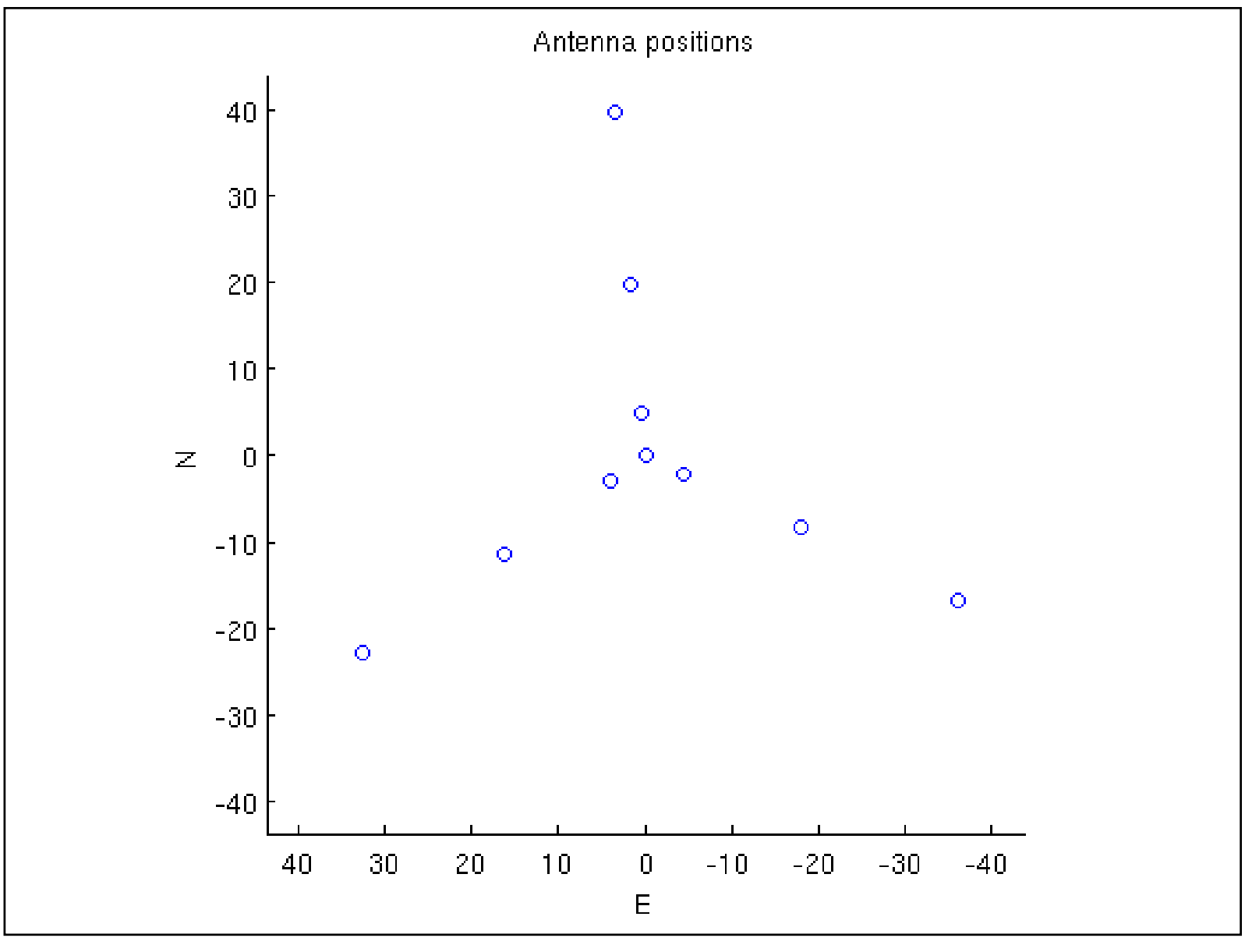
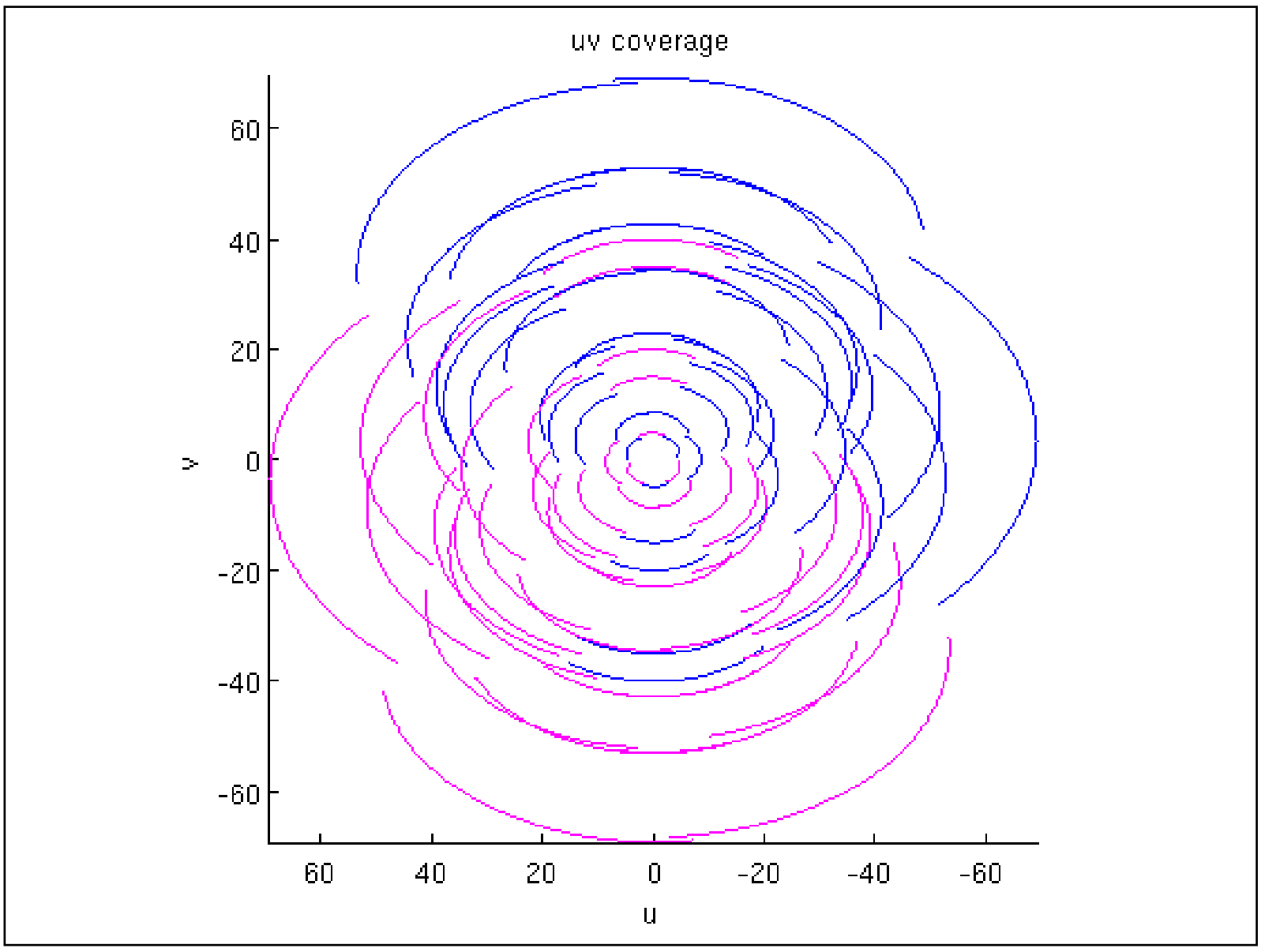
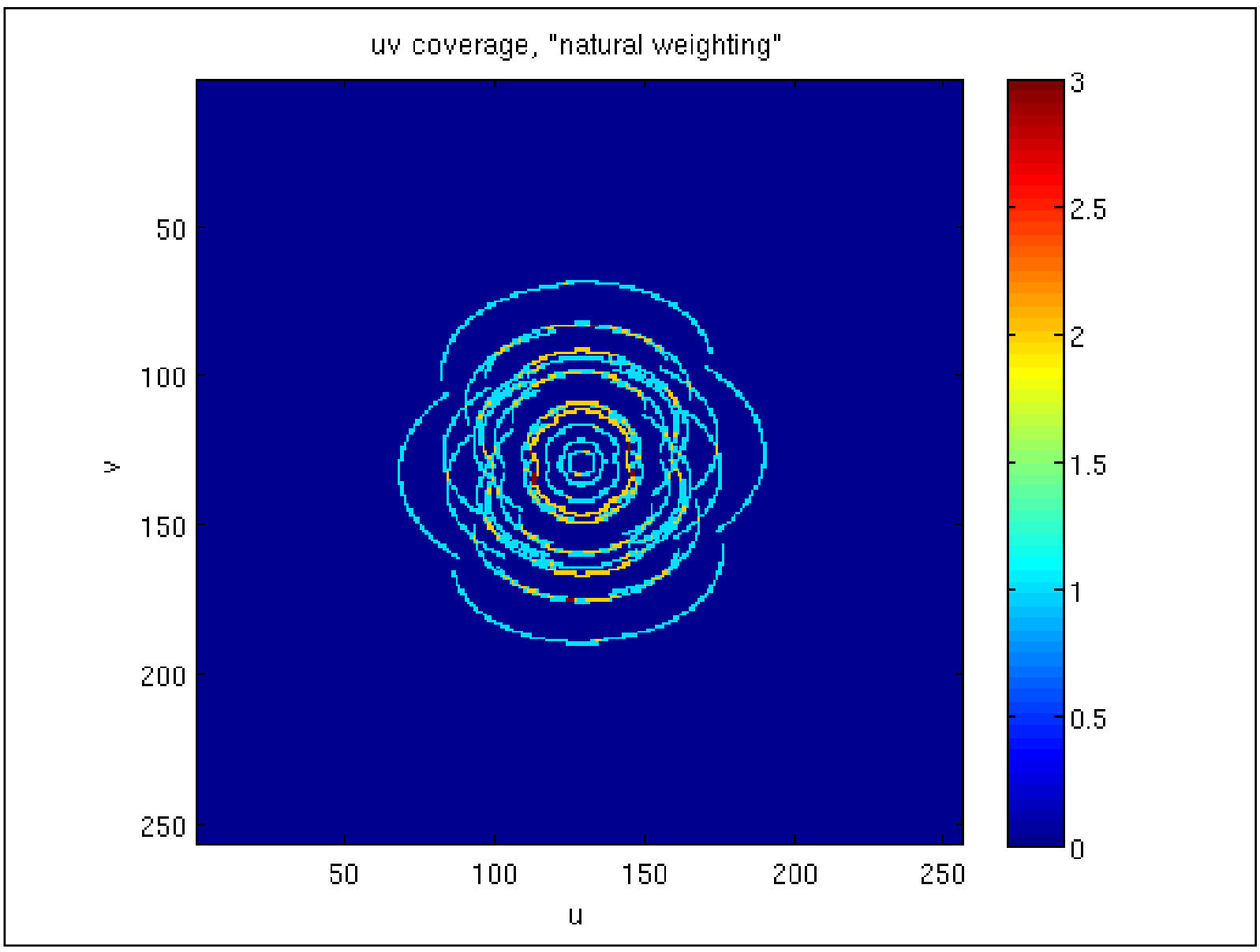
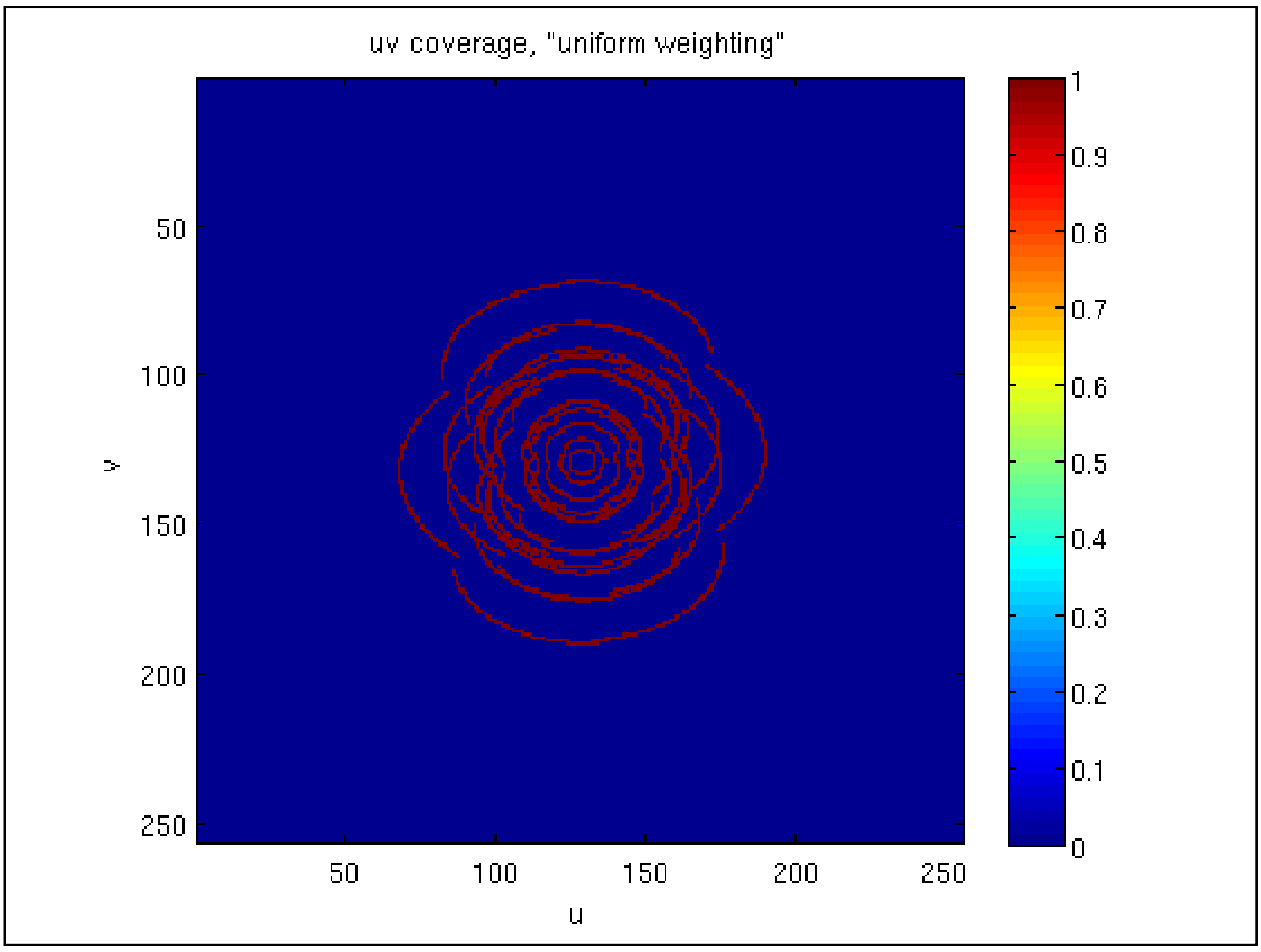
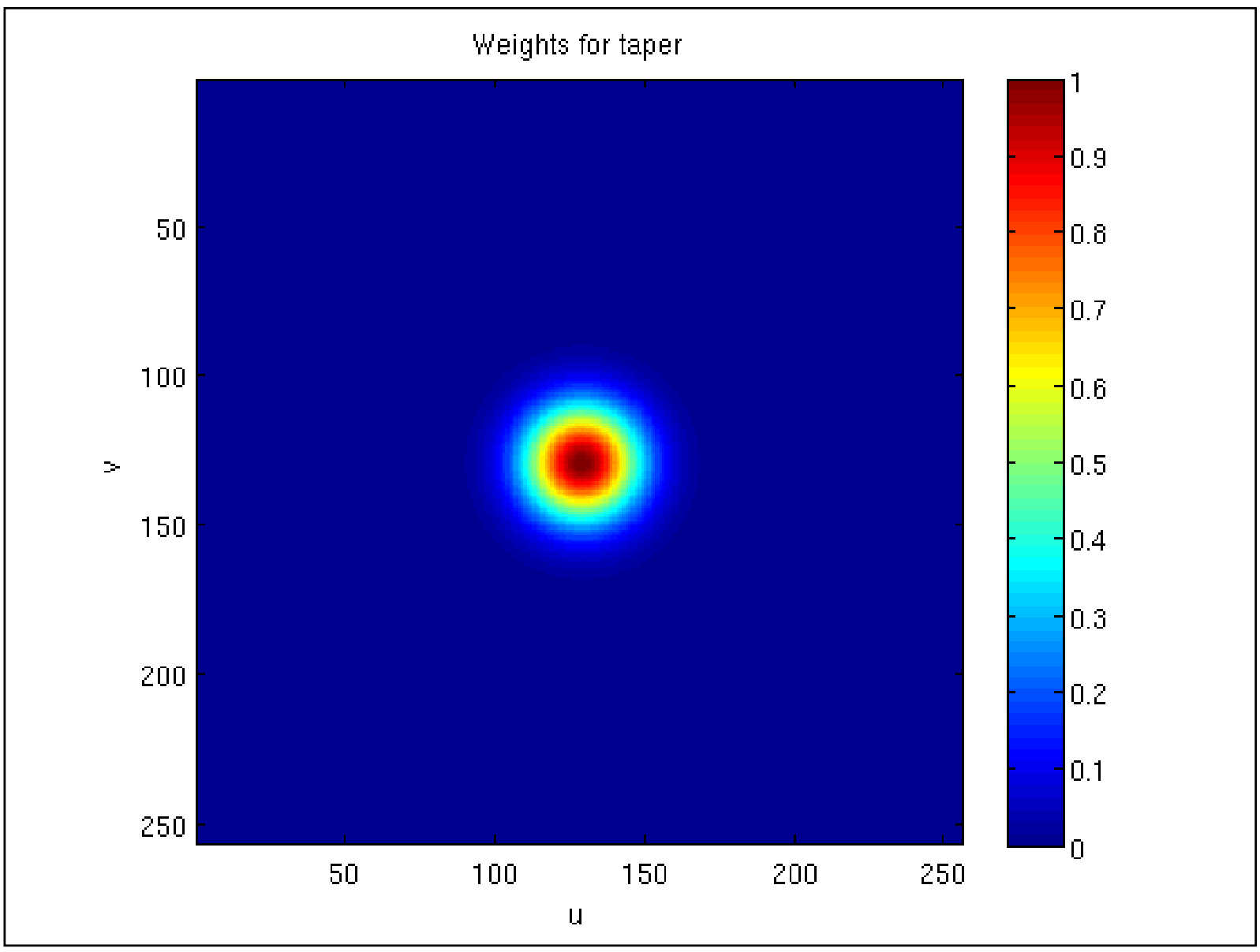
uvAndBeams, Wye, dec 40

