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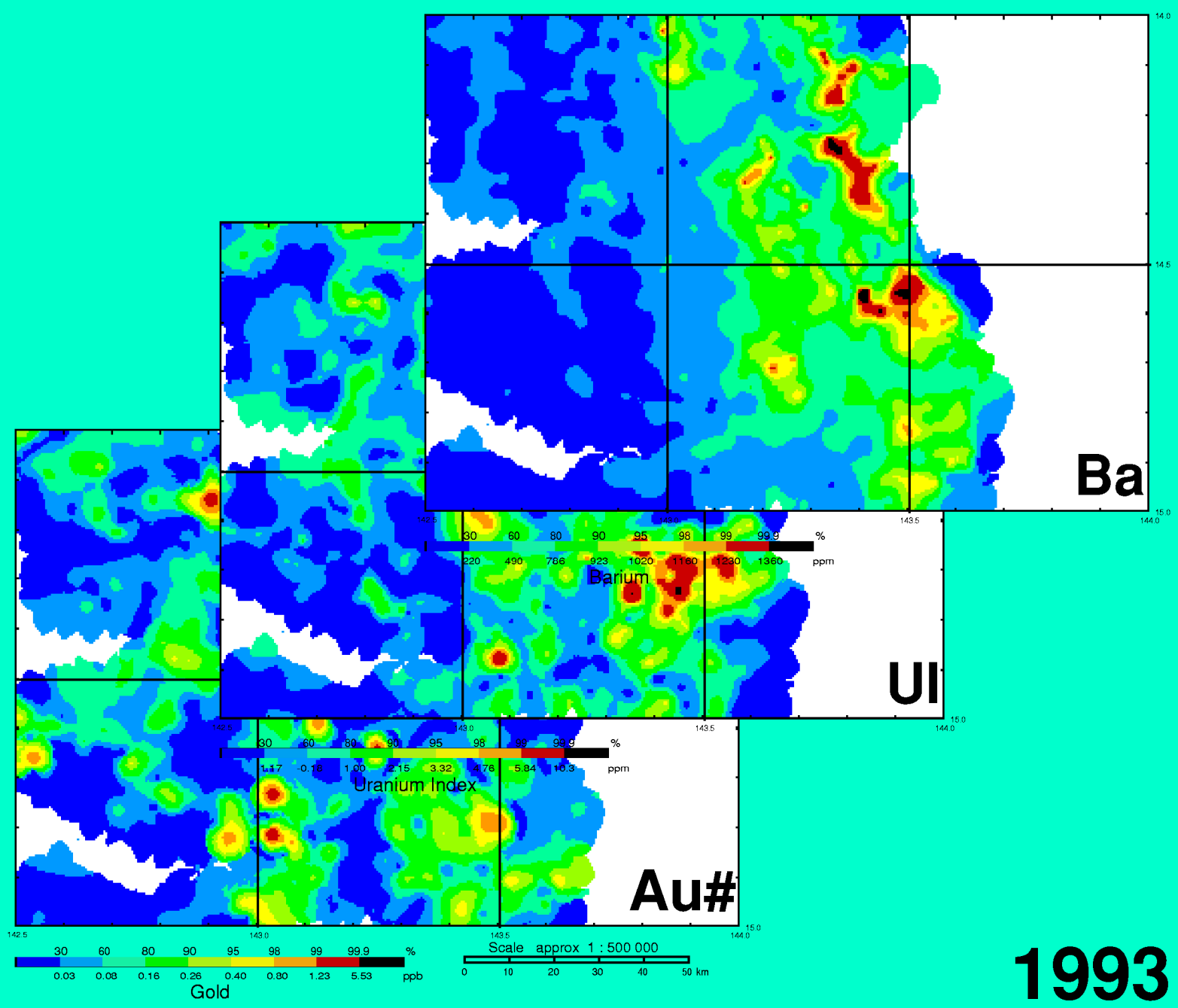
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

EBAGOOLA

STREAM SEDIMENT GEOCHEMICAL ATLAS



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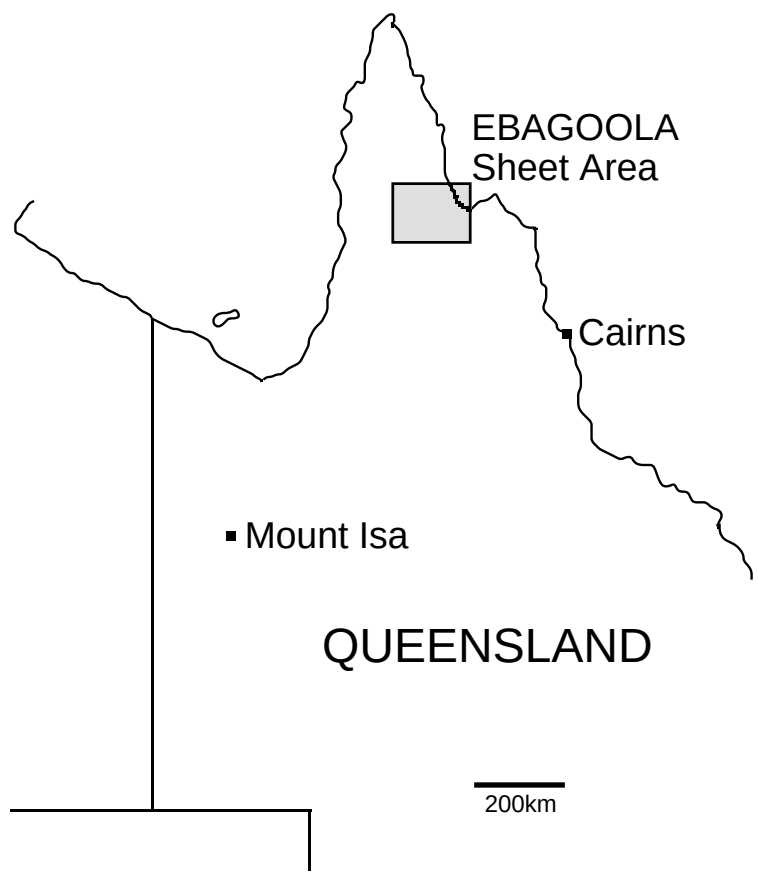
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION

Stream Sediment Geochemical Atlas Series

Ebagoola 1:250 000 sheet area, north Queensland (SD-54-12)



Minerals and Land Use Program

B I Cruikshank and D Butrovski

DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Minister for Resources: Hon. David Beddall
Secretary: Greg Taylor

AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
(formerly BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS)

Executive Director: Harvey Jacka

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This atlas is a product of the National Geoscience Mapping Accord.

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ABSTRACT

This atlas consists of colour images created from data for stream sediment samples from the EBAGOOLA 1:250 000 sheet area, collected and analysed by the North Queensland Project of the Minerals and Land Use Program, Australian Geological Survey Organisation.

The images show the spatial distributions of some 36 elements over the sheet area, plus a number of statistically derived parameters such as principal component factor scores, residuals of Cu, Pb, U and Zn (elements of economic interest with lithochemical overprinting), and additive indices for six types of potential mineralisation. Tables of basic univariate statistical parameters and factor loadings are included in appendices, and overlays of drainage, catchment basins outlines, simplified geology and mineral occurrences, are included.

INTRODUCTION

The Ebagoola Stream Sediment Geochemical Atlas contains colour images of the distributions of element values (raw data) and statistically derived values (factor scores, element residual values and additive indices) from data resulting from field work in the EBAGOOLA 1:250 000 (SD-54-12) sheet area by Minerals and Land Use Program's North Queensland Project. The surfical geochemical (stream sediment) sampling program was undertaken to provide a framework for the assessment of regional mineral potential, lithochemical correlation and environmental baseline studies.

The research forms part of the North Queensland NGMA Project undertaken jointly by the Australian Geological Survey Organisation and the Geological Survey of Queensland. The National Geoscience Mapping Accord, endorsed by the Australian (now Australian and New Zealand) Minerals and Energy Council in 1990 is a joint Commonwealth/State/Territory initiative to produce, using modern technology, a new generation of geoscientific maps, data sets, and other information of strategically important regions of Australia over the next 20 years.

The EBAGOOLA 1:250 000 sheet area is bounded by latitudes 14°S and 15°S, and by longitudes 142°30'E and 144°E, and contains the following six 1:100 000 sheet areas.

STRATHBURN 7469	EBAGOOLA 7569	PRINCESS CHARLOTTE BAY 7669
STRATHMAY 7468	KALKAH 7568	MARINA PLAINS 7668

Analysis

Full details of sampling, chemical analytical and data processing techniques used are given in Cruikshank (1994). The sampling density was one sample per 10-15 km^2 and two samples, 50-70 gm of -180 um fine sediment and 5-6 kg of -1 mm coarse sediment, were collected at each of the 744 sample sites. The fine fraction was analysed in AGSO laboratories by X-ray fluorescence spectrometry (XRFS) for 31 elements (As, Ba, Bi, Ce, Cr, Cu, Fe, Ga, Ge, Hf, La, Mn, Mo, Nb, Nd, Ni, Pb, Rb, Sc, Se, Sn, Sr, Ta, Th, Ti, U, V, W, Y, Zn and Zr), and by Analabs in Perth by ICP-MS for 9 elements (Code GI222 - Ag, Be, Bi, Cd, Mo, P, Sb, Tl and W). A 2kg split of the coarse fraction was analysed by Australian Laboratory Services in Brisbane by bulk cyanide leach/GFAAS for 3 elements (Method PM216 - Au, Pd and Pt). Analyses by Analabs are suffixed with an asterisk (*) and by Australian Laboratory Services with a crosshatch (#). Basic univariate statistics for the data are shown in Appendix 1. All concentrations are in ppm except for Au#, Pd# and Pt# which are in ppb. No parameters have been recorded for Bi, Mo, Pd#, Pt#, Se and Ta as the majority of values for each were below the limit of detection of the methods used. For Pd# and Pt# the only values reported were at the detection limit (0.01 ppb) and below the detection limit, or 'Not detected' (<0.01 ppb).

Image production

The data were gridded to the following parameters:-

Longitude	minimum	- 142.5^{o}
	maximum	- 144.0^{o}
Latitude	minimum	- 14.0^{o}
	maximum	- 15.0^{o}
Grid spacing		- 0.0025^{o}
No. of columns		- 601
No. of rows		- 401
Interpolation method		- Kriging

Search radius - 0.050^{o}
Nearest neighbours - 10

A location approximating to the geometric centre of the drainage basin was used in preference to the sample site as this was held to more accurately represent the spatial relationship between drainage basins. Grid files were converted to colour images by classifying grid point values into 9 percentage-based ranges as follows:-

	Percentage of values	Range	Approximate pseudo colour
1	100.0-99.9	0.1	Black
2	99.9-99.0	0.9	Red
3	99.0-98.0	1.0	Orange
4	98.0-95.0	3.0	Yellow
5	95.0-90.0	5.0	Yellow-green
6	90.0-80.0	10.0	Green
7	80.0-60.0	20.0	Blue-green
8	60.0-30.0	30.0	Dark blue

The images were scaled to approximate the aspect ratio of a 1:500 000 map but have not been rectified to a standard map projection (i.e. are rectangular). Image maps were annotated and printed on a colour laser copier fitted with a PostScript interpreter.

Maps 1 to 37 show raw element distributions. Maps for Bi, Mo, Pd#, Pt#, Se and Ta have been excluded because of the large proportions of 'Not detected' values in their data. Tungsten is shown as W (XRFS by AGSO Laboratory) and W* (ICP-MS by Analabs).

Factor analysis

Principal component factor analysis of log-transformed data, using a Varimax orthogonal transformation solution, resulted in the extraction of 7 Factors, with factor loadings shown in Appendix 2. Principal, or major, loadings are the highest absolute factor loading for the element, and minor loadings are any other absolute factor loadings greater than 0.30. The 7 factors extracted are:-

Factor 1 (accounts for 28.4% of variation in dataset) comprises Ce, La, Nd, Th, U, Y, P*, W and Nb, with minor contributions from Zr, Pb, Ti, Hf and Rb. This factor is considered to represent resistant heavy minerals in the sediment, primarily the phosphate minerals Monazite ($[Ce,La,Nd,Th]PO_4$) and Xenotime ($[Y,HREE]PO_4$ - HREE are heavy Rare Earth Elements), and possibly Zircon ($[Zr,Hf]SiO_4$). These minerals often contain U in appreciable amounts.

Factor 2 (22.0%) comprises Fe, Cu, Ni, V, Sc, Cr, Zn, Ti and As, with minor contributions from Mn, Nb and Sn, and negative contributions from Tl* and Pb. This factor is considered to be related to Fe geochemistry both in the entry of elements into Fe-rich mafic minerals such as Pyroxenes, Amphiboles and Biotite, and in the co-precipitation with, or adsorption onto, hydrated Fe-oxides in the secondary environment.

Factor 3 (12.9%) comprises Sr, Ba, Rb, Pb, Ga, Be*, Tl* and Mn, with minor contributions from P*, Zn, Nd, Ce, La and Th, and negative contributions from Ti, Cr and Nb. This factor is highly intercorrelated with Factor 1 (see Appendix 2) and is considered to be related to the weathering of granites, probably containing K-rich minerals.

Factor 4 (6.5%) comprises Mo*, W* and Sb*.

Factor 5 (3.8%) comprises Bi*, Ge and Au#, with minor contributions from Be*, W and Ag*. The communalities of most of these elements (see Appendix 2) are low suggesting that much of the variance of these elements is not accounted for by the factor. However, the association of Au# with Bi*, W and Ag* may be due to the minerals often associated with Gold mineralisation.

Factor 6 (3.1%) comprises Hf, Zr and Sn, with minor contributions from V and Nb, and a negative contribution from Rb. This is also considered to be related to resistant heavy minerals in the sediment, namely Zircon ($[Zr,Hf]SiO_4$) and Cassiterite (SnO_2).

Factor 7 (2.8%) comprises Cd* and Ag*. The communalities of the elements are low and the association is difficult to explain.

The distributions of factor scores are shown in images 38 to 44.

Element residuals

Residual values for Cu, Pb, U and Zn were estimated by regression against the factor scores for factors in which they have significant contributions and subtraction of the 'fitted' value obtained from the observed or analysed value. For example, the observed concentration of U has been corrected for the concentration of U held in the resistant minerals Monazite, Xenotime and, possibly, Zircon as estimated by regression of U (log-transformed) against Factor 1 scores. Similarly, Cu, Pb and Zn have been corrected for lithological and secondary effects represented in Factors 1, 2 and 3 as appropriate. The 'fitted' value (X_p) was estimated from a regression equation derived from a dataset from which 'outliers' (samples with large residuals) were deleted to more accurately define the parameters of the background population. The equations used are:-

$$\log(Cu_p) = 0.410*F2 + 0.275$$
$$\log(Pb_p) = 0.152*F1 - 0.109*F2 + 0.197*F3 + 1.318$$
$$\log(U_p) = 0.206*F1 + 0.577$$
$$\log(Zn_p) = 0.209*F2 + 0.026*F3 + 1.14$$

where F1, F2 and F3 are Factor 1, Factor 2 and Factor 3 scores respectively. The distributions of residual Cu, Pb, U and Zn are shown in images 45 to 48 respectively.

Additive indices

Additive Indices are summations of standardised values for economic and pathfinder elements characteristic of particular types of mineralisation. The standardised values are dimensionless and are calculated by subtracting the element mean for the dataset from the individual element value and dividing by the element standard deviation. Six Additive Indices were calculated, these being:-

Gold Index (AuI)	- Ag* + As + Au# + Sb*
Base Metal Index (BMI)	- Ba + Cu(res) + Pb(res) + Zn(res)
Heavy Mineral Index (HMI)	- Ce + La + Nd + P* + Th + Y
Porphyry Copper Index (PCI)	- Cu(res) + Mo* + Rb
Platinum Index (PtI)	- Cr + Ni + Pd# + Pt# + V
Uranium Index (UI)	- As + Bi* + Mo* + U(res)

where (res) indicates an element residual value has been used.

Distribution of the values are shown in image 49 to 54.

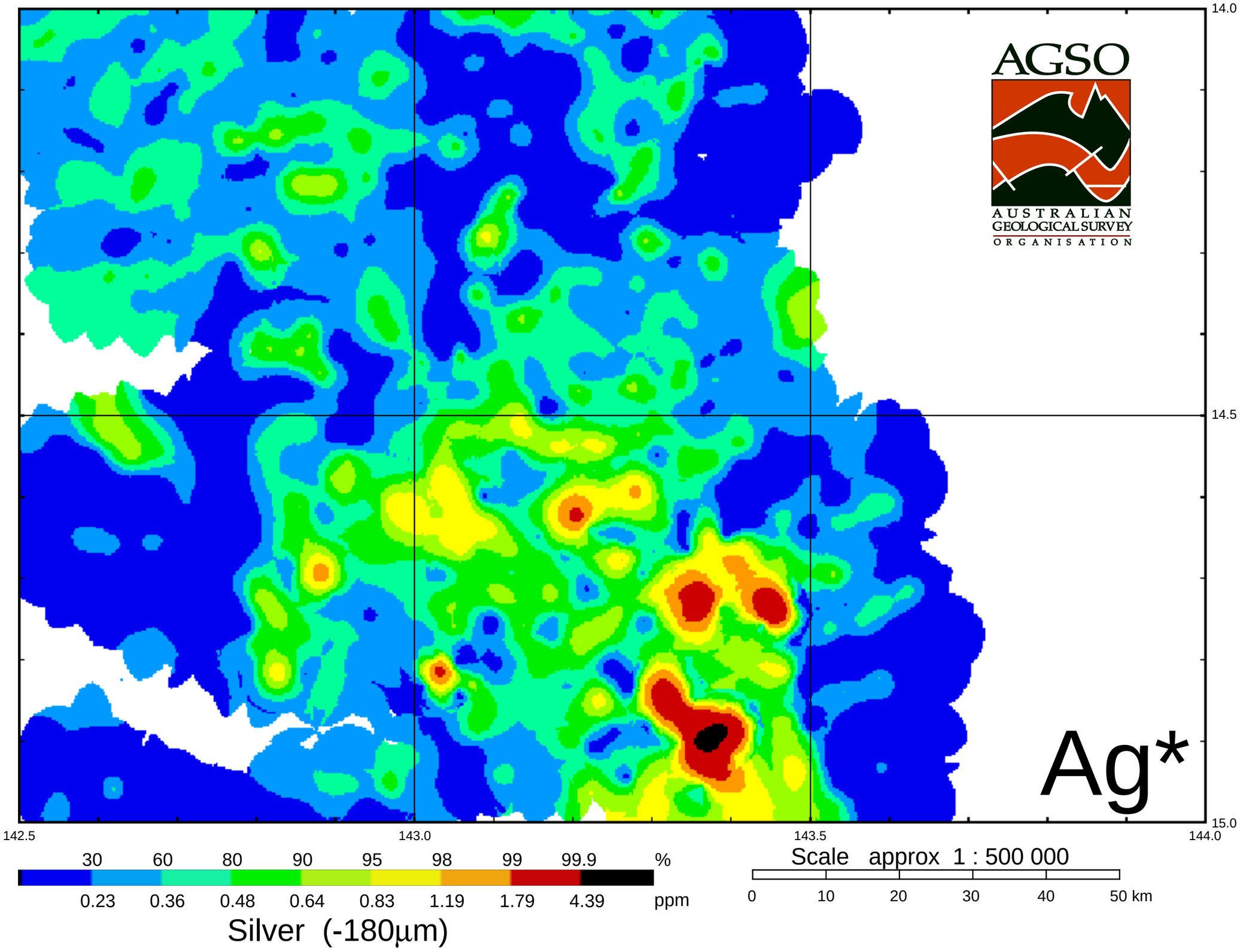
Overlays showing:-

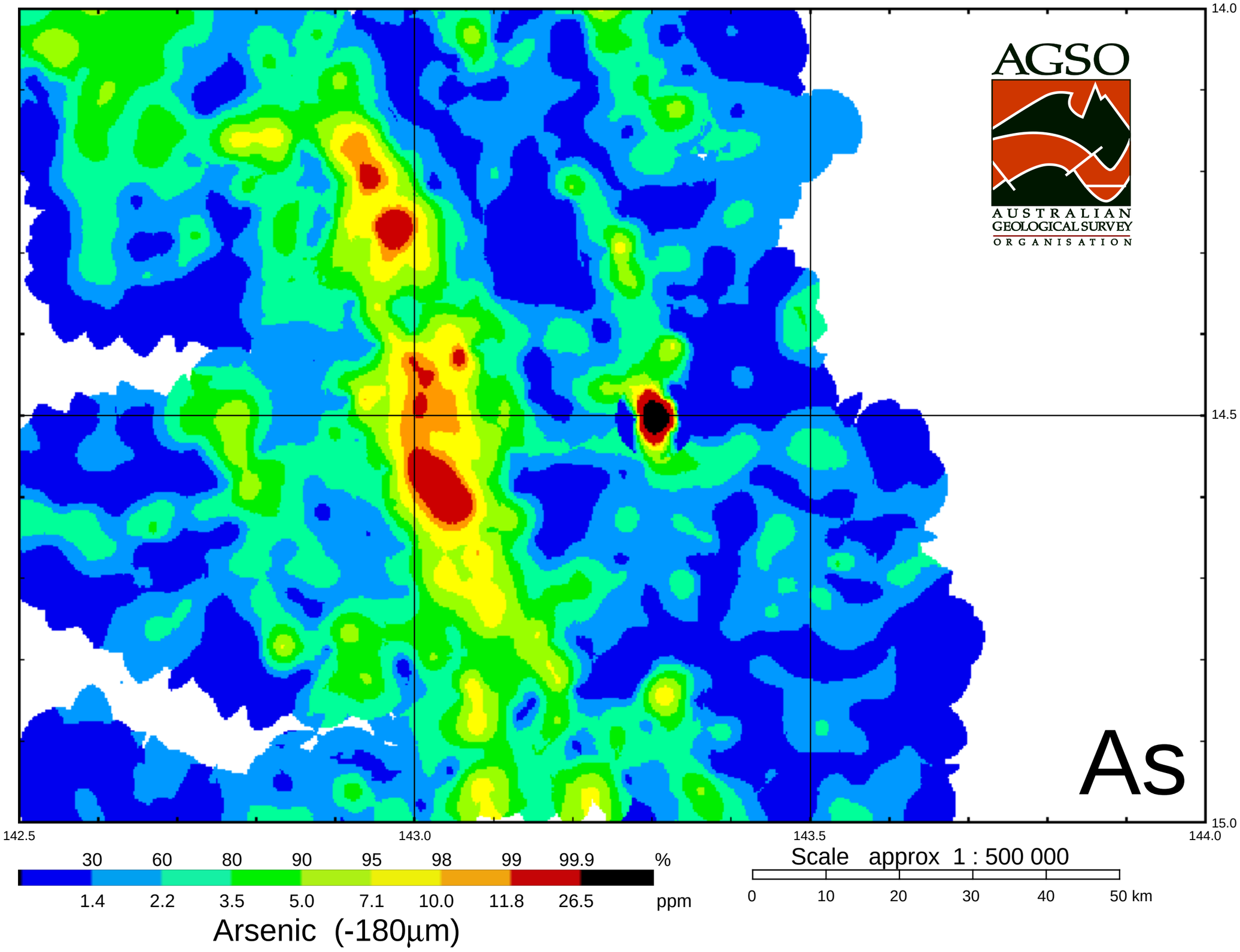
1) sample sites and catchment basin outlines,
2) drainage
and 3) simplified geology and mineral occurrences

are included in a pocket in the inside back cover.

References

Cruikshank, B.I., 1994. Stream sediment geochemistry of the Ebagoola 1:250 000 sheet area, Cape York Peninsula, north Queensland. Australian Geological Survey Organisation, Record 1994/8 (unpublished).


