A catalogue of 294 Galactic supernova remnants

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Abstract. A revised catalogue of 294 Galactic supernova remnants (SNRs) is presented, along with some simple statistics. This catalogue has twenty more entries than did the previous version (from 2009), as 21 new remnants have been added, and one object has been removed as it has been identified as an H II region.

1. Introduction

Over the last thirty years I have produced several versions of a catalogue of Galactic SNRs, with published versions in (Green 1984, 1988, 1991; Stephenson & Green 2002; Green 2004, 2009a), along with more detailed web-based versions since 1995 (most recently in 2009). Here I present an updated version of the catalogue, which now contains 294 entries. Details of the catalogue are presented in Section 2, with notes on the entries added/removed given in Section 3. Section 4 briefly discusses some simple statistics of the remnants in the current catalogue.

2. The catalogue format

The current version of the catalogue contains 294 SNRs, and is based on the published literature up to the end of 2013. For each remnant in the catalogue the following parameters are given.

- **Galactic Coordinates** of the source centroid, quoted to a tenth of a degree as is conventional. (Note: in this catalogue additional leading zeros are not used.)

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- **Right Ascension** and **Declination** of the source centroid. The accuracy of the quoted values depends on the size of the remnant; for small remnants they are to the nearest few seconds of time and the nearest minute of arc respectively, whereas for larger remnants they are rounded to coarser values, but are in every case sufficient to specify a point within the boundary of the remnant. These coordinates are almost always deduced from radio images rather than from X-ray or optical observations, and are for J2000.0.

- **Angular Size** of the remnant, in arcminutes, usually taken from the highest resolution radio image available. The boundary of most remnants approximates reasonably well to a circle or an ellipse. A single value is quoted for the angular size of the nearly circular remnants, which is the diameter of a circle with an area equal to that of the remnant. For elongated remnants the product of two values is quoted, where these are the major and minor axes of the remnant boundary modelled as an ellipse. In a few cases, an ellipse is not a satisfactory description of the boundary of the object (refer to the description of the individual object given in its catalogue entry), although an angular size is still quoted for information. For 'filled-centre' remnants the size quoted is for the largest extent of the observed radio emission, not, as at times has been used by others, the half-width of the centrally brightened peak.

- **Type** of the SNR: 'S' or 'F' if the remnant shows a 'shell' or 'filled-centre' structure, or 'C' if it shows 'composite' (or 'combination') radio structure with a combination of shell and filled-centre characteristics; or 'S?', 'F?' or 'C?', respectively, if there is some uncertainty, or '?' in several cases where an object is conventionally regarded as an SNR even though its nature is poorly known or not well-understood. (Note: the term 'composite' has been used in a different sense, by some authors, to describe SNRs with shell radio and centrally-brightened X-ray morphologies. An alternative term used to describe such remnants is 'mixed morphology', see Rho & Petre 1998.)

- **Flux Density** of the remnant at 1 GHz in jansky. This is *not* a measured value, but is derived from the observed radio-frequency spectrum of the source. The frequency of 1 GHz is chosen because flux density measurements at frequencies both above and below this value are usually available.

- **Spectral Index** of the integrated radio emission from the remnant, α (here defined in the sense, $S \propto \nu^{-\alpha}$, where S is the flux density at a frequency ν). This is either a value that is quoted in the literature, or one deduced from the available integrated flux densities of the remnant. For several SNRs a simple power law is not adequate to describe their radio spectra, either because there is evidence that the integrated spectrum is curved or the spectral index varies across the face of the remnant. In these cases the spectral index is given as 'varies' (refer to the description of the remnant and appropriate references in the detailed catalogue entry for more information). In some cases, for example where the remnant is highly confused with thermal emission, the spectral index is given as '?' since no value can be deduced with any confidence. These spectral indices have a very wide range of quality, and the primary literature should be consulted for any detailed study of the radio spectral indices of these remnants.

- **Other Names** that are commonly used for the remnant. These are given in parentheses if the remnant is only a part of the source. For some remnants, notably the Crab nebula, not all common names are given.

A summary of the data available for all 294 remnants in the catalogue is given in Table 1.

A more detailed version of the catalogue is available on the World-Wide-Web from:

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`http://www.mrao.cam.ac.uk/surveys/snrs/`

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In addition to the basic parameters which are given in Table 1, the detailed catalogue contains the following/additional information. (i) Notes if other Galactic coordinates have at times been used to label it (usually before good observations have revealed the full extent of the object, but sometimes in error), if the SNR is thought to be the remnant of a historical SN, or if the nature of the source as an SNR has been questioned (in which case an appropriate reference is usually given later in the entry). (ii) Short descriptions of the observed structure of the remnant at radio, X-ray and optical wavelengths, as applicable. (iii) Notes on distance determinations, and any point sources or pulsars in or near the object (although they may not necessarily be related to the remnant). (iv) References to observations are given for each remnant, complete with journal, volume, page, and a short description of what information each paper contains (for radio observations these include the telescopes used, the observing frequencies and resolutions, together with any flux density determinations). These references are *not* complete, but cover representative and recent observations of the remnant – up to the end of 2013 – and they should themselves include references to earlier work.