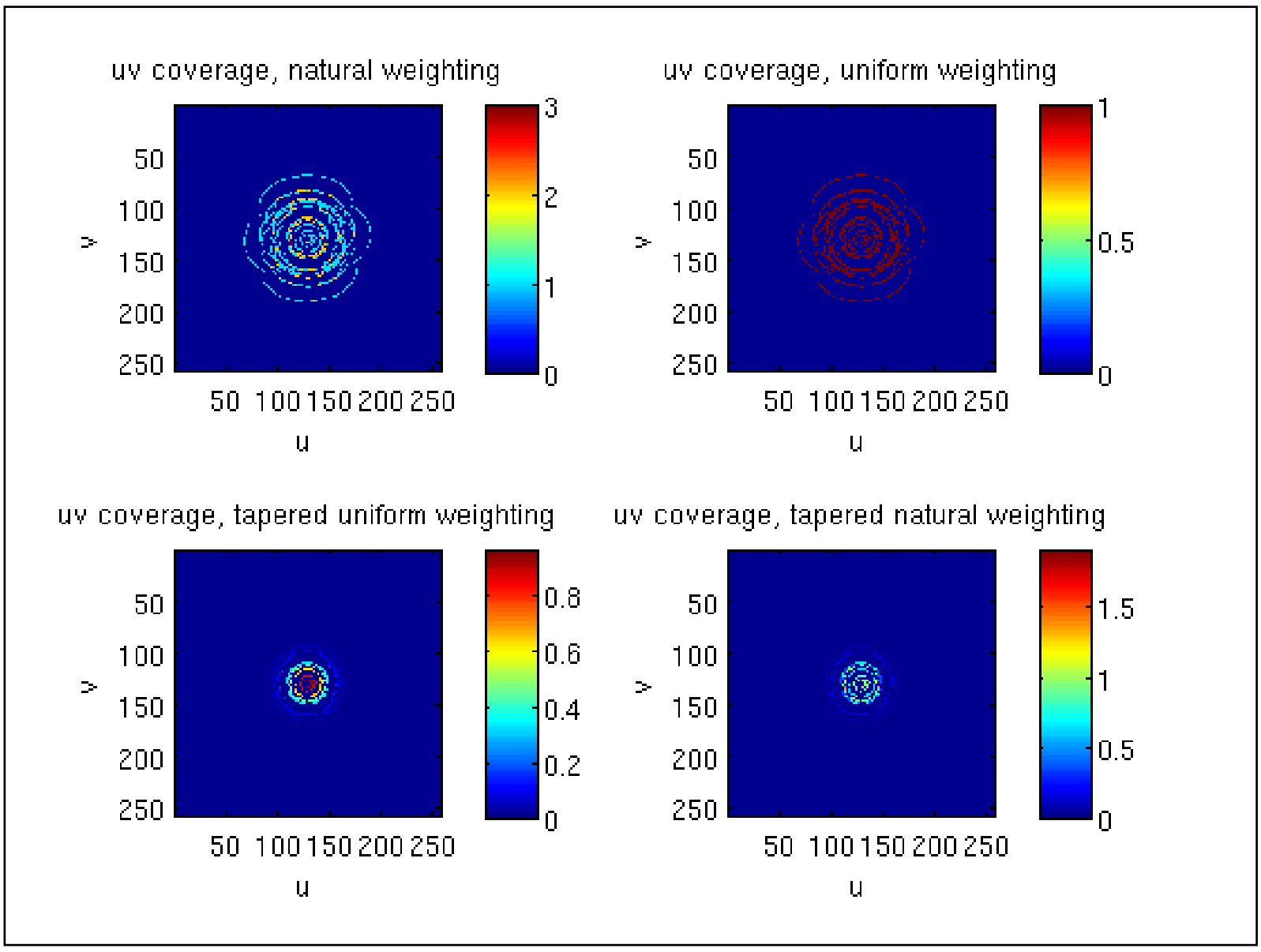


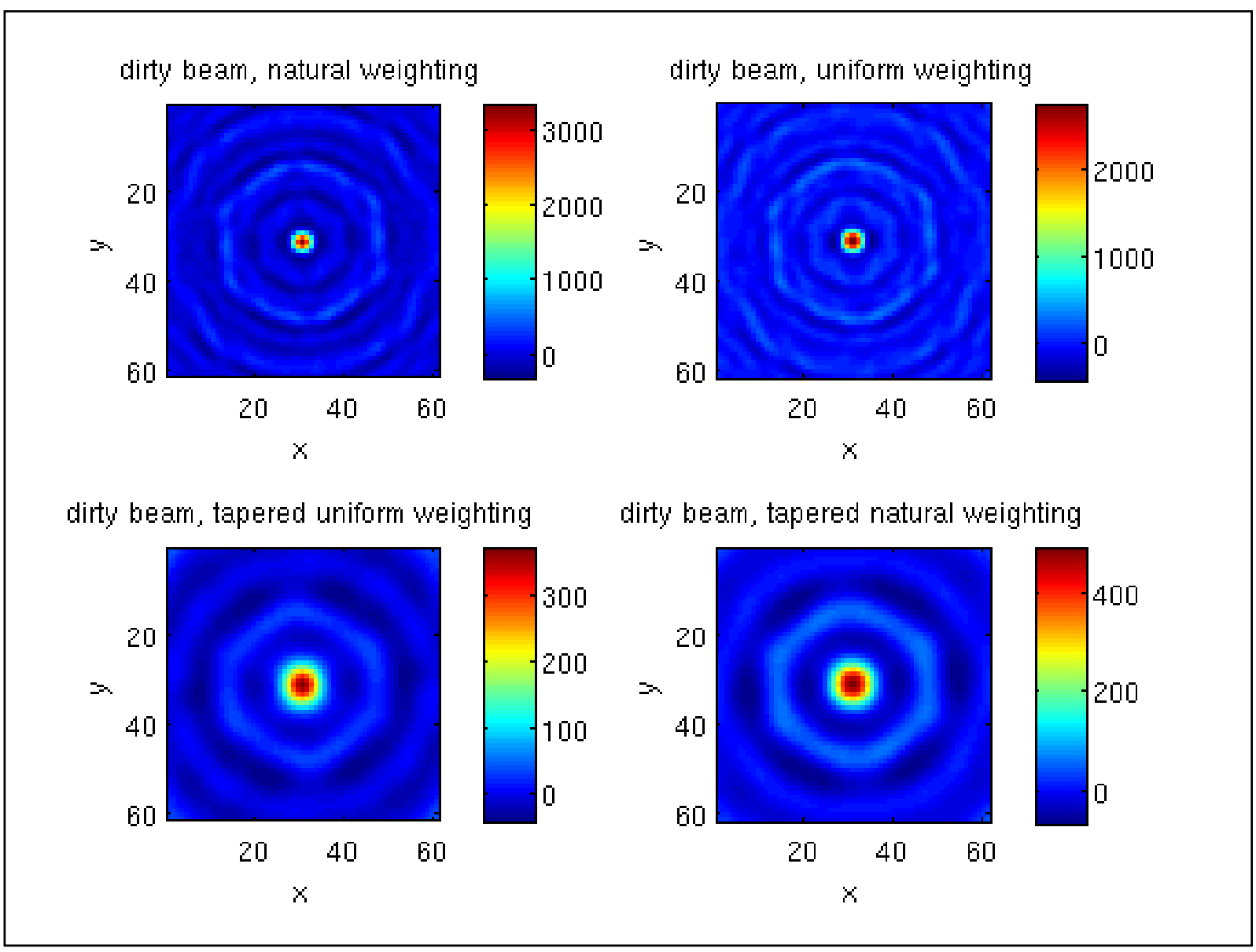

uv coverage
60
40
20
0
-20
-40
-60
v
60
40
20
0
-20
-40
-60
u


uv coverage, "natural weighting"
50
100
150
200
250
v
50
100
150
200
250
u
3
2.5
2
1.5
1
0.5
0


uv coverage, "uniform weighting"
50
100
150
200
250
v
50
100
150
200
250
u
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0


Weights for taper
50
100
150
200
250
v
50
100
150
200
250
u
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0


uv coverage, natural weighting
v
u
50 100 150 200 250
3
2
1
0
uv coverage, uniform weighting
1
0.5
0
uv coverage, tapered uniform weighting
0.8
0.6
0.4
0.2
uv coverage, tapered natural weighting
1.5


dirty beam, natural weighting
y
x
20 40 60
3000
2000
1000
0
dirty beam, uniform weighting
dirty beam, tapered uniform weighting
300
200
100
dirty beam, tapered natural weighting
400

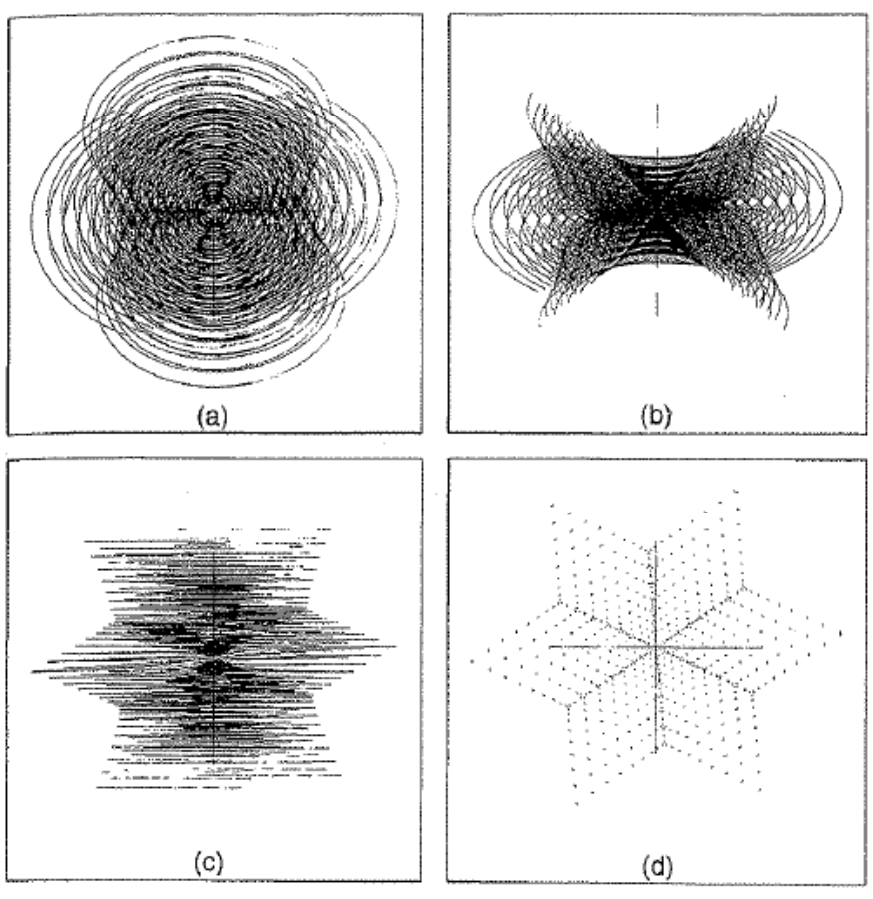


Figure 5.18 Spatial frequency coverage for the VLA with the power-law configuration of Fig. 5.17b: (a) $\delta = 45°$; (b) $\delta = 30°$; (c) $\delta = 0°$; (d) snapshot at zenith. The range of hour angle is ±4 h or as limited by a minimum pointing elevation of 9°, and ±5 min for the snapshot. The lengths of the (u, v) axes from the origin represent the maximum distance of an antenna from the array center, that is, 21 km for the largest configuration. From Napier, Thompson, and Ekers (1983), ©1983 IEEE.

Thomson, Moran & Swenson 2001

CLEAN

I. Compute the DM and the DB by standard Fourier inversion methods. The weights g should be chosen in such a way that the main lobe of the DB becomes a good fit to the selected CB.

II. Subtract over the whole map a DB pattern which is centered at the point at which the DM has its maximum absolute value $|I_o|$ and which is normalized to γI_o at the beam center. The fraction γ will be called the *loop gain*.

III. Repeat step II, each time replacing the DM by the remaining map from the previous iteration. Stop the iterations when the current value of I_o is no longer significant in view of the general noise level on the map.

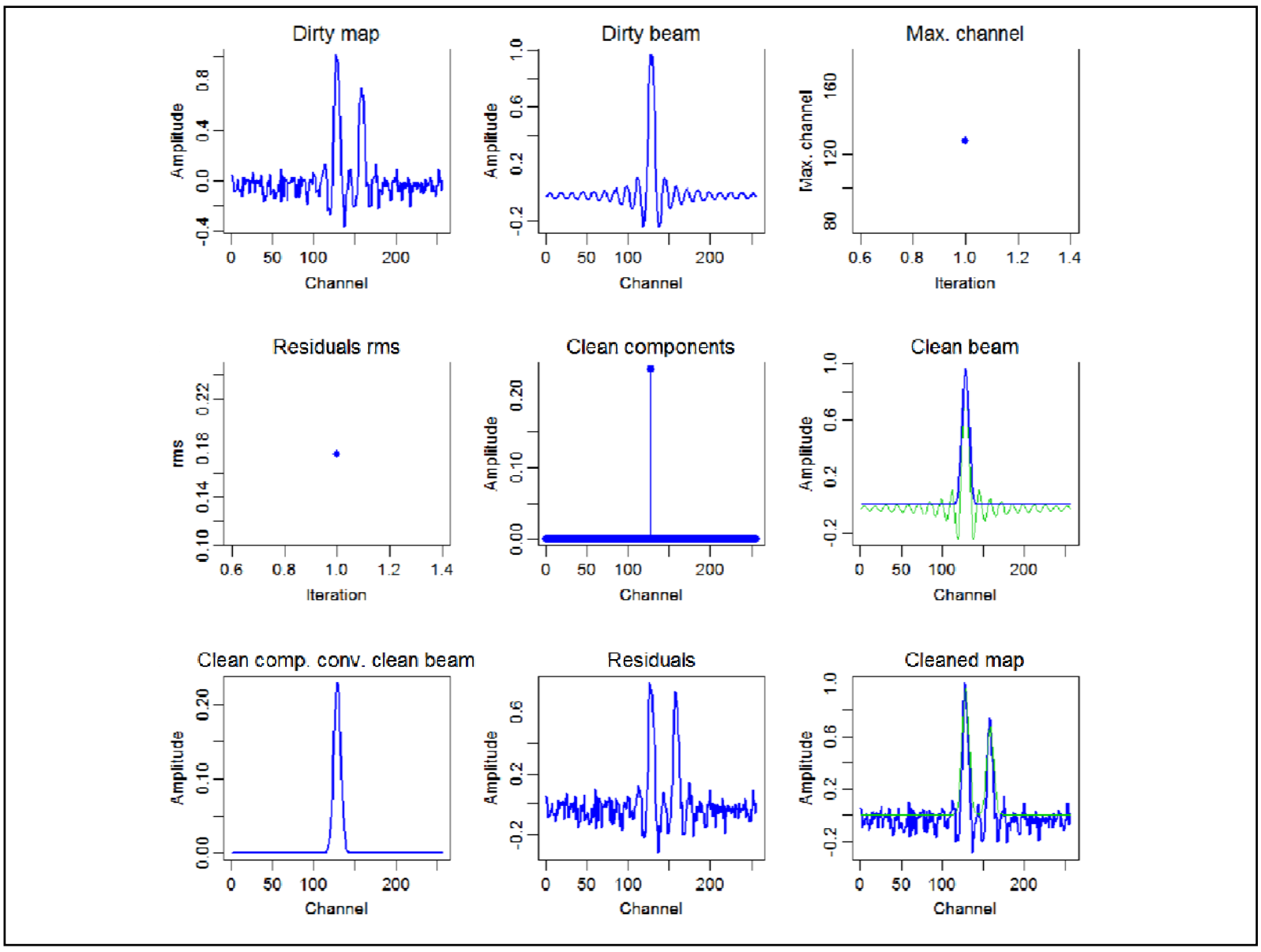
IV. Return to the final remaining map all those components that were removed in step II, but do this in the form of clean beams with the appropriate positions and amplitudes.

