J/A+A/620/A74 Bootes field deep LOFAR 150MHz imaging (Retana-Montenegro+, 2018)

Deep LOFAR 150 MHz imaging of the Bootes field:
Unveiling the faint low-frequency sky.
Retana-Montenegro E., Rottgering H.J.A, Shimwell T.W., van Weeren R.J.,
Prandoni I., Brunetti G., Best P.N, Bruggen M.
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=2018A&A...620A..74R (SIMBAD/NED BibCode)

ADC_Keywords: Surveys ; Galaxies, radio ; Radio continuum

Keywords: surveys - catalogs - radio continuum: general -
techniques: image processing

Abstract:
We have conducted a deep survey (with a central rms of 55uJy) with the LOw Frequency ARray (LOFAR) at 120-168MHz of the Bootes field, with an angular resolution of 3.98"x6.45", and obtained a sample of 10091 radio sources (5σ limit) over an area of $20deg^2$. The astrometry and flux scale accuracy of our source catalog is investigated. The resolution bias, incompleteness and other systematic effects that could affect our source counts are discussed and accounted for. The derived 150MHz source counts present a flattening below sub-mJy flux densities, that is in agreement with previous results from high- and low- frequency surveys. This flattening has been argued to be due to an increasing contribution of star-forming galaxies and faint active galactic nuclei. Additionally, we use our observations to evaluate the contribution of cosmic variance to the scatter in source counts measurements. The latter is achieved by dividing our Bootes mosaic into 10 non-overlapping circular sectors, each one with an approximate area of $2deg^2$. The counts in each sector are computed in the same way as done for the entire mosaic. By comparing the induced scatter with that of counts obtained from depth observations scaled to 150MHz, we find that the 1σ scatter due to cosmic variance is larger than the Poissonian errors of the source counts, and it may explain the dispersion from previously reported depth source counts at flux densities S<1mJy. This work demonstrates the feasibility of achieving deep radio imaging at low-frequencies with LOFAR.

Description:
The LOFAR mosaic image of the Bootes field and its corresponding source catalog are presented here. The mosaic image is obtained using 55 hours of observations, and it has a central rms noise of 0.255mJy/beam and an angular resolution of 3.98"x6.45".

File Summary:

FileName	Lrecl	Records	Explanations
ReadMe	80	.	This file
table2.dat	117	10091	LOFAR source catalog
list.dat	117	1	Information on fits image
fits/*	0	1	Fits image

See also:
J/AJ/123/1784 : 1.4GHz imaging of the Bootes field (de Vries+, 2002)
J/AJ/127/213 : LALA Bootes field X-ray source catalog (Wang+, 2004)
J/AJ/130/923 : Faint radio sources in the NOAO Bootes field (Wrobel+, 2005)
J/ApJ/634/L1 : 16μm sources in the NOAO Bootes field (Kasliwal+, 2005)
J/ApJS/161/9 : X-ray survey of the NDWFS Bootes field (Kenter+, 2005)
J/ApJ/641/140 : Optical counterparts in the NDWFS Bootes field (Brand+ 2006)
J/A+A/535/A38 : Observations of NOAO Bootes field at 153MHz (Intema+, 2011)
J/ApJ/793/82 : LOFAR Bootes and 3C295 field sources (van Weeren+, 2014)
J/MNRAS/450/1477 : VLA 352MHz image of the Bootes field. I. (Coppejans+, 2015)
J/ApJ/817/119 : Bootes field Spitzer/IRAC variability survey (Kozlowski+, 2016)
J/MNRAS/460/2385 : Bootes field LOFAR 150-MHz observations (Williams+, 2016)

Byte-by-byte Description of file: table2.dat

Bytes	Format	Units	Label	Explanations
1- 19	A19	---	SourceID	Source name (JHHMMSS.ss+DDMMSS.s) (Source_ID)
21- 28	F8.4	deg	RAdeg	Right ascension (J2000) (RA)
30- 37	F8.4	deg	e_RAdeg	rms uncertainty on RAdeg (E_RA)
39- 45	F7.4	deg	DEdeg	Declination (J2000) (DEC)
47- 55	F9.4	deg	e_DEdeg	rms uncertainty on DEdeg (E_DEC)
57- 65	F9.4	mJy	Ftotal	Integrated source flux density at 150MHz (Ftotal)
67- 74	F8.4	mJy	e_Ftotal	rms uncertainty on Ftotal (e_Ftotal)
76- 84	F9.4	mJy/beam	Fpeak	Peak flux density at 150MHz
86- 93	F8.4	mJy/beam	e_Fpeak	rms uncertainty on Fpeak (e_Fpeak)
95-100	F6.4	---	Fsmear	Approximate correction factor to the peak

				flux density to account for bandwidth- and time-smearing (Fsmear)
102-107	F6.4	mJy/beam	rms	Local rms noise used for the source detection (rms)
109	A1	---	Type	[R/U] flag indicating if the source is resolved (R) or unresolved (U) (1)
111	A1	---	PyBDSF	[S/M] flag indicating the source structure code by PyBDSF (PyBDSF_code) (2)
113	I1	---	Edge	[0/1] an object that is located close to or in a facet edge, which could result in some flux loss (Flag_edge)
115	I1	---	Artifact	[0/2] a source is identified as an artefact (Flag_artifact) (3)
117	I1	---	Merged	[0/1] a large diffuse source whose separate components are merged into a single one according to a visual inspection (Flag_merged)

Note (1): flag indicating the resolved parametrization of the source as follows:
U = unresolved sources
R = resolved sources
Note (2): flag indicating the indicating the source structure code by PyBDSF as follows:
S = a source with a single component
M = a source with multiple components
Note (3): artifact flag as follows:
0 = no artifact
1 = a source that is probably an artifact
2 = a source that is surely an artifact

Byte-by-byte Description of file: list.dat

Bytes	Format	Units	Label	Explanations
1- 9	F9.5	deg	RAdeg	Right Ascension of center (J2000)
10- 18	F9.5	deg	DEdeg	Declination of center (J2000)
20- 24	I5	---	Nx	Number of pixels along X-axis
26- 30	I5	---	Ny	Number of pixels along Y-axis
32- 52	A21	---	Obs.Date	Observation date (YYYY-MM-DDThh:mm:ss.s)
54- 60	F7.3	MHz	Freq	Observed frequency
62- 68	I7	Kibyte	size	Size of FITS file
70- 93	A24	---	FileName	Name of FITS file, in subdirectory fits
95-117	A23	---	Title	Title of the FITS file

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Edwin Retana, edwinretana(at)gmail.com

(End) Patricia Vannier [CDS] 20-Aug-2018

*The document above follows the rules of the Standard Description for Astronomical Catalogues; from this documentation it is possible to generate **f77** program to load files into arrays or line by line*