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ag*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.23 0.36 0.48 0.64 0.83 1.19 1.79 4.39 ppm
Silver (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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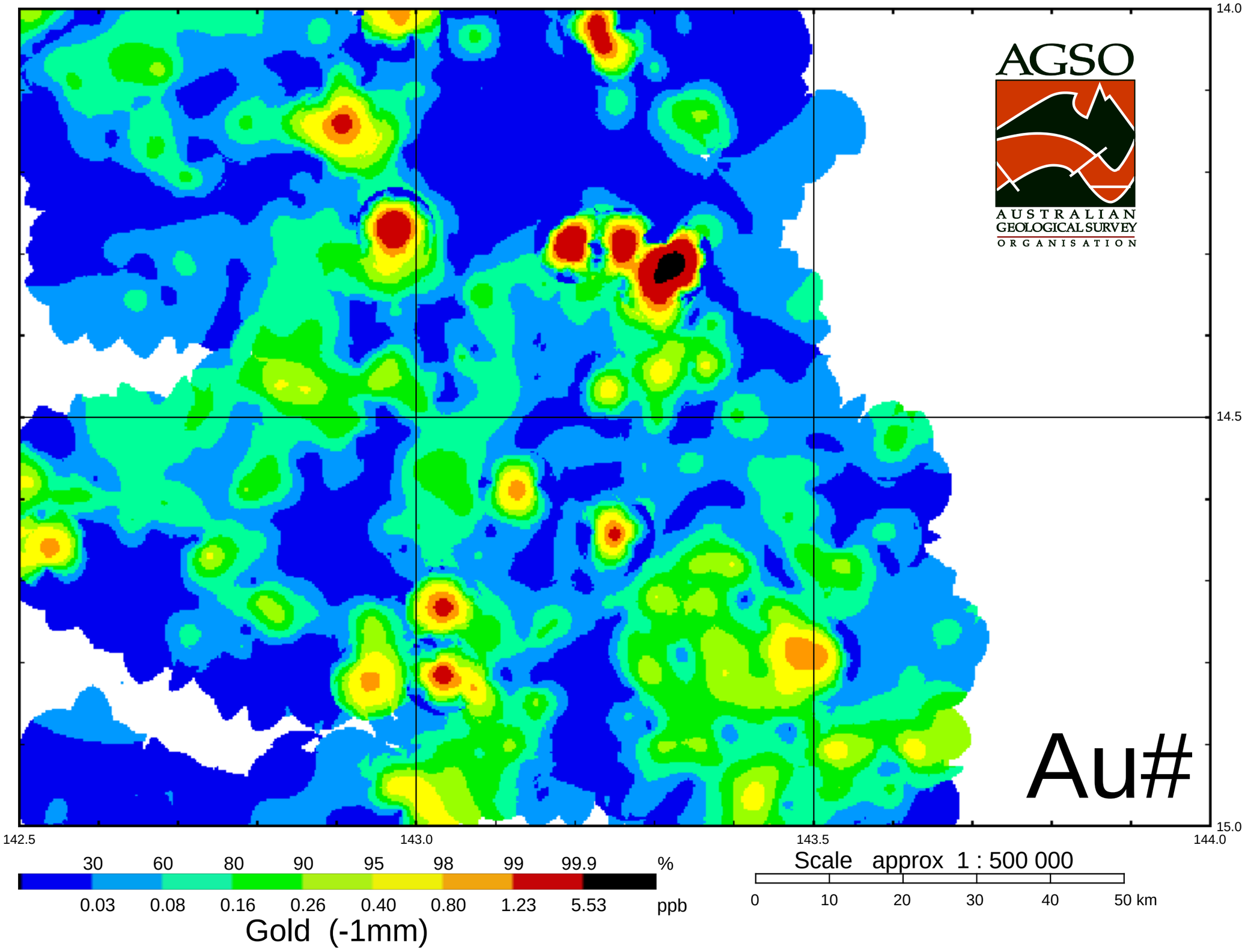
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
As
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
1.4 2.2 3.5 5.0 7.1 10.0 11.8 26.5 ppm
Arsenic (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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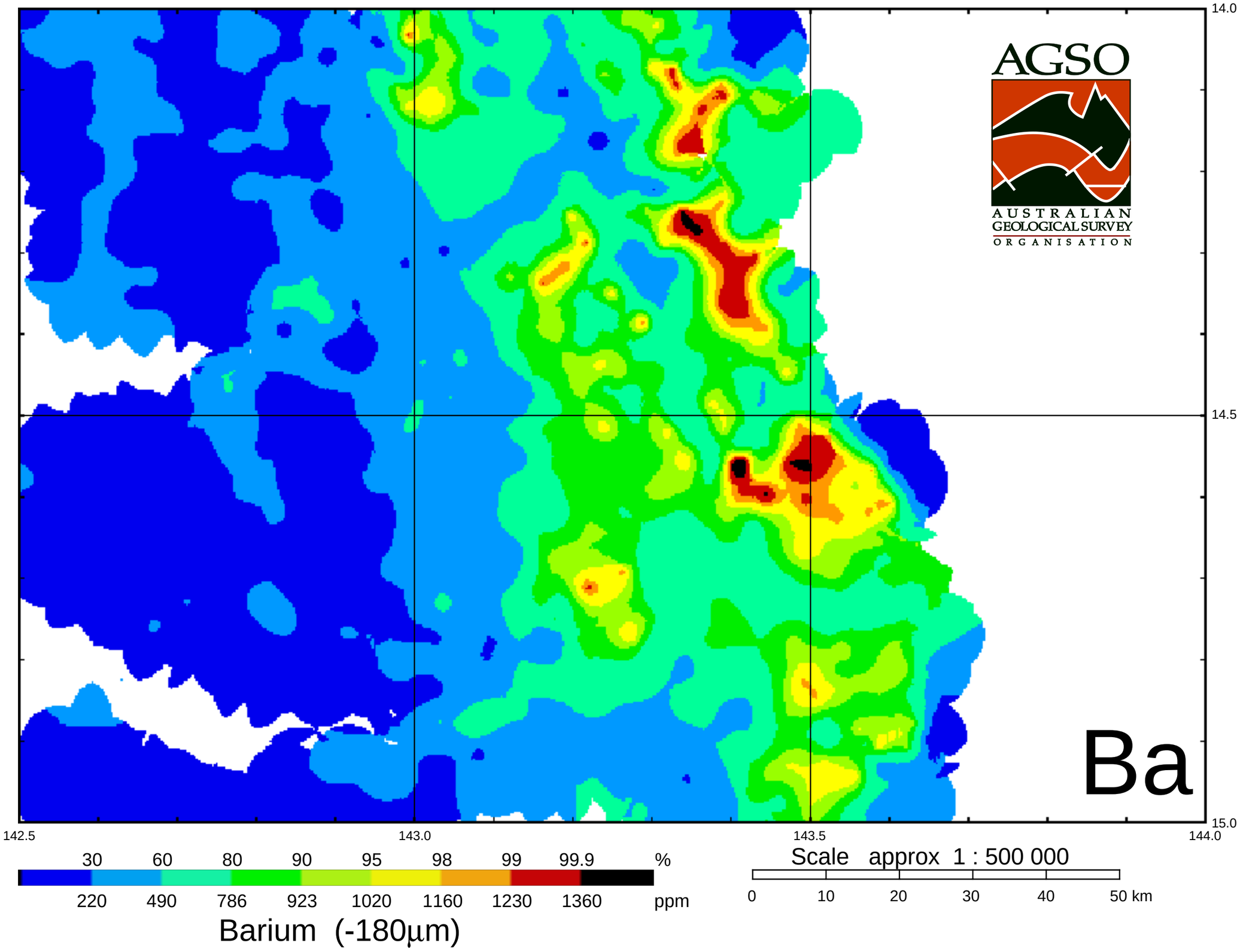
Au#
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.03 0.08 0.16 0.26 0.40 0.80 1.23 5.53 ppb
Gold (-1mm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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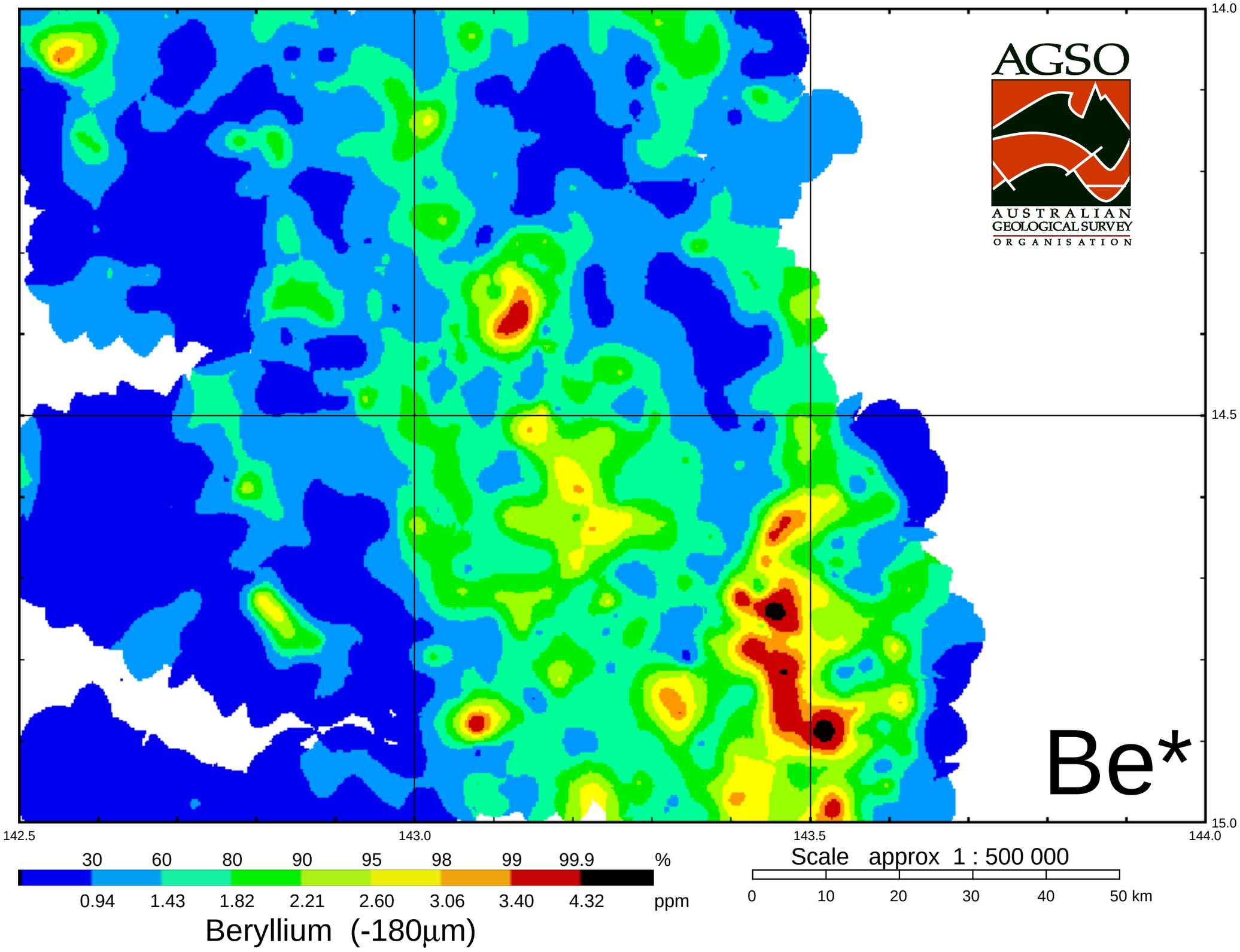
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ba
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
220 490 786 923 1020 1160 1230 1360 ppm
Barium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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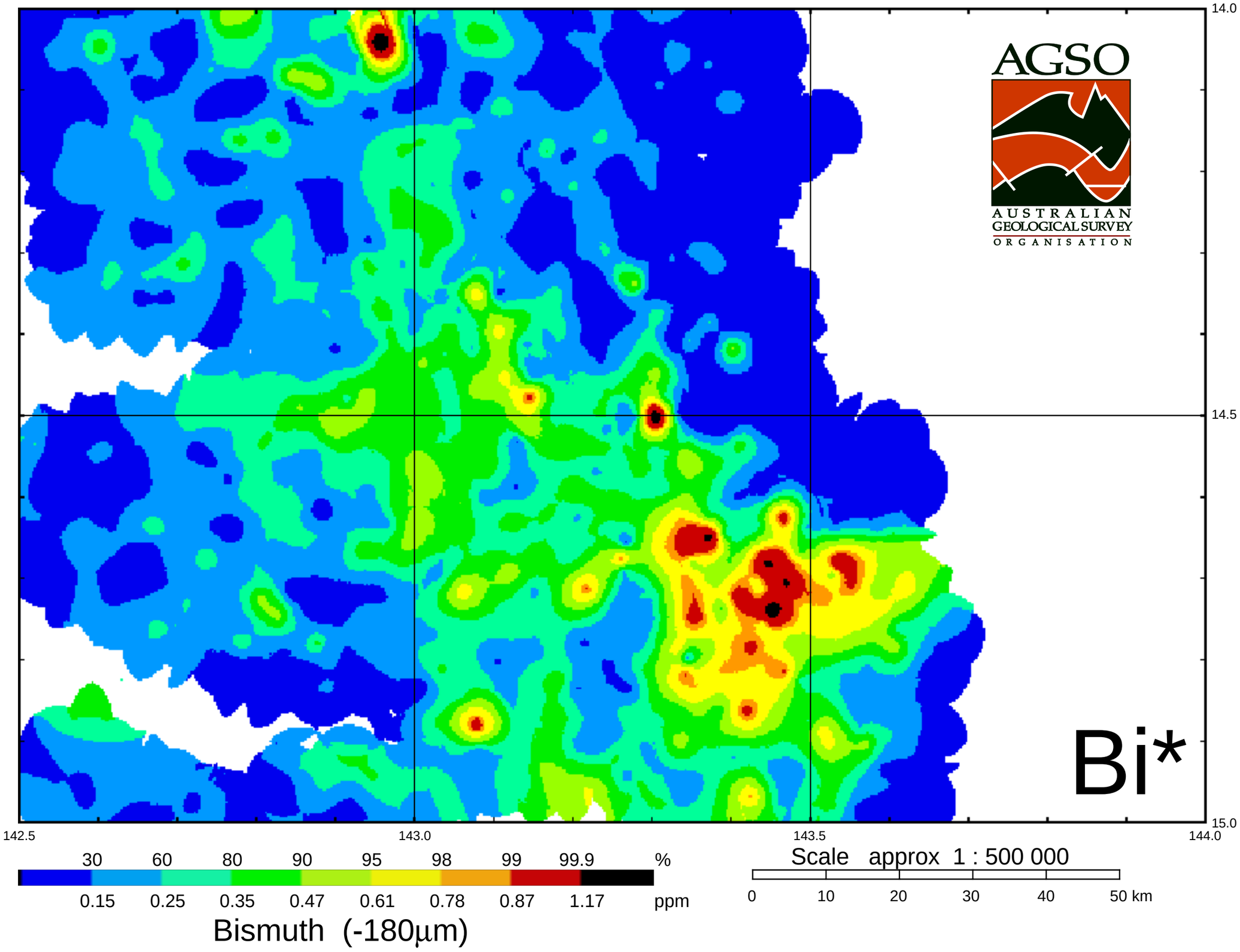
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Be*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.94 1.43 1.82 2.21 2.60 3.06 3.40 4.32 ppm
Beryllium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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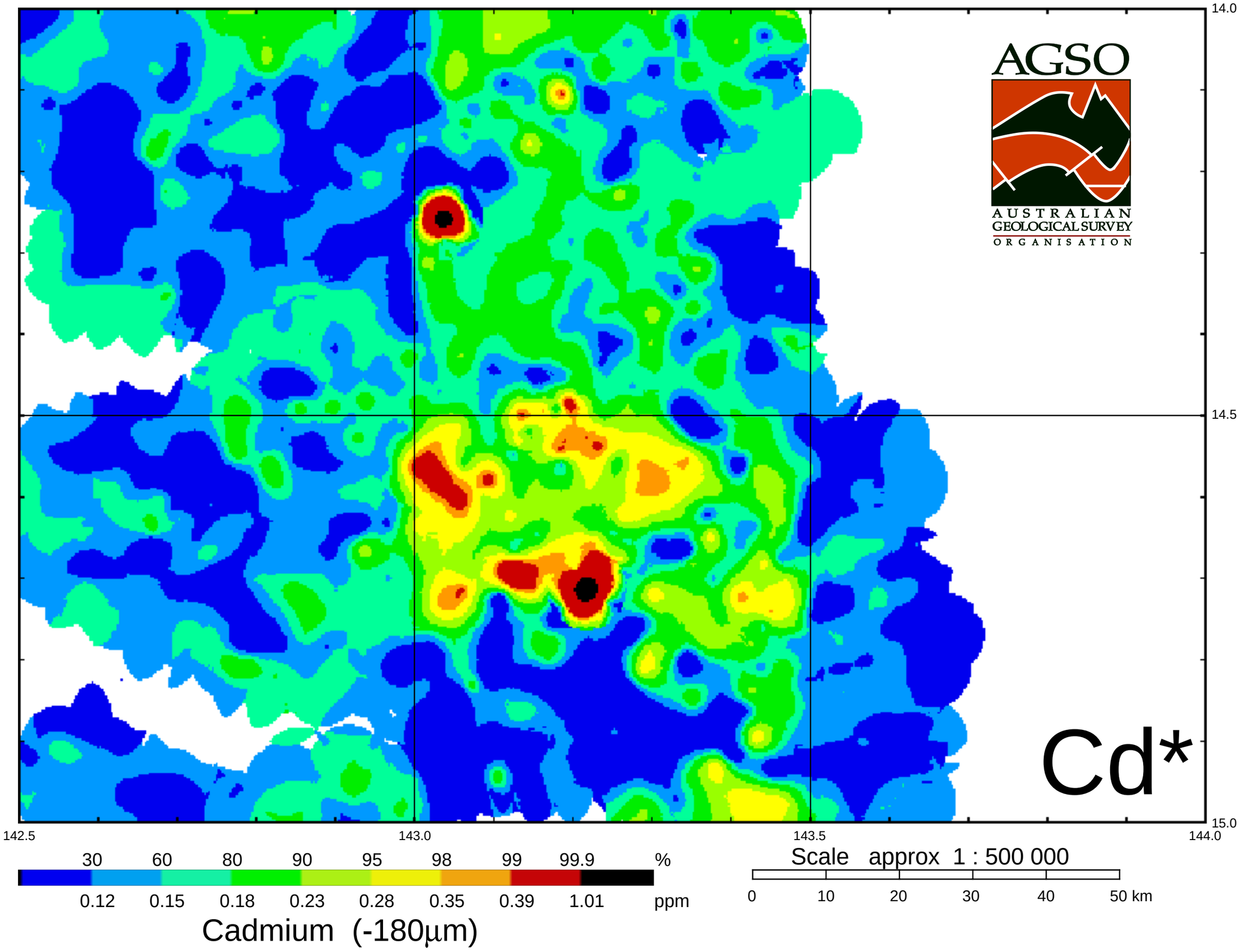
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Bi*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.15 0.25 0.35 0.47 0.61 0.78 0.87 1.17 ppm
Bismuth (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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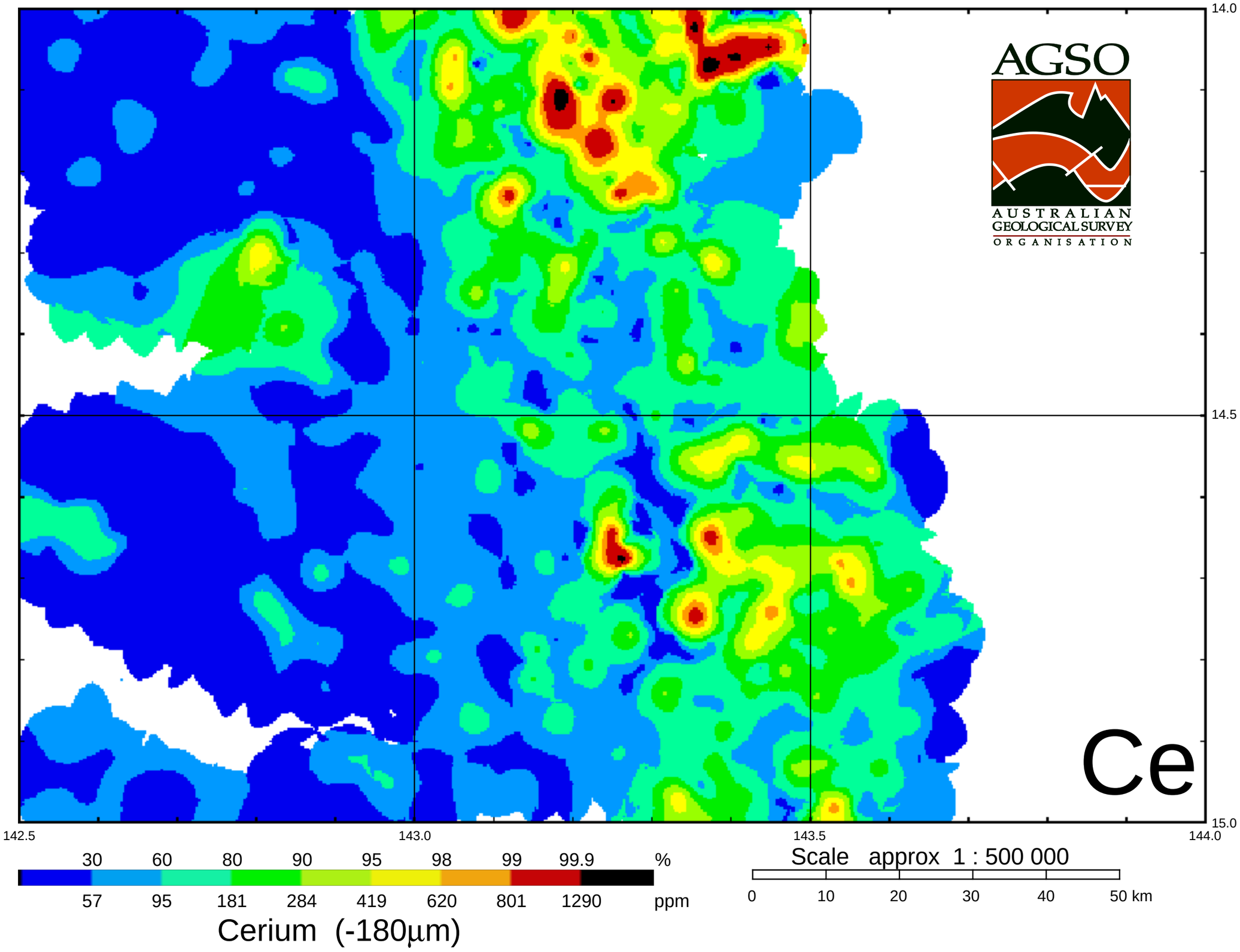
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Cd*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.12 0.15 0.18 0.23 0.28 0.35 0.39 1.01 ppm
Cadmium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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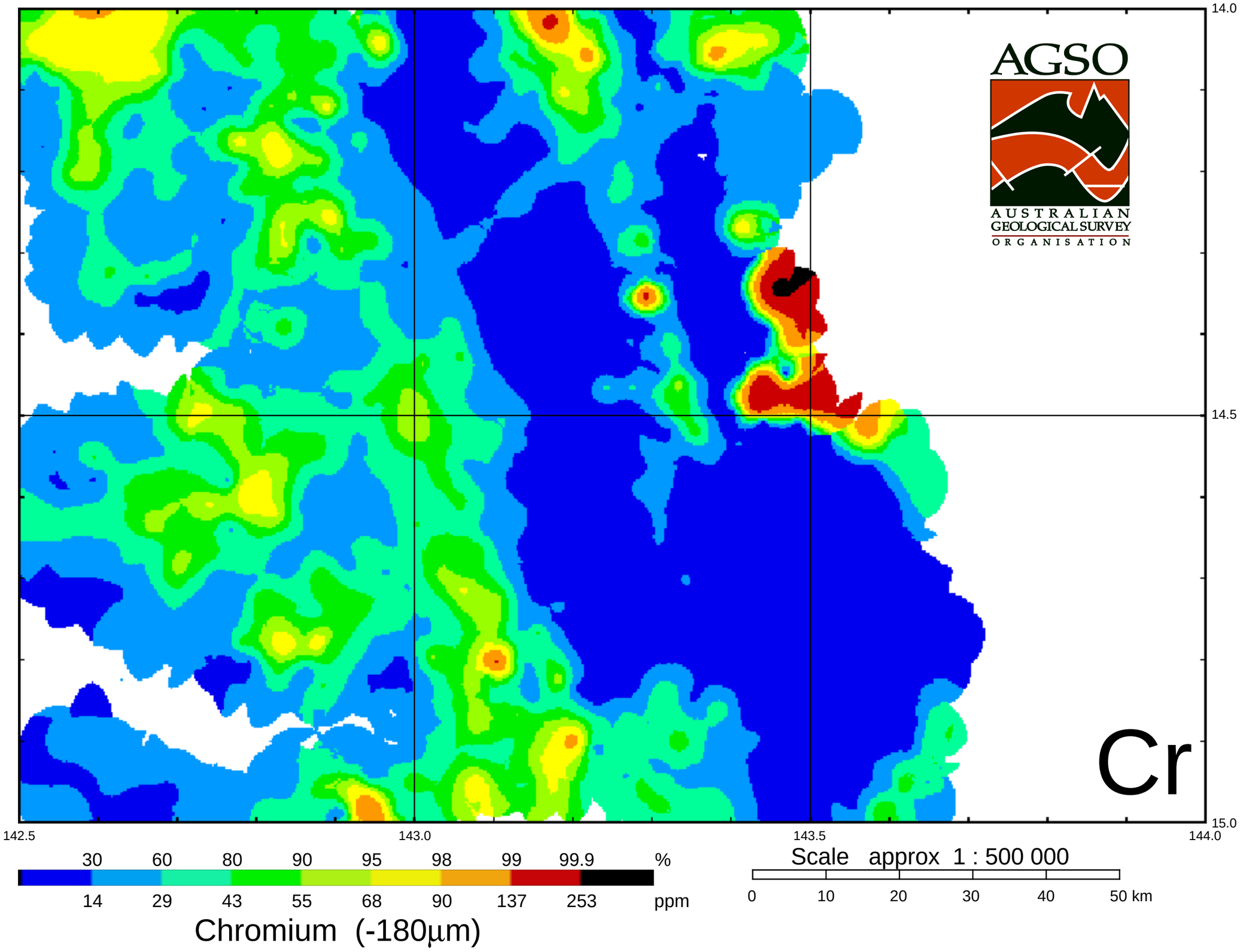
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ce
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
57 95 181 284 419 620 801 1290 ppm
Cerium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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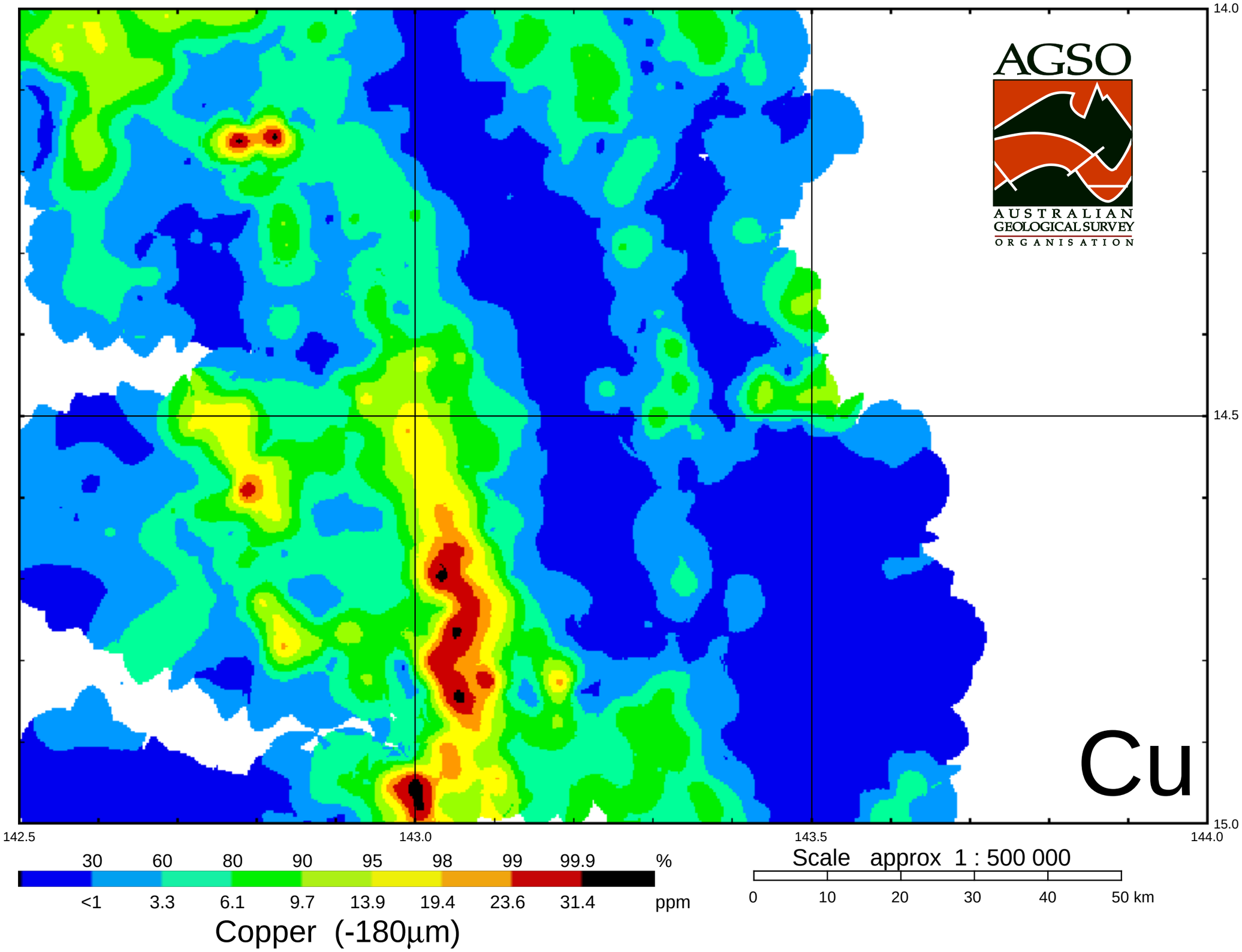
Cr
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
14 29 43 55 68 90 137 253 ppm