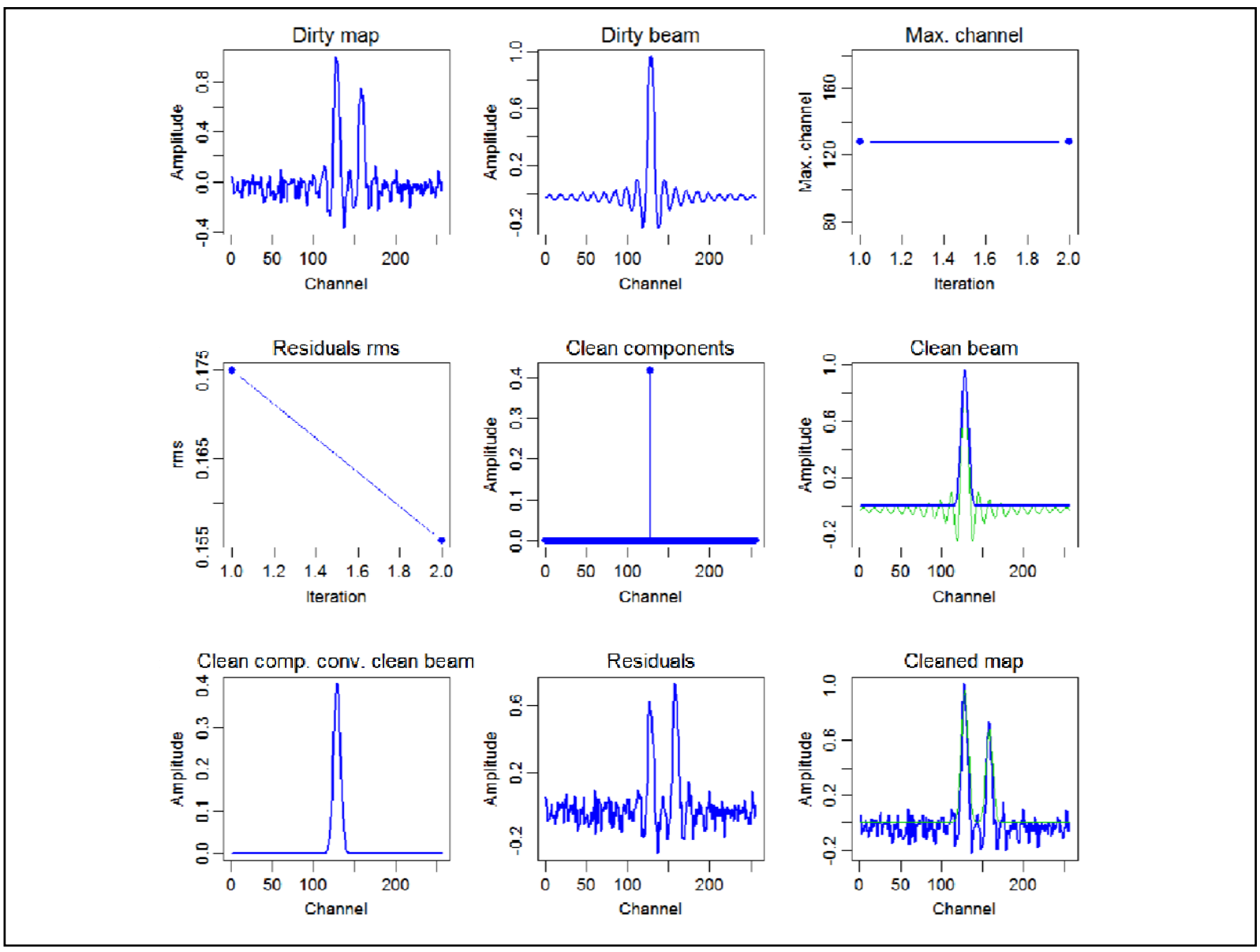
Hogbom (1974)

CLEAN: two sincs with noise

cleanDemo.r

clean1.dat


Dirty map
Amplitude
Channel
Dirty beam
Amplitude
Channel
Max. channel
Max. channel
Iteration
Residuals rms
rms
Iteration
Clean components
Amplitude
Channel
Clean beam
Amplitude
Channel
Clean comp. conv. clean beam
Amplitude
Channel
Residuals
Amplitude
Channel
Cleaned map
Amplitude
Channel


Dirty map
Amplitude
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Dirty beam
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Iteration
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Iteration
Clean components
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Clean comp. conv. clean beam
Amplitude
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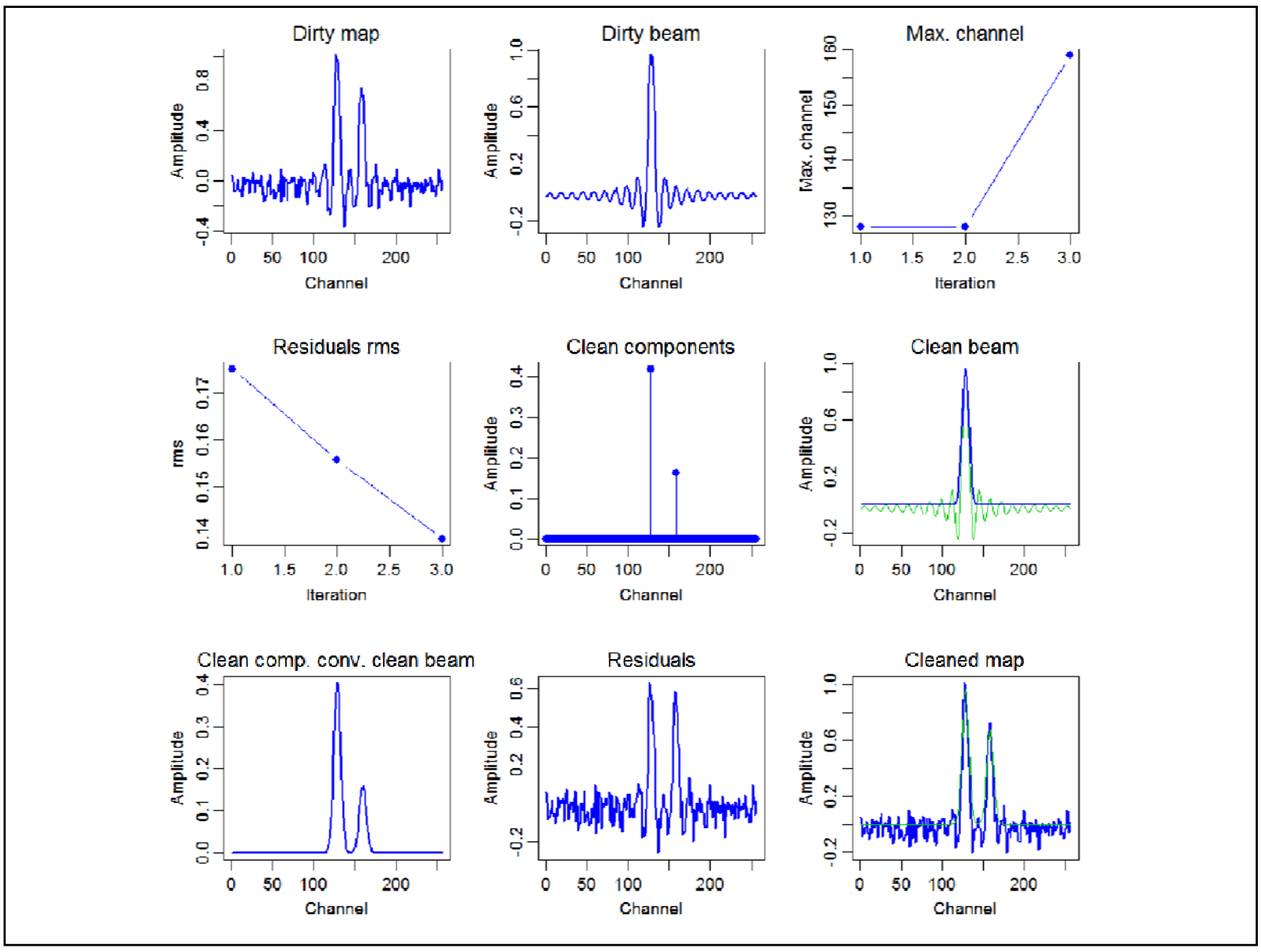
Residuals
Amplitude
Channel
Cleaned map
Amplitude
Channel


Dirty map
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Dirty beam
Amplitude
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Max. channel
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Iteration
Residuals rms
rms
Iteration
Clean components
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Clean comp. conv. clean beam
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Residuals
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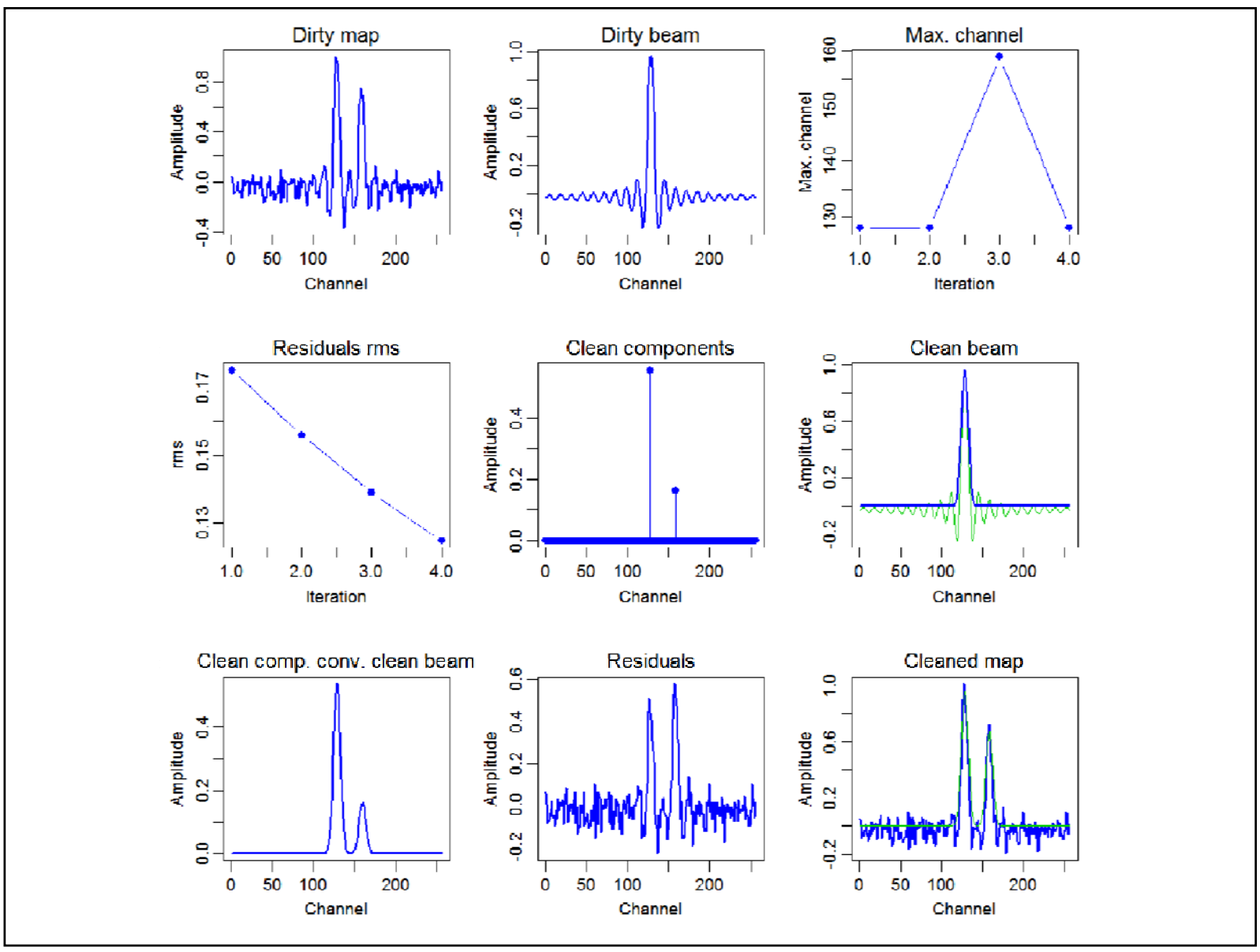
Cleaned map
Amplitude
Channel


Dirty map
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Clean components
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Clean comp. conv. clean beam
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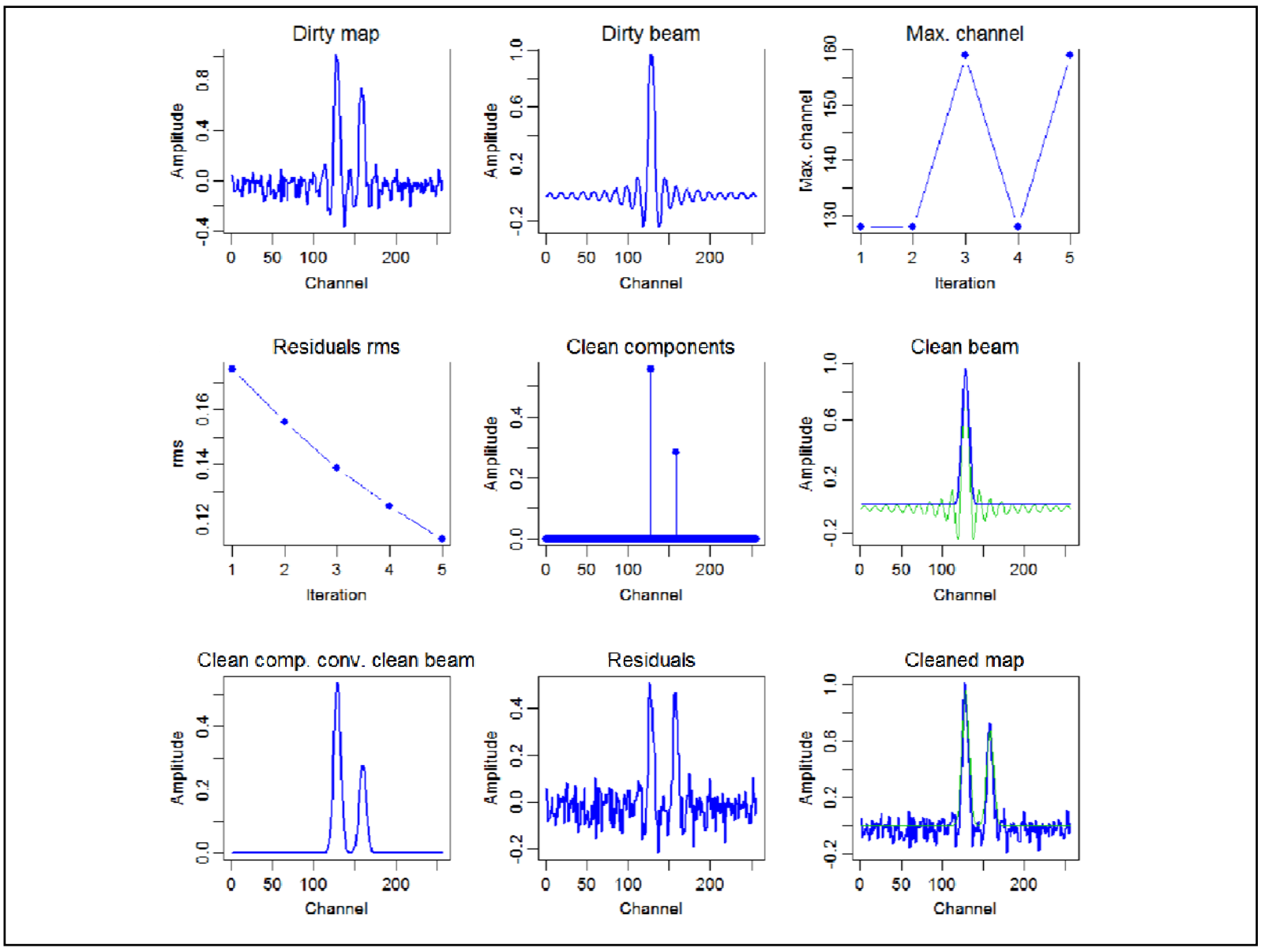
Residuals
Amplitude
Channel
Cleaned map
Amplitude
Channel