The detailed version is available in pdf format for downloading and printing, or as web pages, including a page for each individual remnant. The web pages include links to the 'NASA Astrophysics Data System' for each of the over two thousand references that are included in the detailed listings for individual SNRs.

Some of the parameters included in the catalogue are themselves of quite variable quality. For example, the radio flux density of each remnant at 1 GHz. This is generally of good quality, being obtained from several radio observations over a range of frequencies, both above and below 1 GHz. However, for some remnants (20 remnants in the current catalogue) – often those which have been identified at other than radio wavelengths – no reliable radio flux density is yet available.

Also, although the detailed version of the catalogue contains notes on distances for many remnants reported in the literature, these have a range of reliability. Consequently the distances given within the detailed catalogue should be used with caution in any statistical studies, and reference should be made to the primary literature cited in the detailed catalogue.

The detailed version of the catalogue contains notes both on those objects no longer thought to be SNRs, and on many possible and probable remnants that have been reported in the literature (including possible large, old remnants, seen from radio continuum, X-ray or H I observations).

Table 1. 294 Galactic supernova remnants: summary data.

l	b	RA (J2000) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
0.0	+0.0	17 45 44	−29 00	3.5×2.5	S	100?	0.8?	Sgr A East
0.3	+0.0	17 46 15	−28 38	15×8	S	22	0.6	
0.9	+0.1	17 47 21	−28 09	8	C	18?	varies	
1.0	−0.1	17 48 30	−28 09	8	S	15	0.6?	
1.4	−0.1	17 49 39	−27 46	10	S	2?	?	
1.9	+0.3	17 48 45	−27 10	1.5	S	0.6	0.6	
3.7	−0.2	17 55 26	−25 50	14×11	S	2.3	0.65	
3.8	+0.3	17 52 55	−25 28	18	S?	3?	0.6	
4.2	−3.5	18 08 55	−27 03	28	S	3.2?	0.6?	
4.5	+6.8	17 30 42	−21 29	3	S	19	0.64	Kepler, SN1604, 3C358