Chromium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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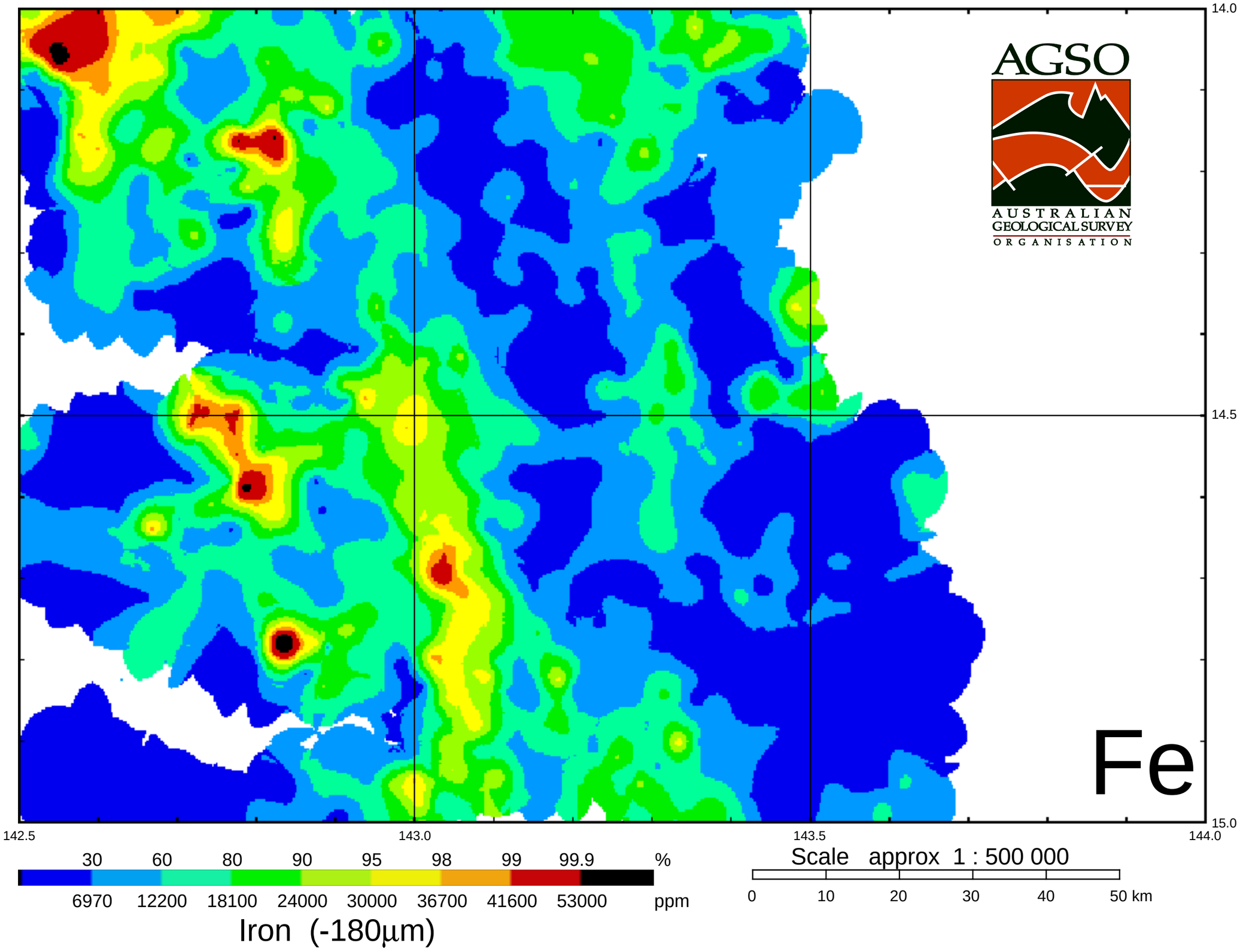
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Cu
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
<1 3.3 6.1 9.7 13.9 19.4 23.6 31.4 ppm
Copper (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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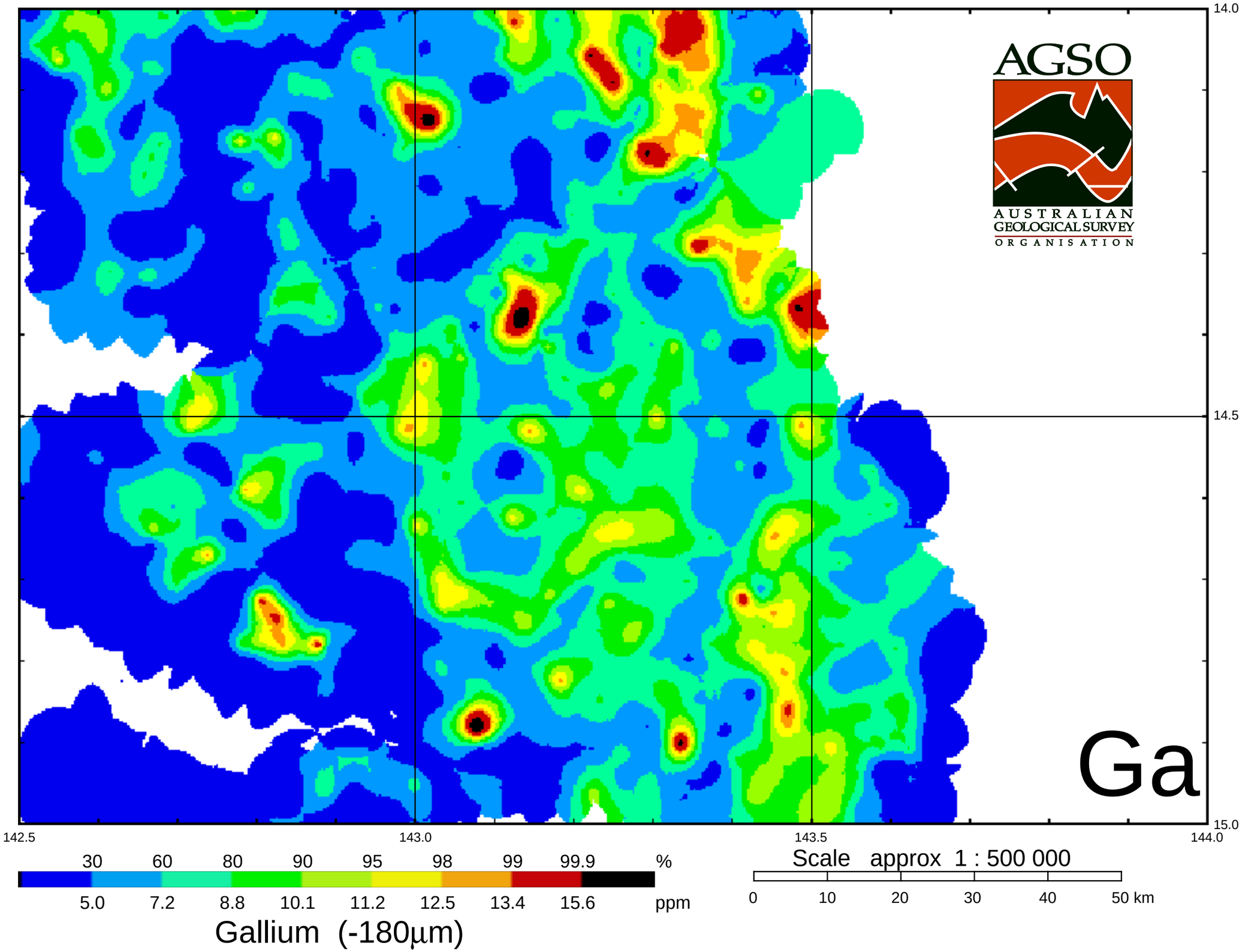
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Fe
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
6970 12200 18100 24000 30000 36700 41600 53000 ppm
Iron (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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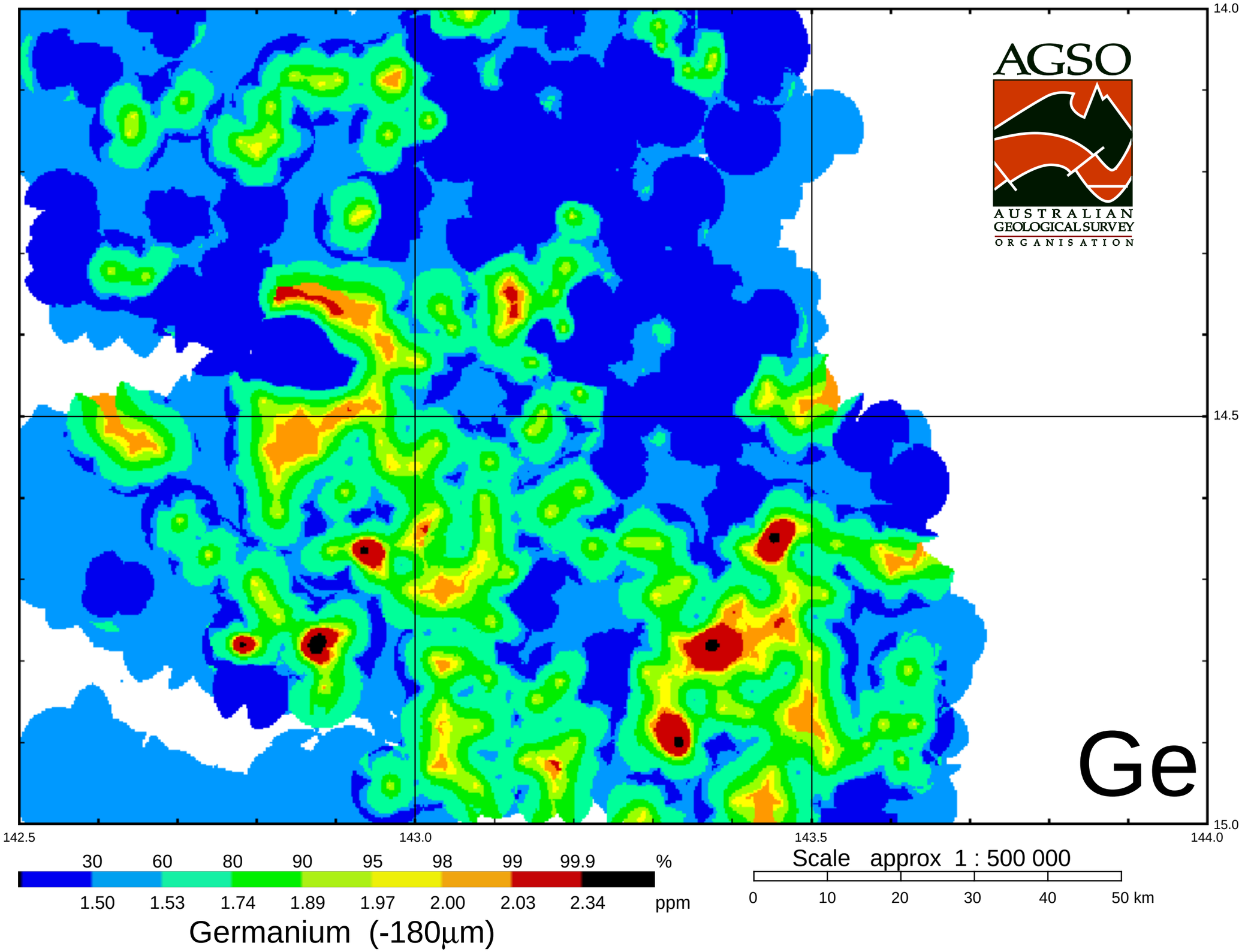
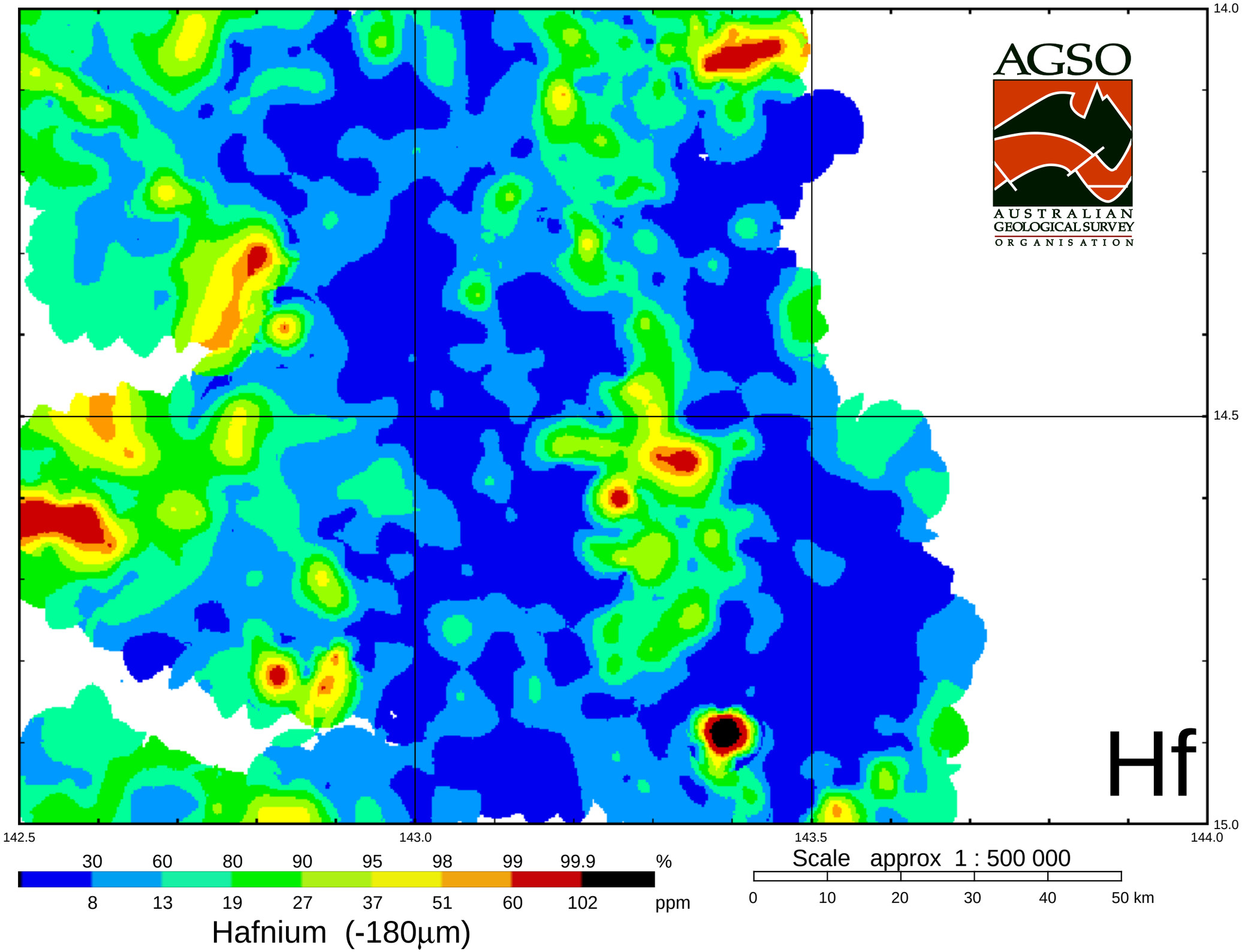
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ga
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
5.0 7.2 8.8 10.1 11.2 12.5 13.4 15.6 ppm
Gallium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ge
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
1.50 1.53 1.74 1.89 1.97 2.00 2.03 2.34 ppm
Germanium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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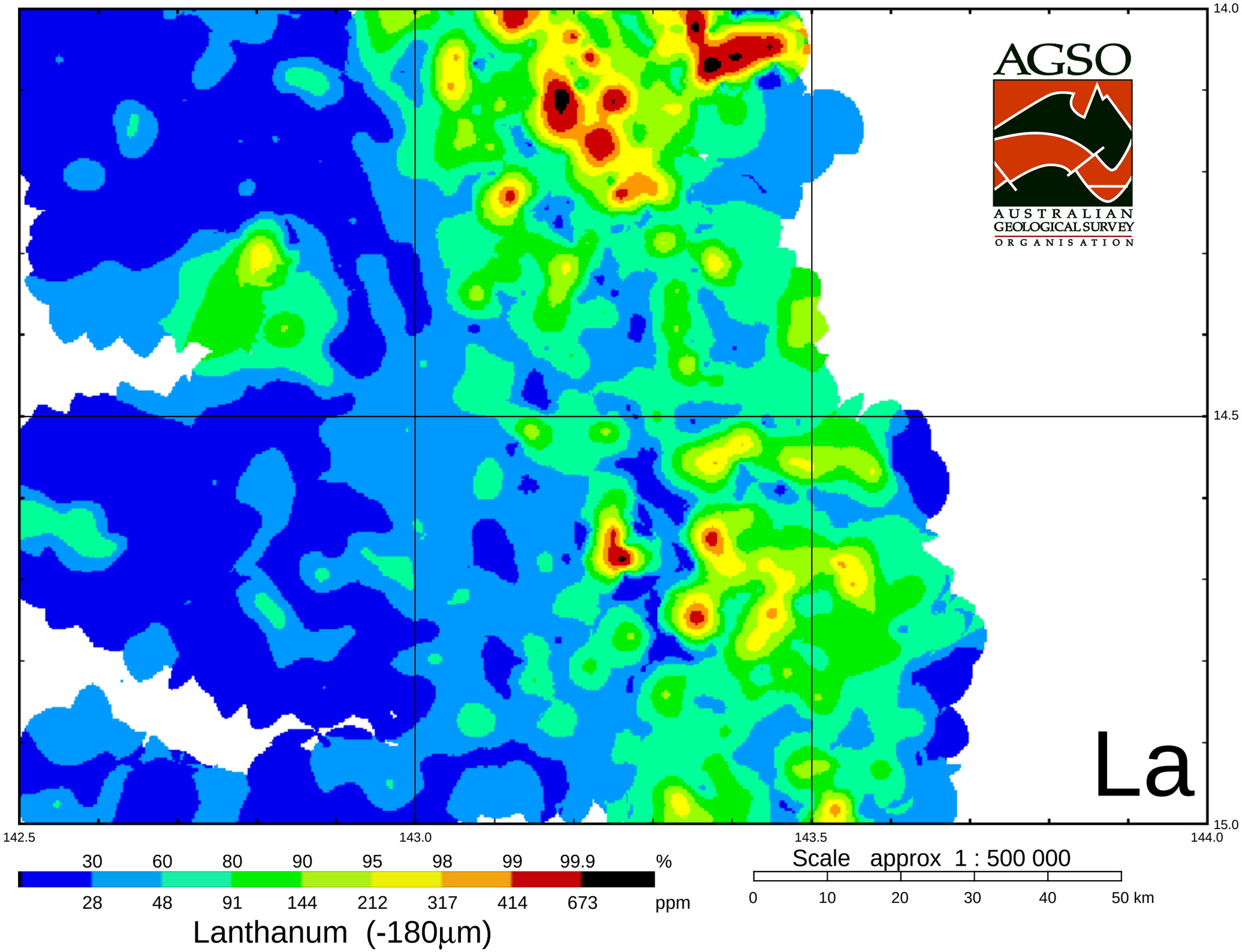
Hf
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
8 13 19 27 37 51 60 102 ppm
Hafnium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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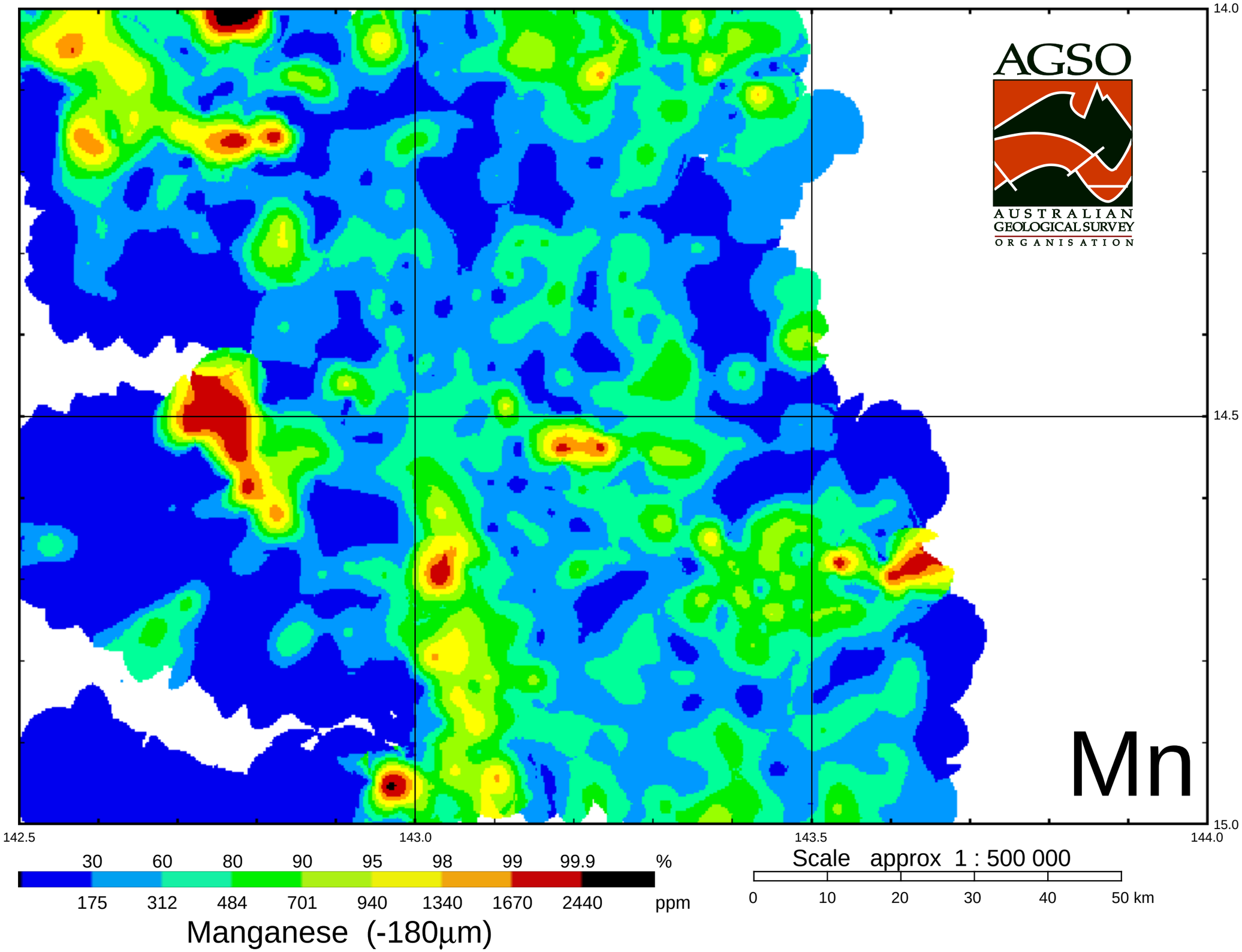
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
La
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
28 48 91 144 212 317 414 673 ppm
Lanthanum (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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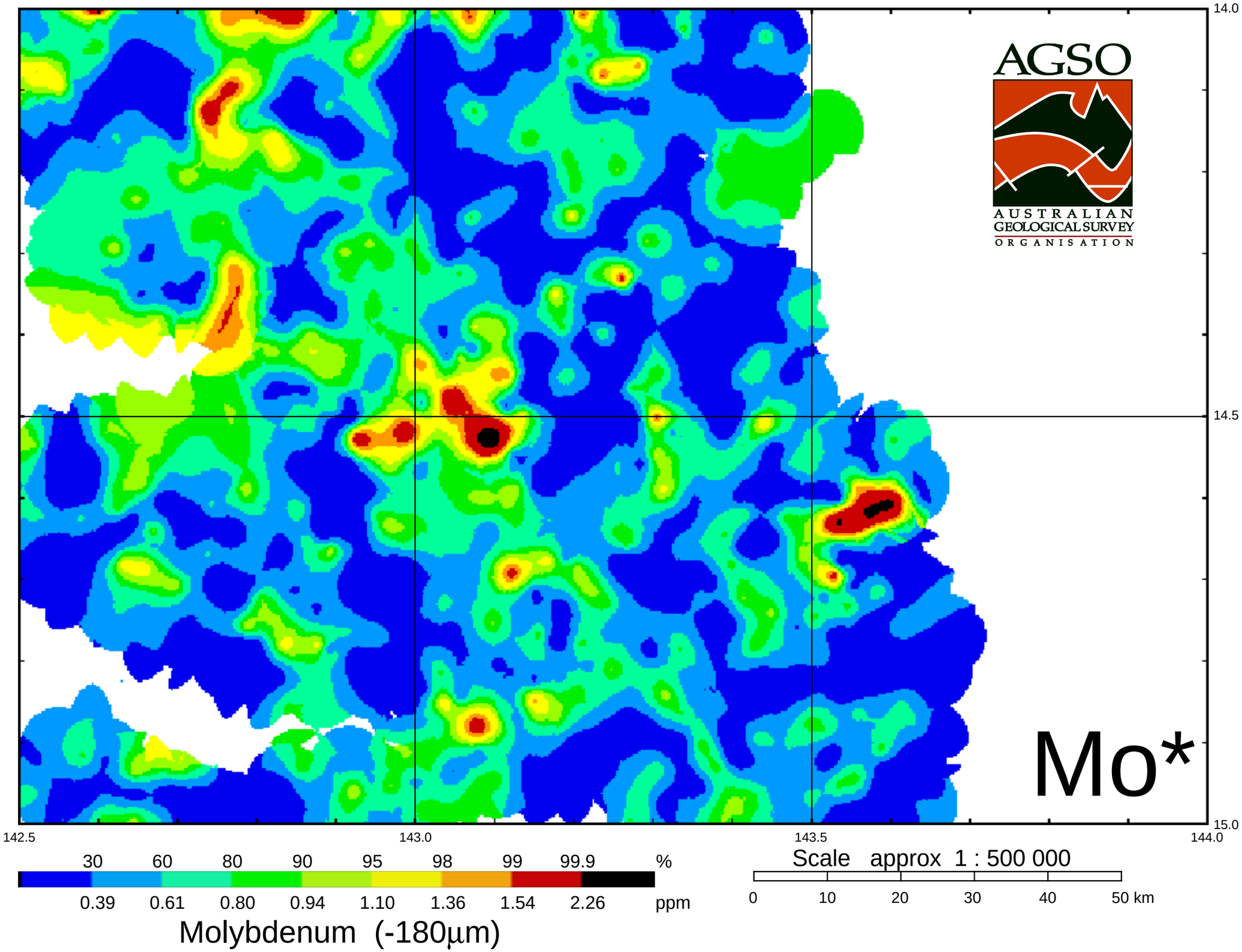
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Mn
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
175 312 484 701 940 1340 1670 2440 ppm
Manganese (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km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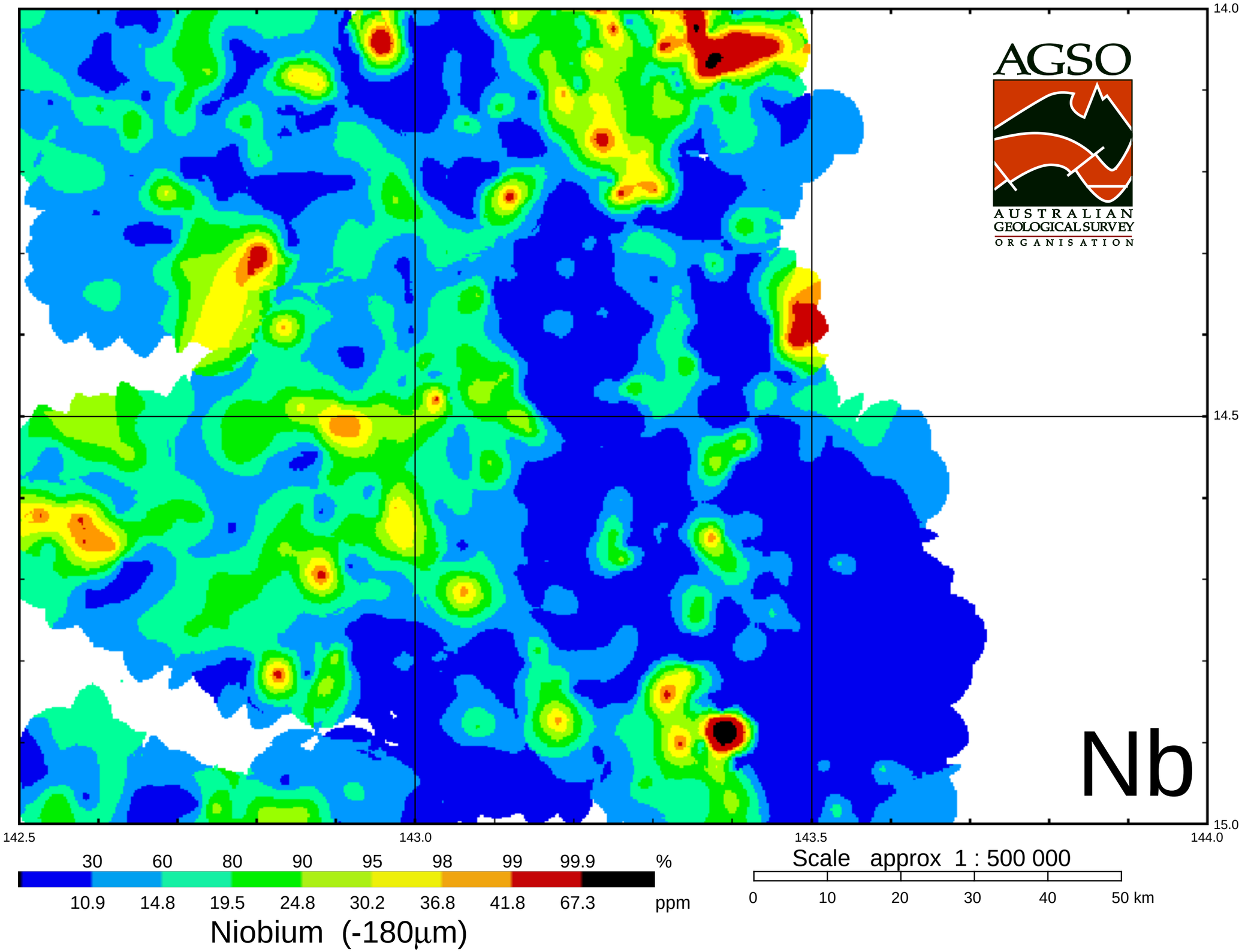
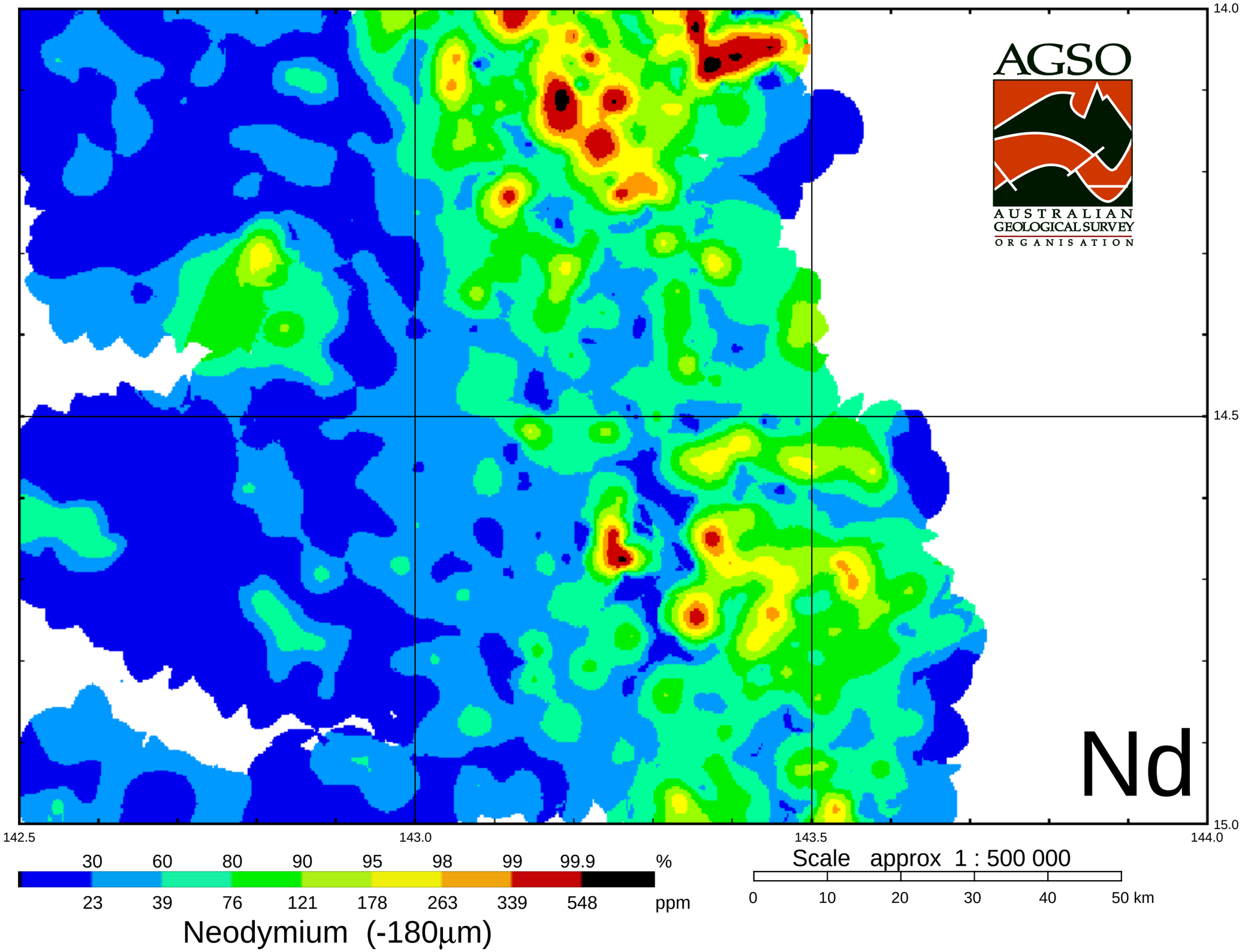
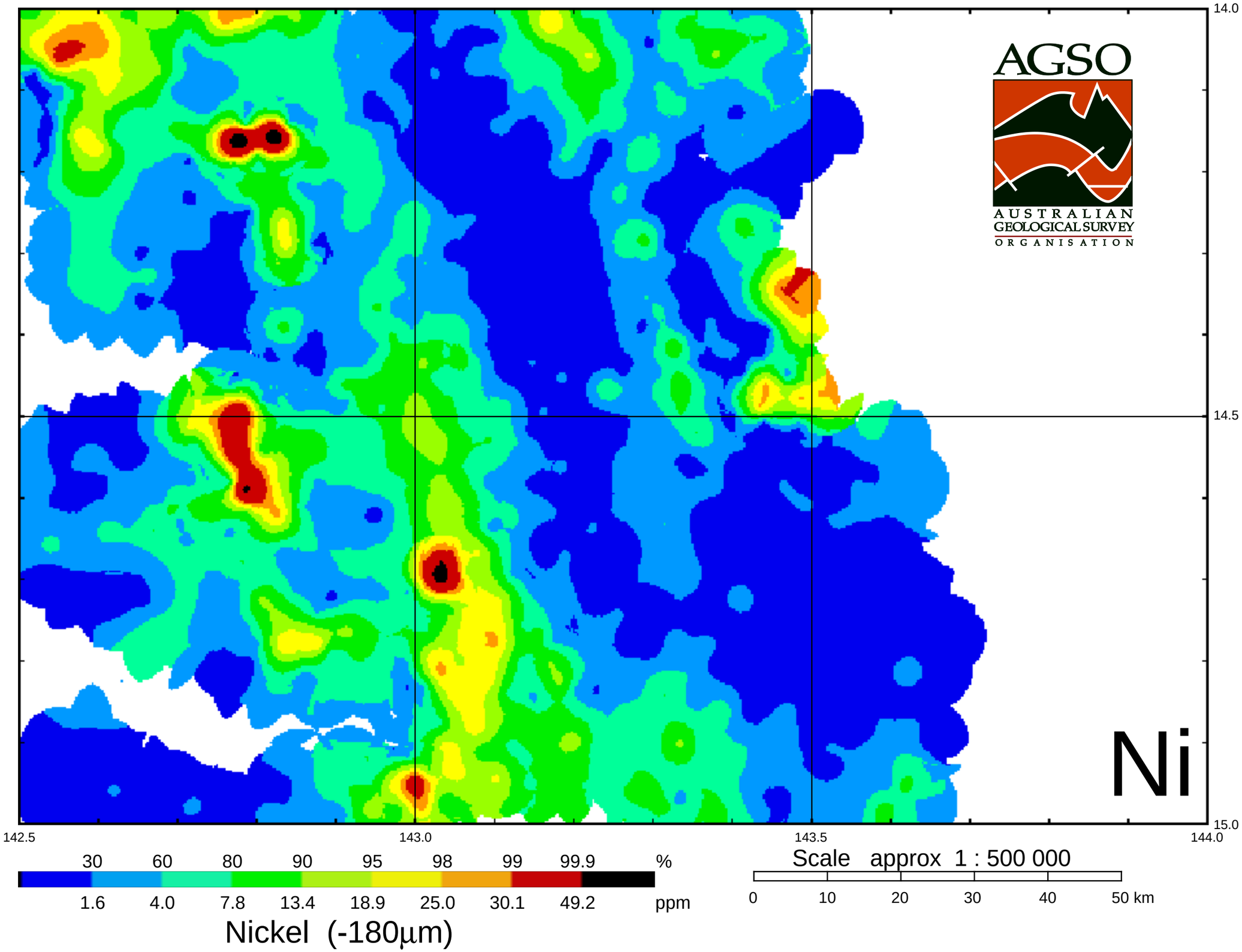
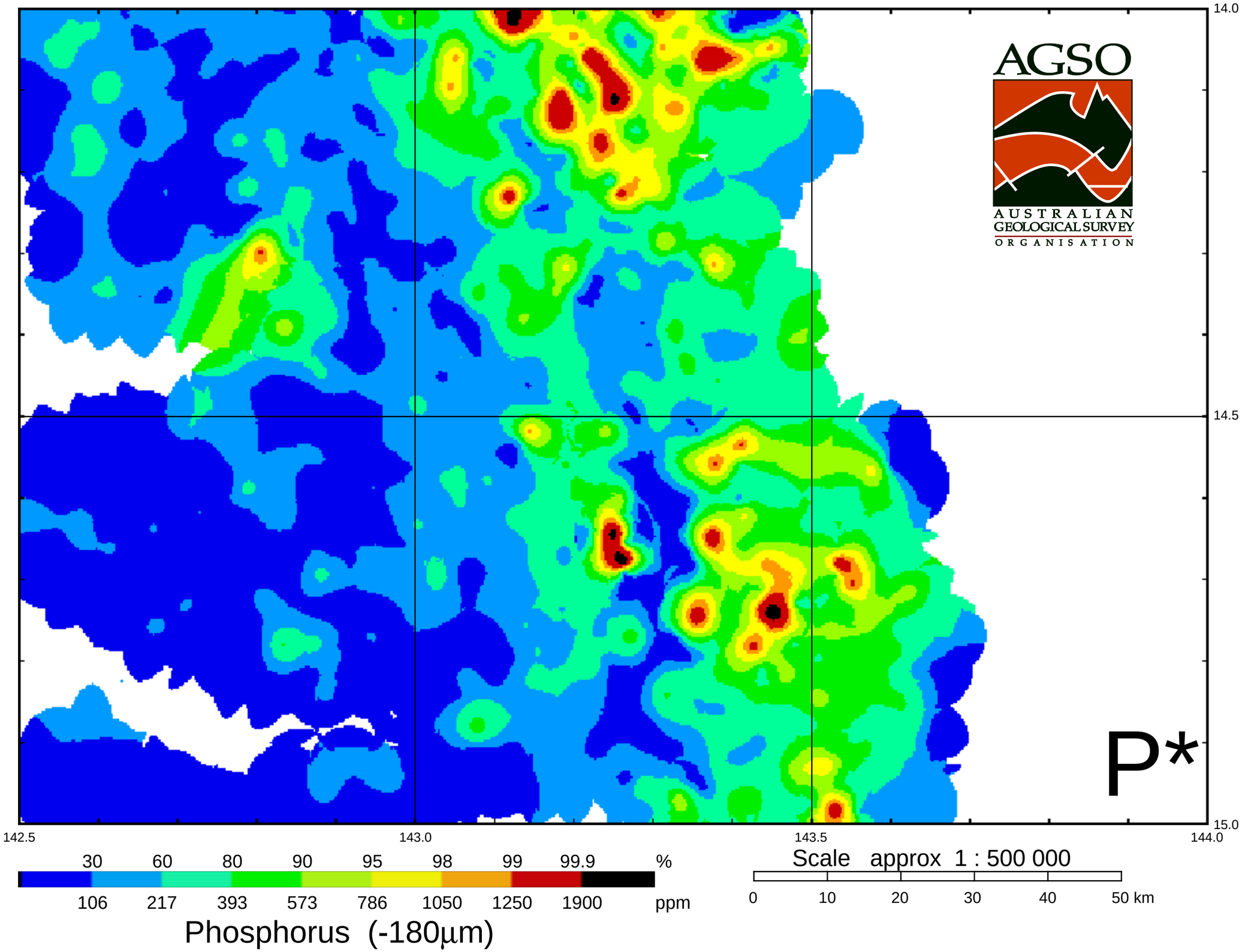
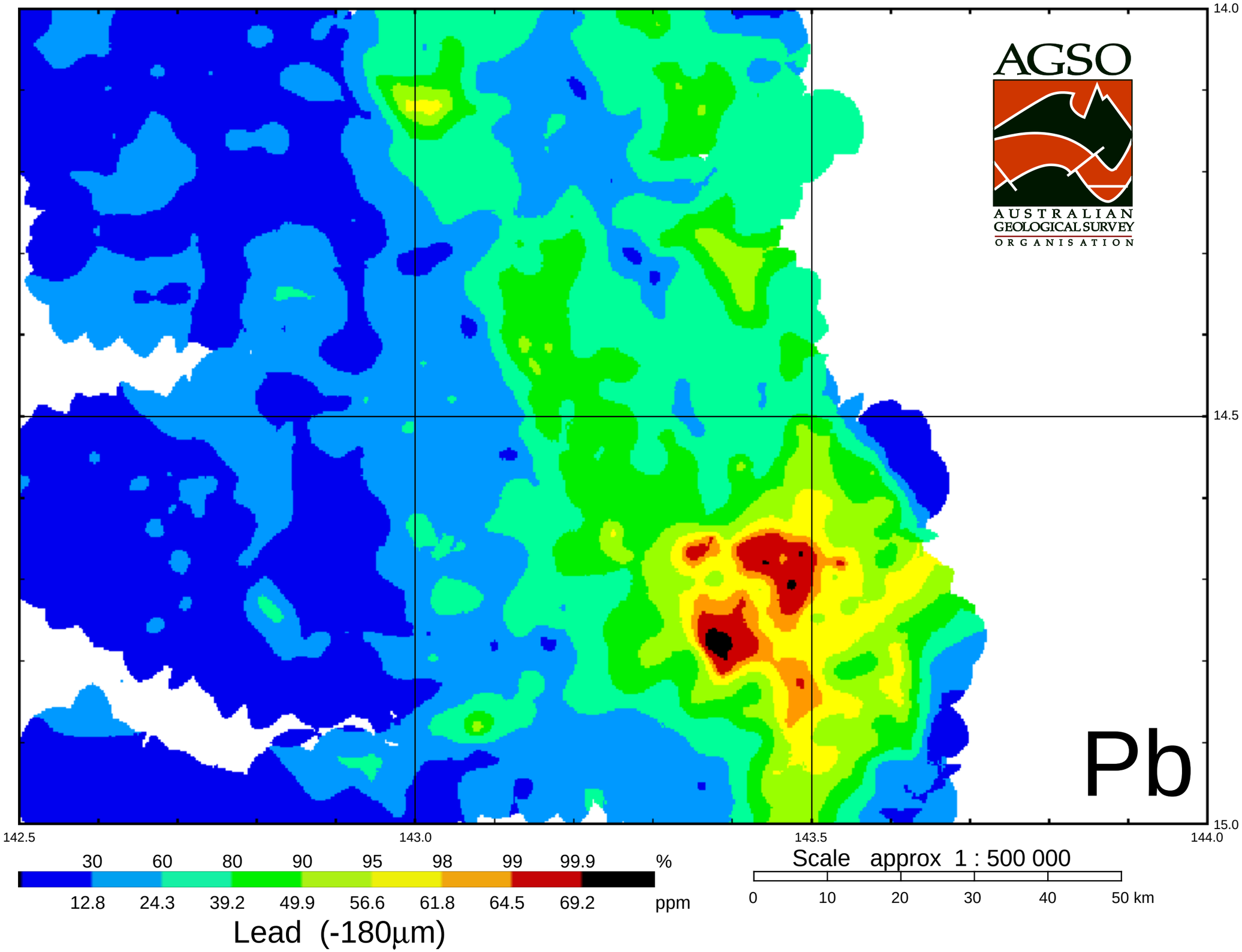
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Mo*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.39 0.61 0.80 0.94 1.10 1.36 1.54 2.26 ppm
Molybdenum (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