Dirty map
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Cleaned map
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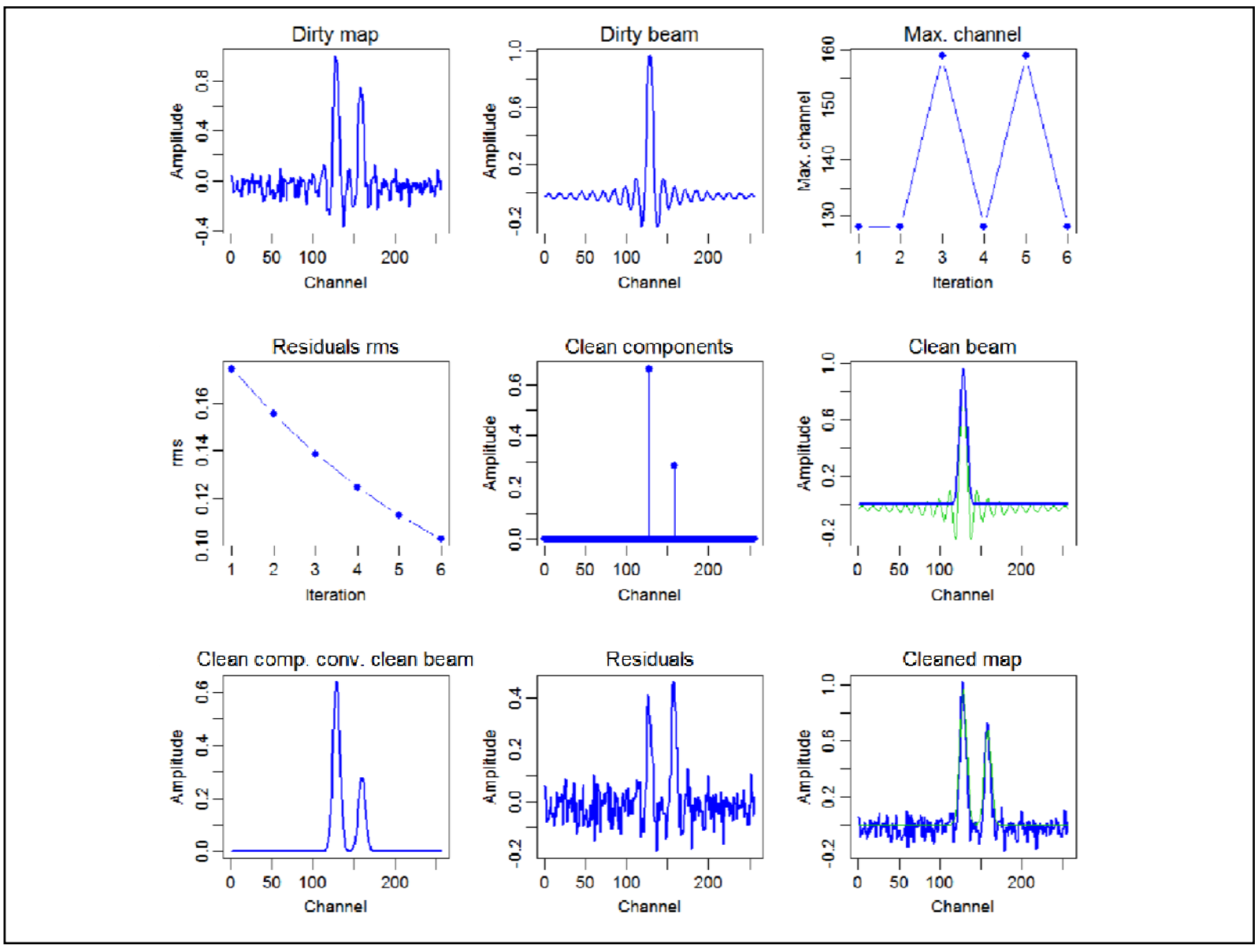
Dirty map
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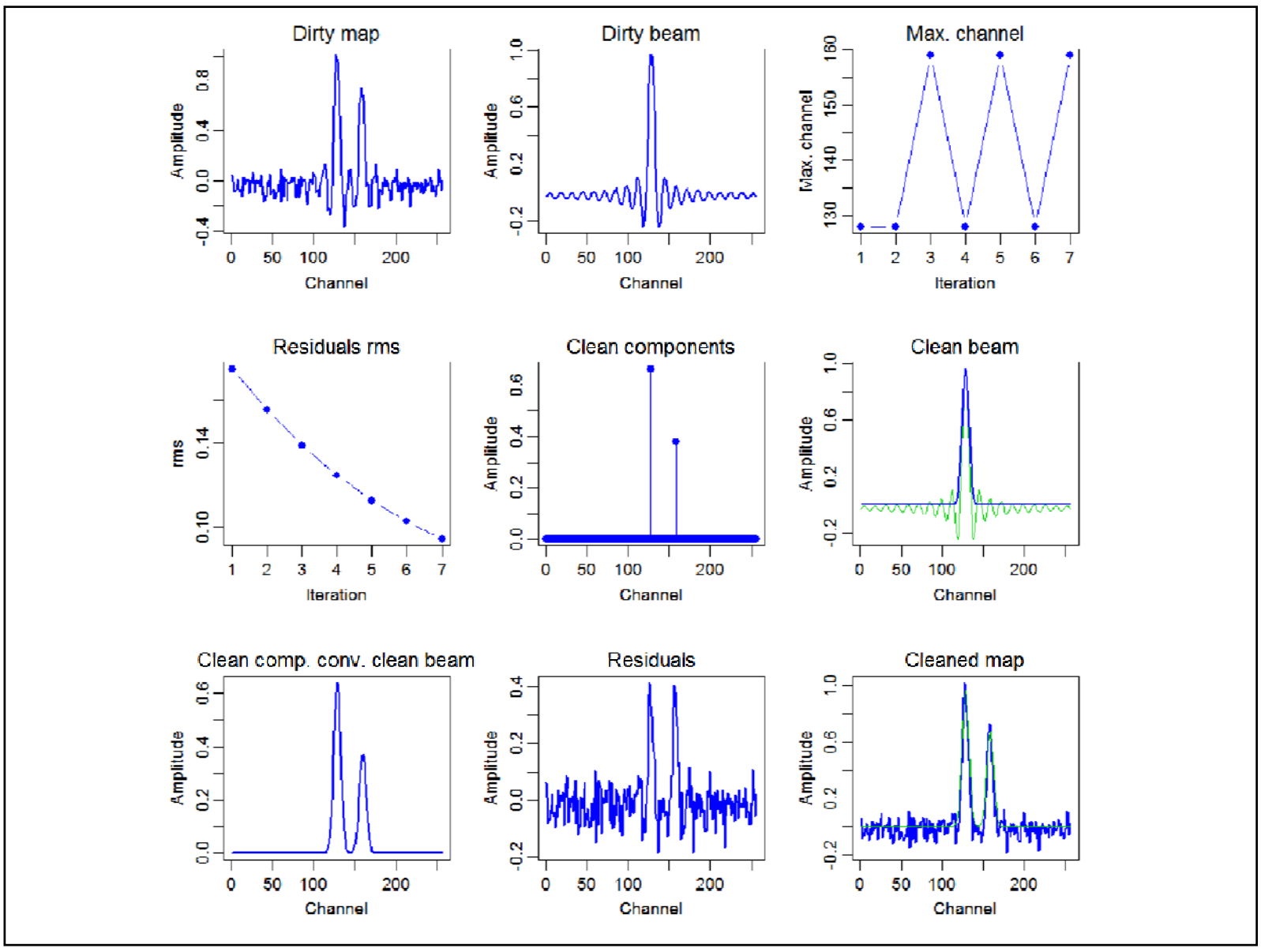
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Cleaned map
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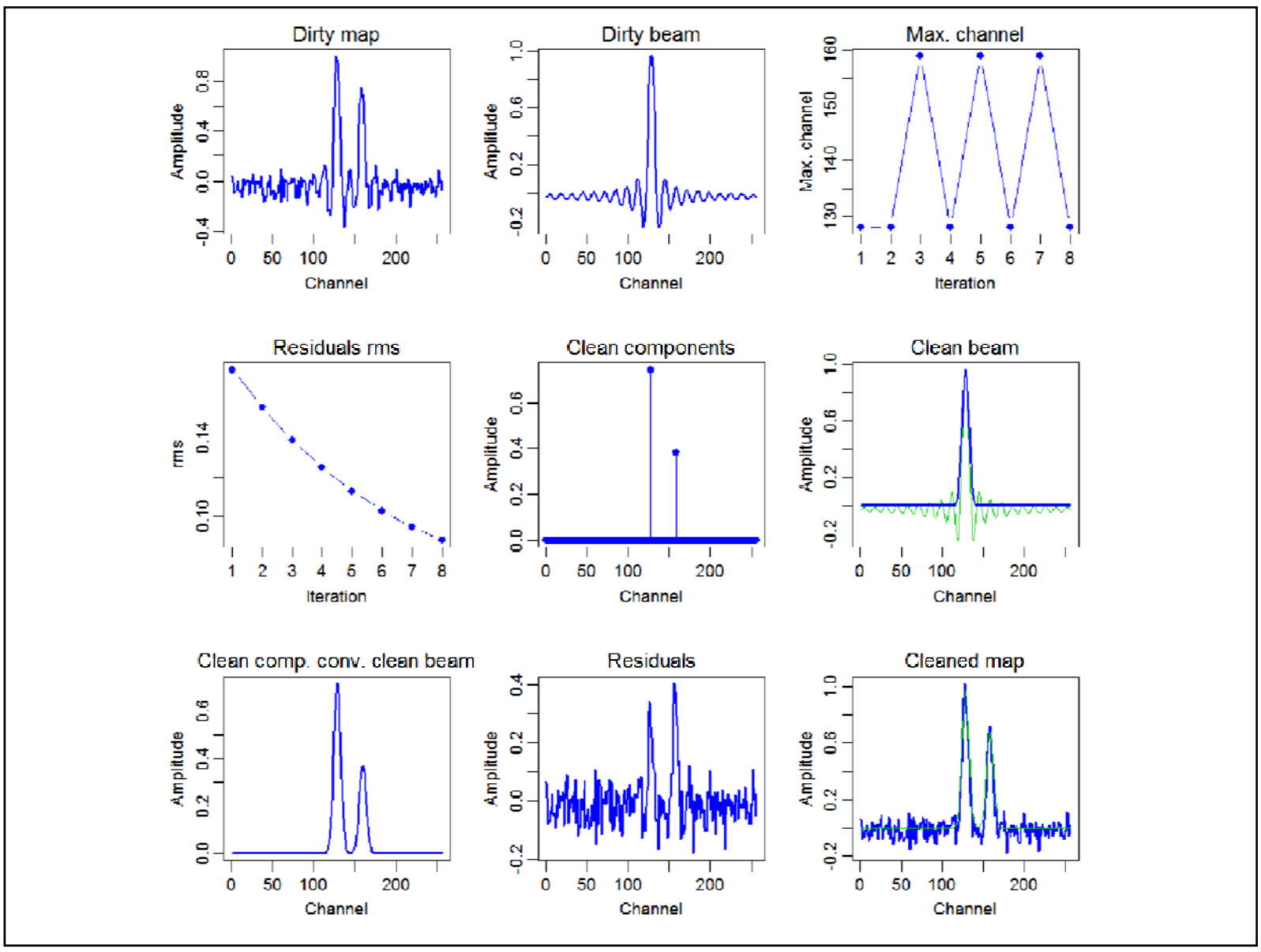
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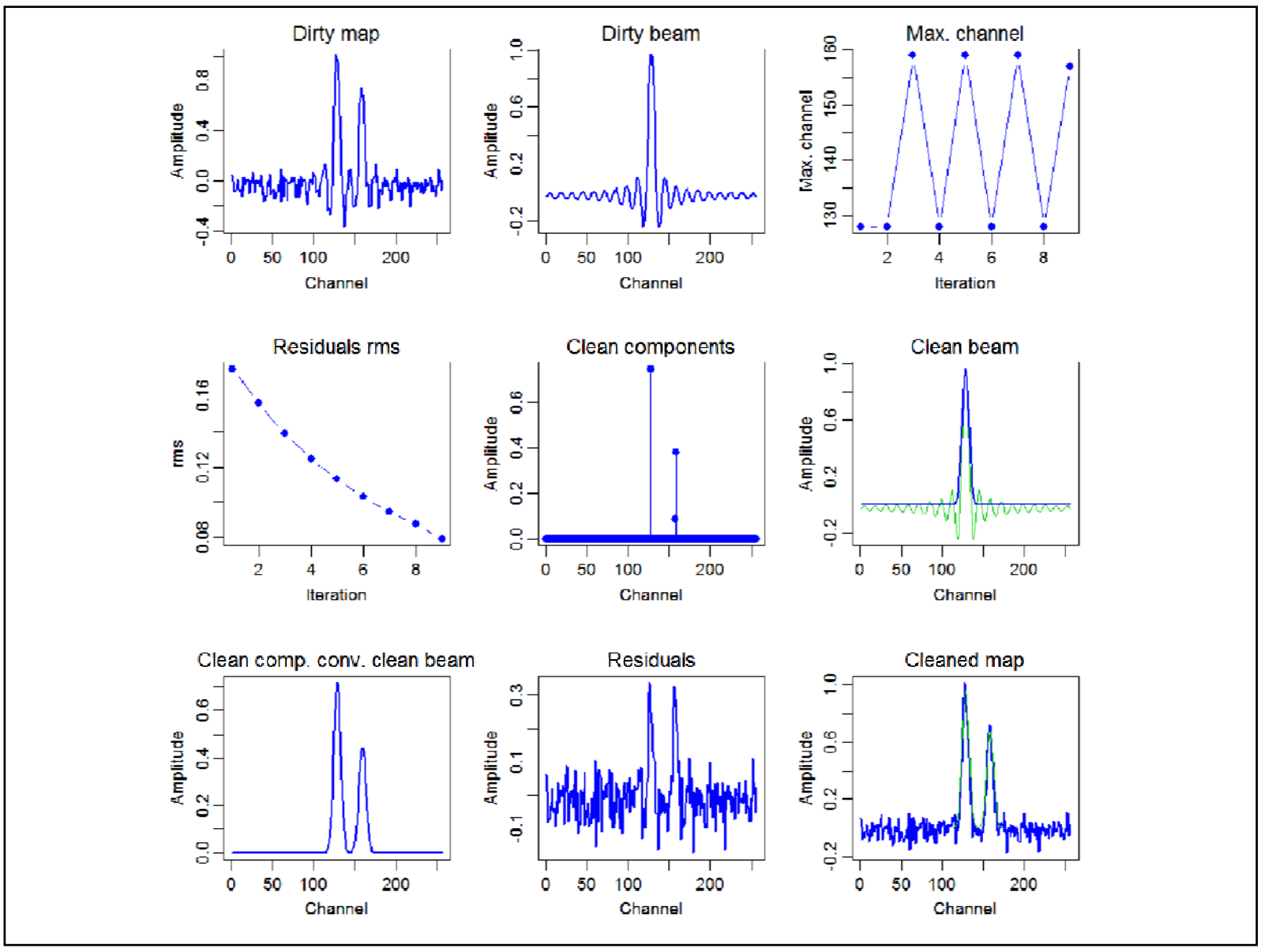
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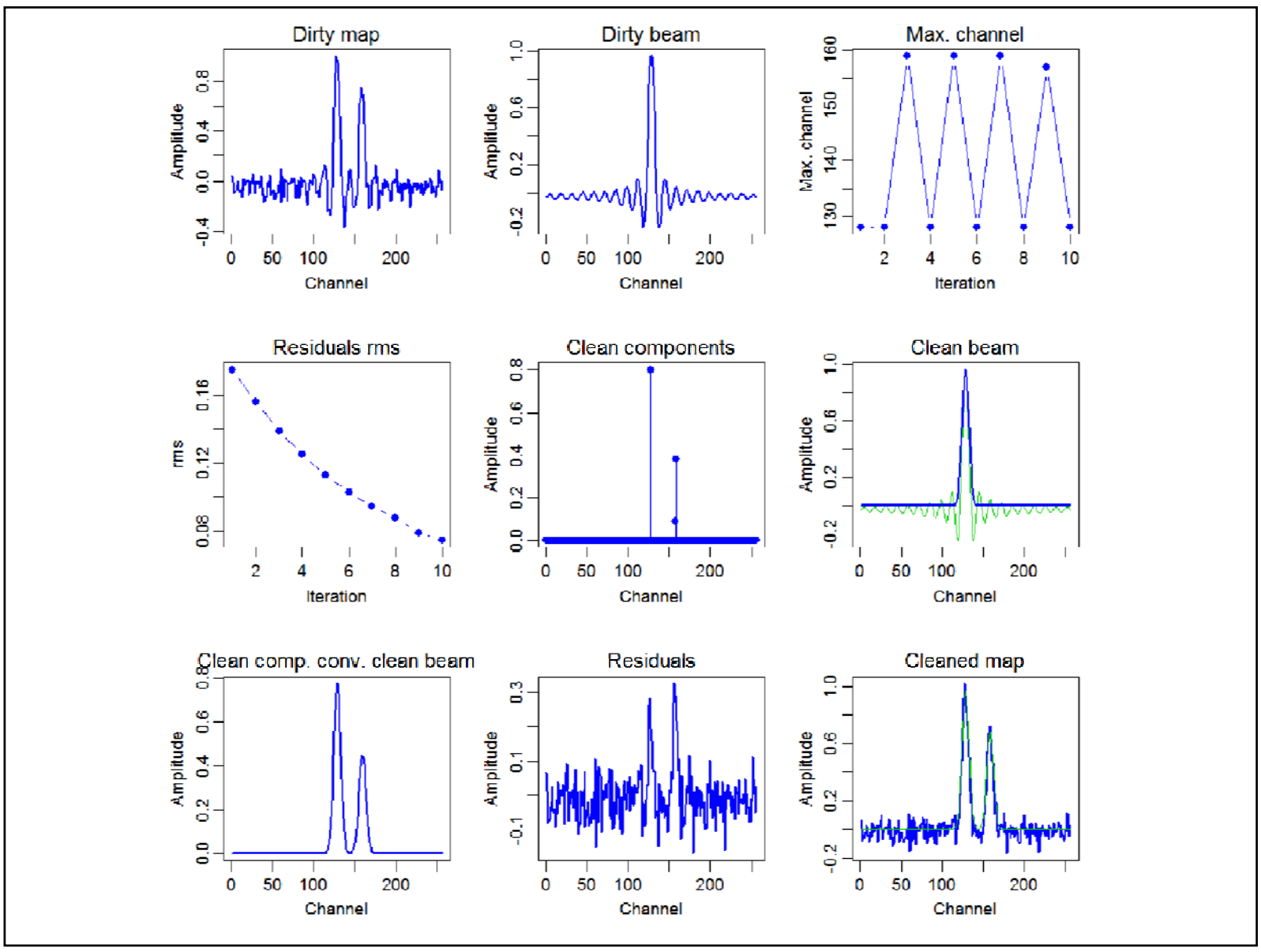
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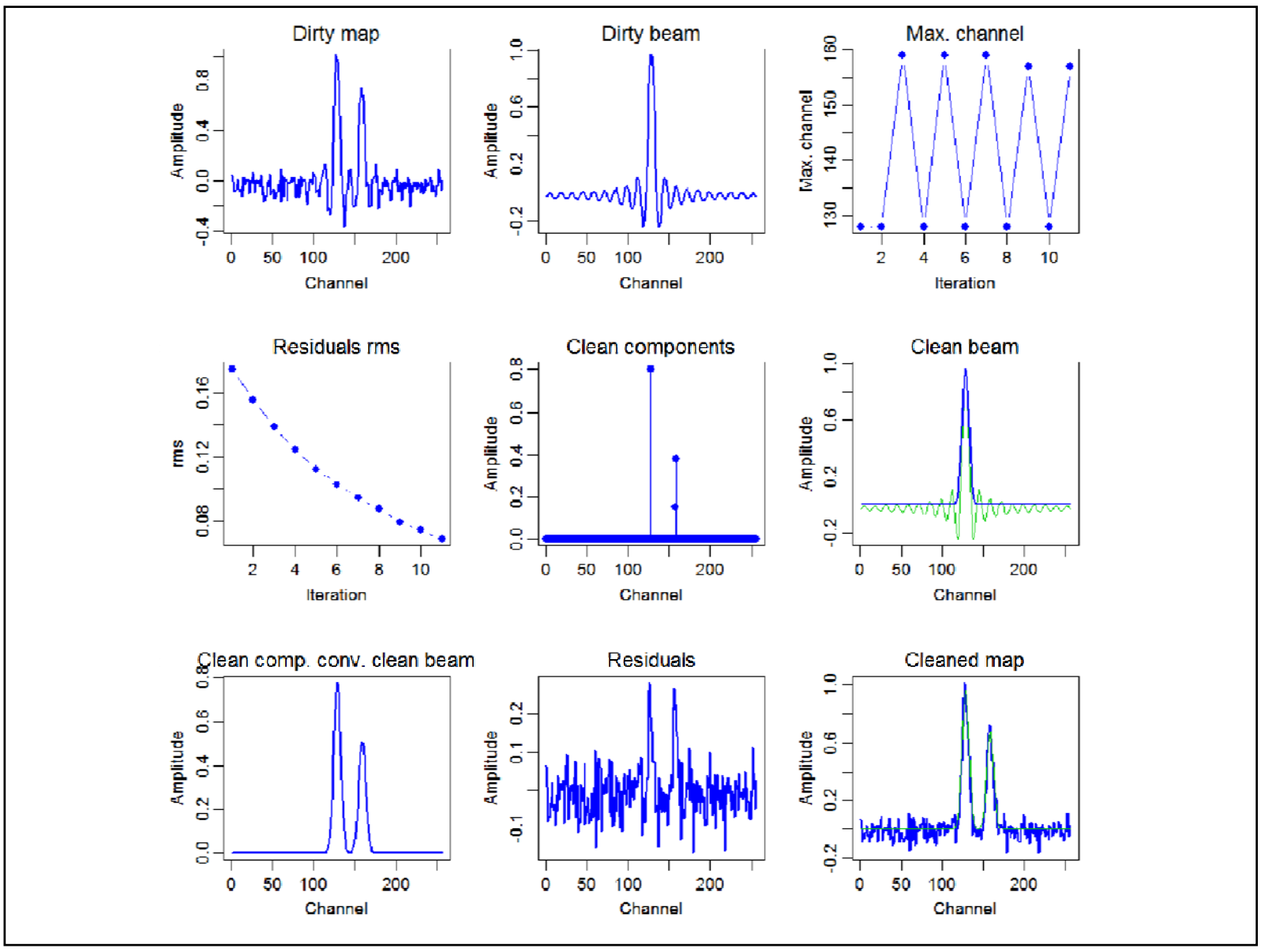
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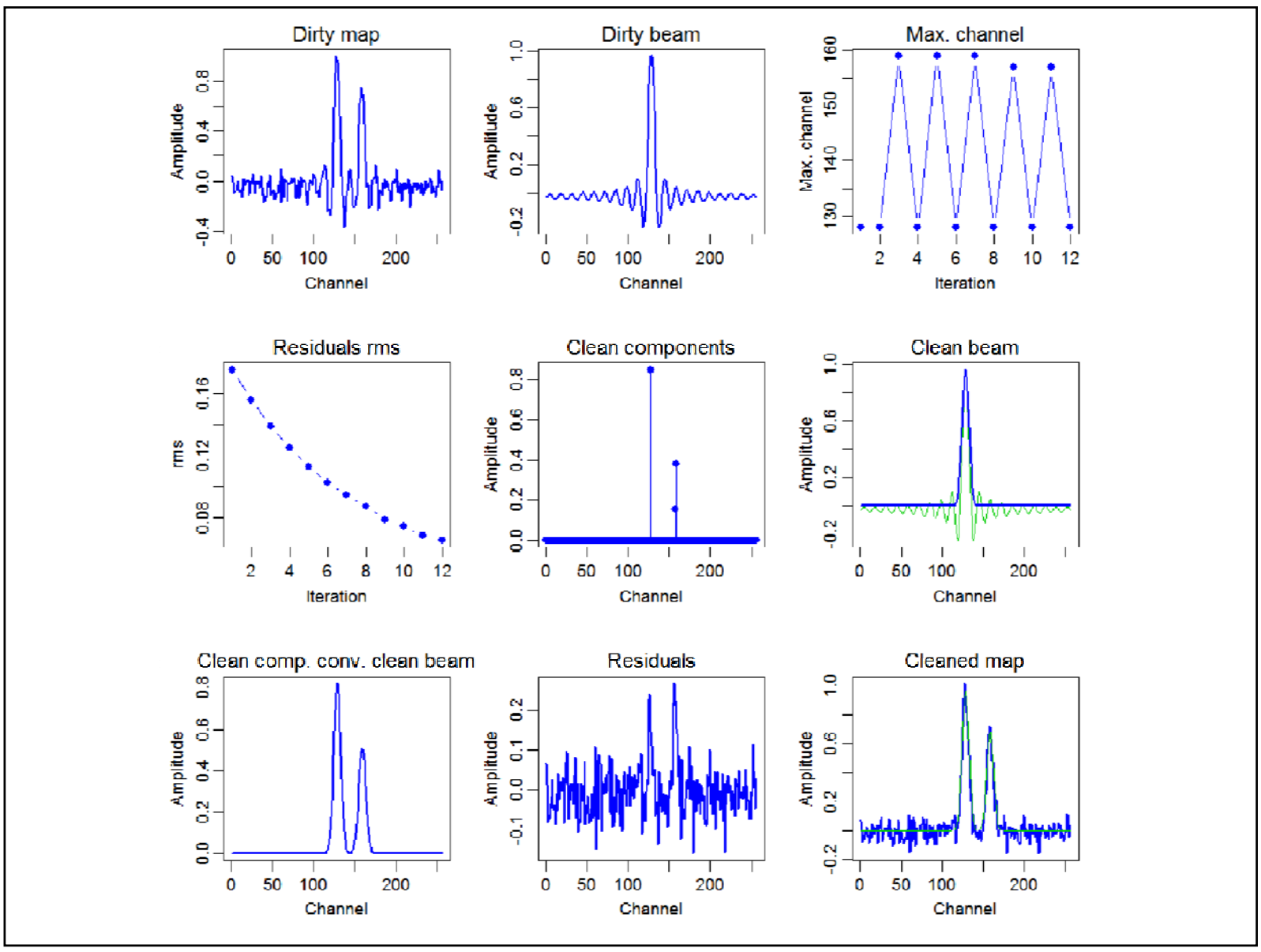