4.8	+6.2	17 33 25	−21 34	18	S	3	0.6	
5.2	−2.6	18 07 30	−25 45	18	S	2.6?	0.6?	
5.4	−1.2	18 02 10	−24 54	35	C?	35?	0.2?	Milne 56
5.5	+0.3	17 57 04	−24 00	15×12	S	5.5	0.7	
5.9	+3.1	17 47 20	−22 16	20	S	3.3?	0.4?	
6.1	+0.5	17 57 29	−23 25	18×12	S	4.5	0.9	
6.1	+1.2	17 54 55	−23 05	30×26	F	4.0?	0.3?	
6.4	−0.1	18 00 30	−23 26	48	C	310	varies	W28
6.4	+4.0	17 45 10	−21 22	31	S	1.3?	0.4?	
6.5	−0.4	18 02 11	−23 34	18	S	27	0.6	
7.0	−0.1	18 01 50	−22 54	15	S	2.5?	0.5?	
7.2	+0.2	18 01 07	−22 38	12	S	2.8	0.6	
7.7	−3.7	18 17 25	−24 04	22	S	11	0.32	1814−24
8.3	−0.0	18 04 34	−21 49	5×4	S	1.2	0.6	
8.7	−5.0	18 24 10	−23 48	26	S	4.4	0.3	
8.7	−0.1	18 05 30	−21 26	45	S?	80	0.5	(W30)
8.9	+0.4	18 03 58	−21 03	24	S	9	0.6	
9.7	−0.0	18 07 22	−20 35	15×11	S	3.7	0.6	
9.8	+0.6	18 05 08	−20 14	12	S	3.9	0.5	
9.9	−0.8	18 10 41	−20 43	12	S	6.7	0.4	
10.5	−0.0	18 09 08	−19 47	6	S	0.9	0.6	
11.0	−0.0	18 10 04	−19 25	11×9	S	1.3	0.6	
11.1	−1.0	18 14 03	−19 46	18×12	S	5.8	0.5	
11.1	−0.7	18 12 46	−19 38	11×7	S	1.0	0.7	
11.1	+0.1	18 09 47	−19 12	12×10	S	2.3	0.4	
11.2	−0.3	18 11 27	−19 25	4	C	22	0.5	
11.4	−0.1	18 10 47	−19 05	8	S?	6	0.5	
11.8	−0.2	18 12 25	−18 44	4	S	0.7	0.3	
12.0	−0.1	18 12 11	−18 37	7?	?	3.5	0.7	
12.2	+0.3	18 11 17	−18 10	6×5	S	0.8	0.7	
12.5	+0.2	18 12 14	−17 55	6×5	C?	0.6	0.4	
12.7	−0.0	18 13 19	−17 54	6	S	0.8	0.8	
12.8	−0.0	18 13 37	−17 49	3	C?	0.8	0.5	
13.3	−1.3	18 19 20	−18 00	70×40	S?	?	?	
13.5	+0.2	18 14 14	−17 12	5×4	S	3.5?	1.0?	
14.1	−0.1	18 16 40	−16 41	6×5	S	0.5	0.6	
14.3	+0.1	18 15 58	−16 27	5×4	S	0.6	0.4	
15.1	−1.6	18 24 00	−16 34	30×24	S?	5.5?	0.0?	
15.4	+0.1	18 18 02	−15 27	15×14	S	5.6	0.62	
15.9	+0.2	18 18 52	−15 02	7×5	S?	5.0	0.63	
16.0	−0.5	18 21 56	−15 14	15×10	S	2.7	0.6	
16.2	−2.7	18 29 40	−16 08	17	S	2.5	0.4	
16.4	−0.5	18 22 38	−14 55	13	S	4.6	0.3?	
16.7	+0.1	18 20 56	−14 20	4	C	3.0	0.6	
17.0	−0.0	18 21 57	−14 08	5	S	0.5	0.5	
17.4	−2.3	18 30 55	−14 52	24?	S	5	0.5?	
17.4	−0.1	18 23 08	−13 46	6	S	0.4	0.7	
17.8	−2.6	18 32 50	−14 39	24	S	5	0.5	
18.1	−0.1	18 24 34	−13 11	8	S	4.6	0.5	
18.6	−0.2	18 25 55	−12 50	6	S	1.4	0.4	