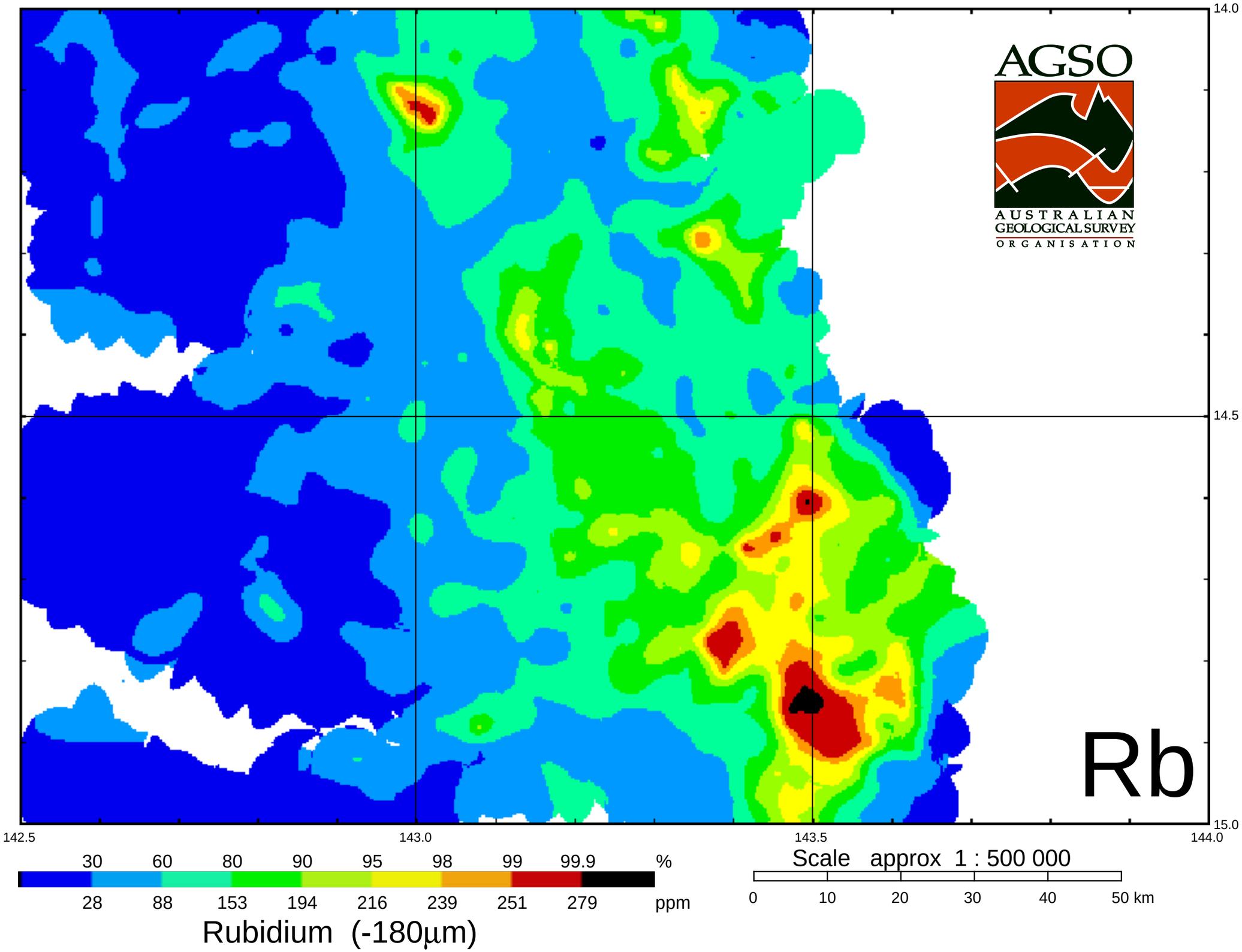

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Nb
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
10.9 14.8 19.5 24.8 30.2 36.8 41.8 67.3 ppm
Niobium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