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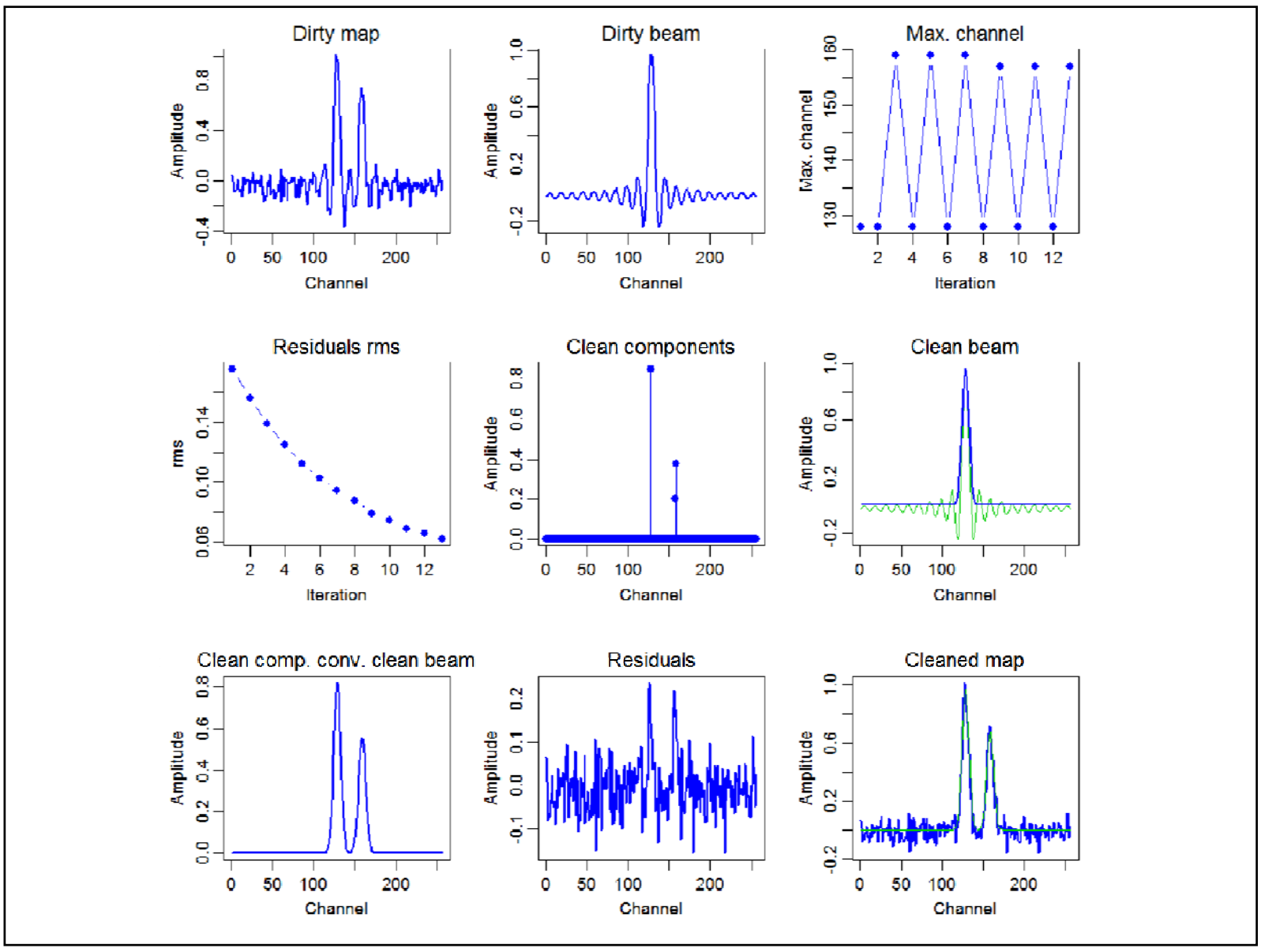
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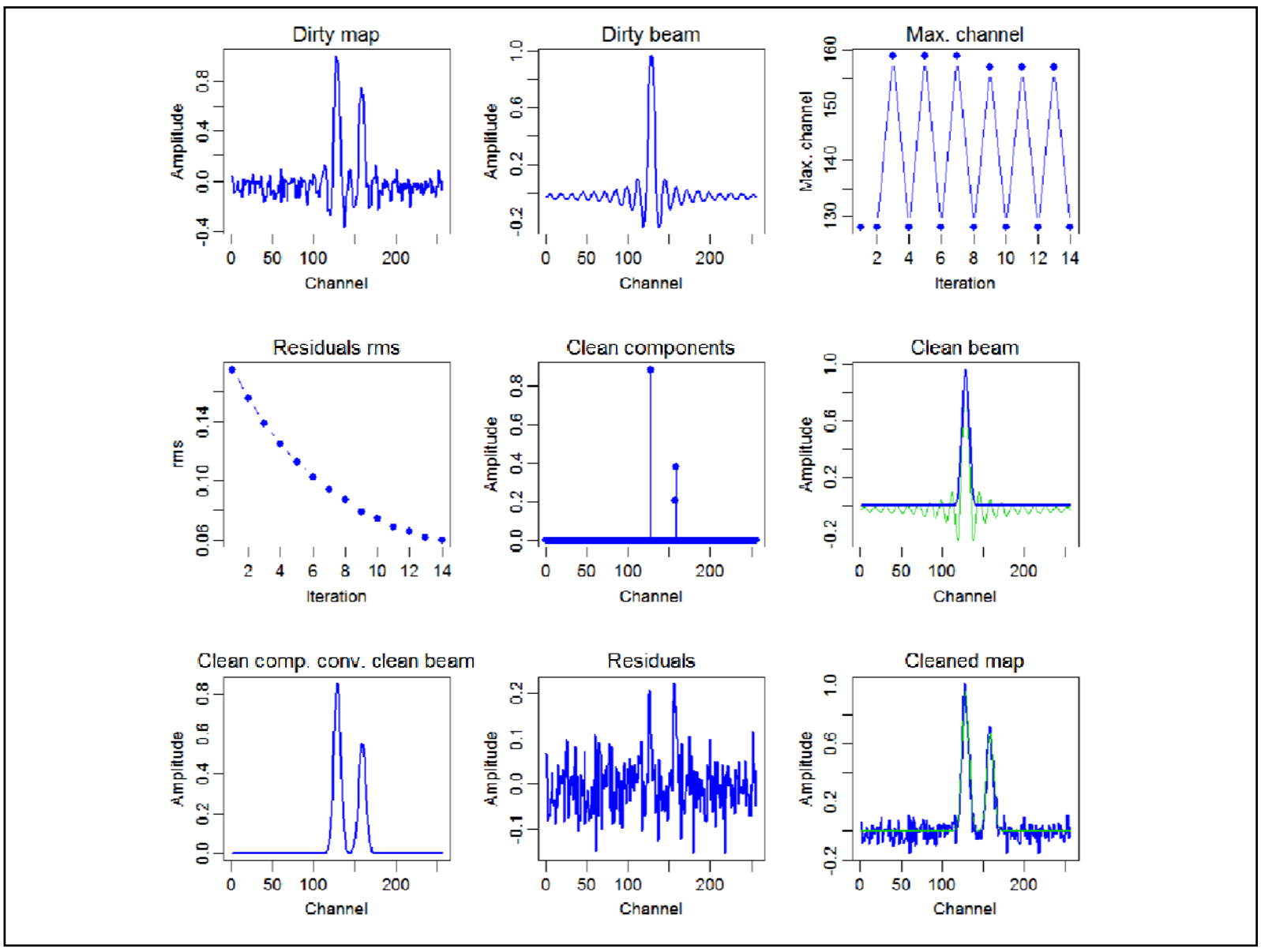
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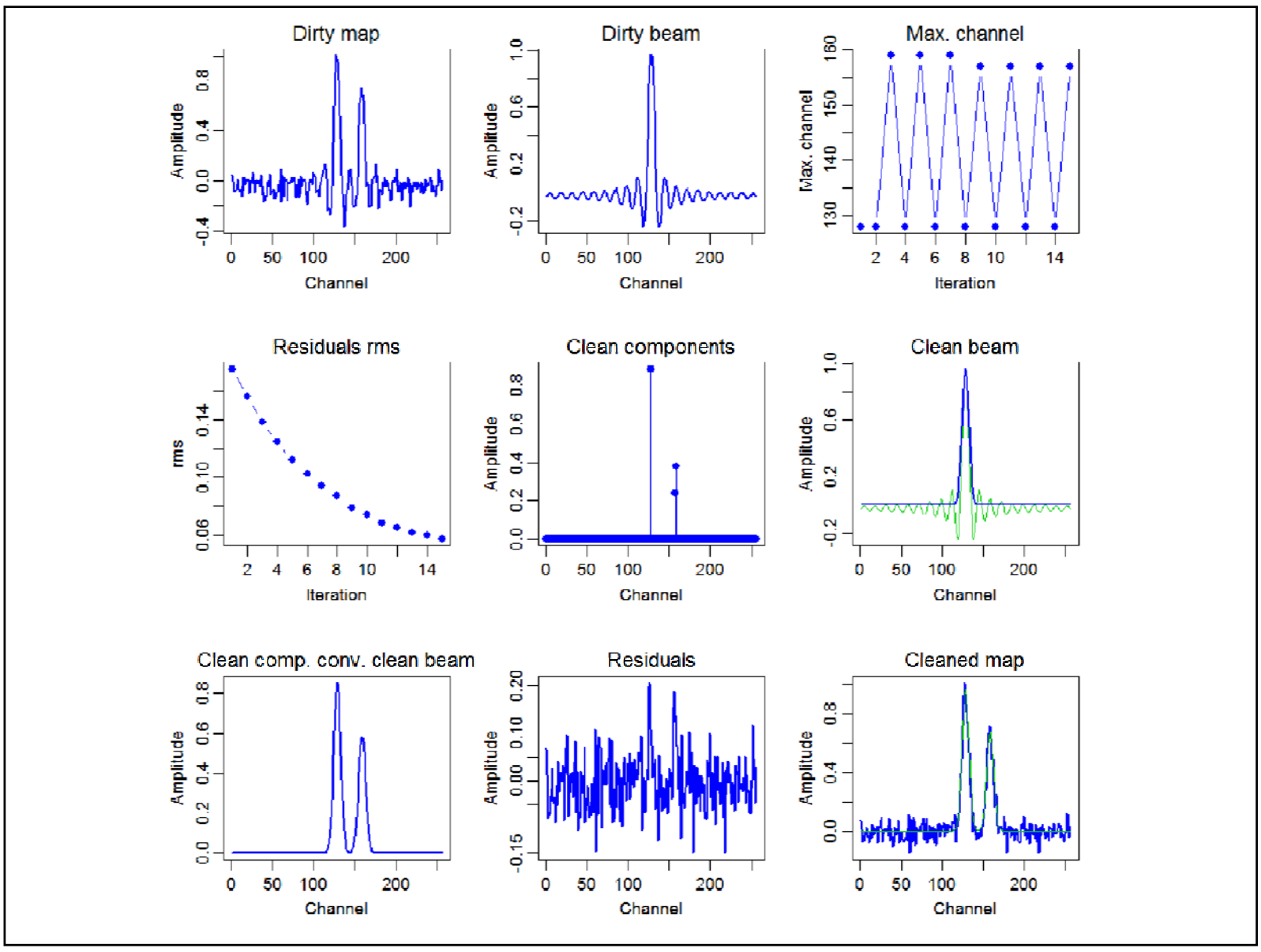
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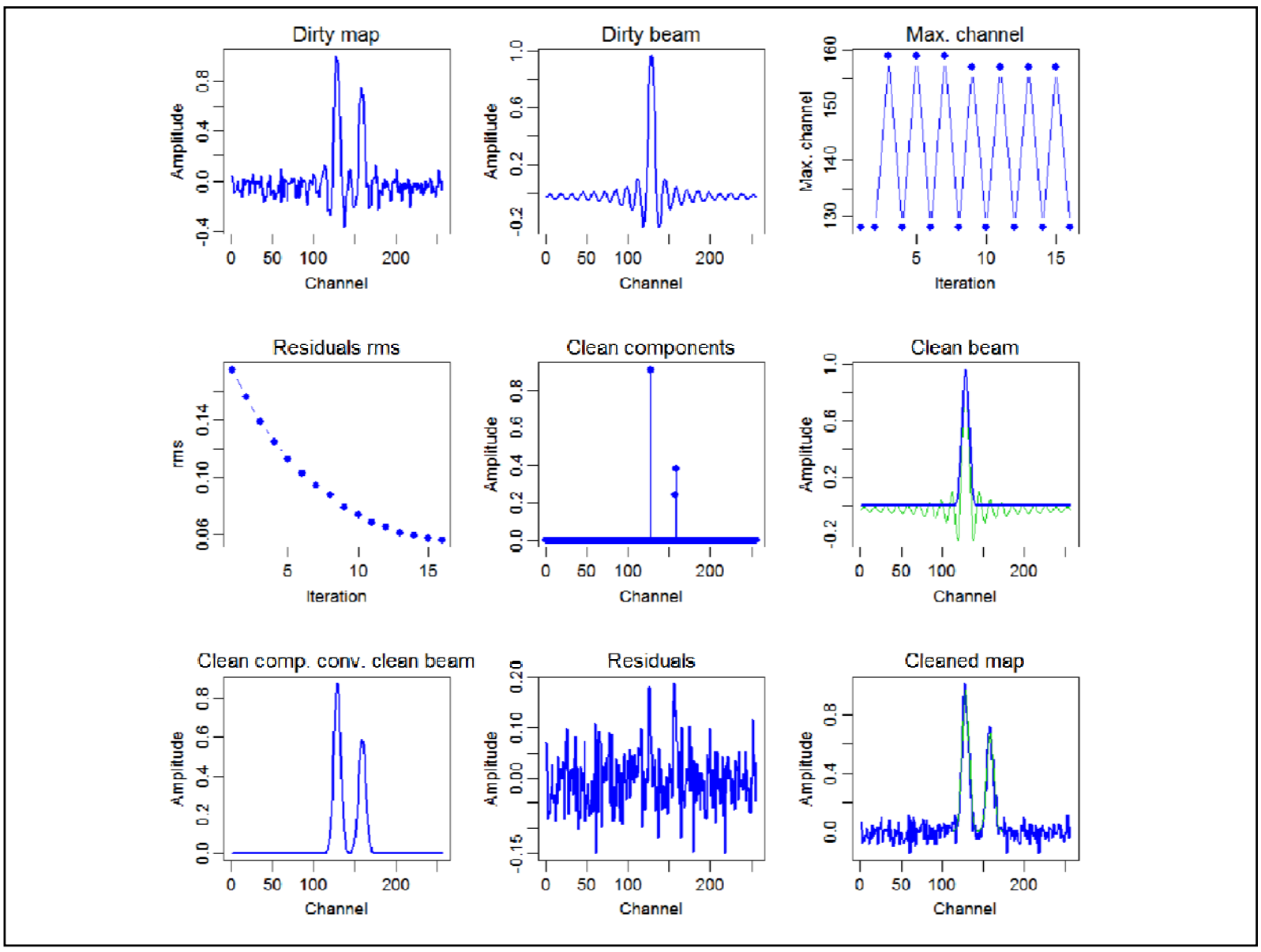
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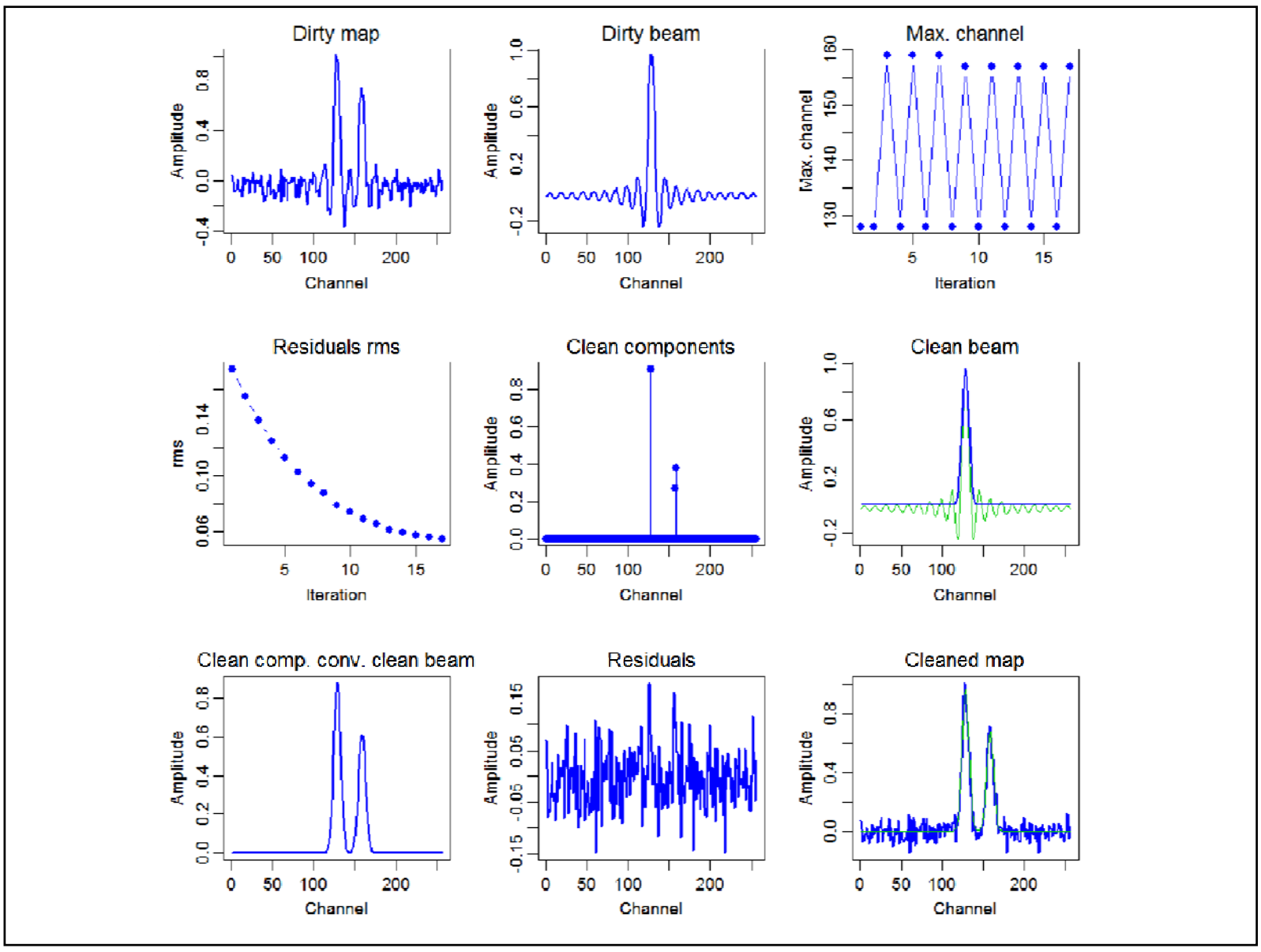
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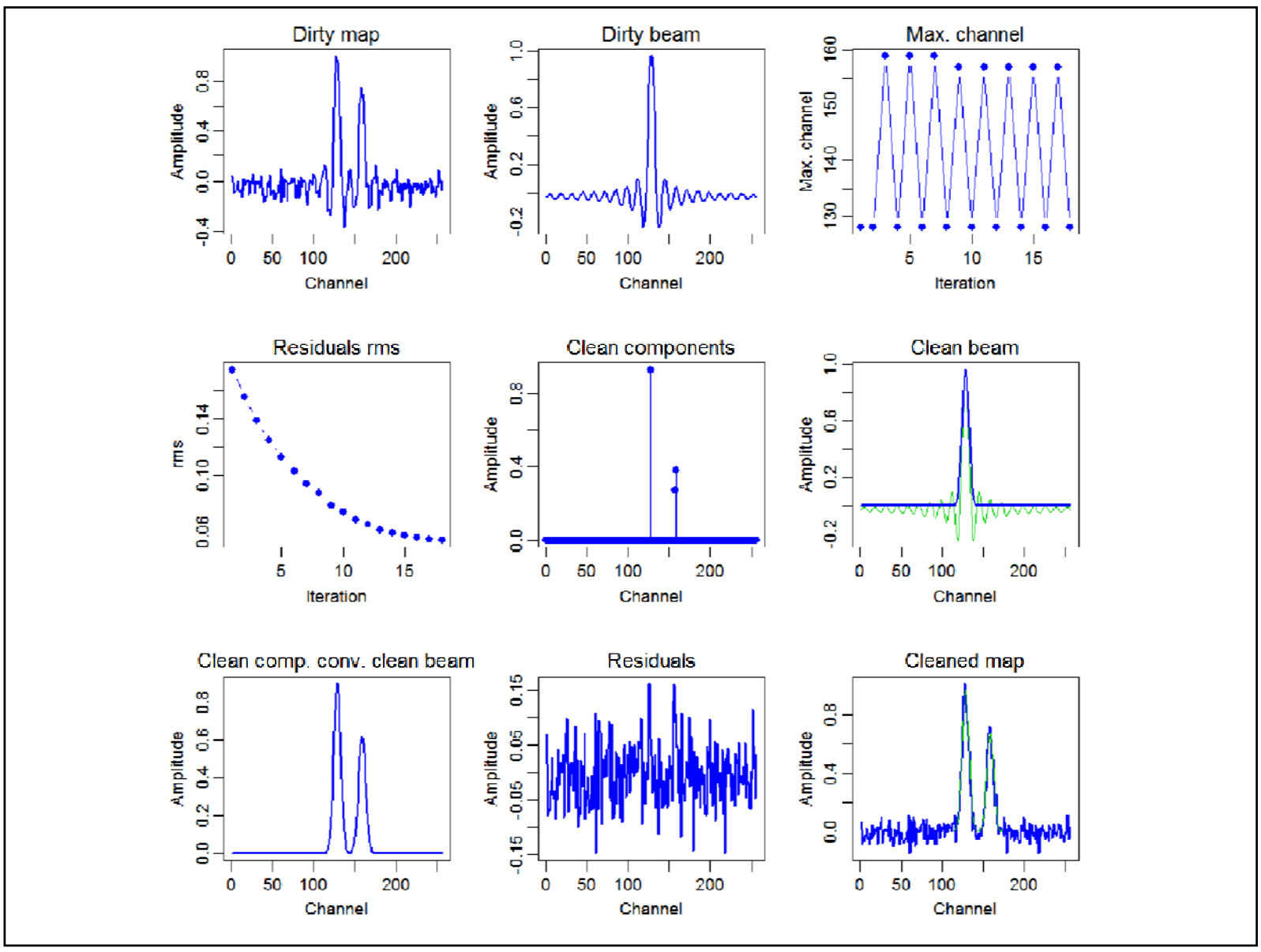
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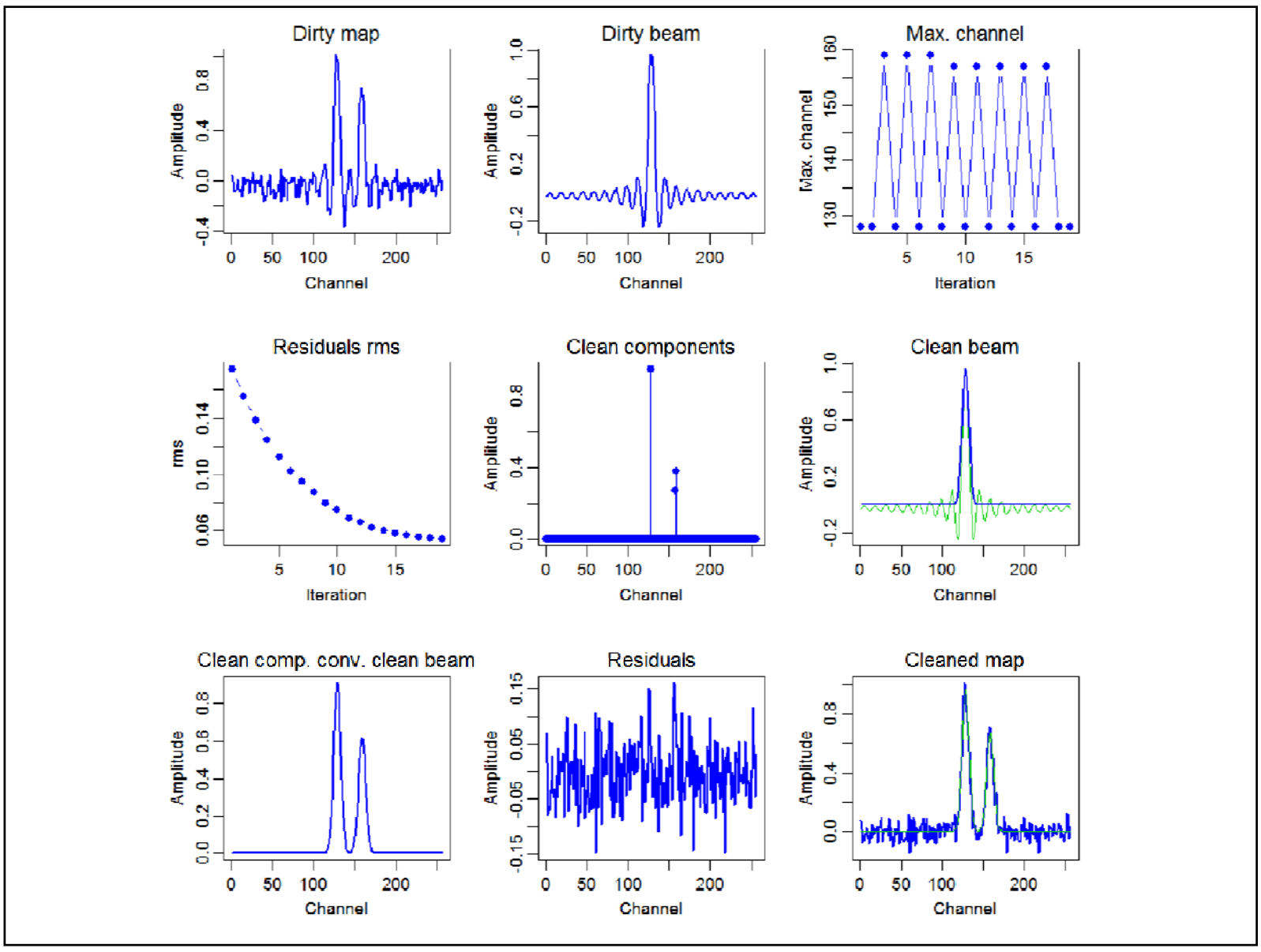
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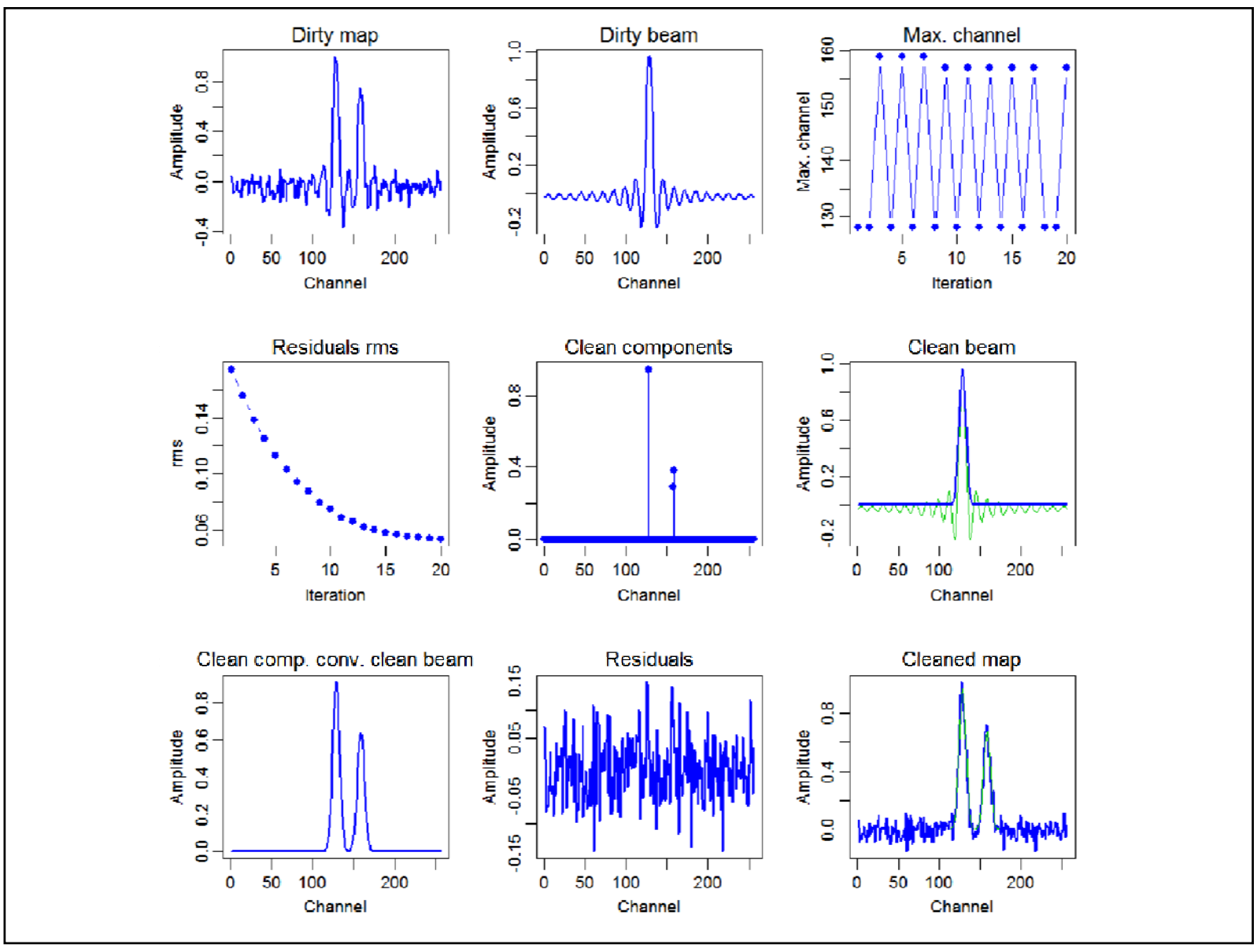