Table 1. (continued).

l	b	RA (J2000) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
18.8	+0.3	18 23 58	−12 23	17×11	S	33	0.46	Kes 67
18.9	−1.1	18 29 50	−12 58	33	C?	37	0.39	
19.1	+0.2	18 24 56	−12 07	27	S	10	0.5	
20.0	−0.2	18 28 07	−11 35	10	F	10	0.1	
20.4	+0.1	18 27 51	−11 00	8	S?	9?	0.1?	
21.0	−0.4	18 31 12	−10 47	9×7	S	1.1	0.6	
21.5	−0.9	18 33 33	−10 35	5	C	7	varies	
21.5	−0.1	18 30 50	−10 09	5	S	0.4	0.5	
21.6	−0.8	18 33 40	−10 25	13	S	1.4	0.5?	
21.8	−0.6	18 32 45	−10 08	20	S	65	0.56	Kes 69
22.7	−0.2	18 33 15	−09 13	26	S?	33	0.6	
23.3	−0.3	18 34 45	−08 48	27	S	70	0.5	W41
23.6	+0.3	18 33 03	−08 13	10?	?	8?	0.3	
24.7	−0.6	18 38 43	−07 32	15?	S?	8	0.5	
24.7	+0.6	18 34 10	−07 05	30×15	C?	20?	0.2?	
25.1	−2.3	18 45 10	−08 00	80×30?	S	8	0.5?	
27.4	+0.0	18 41 19	−04 56	4	S	6	0.68	4C−04.71
27.8	+0.6	18 39 50	−04 24	50×30	F	30	varies	
28.6	−0.1	18 43 55	−03 53	13×9	S	3?	?	
28.8	+1.5	18 39 00	−02 55	100?	S?	?	0.4?	
29.6	+0.1	18 44 52	−02 57	5	S	1.5?	0.5?	
29.7	−0.3	18 46 25	−02 59	3	C	10	0.63	Kes 75
30.7	−2.0	18 54 25	−02 54	16	?	0.5?	0.7?	
30.7	+1.0	18 44 00	−01 32	24×18	S?	6	0.4	
31.5	−0.6	18 51 10	−01 31	18?	S?	2?	?	
31.9	+0.0	18 49 25	−00 55	7×5	S	25	varies	3C391
32.0	−4.9	19 06 00	−03 00	60?	S?	22?	0.5?	3C396.1
32.1	−0.9	18 53 10	−01 08	40?	C?	?	?	
32.4	+0.1	18 50 05	−00 25	6	S	0.25?	?	
32.8	−0.1	18 51 25	−00 08	17	S?	11?	0.2?	Kes 78
33.2	−0.6	18 53 50	−00 02	18	S	3.5	varies	
33.6	+0.1	18 52 48	+00 41	10	S	20	0.51	Kes 79, 4C00.70, HC13
34.7	−0.4	18 56 00	+01 22	35×27	C	250	0.37	W44, 3C392
35.6	−0.4	18 57 15	+02 13	15×11	S?	9	0.5	
36.6	−0.7	19 00 35	+02 56	25?	S?	1.0	0.7?	
36.6	+2.6	18 48 49	+04 26	17×13?	S	0.7?	0.5?	
38.7	−1.3	19 06 40	+04 28	32×19?	S	?	?	
39.2	−0.3	19 04 08	+05 28	8×6	C	18	0.34	3C396, HC24, NRAO 593
39.7	−2.0	19 12 20	+04 55	120×60	?	85?	0.7?	W50, SS433
40.5	−0.5	19 07 10	+06 31	22	S	11	0.4	
41.1	−0.3	19 07 34	+07 08	4.5×2.5	S	25	0.50	3C397
41.5	+0.4	19 05 50	+07 46	10	S?	1?	?	
42.0	−0.1	19 08 10	+08 00	8	S?	0.5?	?	
42.8	+0.6	19 07 20	+09 05	24	S	3?	0.5?	
43.3	−0.2	19 11 08	+09 06	4×3	S	38	0.46	W49B
43.9	+1.6	19 05 50	+10 30	60?	S?	9.0	0.5	
45.7	−0.4	19 16 25	+11 09	22	S	4.2?	0.4?	
46.8	−0.3	19 18 10	+12 09	17×13	S	17	0.54	(HC30)
49.2	−0.7	19 23 50	+14 06	30	S?	160?	0.3?	(W51)
53.6	−2.2	19 38 50	+17 14	33×28	S	8	0.50	3C400.2, NRAO 611
54.1	+0.3	19 30 31	+18 52	12?	C?	0.5	0.1	
54.4	−0.3	19 33 20	+18 56	40	S	28	0.5	(HC40)
55.0	+0.3	19 32 00	+19 50	20×15?	S	0.5?	0.5?	
55.7	+3.4	19 21 20	+21 44	23	S	1?	0.3?	
57.2	+0.8	19 34 59	+21 57	12?	S?	1.8	0.62	(4C21.53)
59.5	+0.1	19 42 33	+23 35	15	S	3?	?	
59.8	+1.2	19 38 55	+24 19	20×16?	?	1.5	0.0	
63.7	+1.1	19 47 52	+27 45	8	F	1.8	0.24	
64.5	+0.9	19 50 25	+28 16	8	S?	0.15?	0.5	
65.1	+0.6	19 54 40	+28 35	90×50	S	5.5	0.61	