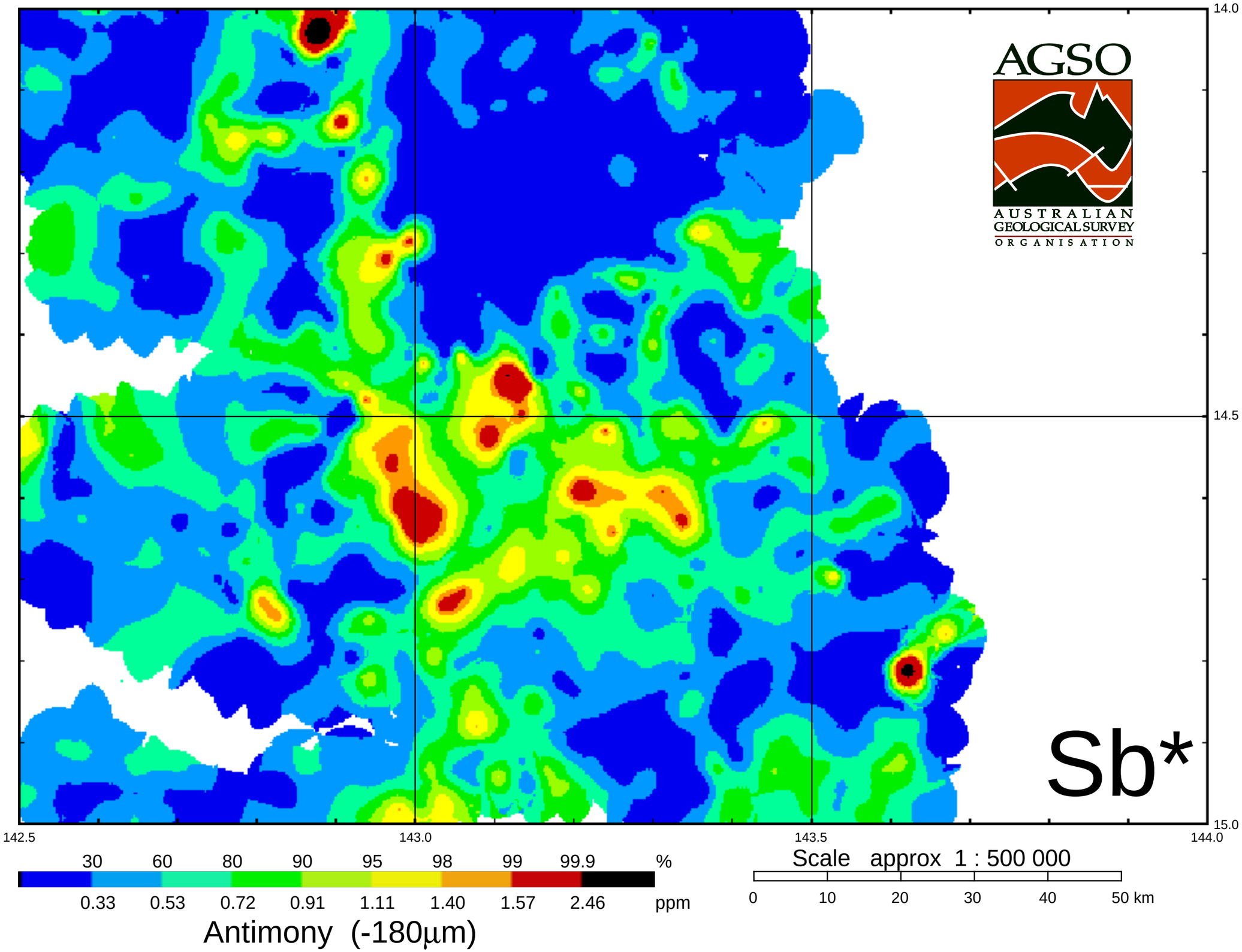

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Nd
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
23 39 76 121 178 263 339 548 ppm
Neodymium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

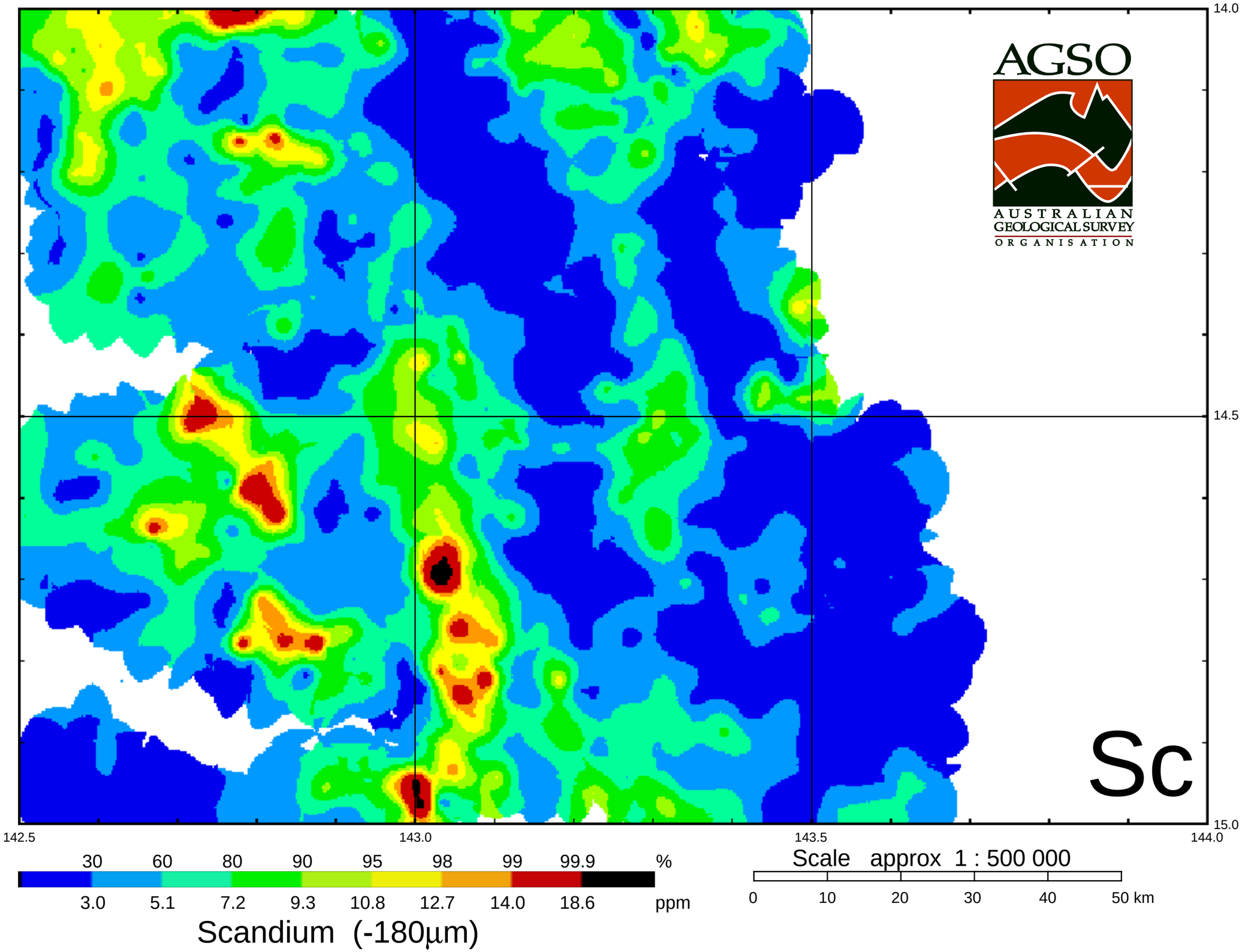

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ni
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
1.6 4.0 7.8 13.4 18.9 25.0 30.1 49.2 ppm
Nickel (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

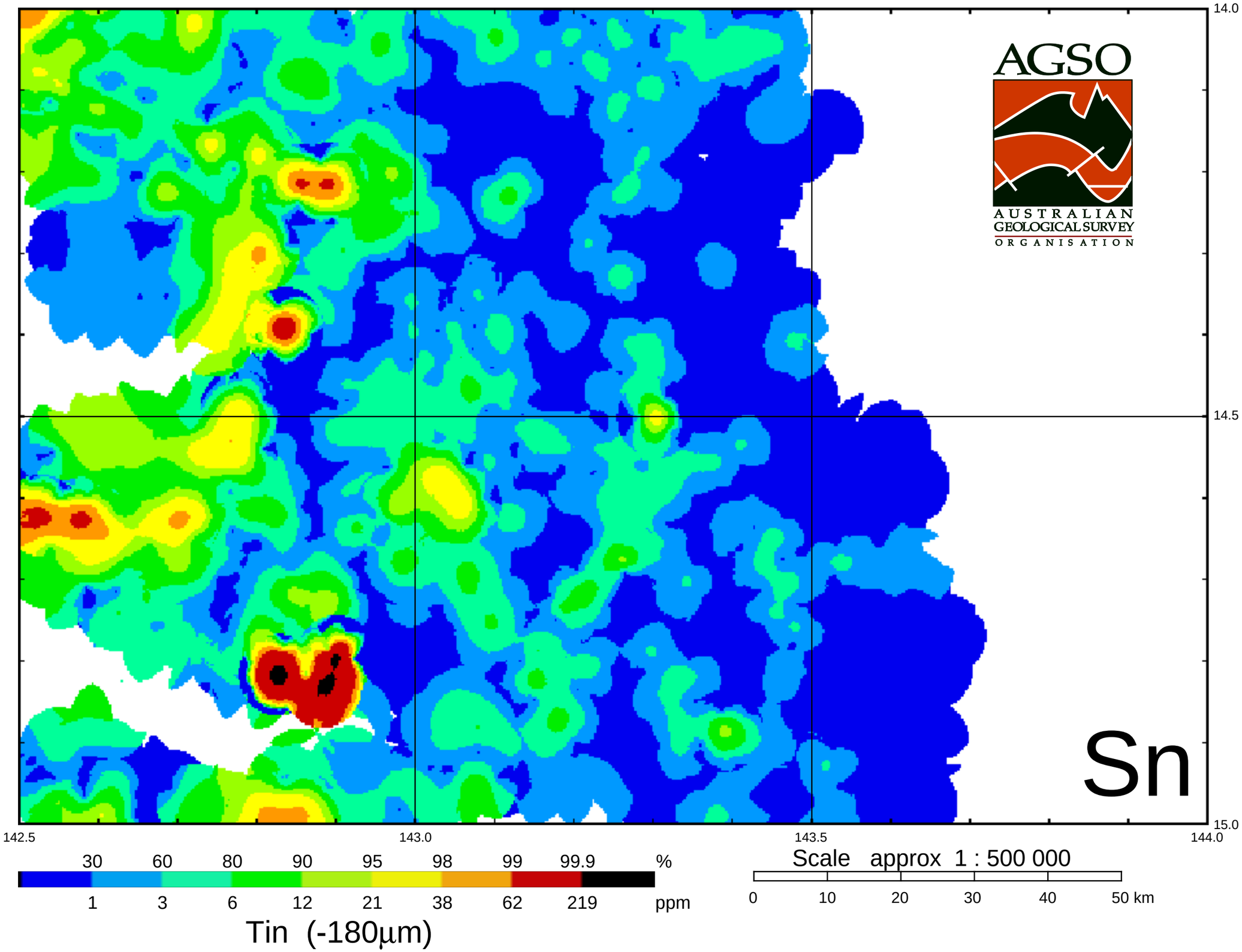

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
P*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
106 217 393 573 786 1050 1250 1900 ppm
Phosphorus (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

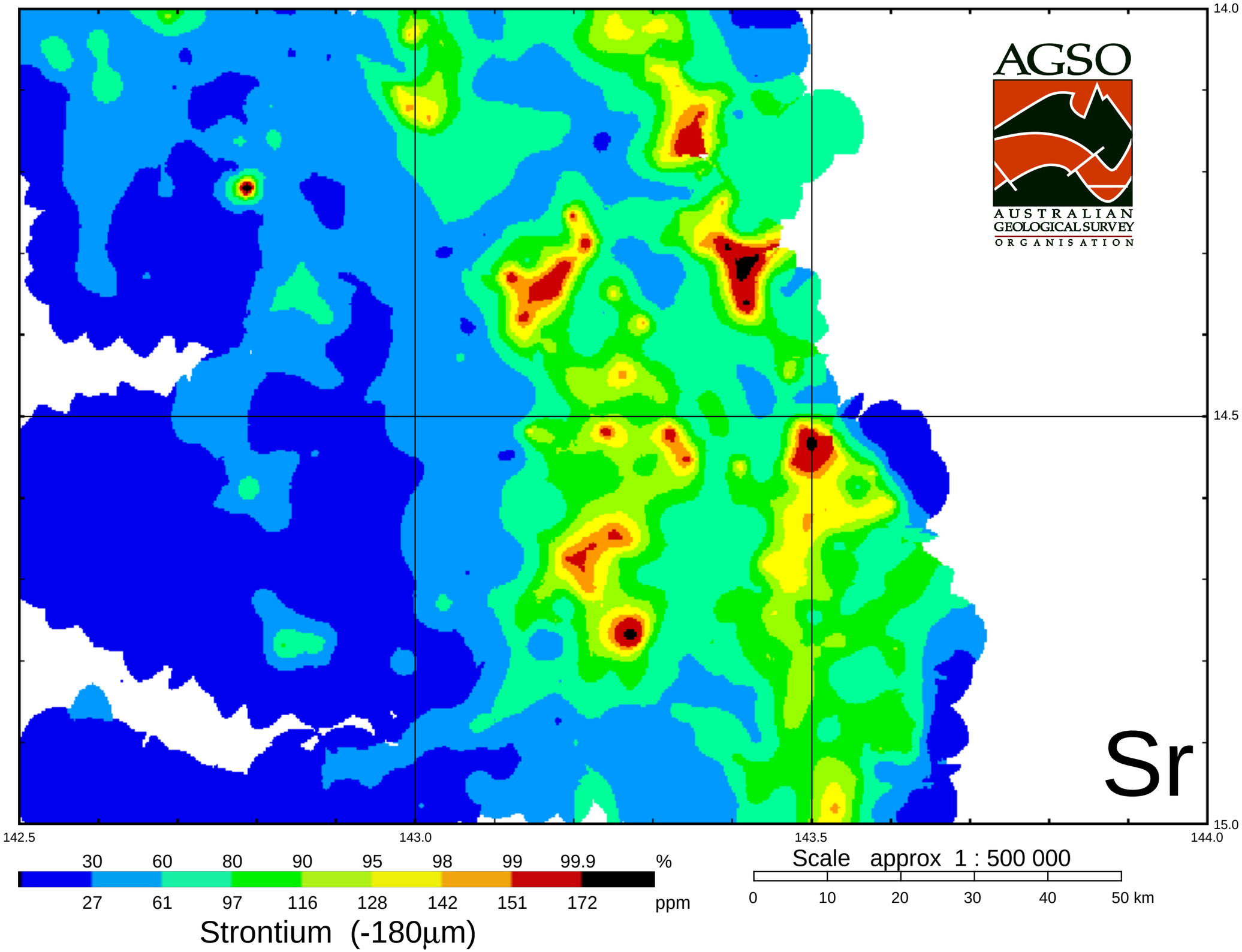

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Pb
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
12.8 24.3 39.2 49.9 56.6 61.8 64.5 69.2 ppm
Lead (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

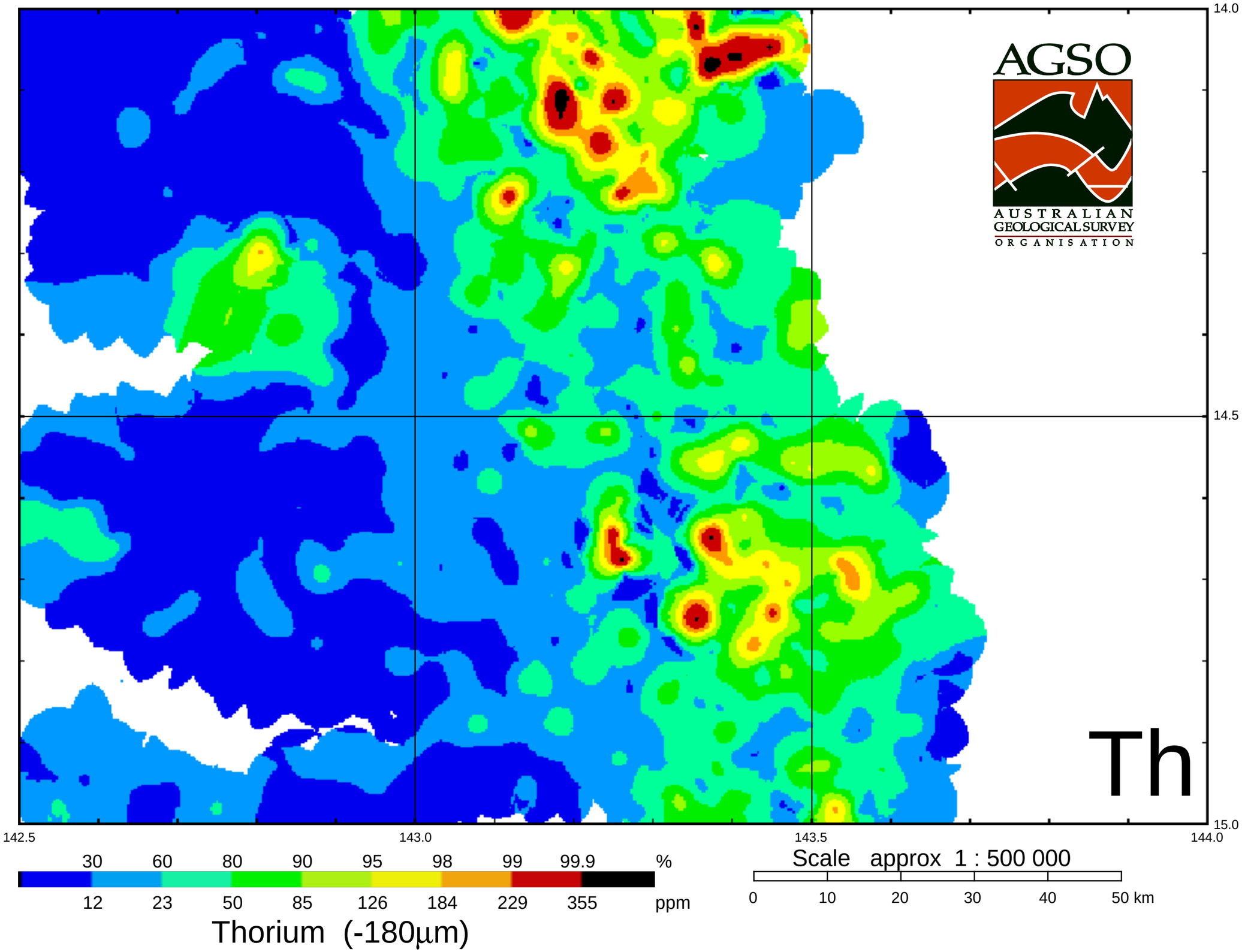

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Rb
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
28 88 153 194 216 239 251 279 ppm
Rubidium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

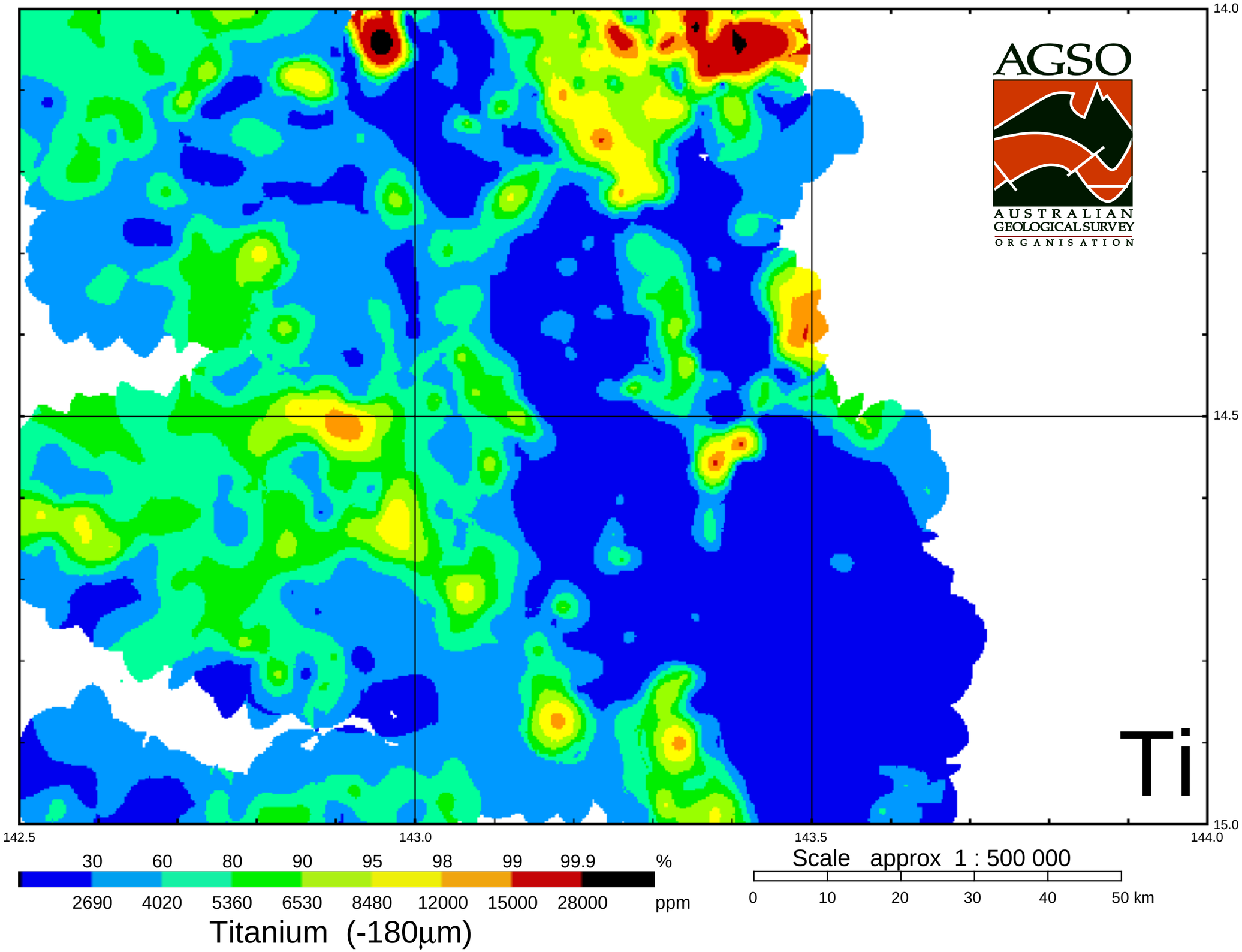

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Sb*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.33 0.53 0.72 0.91 1.11 1.40 1.57 2.46 ppm
Antimony (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

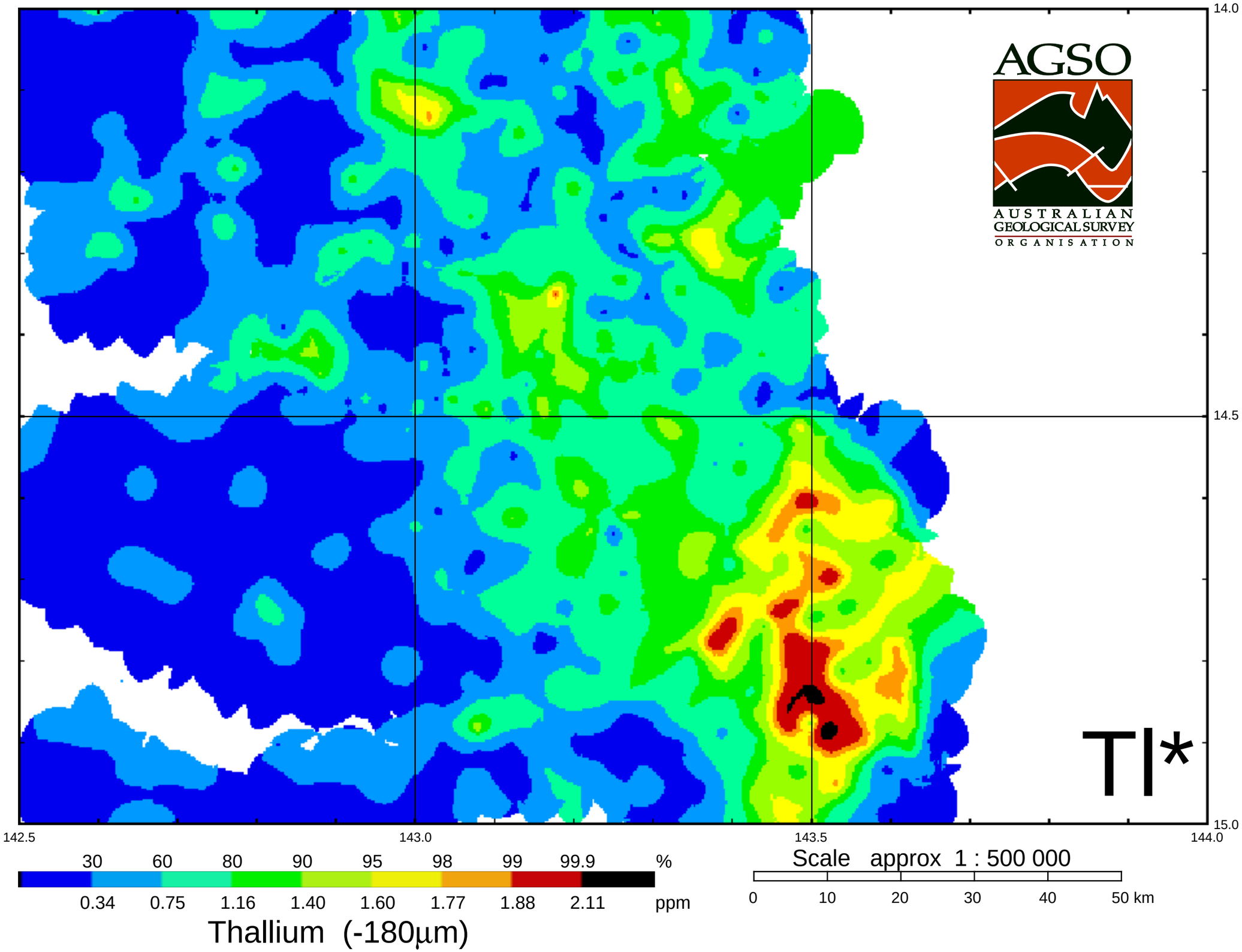

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Sc
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
3.0 5.1 7.2 9.3 10.8 12.7 14.0 18.6 ppm
Scandium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

