

Low-frequency radio maps for the REXCESS cluster sample

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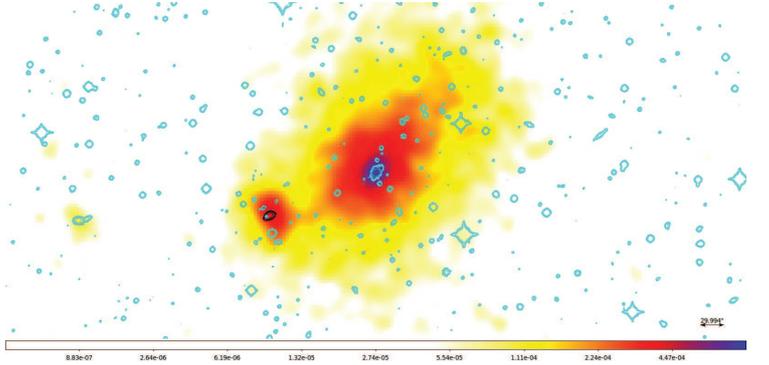
What makes the REXCESS sample so special?

The Representative XMM-Newton Cluster Structure Survey (REXCESS) Cluster sample (Böhringer et al. 2007, A&A 469 1 pp. 363) consists of 33 nearby ($z < 0.2$) galaxy clusters, which were selected from the flux-limited REFLEX catalogue (Böhringer et al. 2004, A&A 425 p.367). All clusters have a X-ray luminosity above $0.4 \cdot 10^{44} h_70^2 \text{ erg s}^{-1}$ in the 0.1–2.4 keV band. The sample is unbiased with respect to the dynamical state of the cluster, containing relaxed and merging clusters, which makes it representative of the local cluster population. It fully samples the cluster luminosity function. The sample is observed in X-ray, optical and radio (610MHz and 240MHz using GMRT and for 18/33 clusters at 1.4 GHz and 2.4 GHz with the ATCA) and has formed the basis of a range of detailed studies characterizing the cluster properties: (Pratt et al. 2007, A&A 461 1 pp 71; Croston et al. 2008, A&A 487 2 pp 431; Pratt et al. 2009, A&A, 498 2 pp 361; Pratt et al. 2010, A&A 511 85; Haarsma et al. 2010, A&A, 713 2 pp. 1037; Böhringer et al. 2010, A&A, 514 32; Arnaud et al. 2010, A&A 517 92) The GMRT data set contains 28 of the 33 clusters as the remaining 5 clusters are below a declination of -45 degrees, which is the observation limit of the GMRT, but these are in the ATCA-observed sample.

All radio observations were done using the GMRT in India at an observing frequency of 610 MHz. Calibration was done using CASA (<http://casa.nrao.edu>) and a script written to speed up the process. The maps are X-ray maps, overlaid with radio emission (black) and optical data from ESO-DSS 2 Red. (cyan). There are 10 evenly spaced radio contour levels starting at 5*RMS.

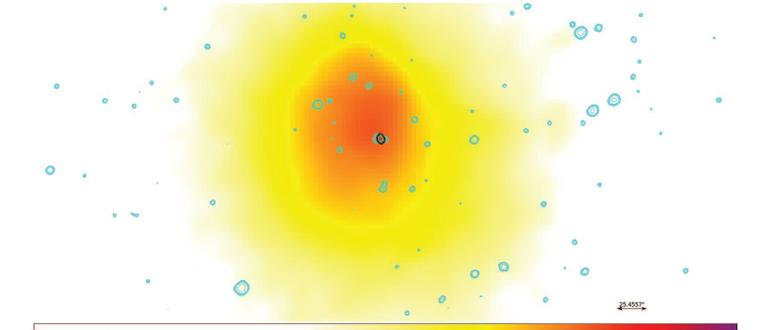
RXCJ0821.8+0112

This cluster shows no radio source associated with the peak of the X-ray emission. But the central radio source seems to be associated with the second peak of the X-ray emission. Additionally there is a optical source associated with it.