Table 1. (continued).

l	b	RA (J2000) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
65.3	+5.7	19 33 00	+31 10	310×240	S?	42	0.6	
65.7	+1.2	19 52 10	+29 26	22	F	5.1	varies	DA 495
65.8	−0.5	19 59 20	+28 38	10×6?	S	?	?	
66.0	−0.0	19 57 50	+29 03	31×25?	S	?	?	
67.6	+0.9	19 57 45	+30 53	50×45?	S	?	?	
67.7	+1.8	19 54 32	+31 29	15×12	S	1.0	0.61	
67.8	+0.5	20 00 00	+30 51	7×5	?	?	?	
68.6	−1.2	20 08 40	+30 37	23	?	1.1	0.2	
69.0	+2.7	19 53 20	+32 55	80?	?	120?	varies	CTB 80
69.7	+1.0	20 02 40	+32 43	16×14	S	2.0	0.7	
73.9	+0.9	20 14 15	+36 12	27	S?	9	0.23	
74.0	−8.5	20 51 00	+30 40	230×160	S	210	varies	Cygnus Loop
74.9	+1.2	20 16 02	+37 12	8×6	F	9	varies	CTB 87
76.9	+1.0	20 22 20	+38 43	9	C	2?	?	
78.2	+2.1	20 20 50	+40 26	60	S	320	0.51	DR4, γ Cygni SNR
82.2	+5.3	20 19 00	+45 30	95×65	S	120?	0.5?	W63
83.0	−0.3	20 46 55	+42 52	9×7	S	1	0.4	
84.2	−0.8	20 53 20	+43 27	20×16	S	11	0.5	
85.4	+0.7	20 50 40	+45 22	24?	S	?	0.2	
85.9	−0.6	20 58 40	+44 53	24	S	?	0.2	
89.0	+4.7	20 45 00	+50 35	120×90	S	220	0.38	HB21
93.3	+6.9	20 52 25	+55 21	27×20	C?	9	0.45	DA 530, 4C(T)55.38.1
93.7	−0.2	21 29 20	+50 50	80	S	65	0.65	CTB 104A, DA 551
94.0	+1.0	21 24 50	+51 53	30×25	S	13	0.45	3C434.1
96.0	+2.0	21 30 30	+53 59	26	S	0.35	0.6	
106.3	+2.7	22 27 30	+60 50	60×24	C?	6	0.6	
108.2	−0.6	22 53 40	+58 50	70×54	S	8	0.5	
109.1	−1.0	23 01 35	+58 53	28	S	22	0.45	CTB 109
111.7	−2.1	23 23 26	+58 48	5	S	2720	0.77	Cassiopeia A, 3C461
113.0	+0.2	23 36 35	+61 22	40×17?	?	4	0.5?	
114.3	+0.3	23 37 00	+61 55	90×55	S	5.5	0.5	
116.5	+1.1	23 53 40	+63 15	80×60	S	10	0.5	
116.9	+0.2	23 59 10	+62 26	34	S	8	0.57	CTB 1
119.5	+10.2	00 06 40	+72 45	90?	S	36	0.6	CTA 1
120.1	+1.4	00 25 18	+64 09	8	S	56	0.58	Tycho, 3C10, SN1572
126.2	+1.6	01 22 00	+64 15	70	S?	6	0.5	
127.1	+0.5	01 28 20	+63 10	45	S	12	0.45	R5
130.7	+3.1	02 05 41	+64 49	9×5	F	33	0.07	3C58, SN1181
132.7	+1.3	02 17 40	+62 45	80	S	45	0.6	HB3
152.4	−2.1	04 07 50	+49 11	100×95	S	3.5?	0.7?	
156.2	+5.7	04 58 40	+51 50	110	S	5	0.5	
159.6	+7.3	05 20 00	+50 00	240×180?	S	?	?	
160.9	+2.6	05 01 00	+46 40	140×120	S	110	0.64	HB9
166.0	+4.3	05 26 30	+42 56	55×35	S	7	0.37	VRO 42.05.01
178.2	−4.2	05 35 05	+28 11	72×62	S	2	0.5	
179.0	+2.6	05 53 40	+31 05	70	S?	7	0.4	
180.0	−1.7	05 39 00	+27 50	180	S	65	varies	S147
182.4	+4.3	06 08 10	+29 00	50	S	0.5	0.4	
184.6	−5.8	05 34 31	+22 01	7×5	F	1040	0.30	Crab Nebula, 3C144, SN1054
189.1	+3.0	06 17 00	+22 34	45	C	160	0.36	IC443, 3C157
190.9	−2.2	06 01 55	+18 24	70×60	S	1.3?	0.7?	
192.8	−1.1	06 09 20	+17 20	78	S	20?	0.6?	PKS 0607+17
205.5	+0.5	06 39 00	+06 30	220	S	140	0.4	Monoceros Nebula
206.9	+2.3	06 48 40	+06 26	60×40	S?	6	0.5	PKS 0646+06
213.0	−0.6	06 50 50	−00 30	160×140?	S	21	0.4	
260.4	−3.4	08 22 10	−43 00	60×50	S	130	0.5	Puppis A, MSH 08−4*4*
261.9	+5.5	09 04 20	−38 42	40×30	S	10?	0.4?	
263.9	−3.3	08 34 00	−45 50	255	C	1750	varies	Vela (XYZ)
266.2	−1.2	08 52 00	−46 20	120	S	50?	0.3?	RX J0852.0−4622
272.2	−3.2	09 06 50	−52 07	15?	S?	0.4	0.6	

Table 1. (continued).