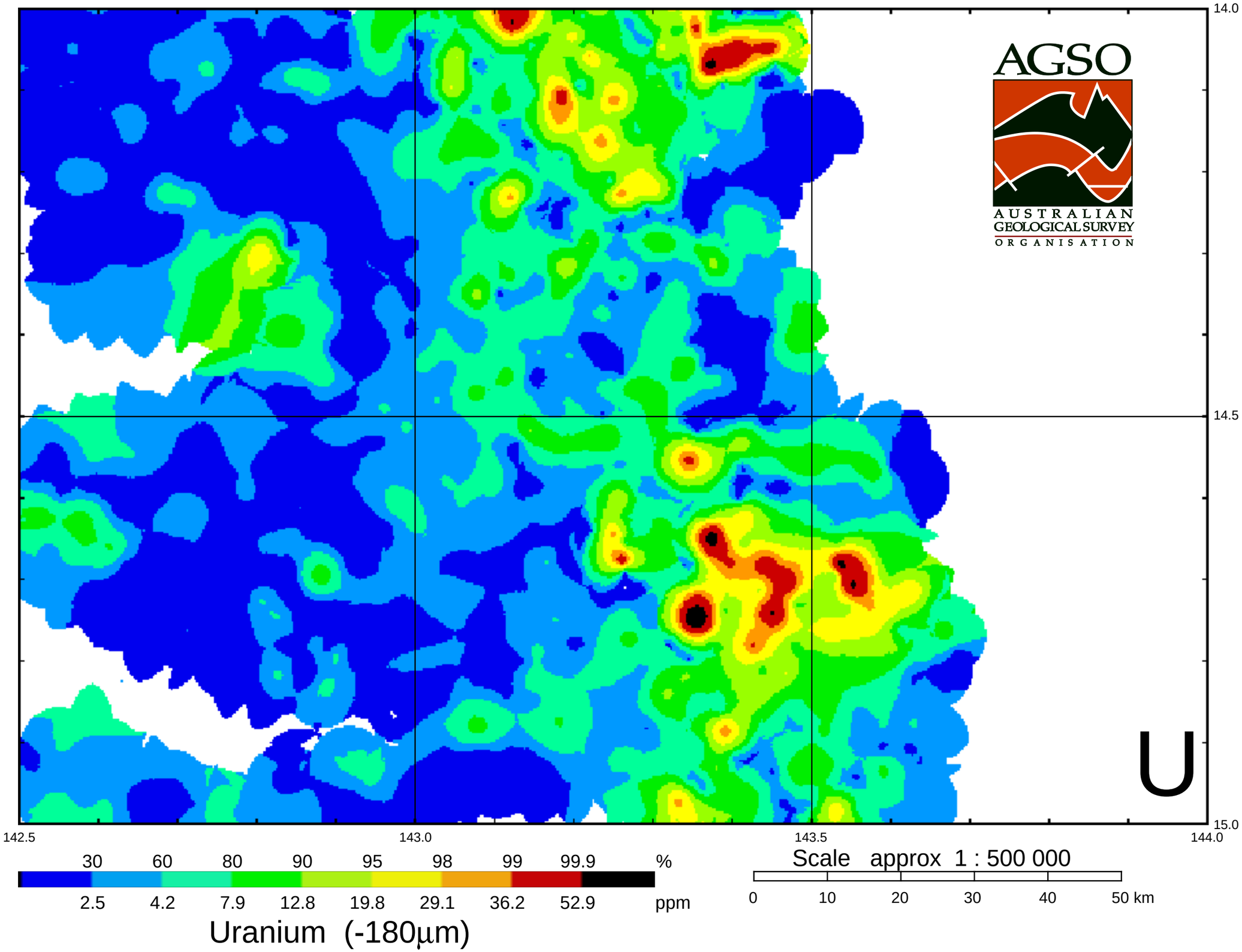

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Sn
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
1 3 6 12 21 38 62 219 ppm
Tin (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

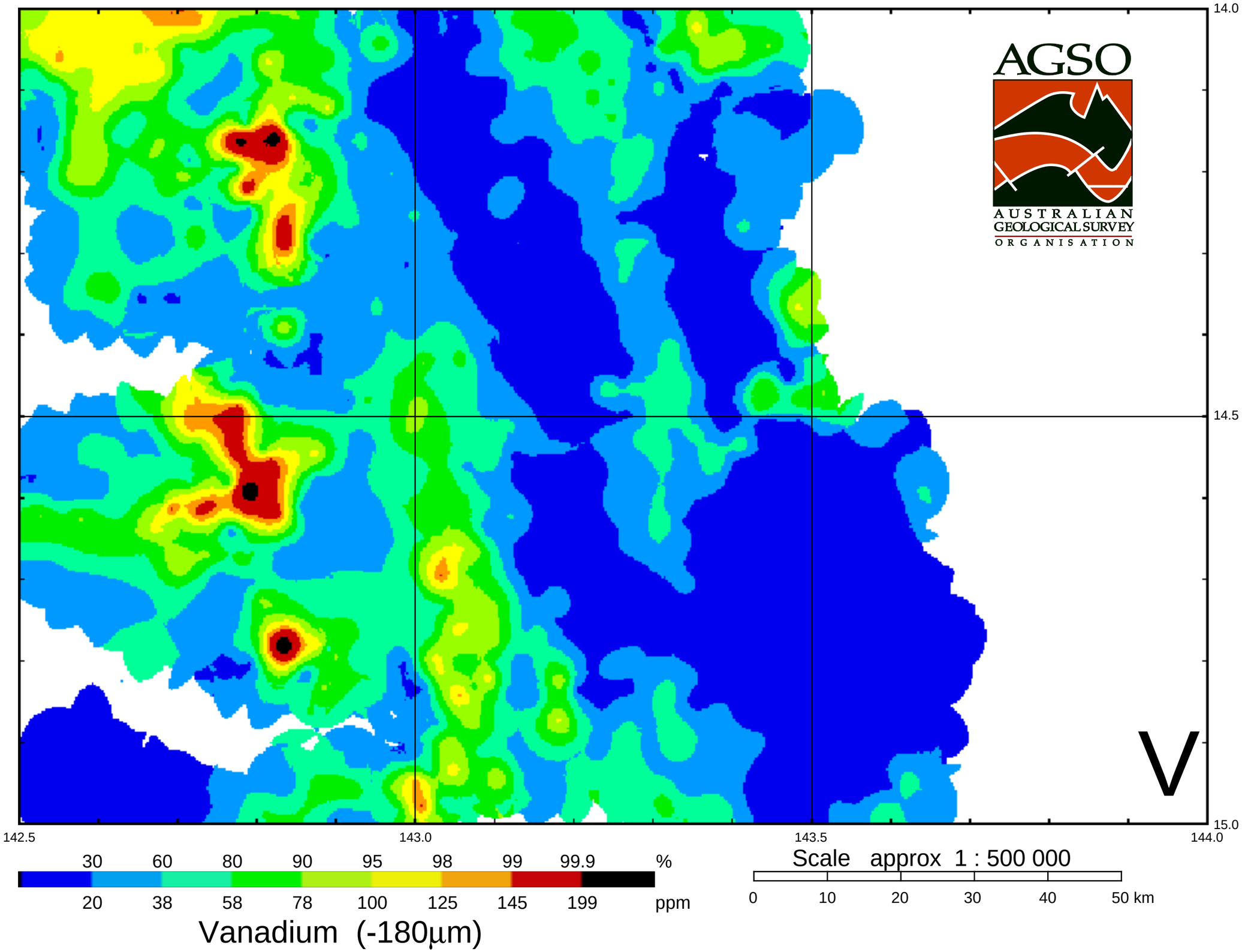

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Sr
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
27 61 97 116 128 142 151 172 ppm
Strontium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

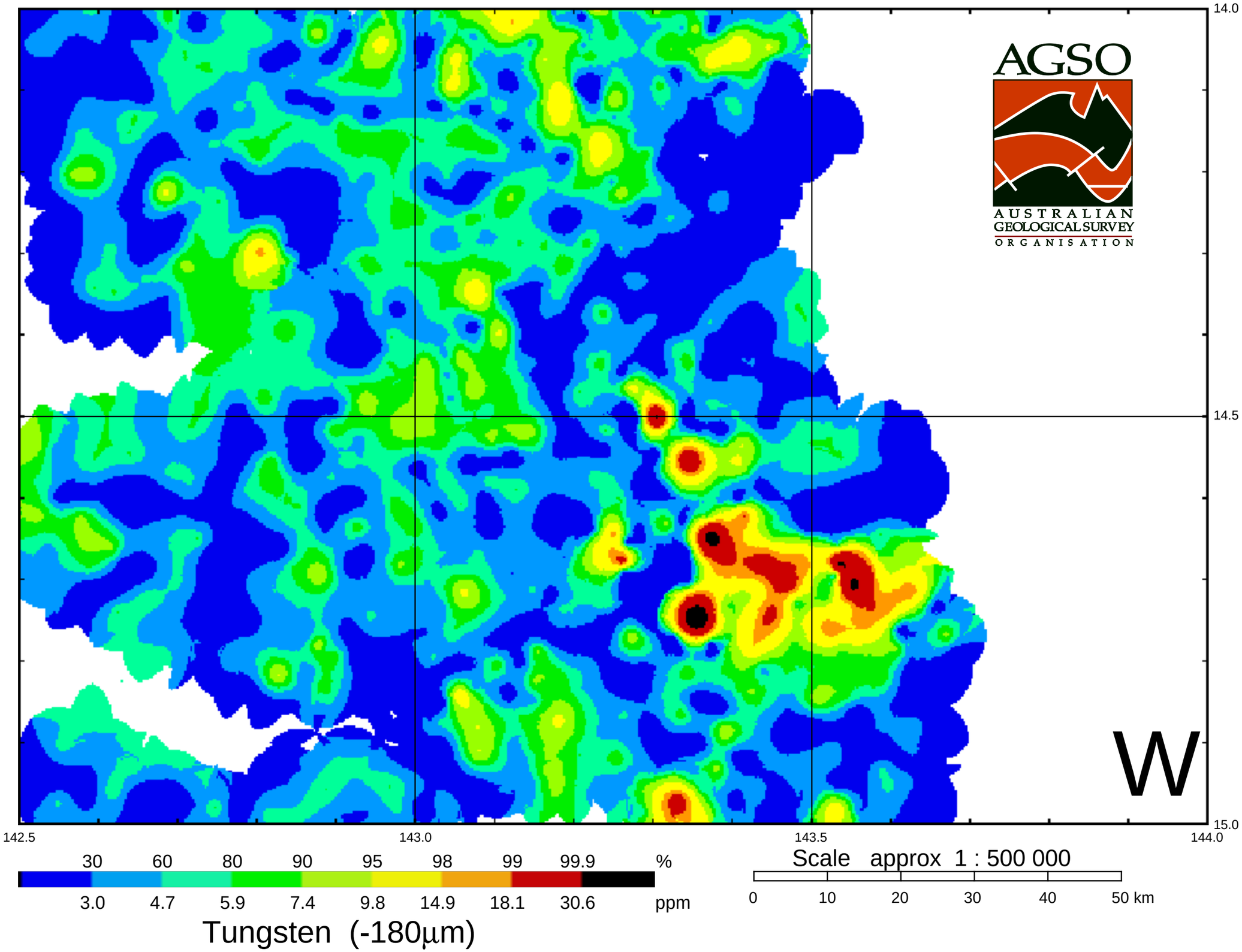

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Th
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
12 23 50 85 126 184 229 355 ppm
Thorium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

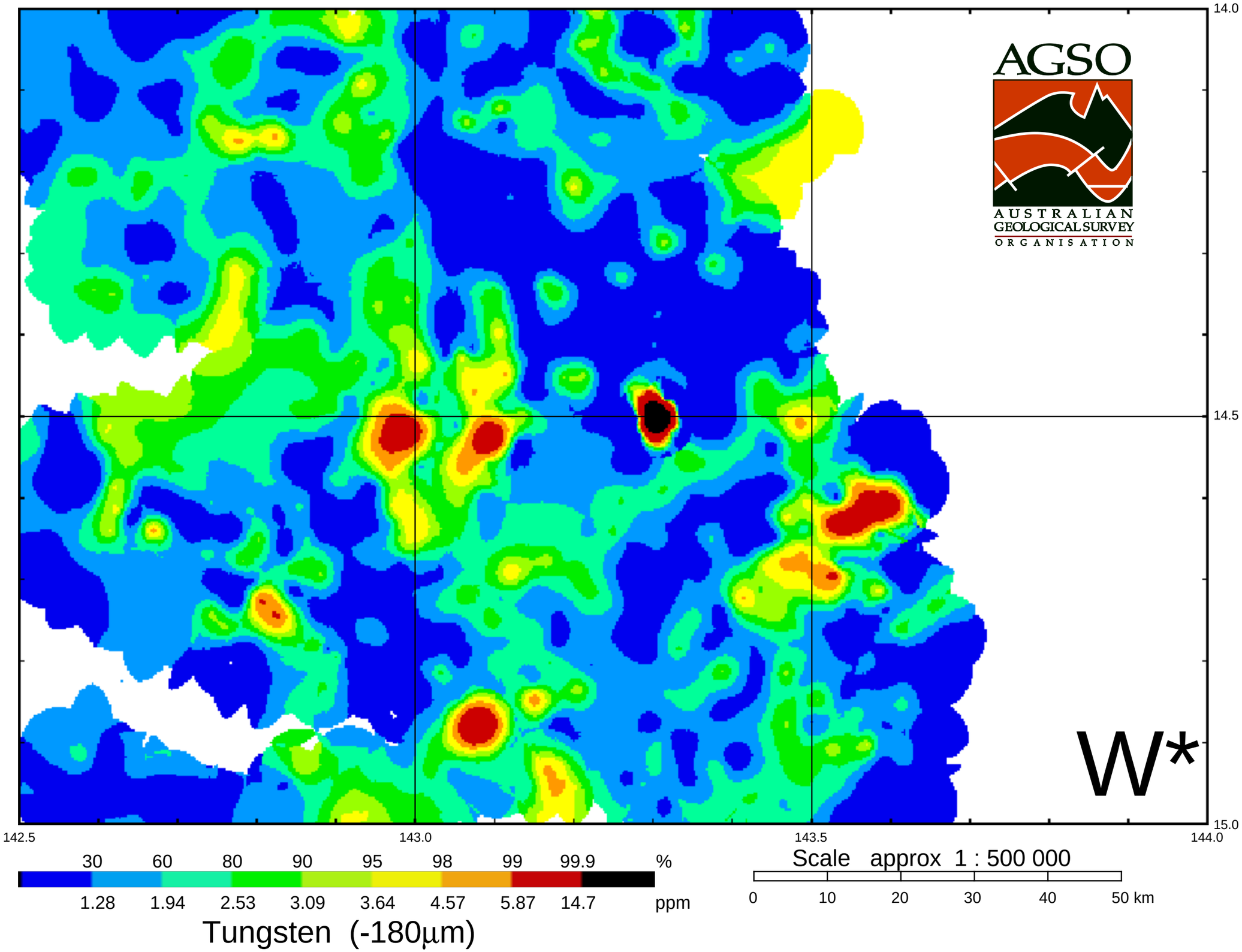

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Ti
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
2690 4020 5360 6530 8480 12000 15000 28000 ppm
Titanium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

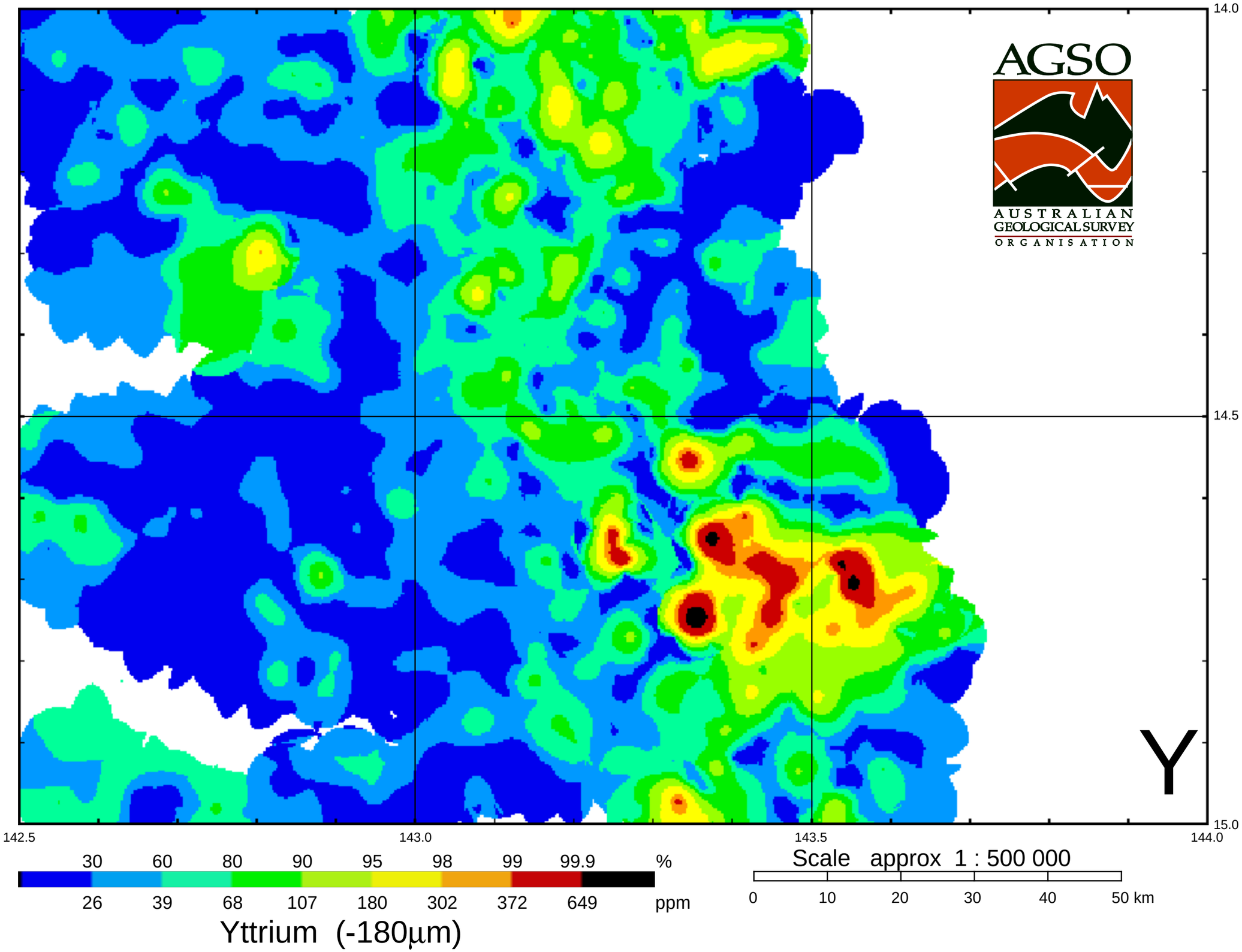

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Tl*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
0.34 0.75 1.16 1.40 1.60 1.77 1.88 2.11 ppm
Thallium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

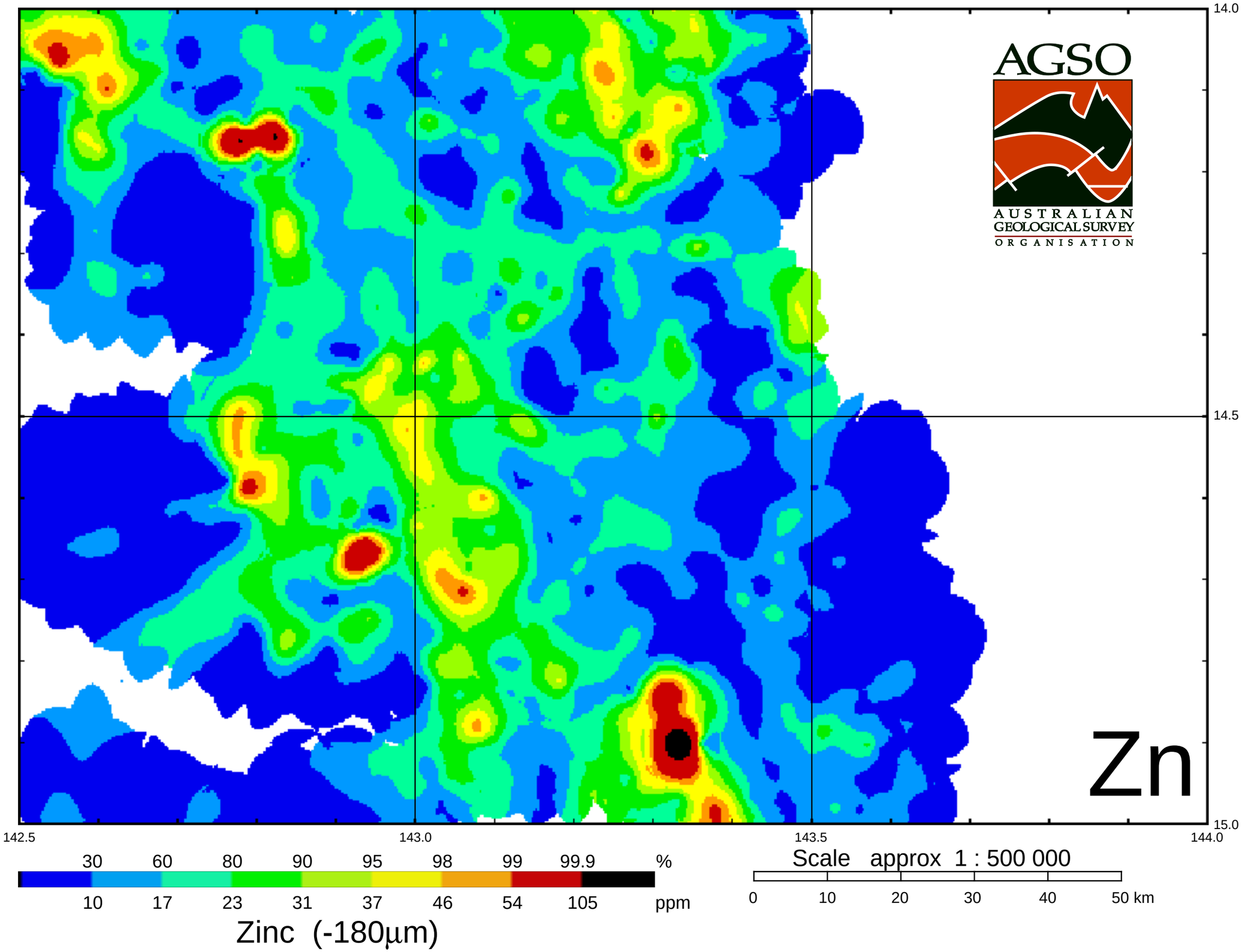

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
U
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
2.5 4.2 7.9 12.8 19.8 29.1 36.2 52.9 ppm
Uranium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

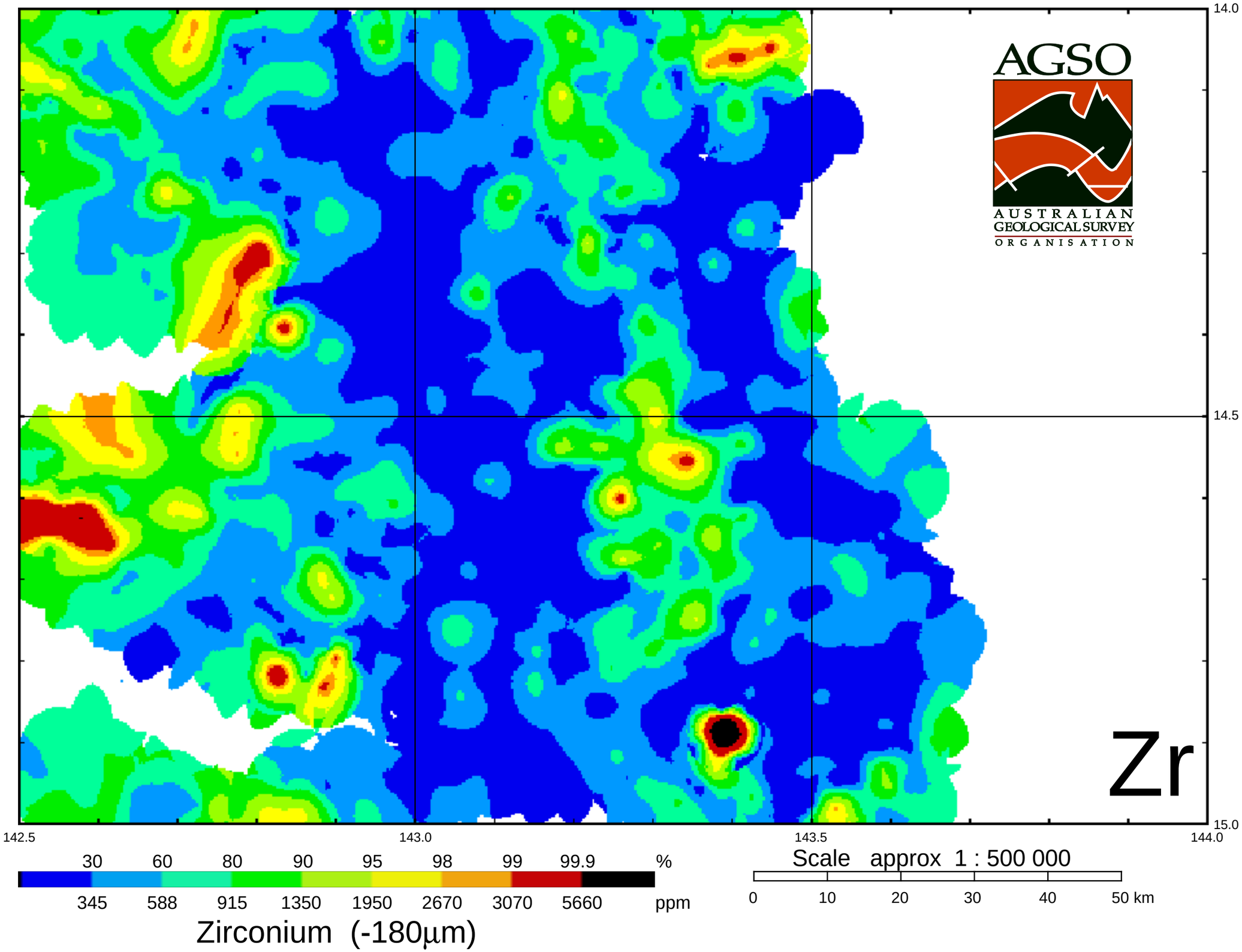

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
V
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
20 38 58 78 100 125 145 199 ppm
Vanadium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

