at higher frequencies? shape beams??
- Bas van der Tol is inspecting solutions and using ***differential*** direction dependent gain phases to constrain phase screens
 - avoiding the need to separate instrument from ionosphere
 - but complicating the interpretation....
- Initial results provide intriguing patterns across pierce point distribution, and suggest an optimum thin-screen height of 200km (i.e. the bottom of the F layer)

LOFAR Calibration & Imaging Tiger Team

George Heald
LSM, 21/8/2013

ASTRON is part of the Netherlands Organisation for Scientific Research (NWO)



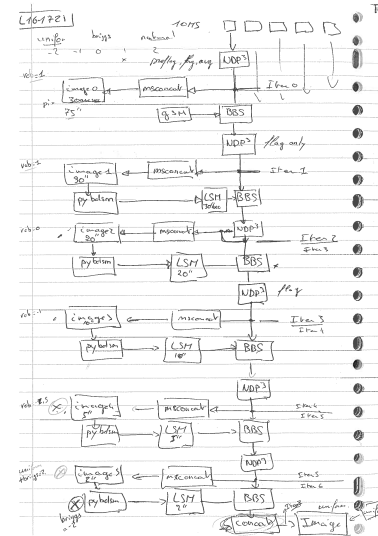
LOFAR

- Tammo Jan Dijkema
- Nicolas Vilchez
- Bas van der Tol
- Manu Orru
- George Heald
- Joris van Zwieten



- Many improvements still needed in imaging pipeline in order to provide post-MSSS image quality from the production system
- Manpower not available due to other obligations (cobalt etc)
- Fast progress needed: small group selected to work together on top priority items

- Scope is to produce a better pipeline
 - major cycle (selfcal)
 - direction dependent effects
 - improved algorithms
 - decision making
 - quality control
 - etc
- Exact specs still being finalized, but expect substantial improvements in both dynamic range and image resolution (e.g. 10" instead of 1')



Vilchez

- Starting now ... weekly group meetings have started and people are getting up to speed and acquainted with the relevant issues
- Stay tuned for LSM updates as we get rolling!