l	*b*	RA (J2000) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
279.0	+1.1	09 57 40	−53 15	95	S	30?	0.6?	
284.3	−1.8	10 18 15	−59 00	24?	S	11?	0.3?	MSH 10−5*3*
286.5	−1.2	10 35 40	−59 42	26×6	S?	1.4?	?	
289.7	−0.3	11 01 15	−60 18	18×14	S	6.2	0.2?	
290.1	−0.8	11 03 05	−60 56	19×14	S	42	0.4	MSH 11−6*1*A
291.0	−0.1	11 11 54	−60 38	15×13	C	16	0.29	(MSH 11−6*2*)
292.0	+1.8	11 24 36	−59 16	12×8	C	15	0.4	MSH 11−5*4*
292.2	−0.5	11 19 20	−61 28	20×15	S	7	0.5	
293.8	+0.6	11 35 00	−60 54	20	C	5?	0.6?	
294.1	−0.0	11 36 10	−61 38	40	S	>2?	?	
296.1	−0.5	11 51 10	−62 34	37×25	S	8?	0.6?	
296.5	+10.0	12 09 40	−52 25	90×65	S	48	0.5	PKS 1209−51/52
296.7	−0.9	11 55 30	−63 08	15×8	S	3	0.5	
296.8	−0.3	11 58 30	−62 35	20×14	S	9	0.6	1156−62
298.5	−0.3	12 12 40	−62 52	5?	?	5?	0.4?	
298.6	−0.0	12 13 41	−62 37	12×9	S	5?	0.3	
299.2	−2.9	12 15 13	−65 30	18×11	S	0.5?	?	
299.6	−0.5	12 21 45	−63 09	13	S	1.0?	?	
301.4	−1.0	12 37 55	−63 49	37×23	S	2.1?	?	
302.3	+0.7	12 45 55	−62 08	17	S	5?	0.4?	
304.6	+0.1	13 05 59	−62 42	8	S	14	0.5	Kes 17
306.3	−0.9	13 21 50	−63 34	4	S?	0.16?	0.5?	
308.1	−0.7	13 37 37	−63 04	13	S	1.2?	?	
308.4	−1.4	18 41 30	−63 44	12×6?	S?	0.4?	?	
308.8	−0.1	13 42 30	−62 23	30×20?	C?	15?	0.4?	
309.2	−0.6	13 46 31	−62 54	15×12	S	7?	0.4?	
309.8	+0.0	13 50 30	−62 05	25×19	S	17	0.5	
310.6	−1.6	14 00 45	−63 26	2.5	C?	?	?	
310.6	−0.3	13 58 00	−62 09	8	S	5?	?	Kes 20B
310.8	−0.4	14 00 00	−62 17	12	S	6?	?	Kes 20A
311.5	−0.3	14 05 38	−61 58	5	S	3?	0.5	
312.4	−0.4	14 13 00	−61 44	38	S	45	0.36	
312.5	−3.0	14 21 00	−64 12	20×18	S	3.5?	?	
315.1	+2.7	14 24 30	−57 50	190×150	S	?	?	
315.4	−2.3	14 43 00	−62 30	42	S	49	0.6	RCW 86, MSH 14−6*3*
315.4	−0.3	14 35 55	−60 36	24×13	?	8	0.4	
315.9	−0.0	14 38 25	−60 11	25×14	S	0.8?	?	
316.3	−0.0	14 41 30	−60 00	29×14	S	20?	0.4	(MSH 14−57)
317.3	−0.2	14 49 40	−59 46	11	S	4.7?	?	
318.2	+0.1	14 54 50	−59 04	40×35	S	>3.9?	?	
318.9	+0.4	14 58 30	−58 29	30×14	C	4?	0.2?	
320.4	−1.2	15 14 30	−59 08	35	C	60?	0.4	MSH 15−5*2*, RCW 89
320.6	−1.6	15 17 50	−59 16	60×30	S	?	?	
321.9	−1.1	15 23 45	−58 13	28	S	>3.4?	?	
321.9	−0.3	15 20 40	−57 34	31×23	S	13	0.3	
322.1	+0.0	15 20 49	−57 10	8×4.5?	S?	?	?	
322.5	−0.1	15 23 23	−57 06	15	C	1.5	0.4	
323.5	+0.1	15 28 42	−56 21	13	S	3?	0.4?	
326.3	−1.8	15 53 00	−56 10	38	C	145	varies	MSH 15−5*6*
327.1	−1.1	15 54 25	−55 09	18	C	7?	?	
327.2	−0.1	15 50 55	−54 18	5	S	0.4	?	
327.4	+0.4	15 48 20	−53 49	21	S	30?	0.6	Kes 27
327.4	+1.0	15 46 48	−53 20	14	S	1.9?	?	
327.6	+14.6	15 02 50	−41 56	30	S	19	0.6	SN1006, PKS 1459−41
328.4	+0.2	15 55 30	−53 17	5	F	15	0.0	(MSH 15−57)
329.7	+0.4	16 01 20	−52 18	40×33	S	>34?	?	
330.0	+15.0	15 10 00	−40 00	180?	S	350?	0.5?	Lupus Loop
330.2	+1.0	16 01 06	−51 34	11	S?	5?	0.3	
332.0	+0.2	16 13 17	−50 53	12	S	8?	0.5	
332.4	−0.4	16 17 33	−51 02	10	S	28	0.5	RCW 103

Table 1. (continued).