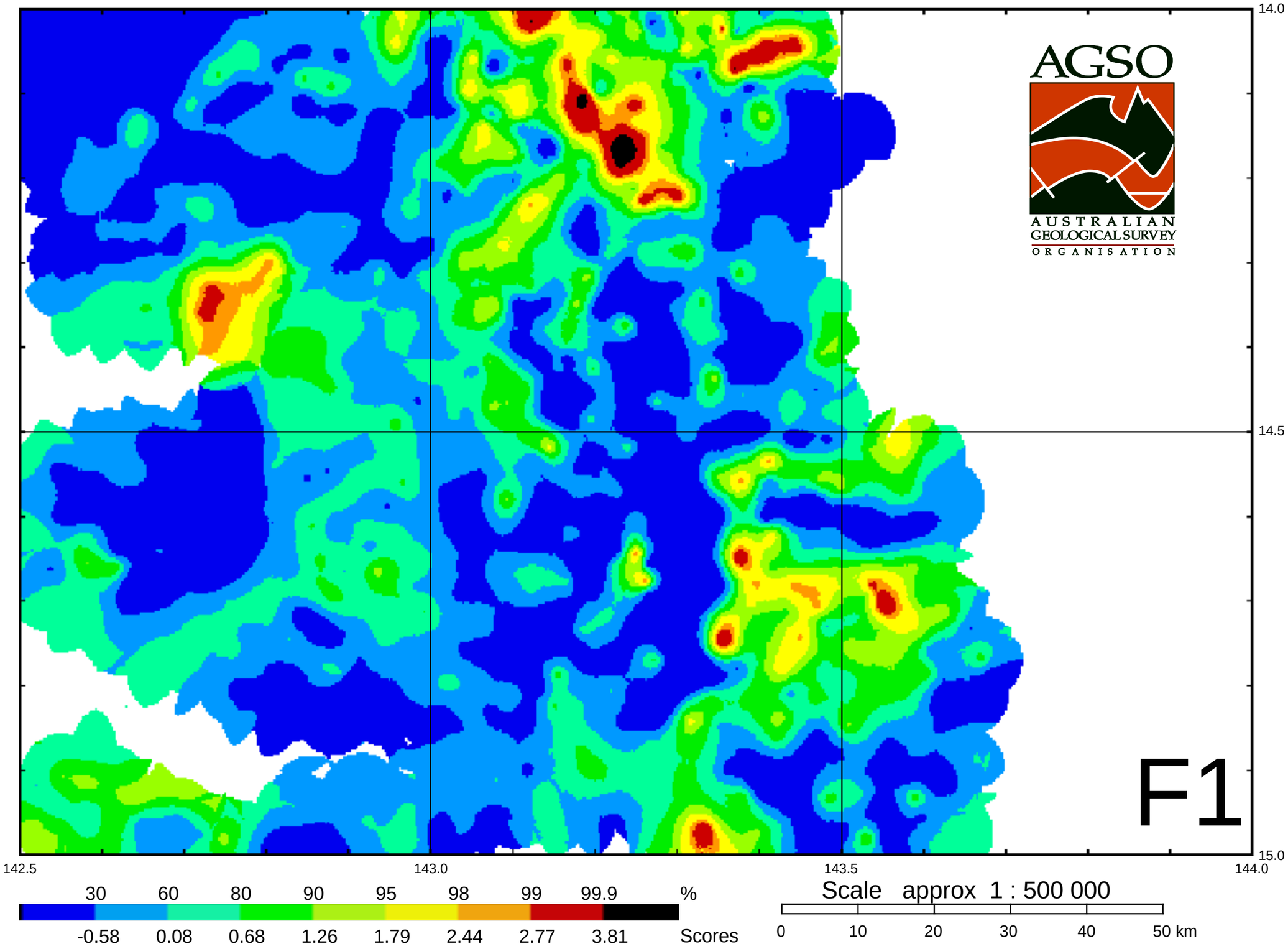

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
W
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
3.0 4.7 5.9 7.4 9.8 14.9 18.1 30.6 ppm
Tungsten (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
W*
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
1.28 1.94 2.53 3.09 3.64 4.57 5.87 14.7 ppm
Tungsten (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

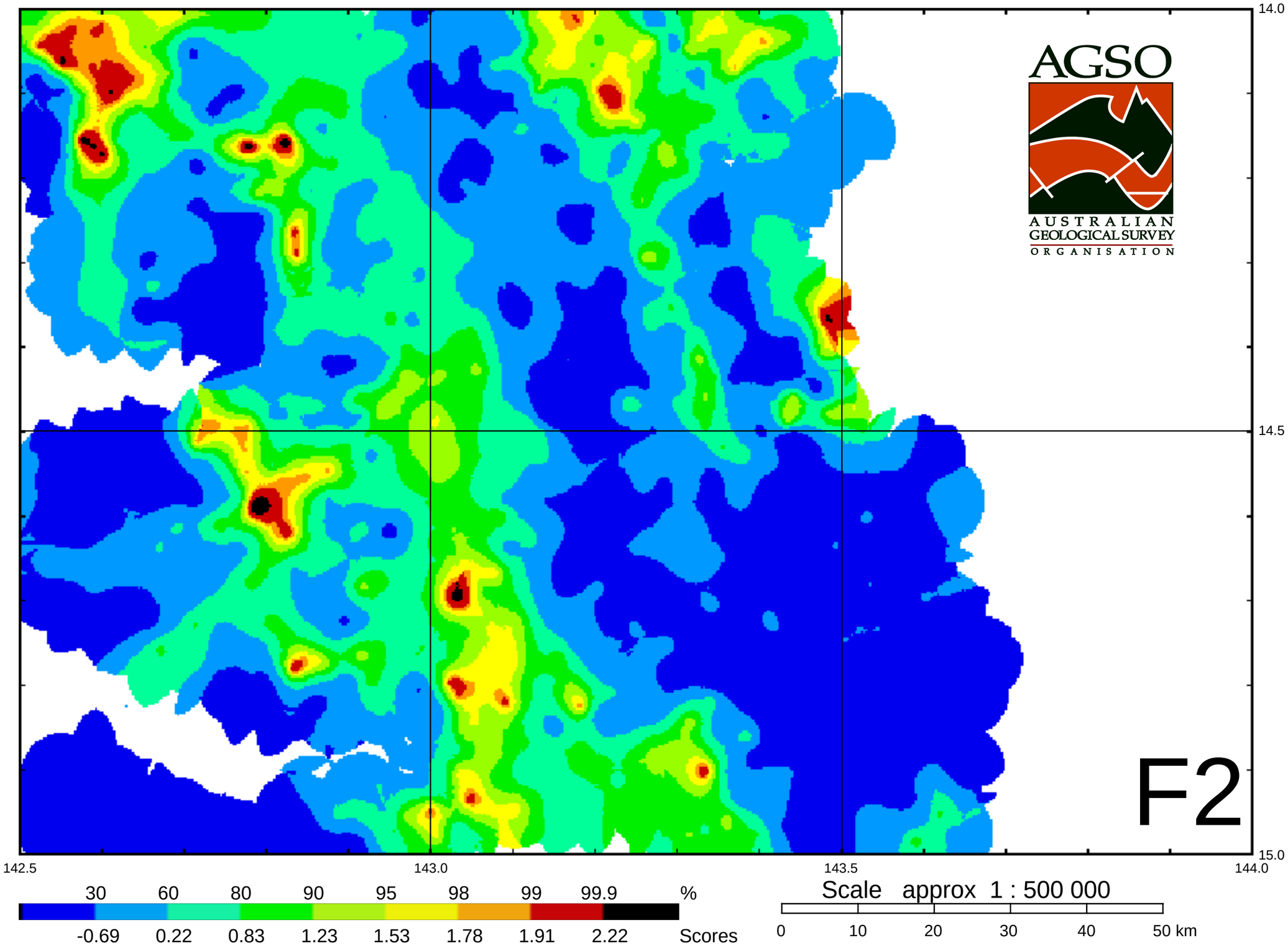

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Y
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
26 39 68 107 180 302 372 649 ppm
Yttrium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Zn
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
10 17 23 31 37 46 54 105 ppm
Zinc (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

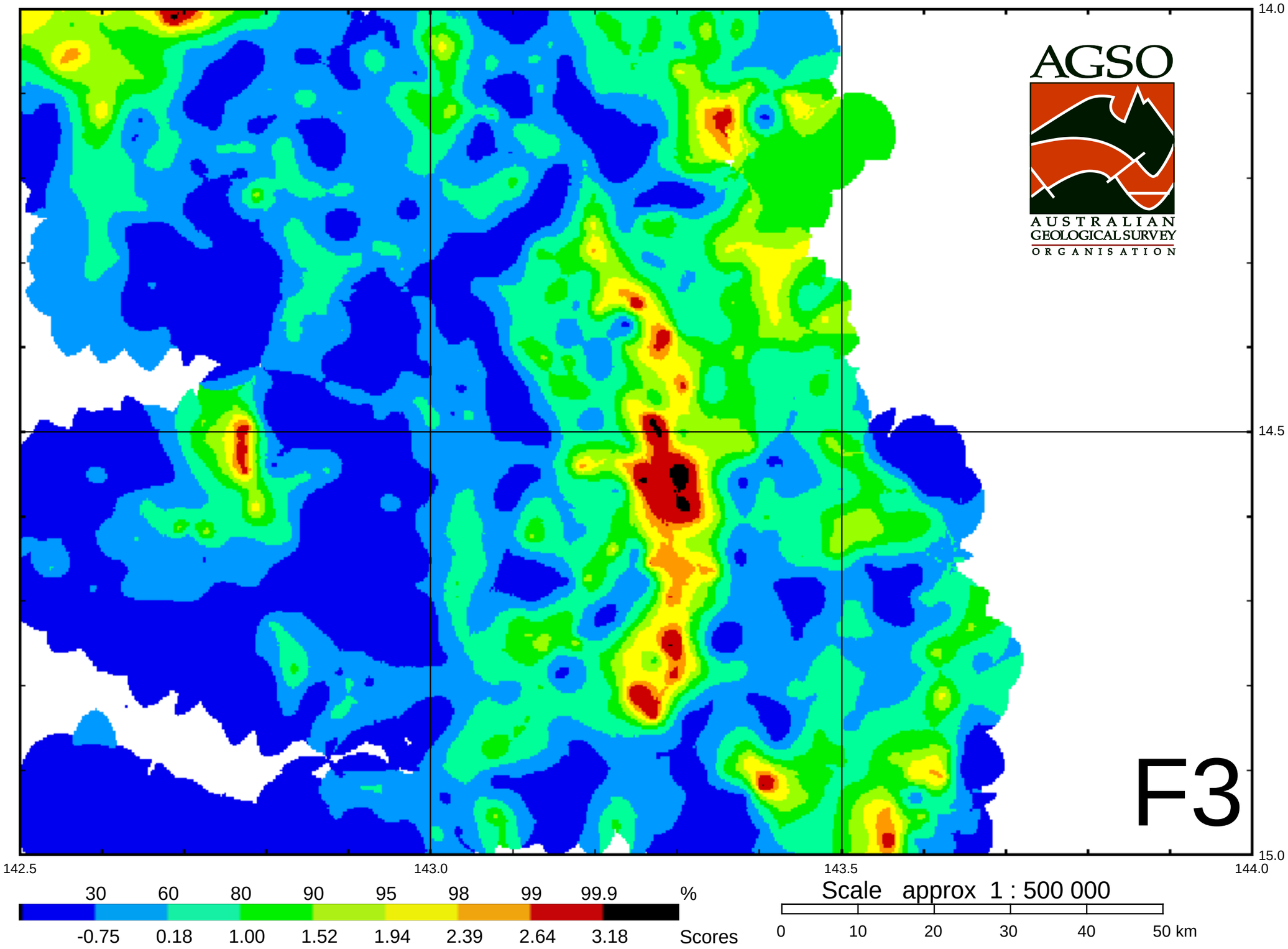

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
Zr
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
345 588 915 1350 1950 2670 3070 5660 ppm
Zirconium (-180µm)
Scale approx 1 : 500 000
0 10 20 30 40 50 km



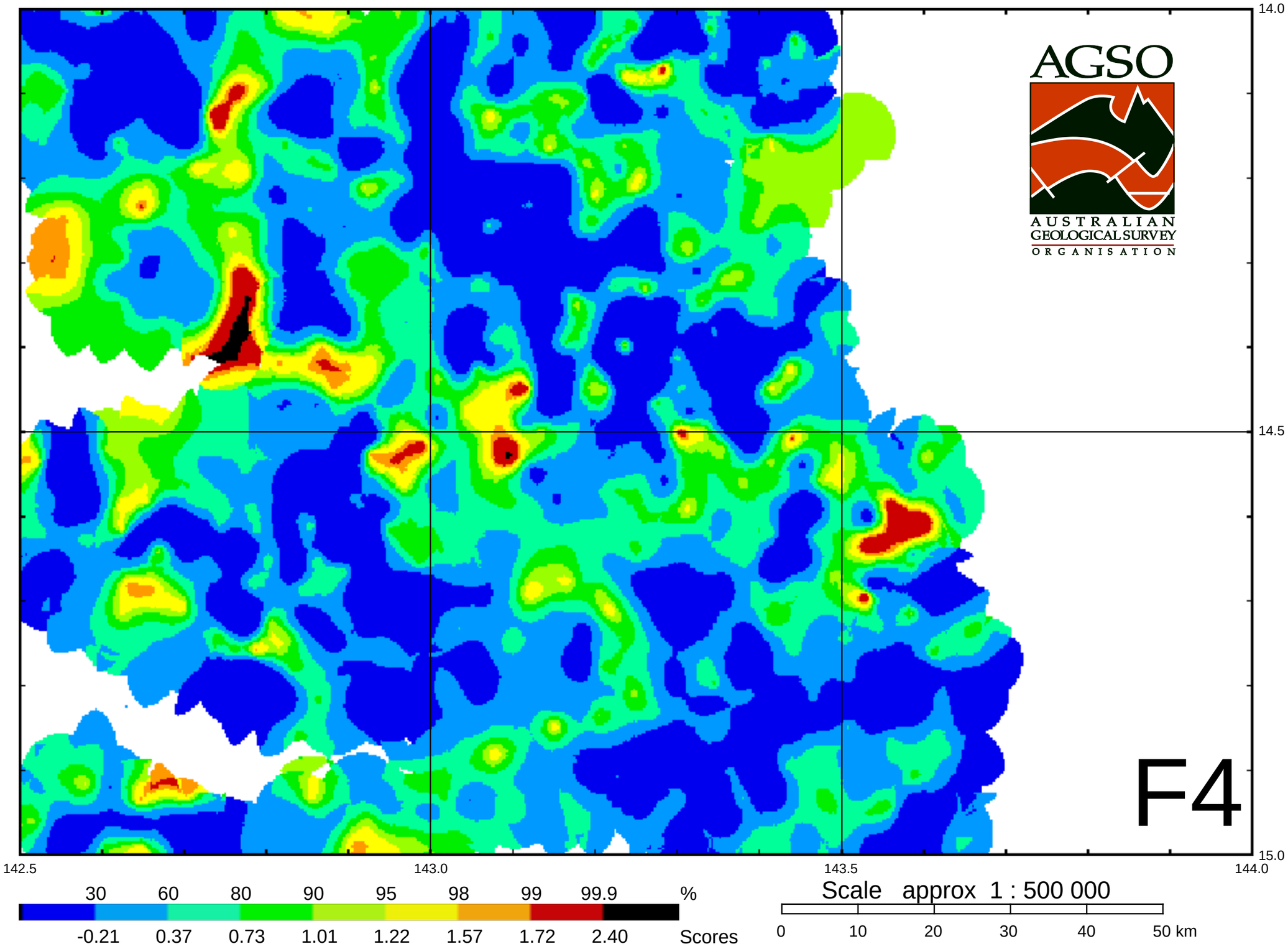
Factor 1 (Ce,La,Nd,Th,U,Y,P*,W and Nb)



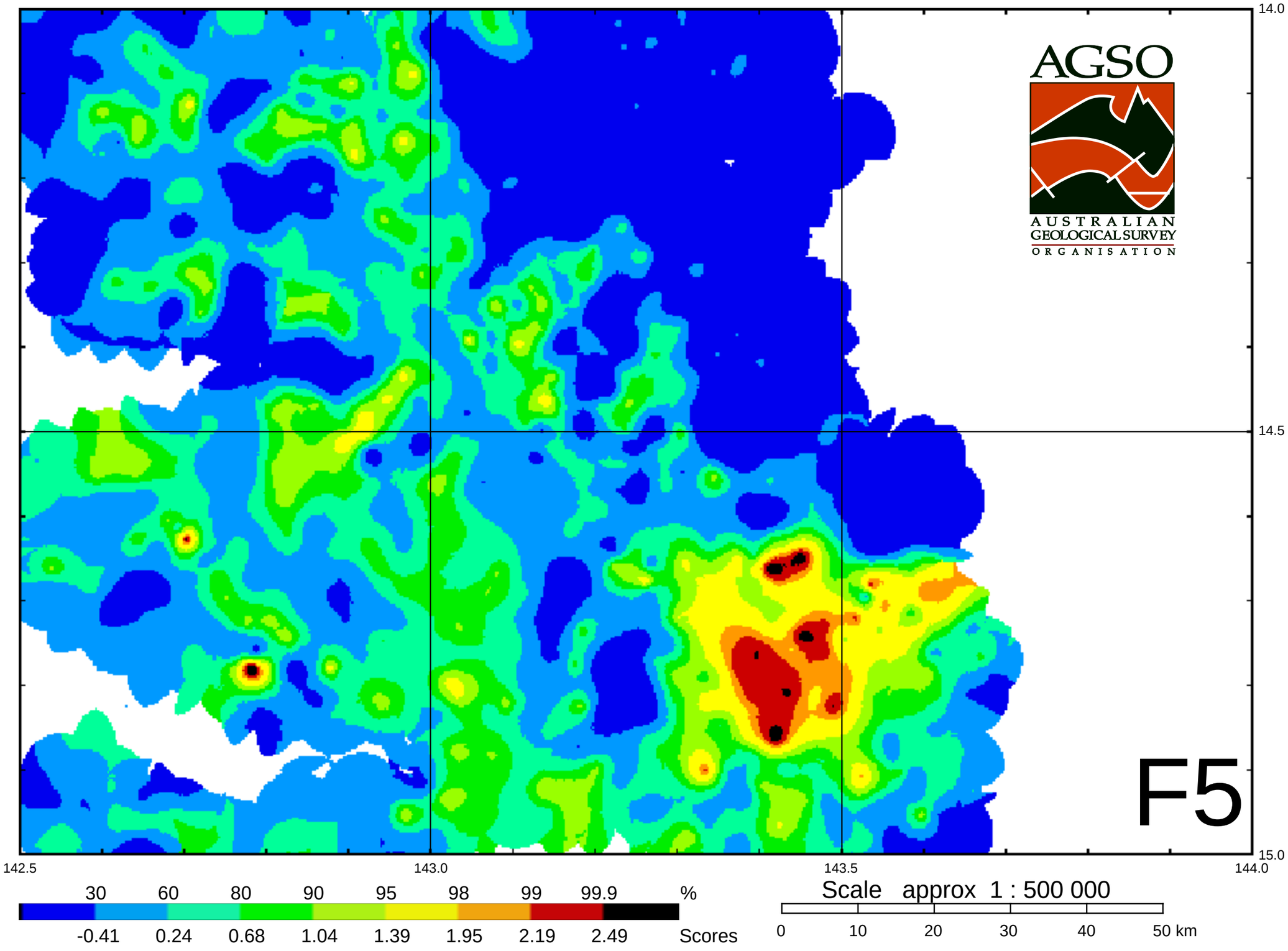
Factor 2 (Fe,Cu,Ni,V,Sc,Cr,Zn,Ti and As)



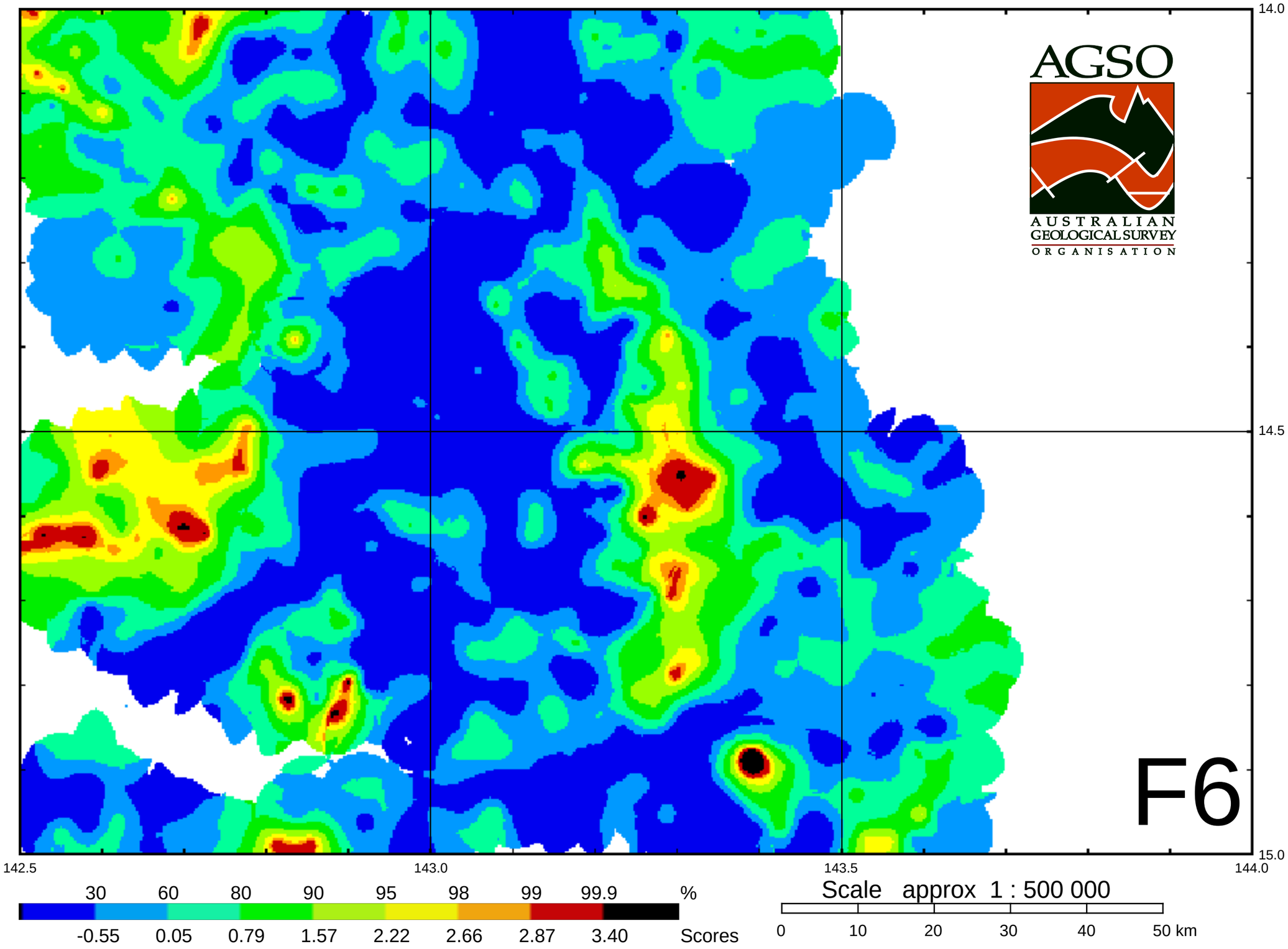
Factor 3 (Sr,Ba,Rb,Pb,Ga,Be*,Tl* and Mn)