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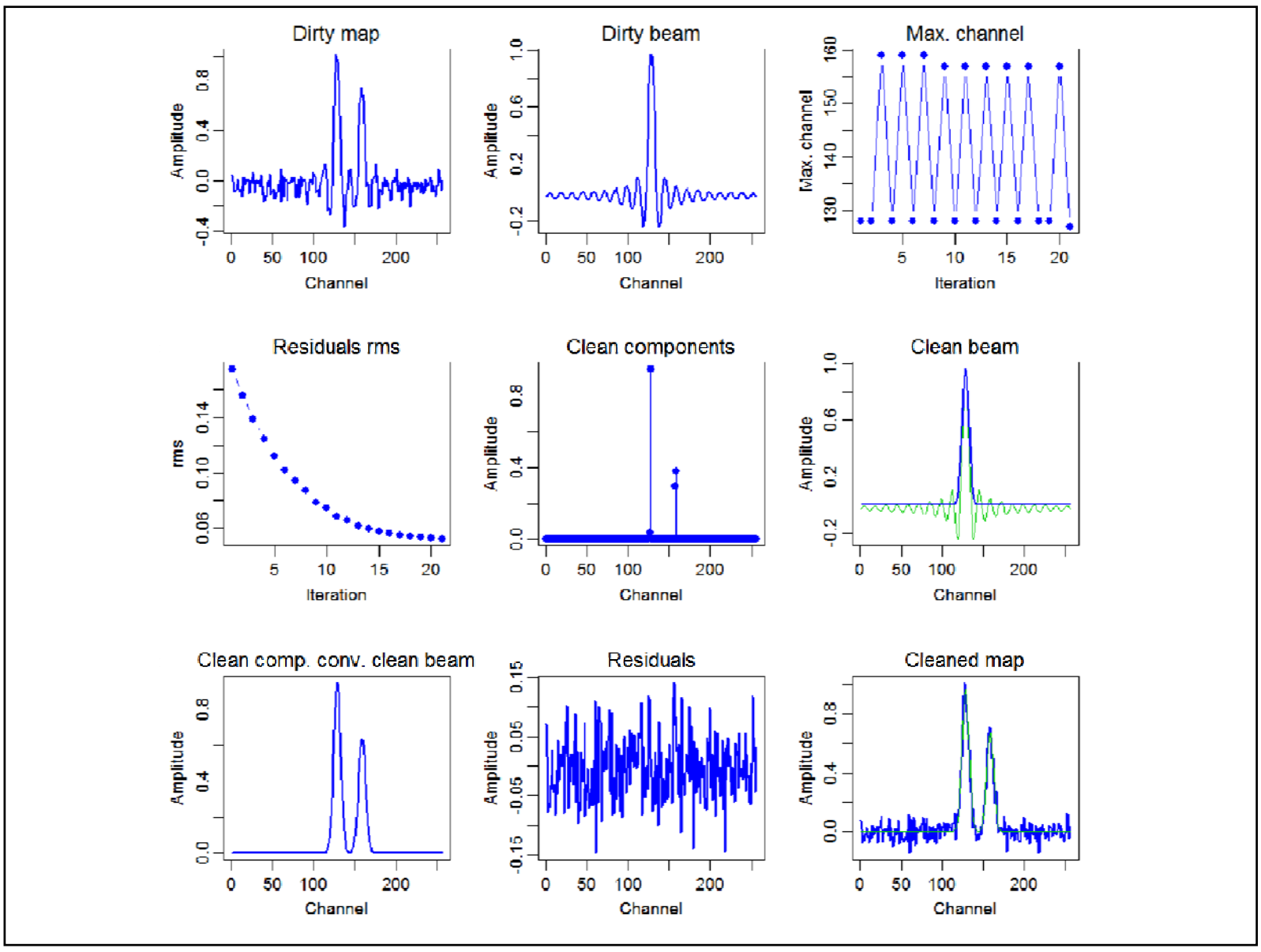
Dirty map
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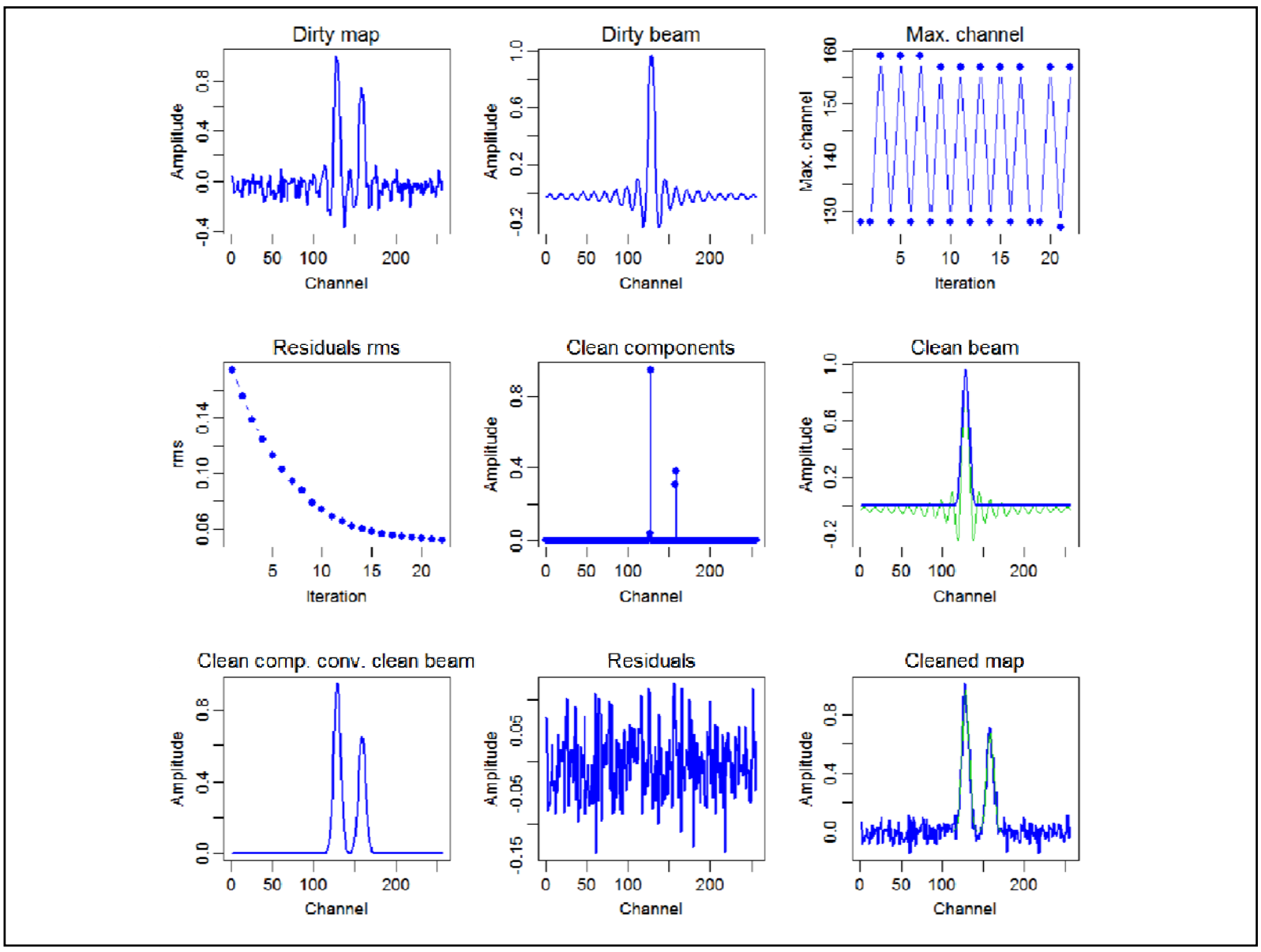
Dirty map
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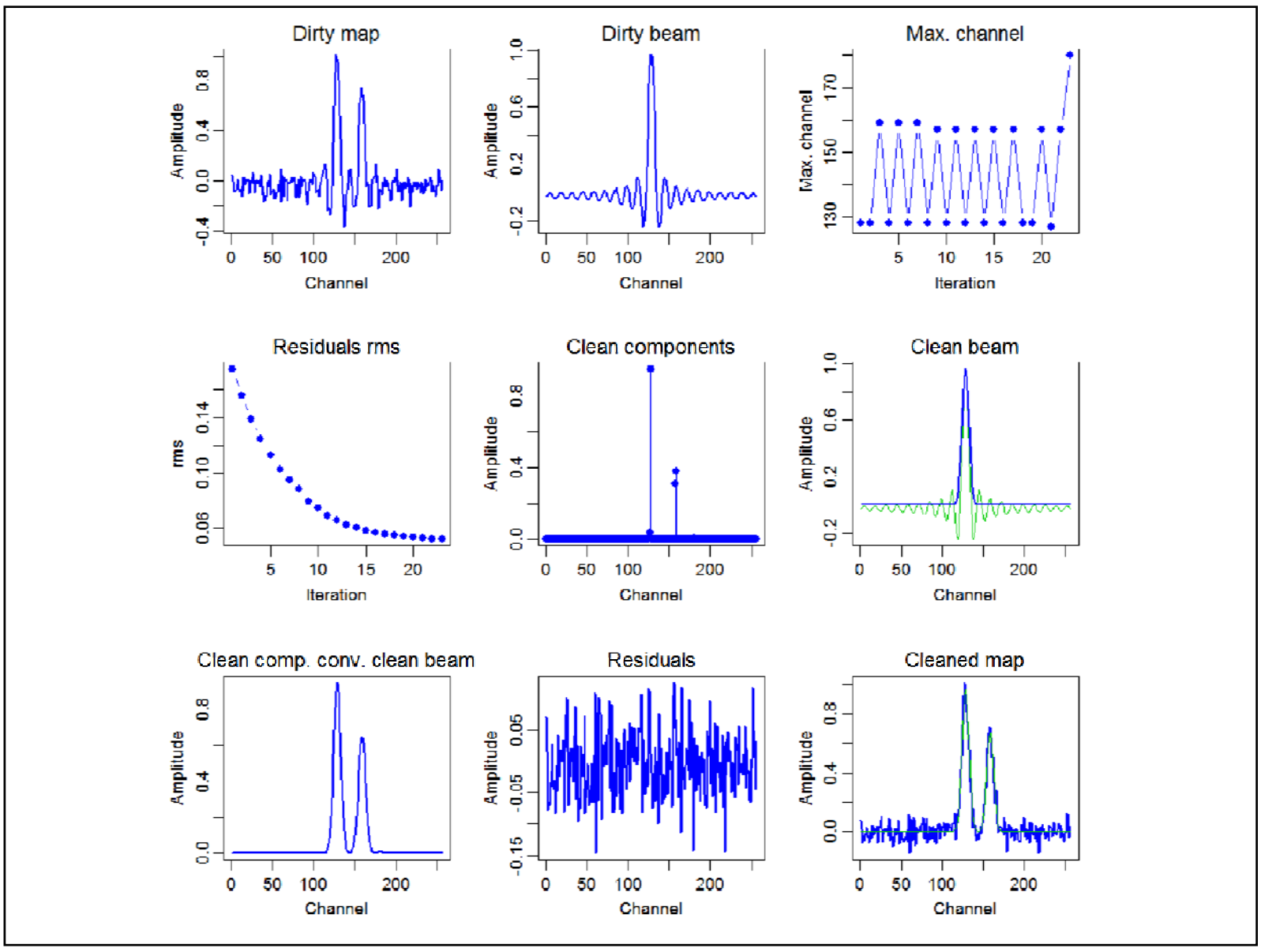
Dirty map
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Cleaned map
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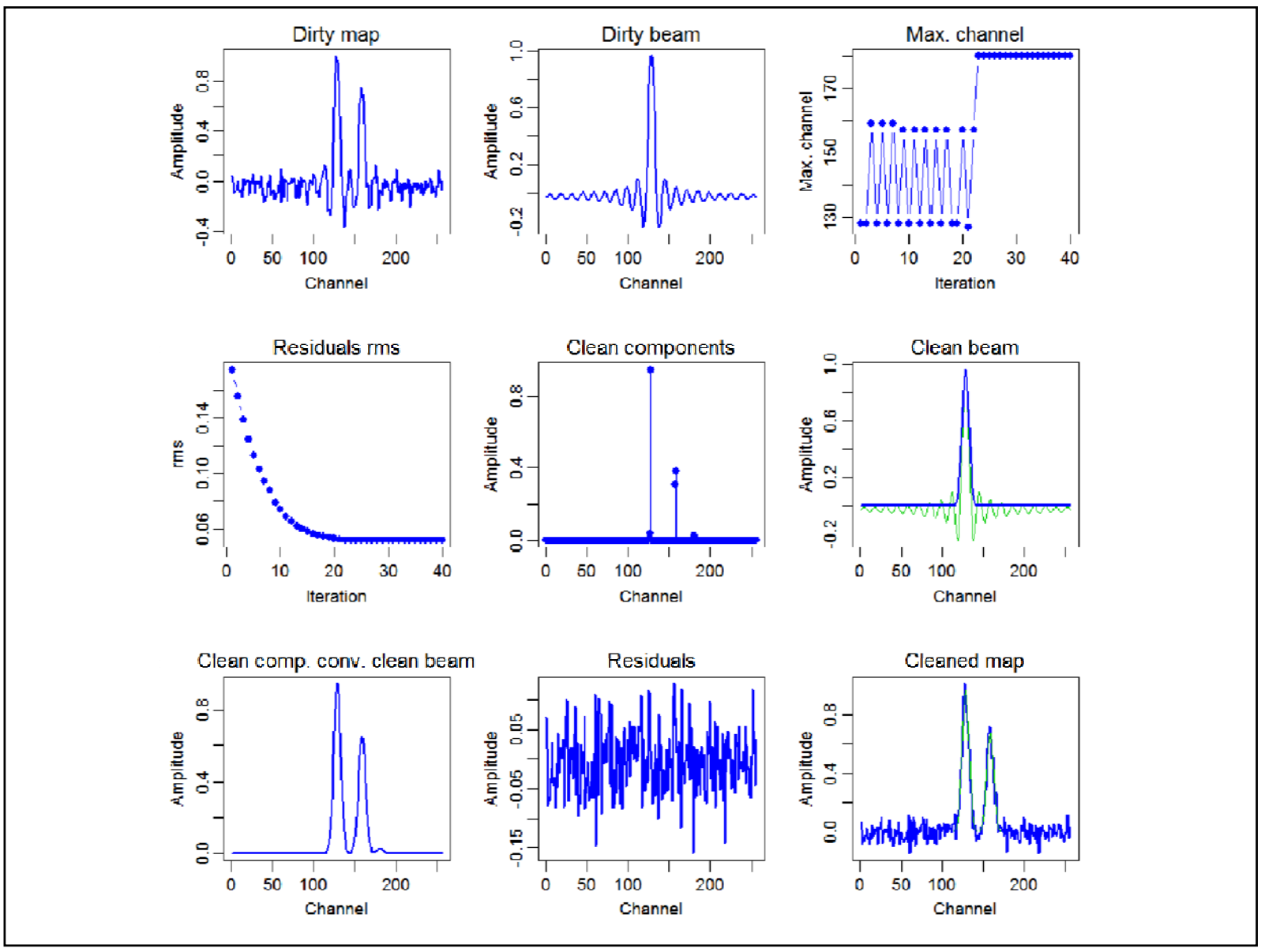
Dirty map
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Clean components
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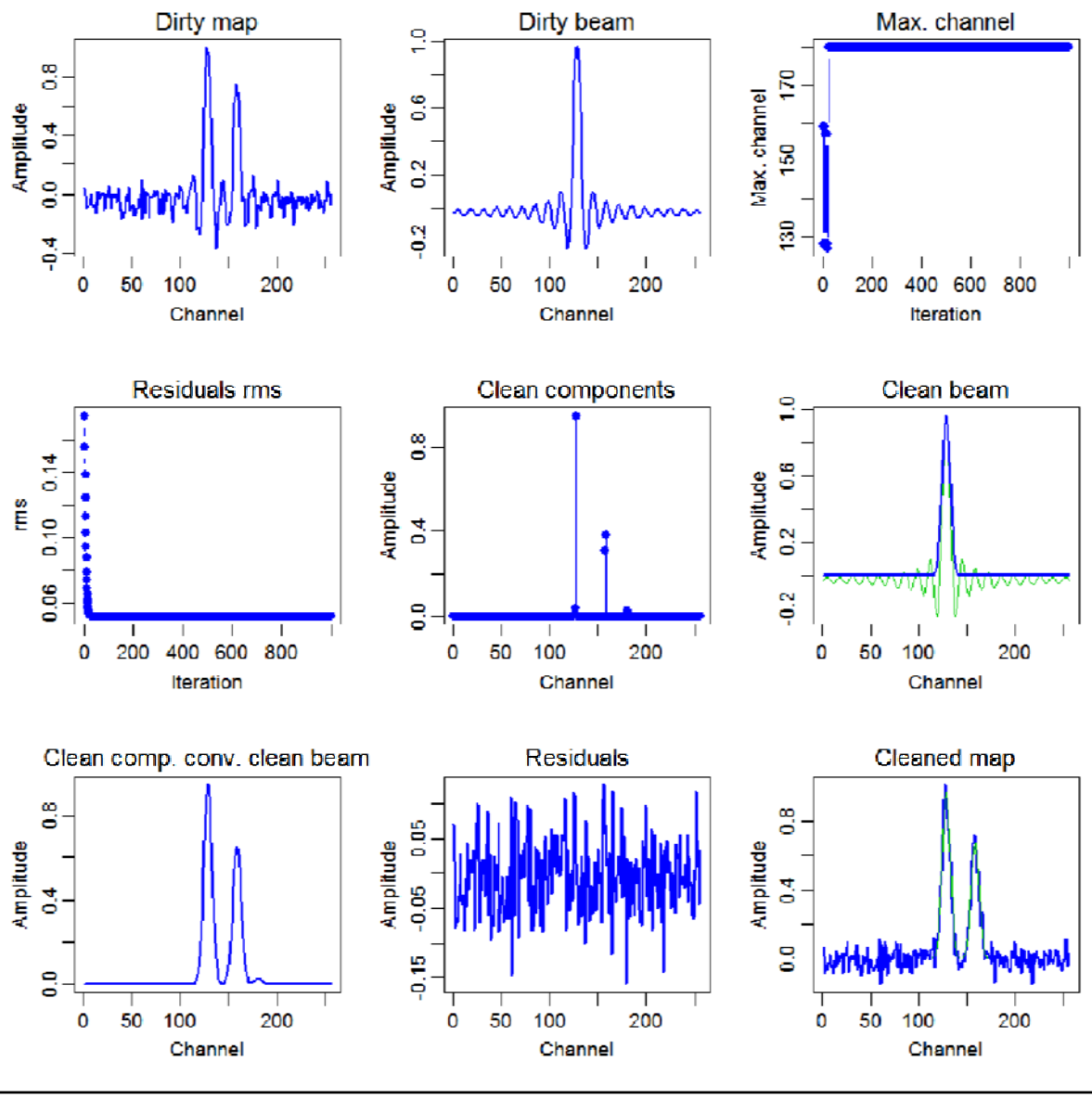
Clean comp. conv. clean beam
Amplitude
Channel
Residuals
Amplitude
Channel
Cleaned map
Amplitude
Channel