l	b	RA (J2000) (h m s)	Dec (° ′)	size /arcmin	type	Flux at 1 GHz/Jy	spectral index	other name(s)
332.4	+0.1	16 15 20	−50 42	15	S	26	0.5	MSH 16−5*1*, Kes 32
332.5	−5.6	16 43 20	−54 30	35	S	2?	0.7?	
335.2	+0.1	16 27 45	−48 47	21	S	16	0.5	
336.7	+0.5	16 32 11	−47 19	14×10	S	6	0.5	
337.0	−0.1	16 35 57	−47 36	1.5	S	1.5	0.6?	(CTB 33)
337.2	−0.7	16 39 28	−47 51	6	S	1.5	0.4	
337.2	+0.1	16 35 55	−47 20	3×2	?	1.5?	?	
337.3	+1.0	16 32 39	−46 36	15×12	S	16	0.55	Kes 40
337.8	−0.1	16 39 01	−46 59	9×6	S	18	0.5	Kes 41
338.1	+0.4	16 37 59	−46 24	15?	S	4?	0.4	
338.3	−0.0	16 41 00	−46 34	8	C?	7?	?	
338.5	+0.1	16 41 09	−46 19	9	?	12?	?	
340.4	+0.4	16 46 31	−44 39	10×7	S	5	0.4	
340.6	+0.3	16 47 41	−44 34	6	S	5?	0.4?	
341.2	+0.9	16 47 35	−43 47	22×16	C	1.5?	0.6?	
341.9	−0.3	16 55 01	−44 01	7	S	2.5	0.5	
342.0	−0.2	16 54 50	−43 53	12×9	S	3.5?	0.4?	
342.1	+0.9	16 50 43	−43 04	10×9	S	0.5?	?	
343.0	−6.0	17 25 00	−46 30	250	S	?	?	RCW 114
343.1	−2.3	17 08 00	−44 16	32?	C?	8?	0.5?	
343.1	−0.7	17 00 25	−43 14	27×21	S	7.8	0.55	
344.7	−0.1	17 03 51	−41 42	8	C?	2.5?	0.3?	
345.7	−0.2	17 07 20	−40 53	6	S	0.6?	?	
346.6	−0.2	17 10 19	−40 11	8	S	8?	0.5?	
347.3	−0.5	17 13 50	−39 45	65×55	S?	30?	?	RX J1713.7−3946
348.5	−0.0	17 15 26	−38 28	10?	S?	10?	0.4?	
348.5	+0.1	17 14 06	−38 32	15	S	72	0.3	CTB 37A
348.7	+0.3	17 13 55	−38 11	17?	S	26	0.3	CTB 37B
349.2	−0.1	17 17 15	−38 04	9×6	S	1.4?	?	
349.7	+0.2	17 17 59	−37 26	2.5×2	S	20	0.5	
350.0	−2.0	17 27 50	−38 32	45	S	26	0.4	
350.1	−0.3	17 17 40	−37 24	4?	?	6?	0.8?	
351.2	+0.1	17 22 27	−36 11	7	C?	5?	0.4	
351.7	+0.8	17 21 00	−35 27	18×14	S	10	0.5?	
351.9	−0.9	17 28 52	−36 16	12×9	S	1.8?	?	
352.7	−0.1	17 27 40	−35 07	8×6	S	4	0.6	
353.6	−0.7	17 32 00	−34 44	30	S	2.5?	?	
353.9	−2.0	17 38 55	−35 11	13	S	1?	0.5?	
354.1	+0.1	17 30 28	−33 46	15×3?	C?	?	varies	
354.8	−0.8	17 36 00	−33 42	19	S	2.8?	?	
355.4	+0.7	17 31 20	−32 26	25	S	5?	?	
355.6	−0.0	17 35 16	−32 38	8×6	S	3?	?	
355.9	−2.5	17 45 53	−33 43	13	S	8	0.5	
356.2	+4.5	17 19 00	−29 40	25	S	4	0.7	
356.3	−1.5	17 42 35	−32 52	20×15	S	3?	?	
356.3	−0.3	17 37 56	−32 16	11×7	S	3?	?	
357.7	−0.1	17 40 29	−30 58	8×3?	?	37	0.4	MSH 17−3*9*
357.7	+0.3	17 38 35	−30 44	24	S	10	0.4?	
358.0	+3.8	17 26 00	−28 36	38	S	1.5?	?	
358.1	+0.1	17 37 00	−29 59	20	S	2?	?	
358.5	−0.9	17 46 10	−30 40	17	S	4?	?	
359.0	−0.9	17 46 50	−30 16	23	S	23	0.5	
359.1	−0.5	17 45 30	−29 57	24	S	14	0.4?	
359.1	+0.9	17 39 36	−29 11	12×11	S	2?	?	

3. SNRs added to/objects removed from the catalogue

The following remnants have been added to the catalogue since the last published version (Green 2009a).

- G35·6−0·4, which was re-identified as a SNR by Green (2009b) from radio and infra-red survey observations. This source had been listed in several SNR catalogues Milne (1970); Downes (1971); Ilovaisky & Lequeux (1972); Milne (1979). But Caswell & Clark (1975) derived a thermal radio index for it, and regarded it as an H II region, not a SNR, and hence it was not listed in earlier versions of this catalogue.

- G64·5+0·9, a shell remnant, which was identified from radio observations by Hurley-Walker et al. (2009). (This source had previously been reported as a possible SNR by Tian & Leahy 2006).

- G159·6+7·3, a large optical shell remnant identified by Fesen & Milisavljevic (2010).

- G310·6−1·6, a small X-ray remnant with an X-ray pulsar, identified by Renaud et al. (2010).

- G21·6−0·8, a faint shell remnant found in the radio by Bietenholz et al. (2011).

- Two faint shell remnants – G25·1−2·3 and G178·2−4·2 – found by Gao et al. (2011) in radio surveys.

- G41·5+0·4 and G42·0−0·1, which are two of three possible remnants suggested by Kaplan et al. (2002), as they have had the non-thermal nature of their radio emission confirmed by Alves et al. (2012).