RXCJ0547.6-3152

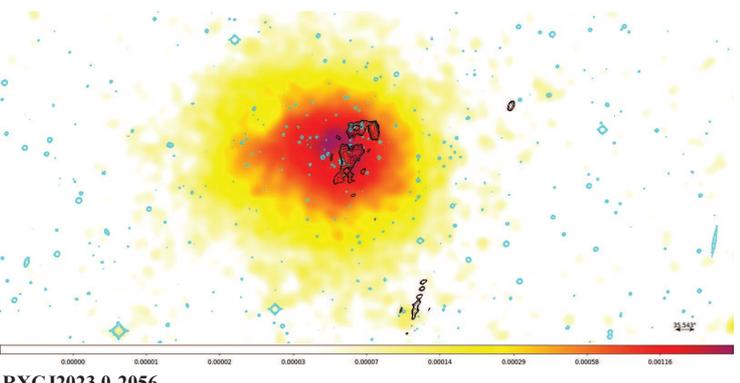
This cluster shows a radio source associated with the peak of the X-ray emission. Additionally there is a optical source associated with it. The radio emission left of the central source shows no associated optical source.



Source Name	z	Distance (Mpc)	Luminosity _{610MHz} (W Hz ⁻¹)	CC	disturbed	number of extended sources	number of unresolved sources	RMS (Jy/beam) (1 SB)
RXCJ0003 8+0203	0,0924	423,1	4,08E+24			-	5	1,61E-04
RXCJ0006 0-3443	0,1147	533,1	9,98E+24	✓		-	1	1,68E-04
RXCJ0020 7-2542	0,1410	666,6	1,48E+25			-	4	2,79E-04
RXCJ0049 4-2931	0,1084	501,8				-	-	3,30E-04
RXCJ0211 4-4017	0,1008	464,2	1,20E+25			1	-	2,35E-04
RXCJ0225 1-2928	0,0604	270,5	6,68E+24	✓		-	5	1,37E-04
RXCJ0345 7-4112	0,0603	270,1	2,81E+24	✓		8	3	2,63E-04
RXCJ0547 6-3152	0,1483	704,3	1,73E+25			-	1	2,04E-04
RXCJ0605 8-3518	0,1392	657,3	1,05E+26	✓		-	1	5,67E-04
RXCJ0821 8+0112	0,0822	373,8	3,87E+24			-	2	1,30E-04
RXCJ0956 4-1004	0,1634	783,4	2,56E+25			3	4	9,61E-05
RXCJ0958 3-1103	0,1669	801,9	9,73E+24	✓		-	1	2,68E-04
RXCJ1044 5-0704	0,1342	631,7	9,59E+24	✓		-	8	2,27E-04
RXCJ1141 4-1216	0,1195	557,2	1,81E+25	✓		-	2	1,88E-04
RXCJ1236 7-3354	0,0796	361,3	3,58E+24			-	6	1,84E-04
RXCJ1302 8-0230	0,0847	385,9	6,34E+24	✓	✓	1	1	1,31E-04
RXCJ1311 4-0120	0,1832	888,9	4,01E+25	✓		2	4	1,49E-04
RXCJ1516 3+0005	0,1181	550,2	1,31E+25			-	1	1,23E-04
RXCJ1516 5-0056	0,1198	558,7	8,41E+24	✓	✓	1	3	1,23E-04
RXCJ2014 8-2430	0,1612	733,0	2,85E+25	✓		-	1	1,80E-04
RXCJ2023 0-2056	0,0564	251,9	4,54E+24	✓	✓	2	2	1,76E-04
RXCJ2048 1-1750	0,1475	700,2		✓	✓	-	-	1,83E-04
RXCJ2149 1-3041	0,1184	551,7	2,56E+25	✓		-	3	2,15E-04
RXCJ2152 2-1942	0,0963	442,2	7,37E+25			1	1	8,46E-04
RXCJ2157 4-0747	0,0579	258,9	2,54E+24	✓		3	2	9,70E-05
RXCJ2217 7-3543	0,1486	705,9	1,65E+25			1	1	3,63E-04
RXCJ2218 6-3853	0,1411	667,1	3,14E+25	✓		1	3	1,45E-04
RXCJ2234 5-3744	0,1510	718,4	2,44E+25			3	1	1,77E-04