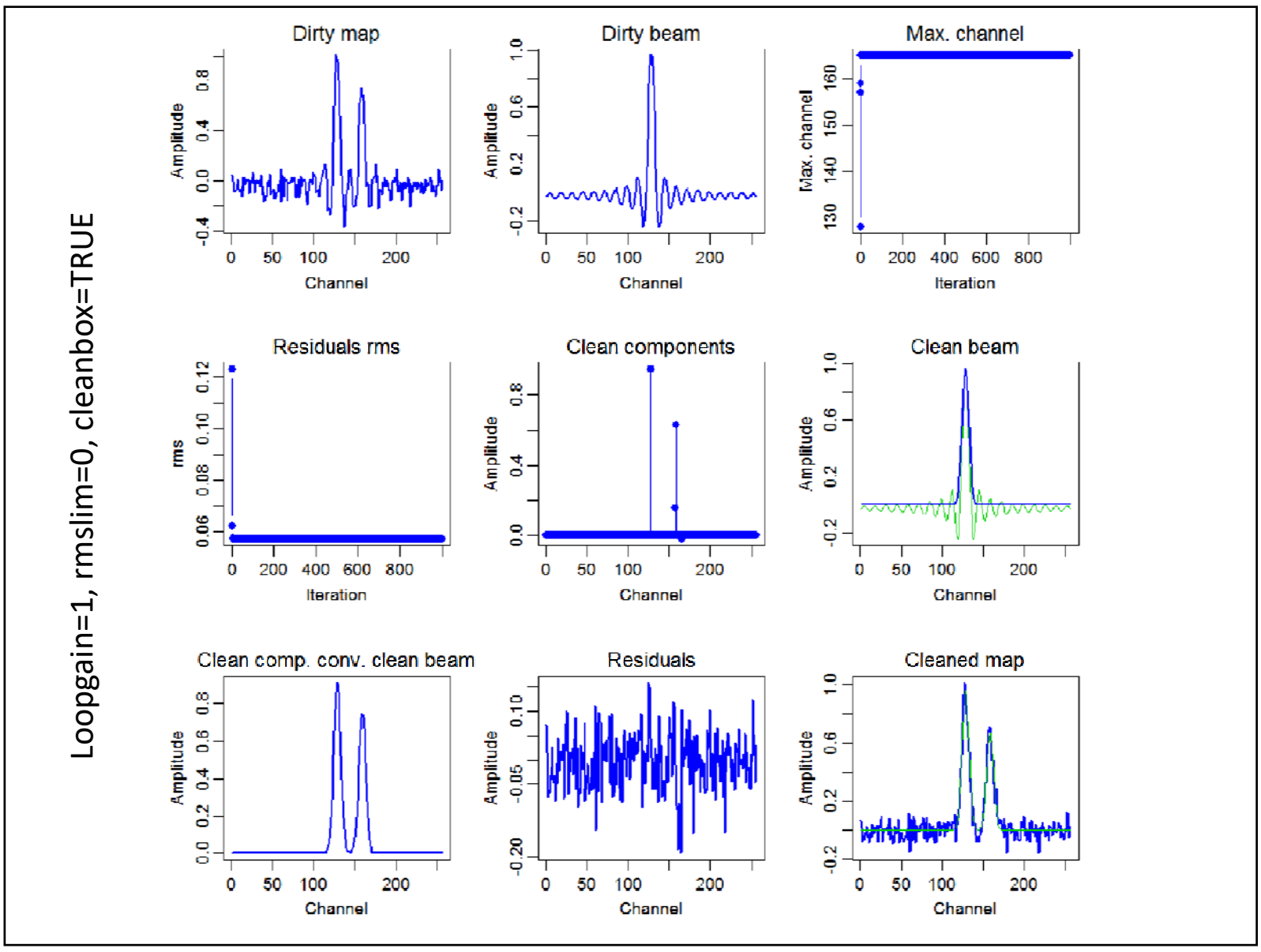
CLEAN: experiments with gain, region, and iterations