- G213·0−0·6, a large, faint radio shell first reported as a possible SNR by Reich, Zhang & Fürst (2003), for which optical filaments have been recently detected by Stupar & Parker (2012). Note that Stupar & Parker re-designated this remnant as G213·3−0·4, but following IAU recommendations (Dickel, Lortet & de Boer 1987) I have retained the original name.

- G296·7−0·9 – which had been proposed as a possible SNR by Schaudel et al. (2002) – was confirmed as a remnant by Robbins et al. (2012), using radio and X-ray observations.

- G308·4−1·4, identified as a SNR by Prinz & Becker (2012) from radio and X-ray observations. But also see Hui et al. (2012) and De Horta et al. (2013), who regard only the eastern portion of this as a smaller SNR G308.3−1.4 (which had previously been noted as a possible remnant by Schaudel et al. 2002).

- Five shell remnants – G38·7−1·3, G65·8−0·5, G66·0−0·0, G67·6+0·9 and G67·8+0·5 – identified by Sabin et al. (2013) from a Galactic Hα survey, which also have radio emission. One or possibly two of these sources have previously been reported as possible SNRs. Schaudel et al. (2002) reported X-ray and radio emission from G38.7−1.4, which is the brighter eastern part of G38·7−1·3. Trushkin (2001) listed G67.8+0.8 as a possible SNR,

based on its extended emission seen in the NRAO VLA Sky Survey (NVSS; Condon et al. 1998), which may be part of G67·6+0·9.

- G152·4−2·1 and G190·9−2·2, two faint radio shell SNRs found by Foster et al. (2013). Note that the centres of these remnants are offset slightly from the nominal positions given by the names given to these remnants by Foster et al.

- G306·3−0·9, a small remnant identified by Reynolds et al. (2013) from X-ray and radio observations.

- G322·1+0·0, a distorted radio/X-ray shell surrounding Cir X-1 identified by Heinz et al. (2013).

G16·8−1·1 has been removed from this version of the catalogue, as Sun et al. (2011) identify it as probably an H ɪɪ region, rather than a SNR; see also Stupar & Parker (2011), who also questioned the SNR identification for this source.

4. Discussion

There are 20 Galactic SNRs that are either not detected at radio wavelengths, or are poorly defined by current radio observations, so that their flux density at 1 GHz cannot be determined with any confidence: i.e. 93% of the remnants have a flux density at 1 GHz included in the catalogue. Of the catalogued remnants, $\approx 40\%$ are detected in X-ray, and $\approx 30\%$ in the optical. At both of these wavebands Galactic absorption hampers the detection of distant remnants.

In the current version of the catalogue, 79% of remnants are classified as shell (or possible shell), 12% are composite (or possible composite), and just 5% are filled-centre (or possible filled centre) remnants. The types of the remaining remnants are not clear from current observations, or else they are objects which are conventionally regarded as SNRs although they do not fit well into any of the conventional types (e.g. CTB80 (=G69·0+2·7), MSH 17−39 (=G357·7−0·1)).

In previous papers (e.g. Green 1991, 2005) I have discussed the selection effects that apply to the identification of Galactic SNRs, which are dominated by those that apply at radio wavelengths. These are: (i) difficulty in finding low surface brightness remnants, and (ii) difficulty in finding small angular size remnants, which are not resolved in available wide-area Galactic surveys. In Green (2005) I derived a surface brightnesses completeness limit of $\Sigma \approx 10^{-20}$ W $m^{-2}\,Hz^{-1}\,sr^{-1}$, at 1 GHz. This limit was used in Green (2014) to select a sample of 68 brighter SNRs from the previous 2009 version of the catalogue, and then derive constraints on the distribution of remnants with Galactocentric radius. Of the new remnants added to the catalogue in this revision, 9 do not currently have integrated radio flux densities. For example, the five remnants identified by Sabin et al. (2013) do have radio observations available, but from the NVSS (Condon et al. 1998) and the PMN survey (Griffith & Wright 1993), which filter large scale structure, so that they do not provide integrated flux densities. Of the other 12 new SNRs, none is above the nominal completeness limit used in Green (2014). Also, the one object removed, G16·8−1·1, was

also below this limit. However, revision of the sizes and flux densities means that two remnants (G20·4+0·1 and G46·8−0·3) that were not in the sample of brighter remnants now are, and one (G54·1+0·3) is no longer. Hence the previously derived constraints on the distribution of Galactic SNRs is not be strongly affected by this revision of the catalogue (especially since G46·8−0·3 and G54·1+0·3 are close in Galactic longitude).

It should be noted that the catalogue is far from homogeneous. Although many remnants, or possible remnants, were first identified from wide-area radio surveys, there are many others that have been observed with diverse observational parameters, making uniform criteria for inclusion in the main catalogue difficult.

Acknowledgements

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