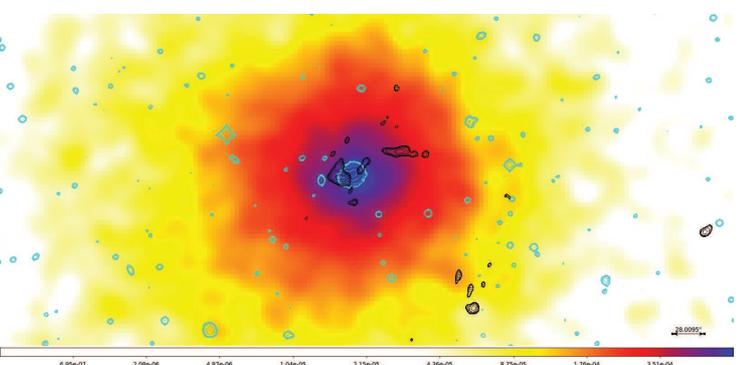
RXCJ2234.5-3744

This cluster shows radio sources associated with the peak of the X-ray emission. Additionally there are optical sources associated with them. This cluster shows a lot of radio structure requiring further investigation



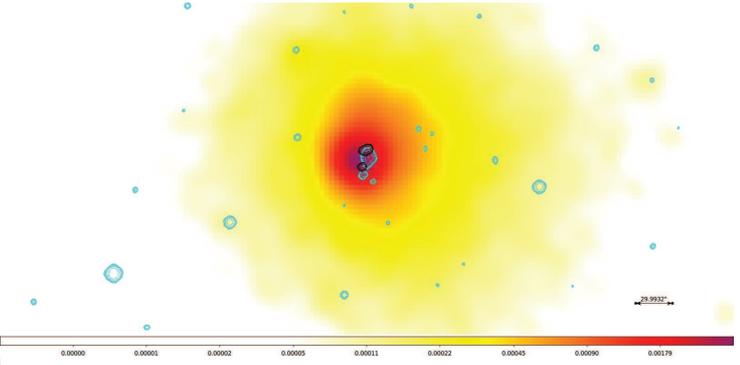
RXCJ2023.0-2056

This cluster shows radio sources associated with the peak of the X-ray emission. But as two radio sources seem to be associated with the optical source the positioning from the REFLEX catalogue was used to identify the optical counterpart. It could be that they are both associated with the source and are associated with the jets of the optical source, but this needs further examination. The elongated source right of the central peak has no optical counterpart. The source left-below the central one seems to be associated with an X-ray cavity and has an optical counterpart.



RXCJ1302.8-0230

This cluster shows a radio source associated with the peak of the X-ray emission. Additionally there is a optical source associated with it.



Results

Data reduction at 610 MHz is now complete. 26 clusters show associated radio sources. The clusters with associated radio sources are nicely distributed over the whole X-ray luminosity and X-ray temperature range. The sources in RXCJ2023 and RXCJ2157 have structure consistent with typical double-lobed radio-loud AGN. The luminosity column show the total radio luminosity within the 2 Mpc range of the cluster. 4/9 of the sources associated with the central bright galaxy show a double lobe structure. RXCJ2023 needs further investigation as it shows an elongated radio source without any optical counterpart. Some sources seem to show a relation with the X-ray emission while some do not. It clearly needs further clarification if there is a relation and if so how they are related.

Acknowledgements

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