cleanDemo.r

loopgain=0.25, rmslim=0, cleanbox=TRUE



Loopgain=1, rmslim=0, cleanbox=TRUE



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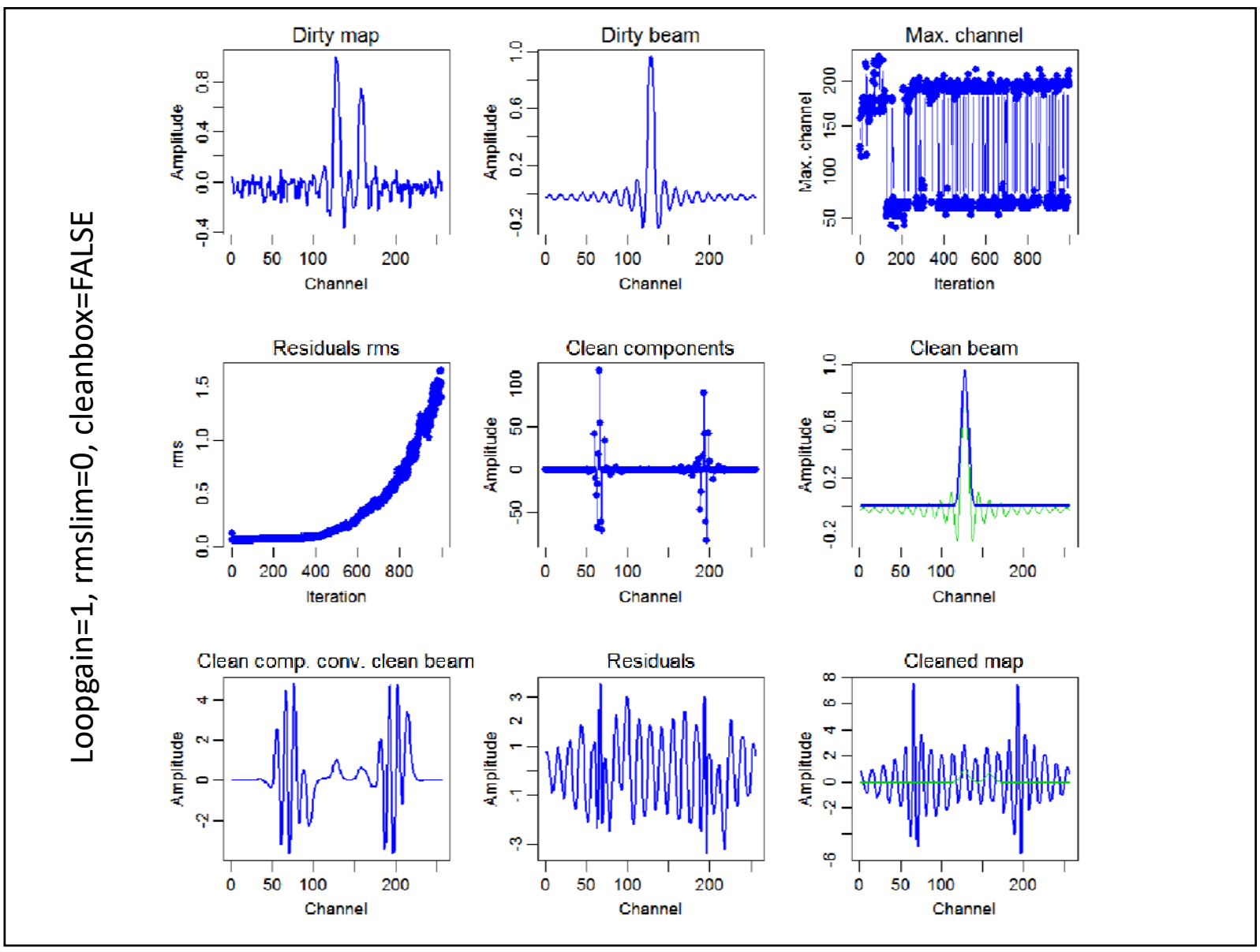
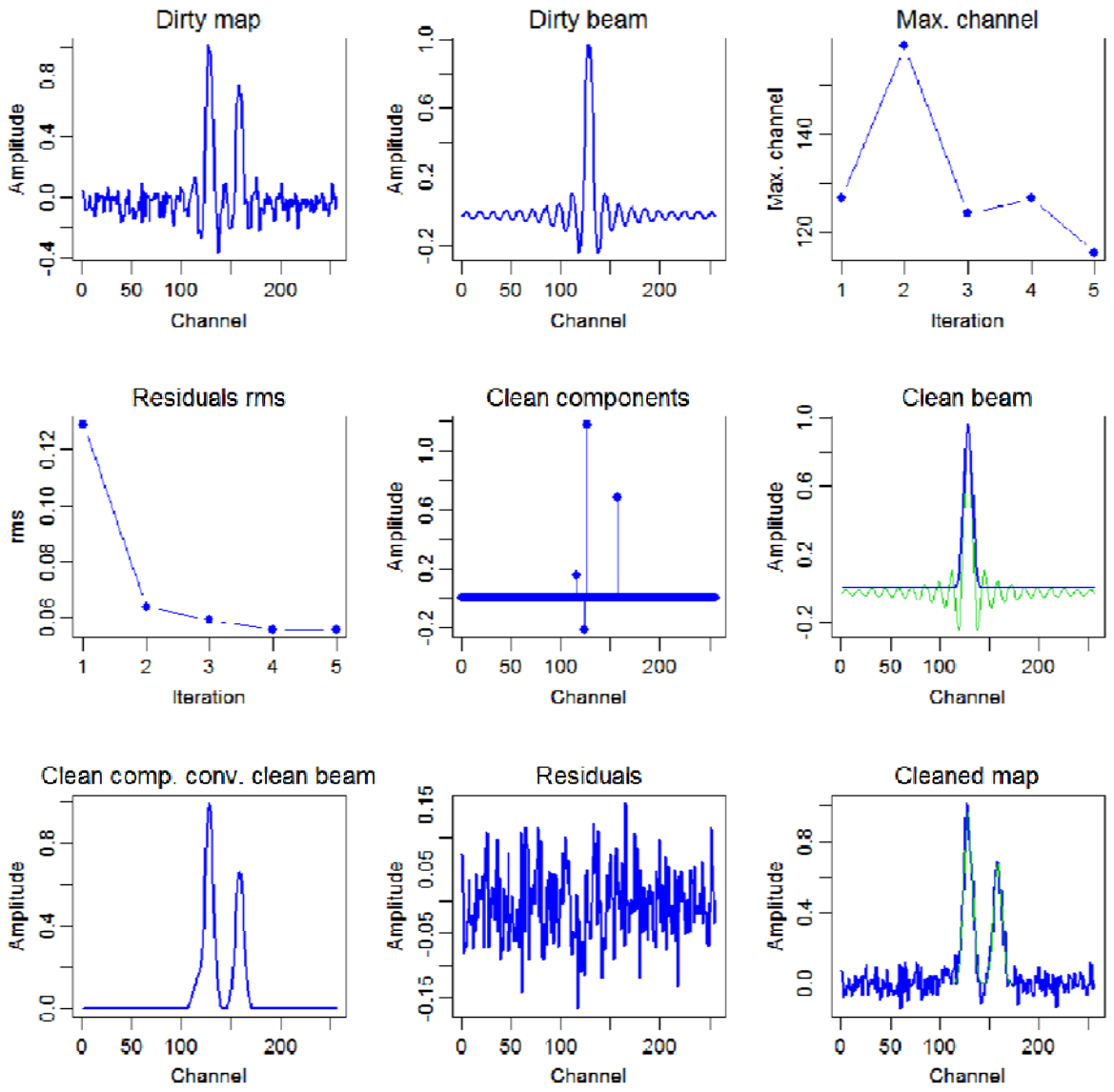


loopgain=1, rmslim=NA, cleanbox=FALSE



CLEAN: examples

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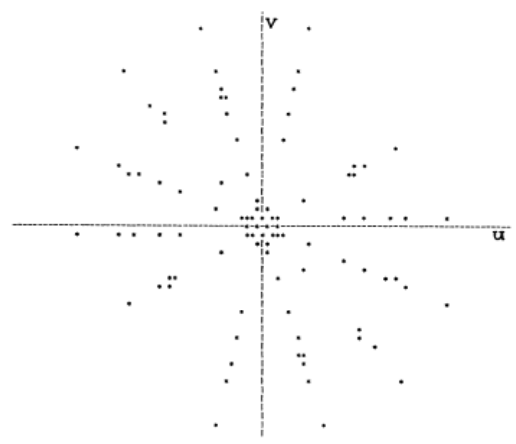

Figure 1 Example of a baseline coverage obtained with the Green Bank Interferometer. The measured points have been mirrored through the origin to give a better impression of the overall structure.

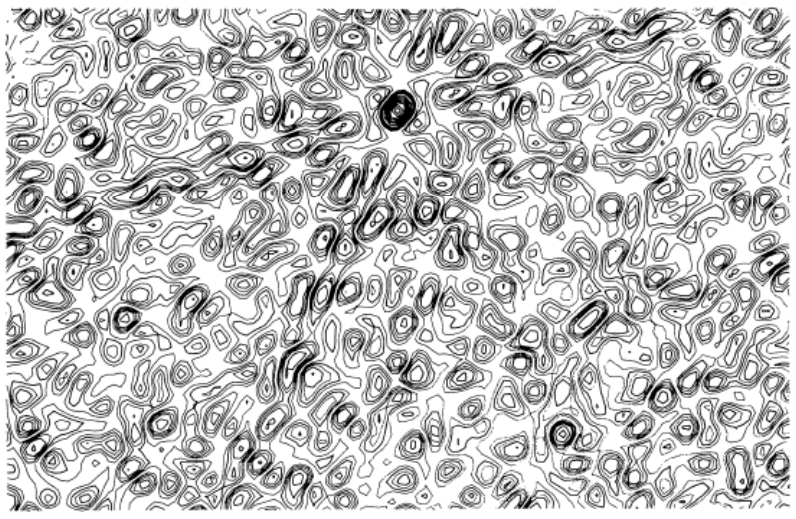

Figure 2 The "dirty beam" corresponding to the u,v coverage shown in figure 1. Contours are drawn at 5, 10, 15, 20, 30 etc. % of the beam maximum (top center). No distinction has been made in the figure between positive and negative contours; half of the sidelobes are in fact negative.

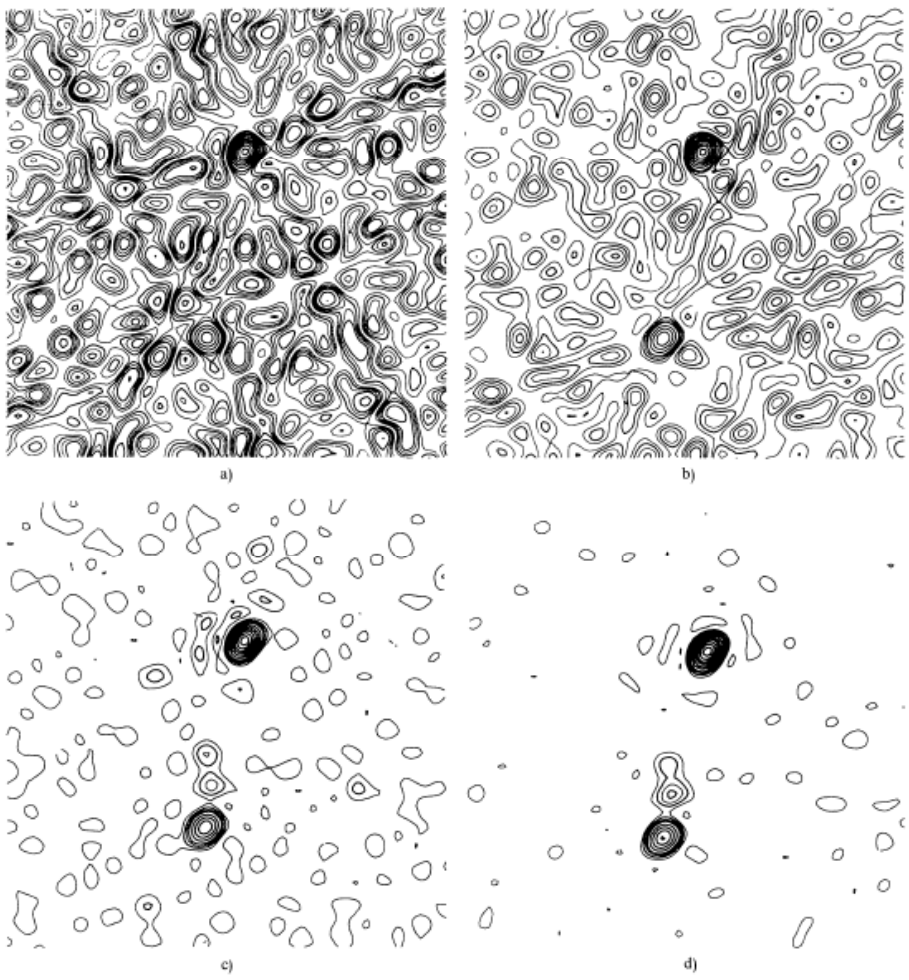

Figure 3 Illustrating the effect of the CLEAN procedure on measurements at 2695 MHz of the radio source 3C 244.1 taken with the u,v coverage shown in figure 1. Contours are drawn at the same intensity ratios as in figure 2. a) the "dirty map" b) cleaned map after one iteration with the loop gain $\gamma = 1$ and subsequent return of the clean beam, c) same, but after two iterations and the return of the two clean beams. The north preceding component is extended and there are some weaker components present, d) 6 iterations. The further improvement here is due to the cleaning of the sidelobes from the less intense features that remain after the two first iterations.