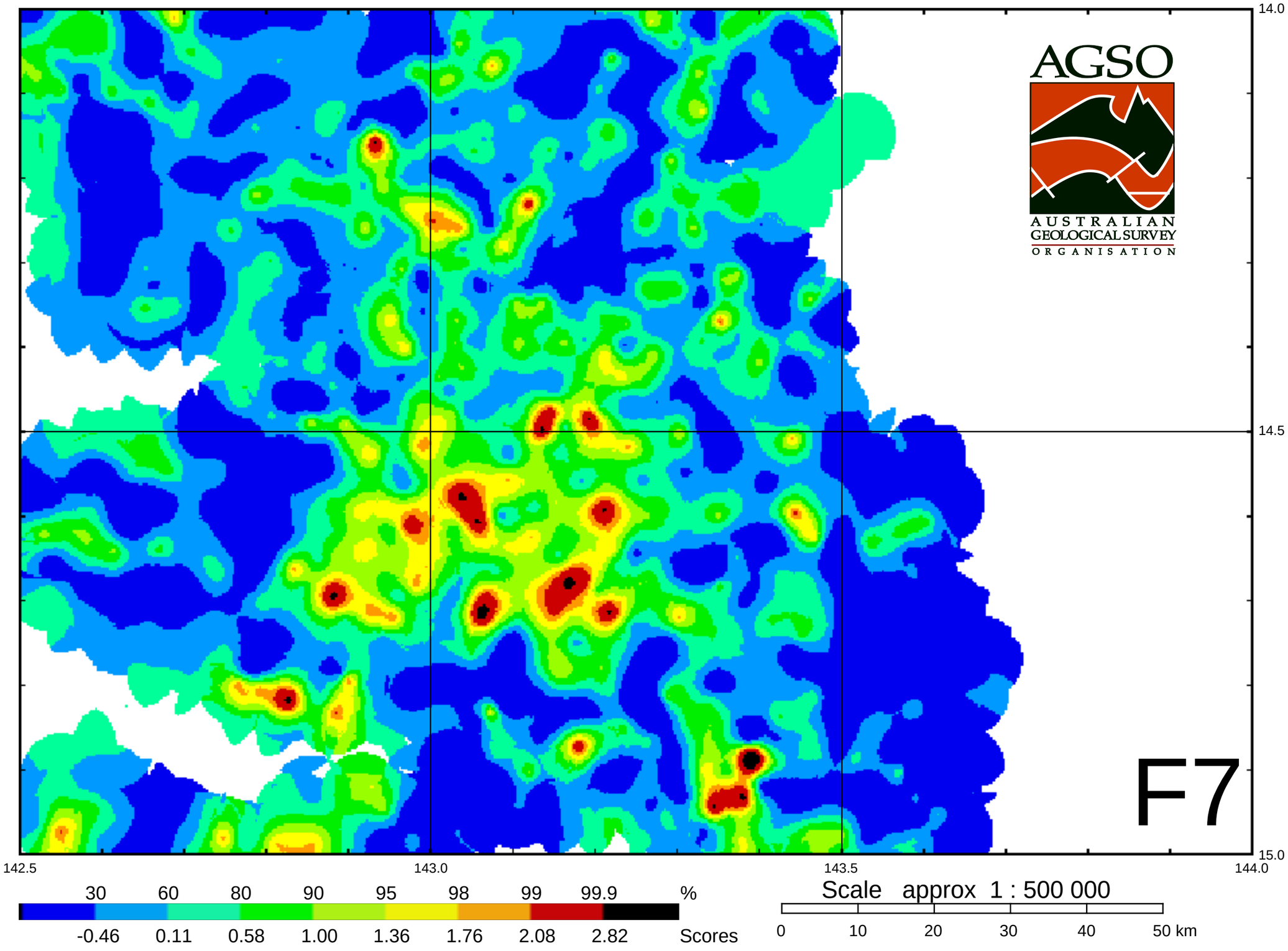
Factor 4 (Mo*,W* and Sb*)



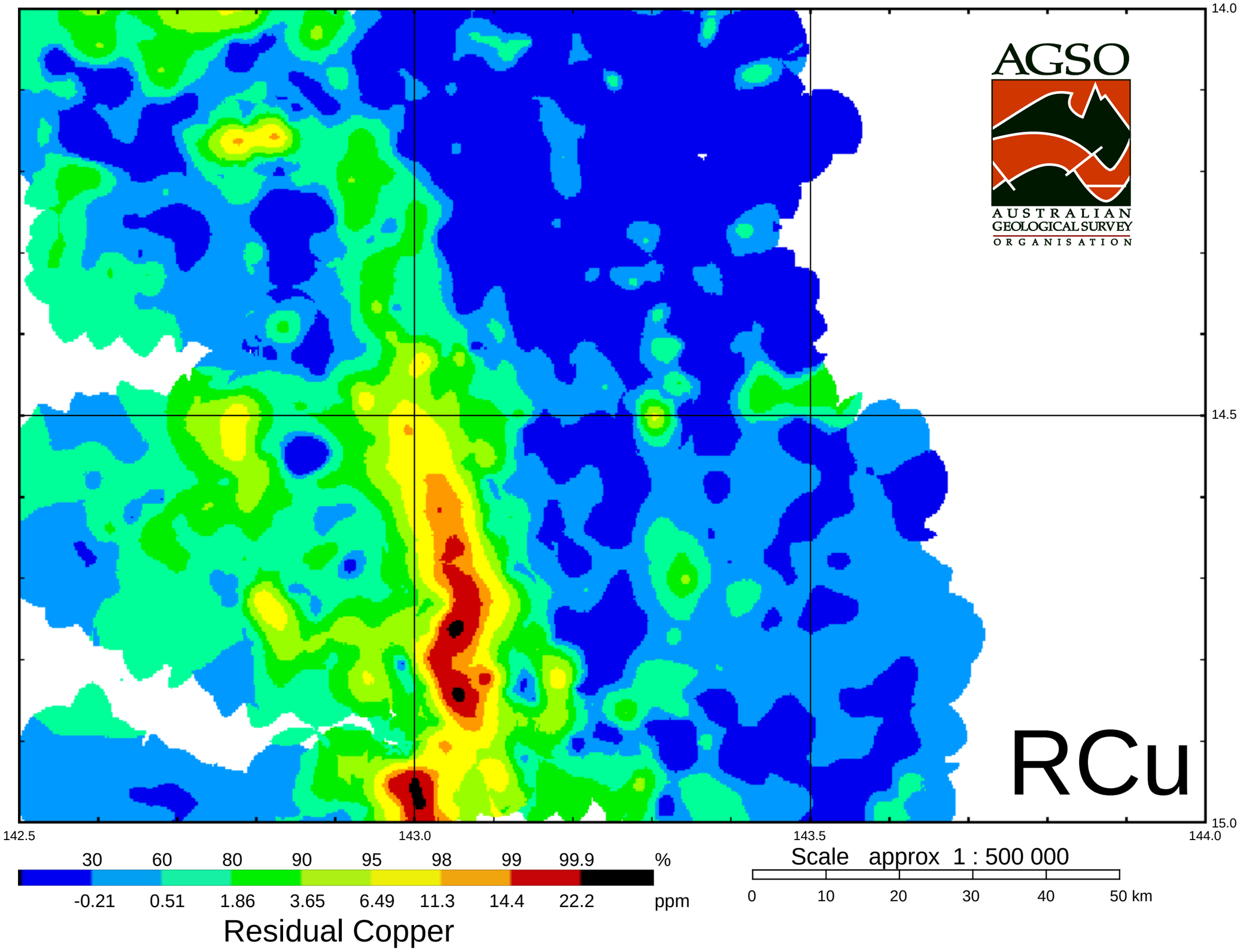
Factor 5 (Bi*,Ge and Au#)

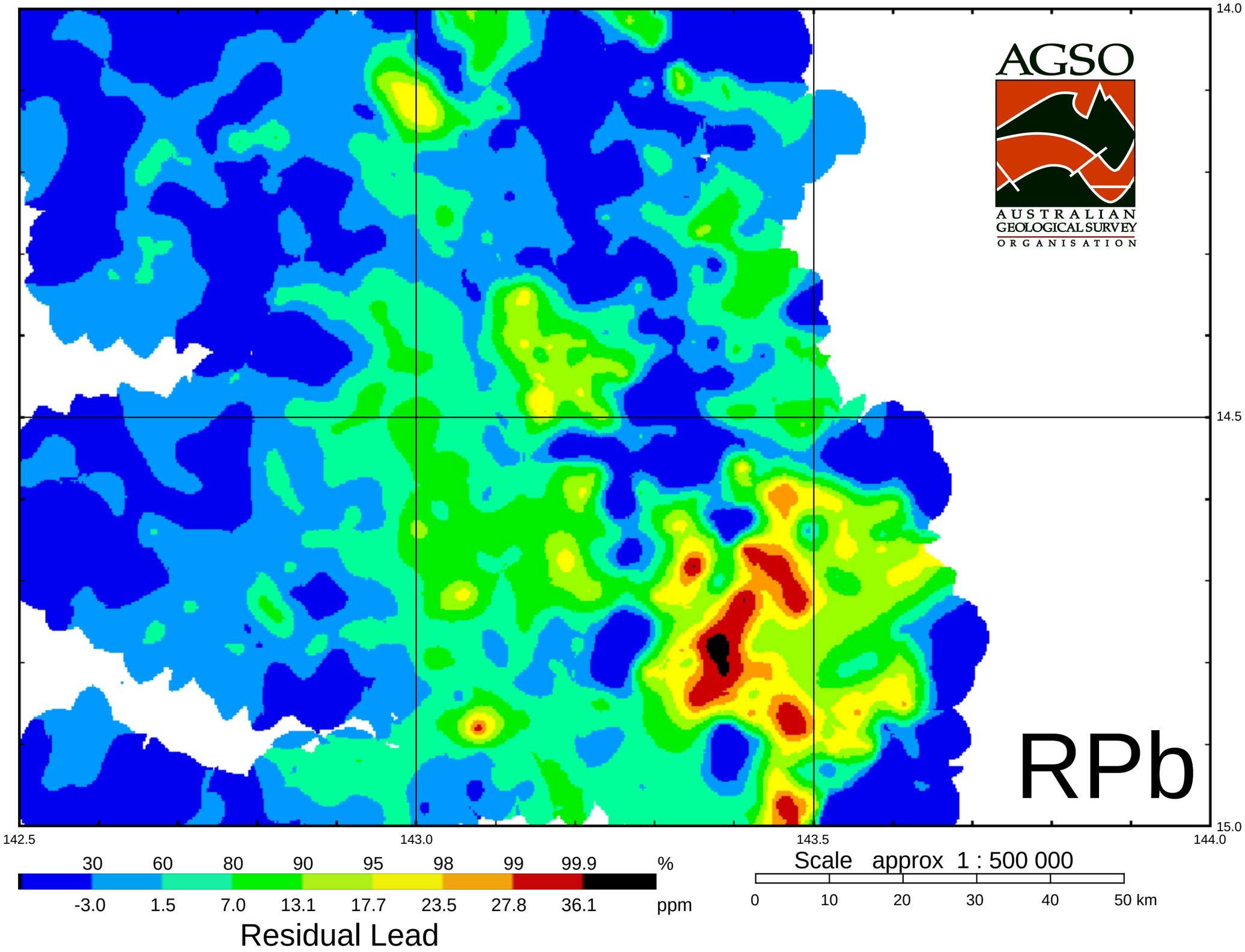


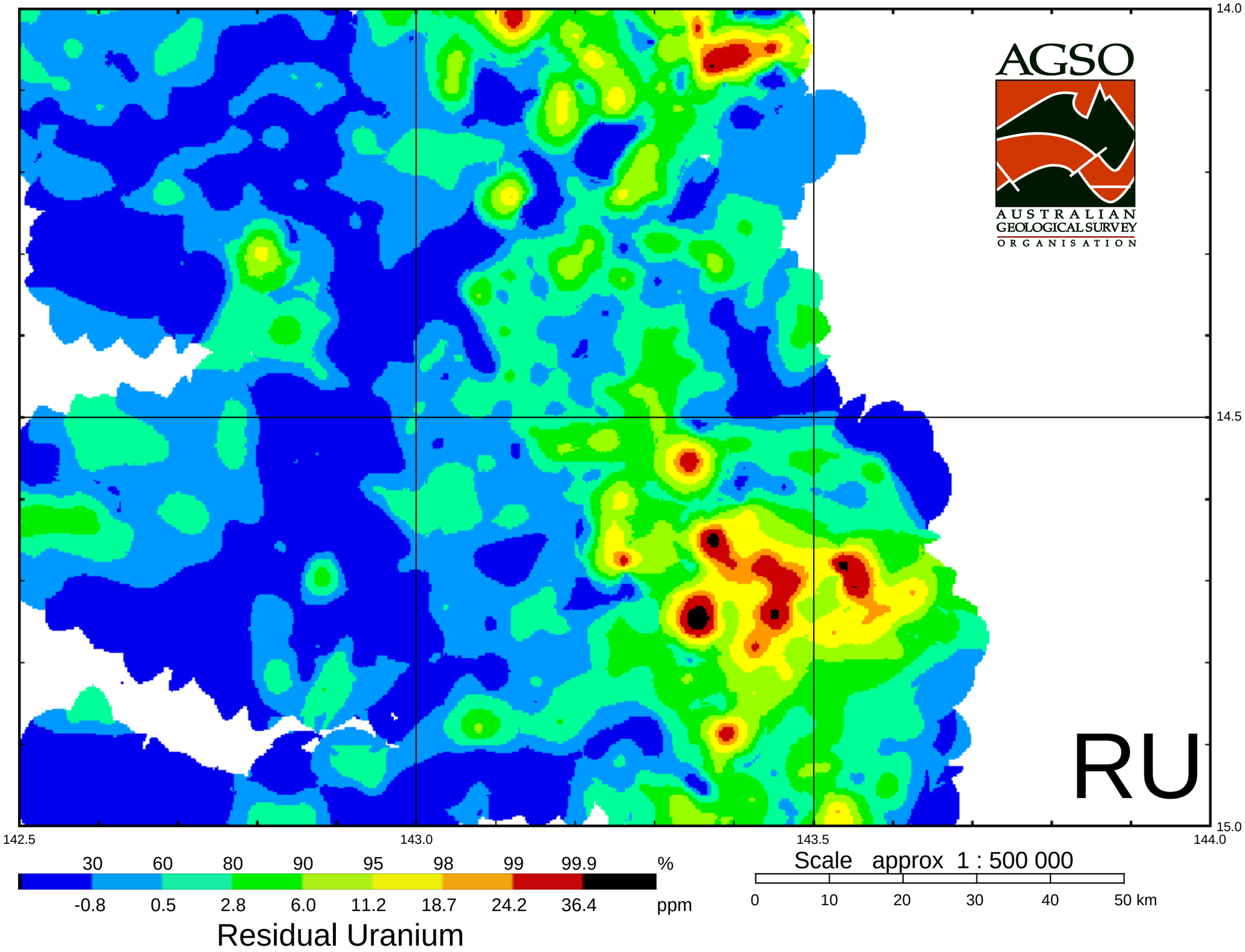
Factor 6 (Hf,Zr and Sn)

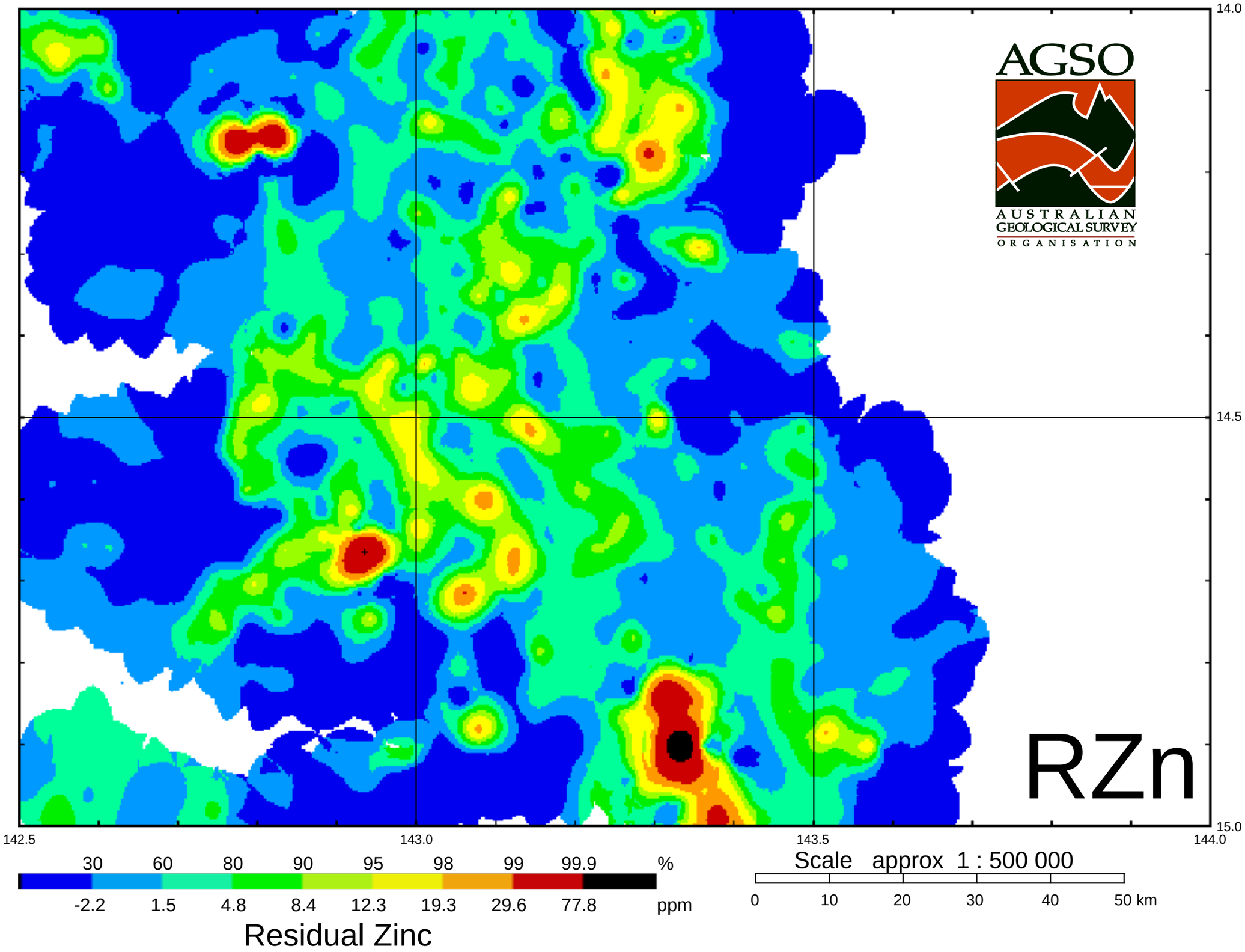


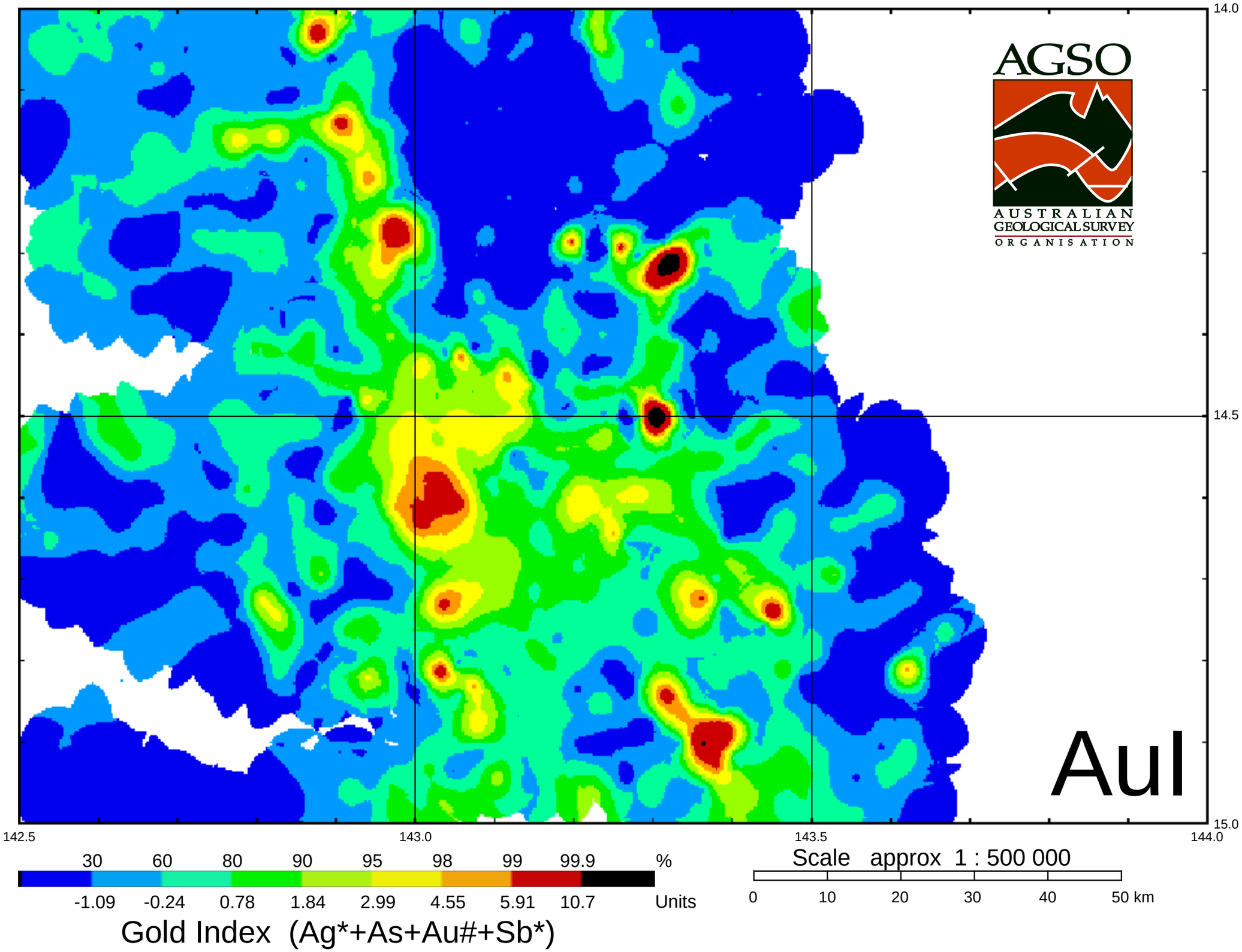
Factor 7 (Cd* and Ag*)

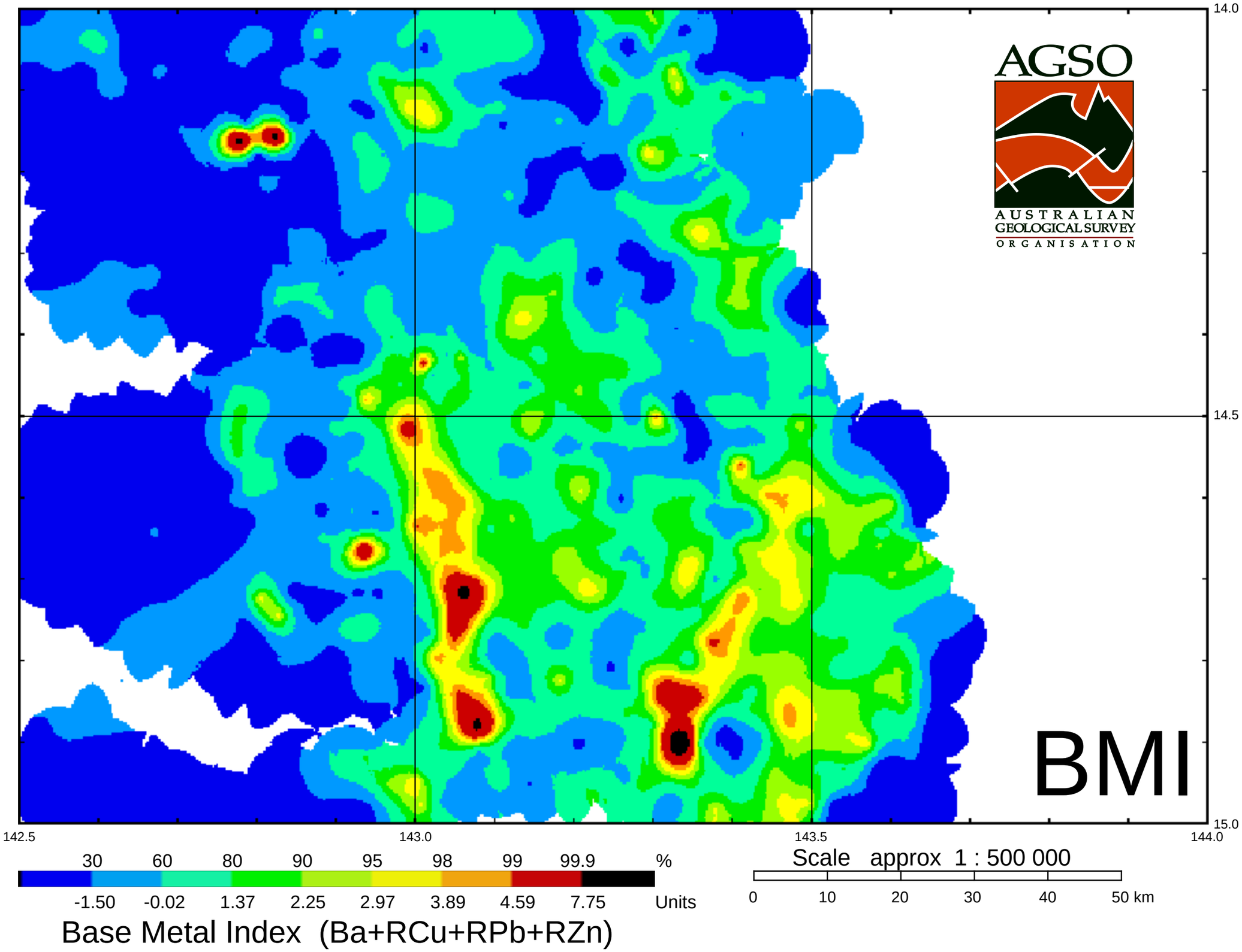

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
RCu
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-0.21 0.51 1.86 3.65 6.49 11.3 14.4 22.2 ppm
Residual Copper
Scale approx 1 : 500 000
0 10 20 30 40 50 km

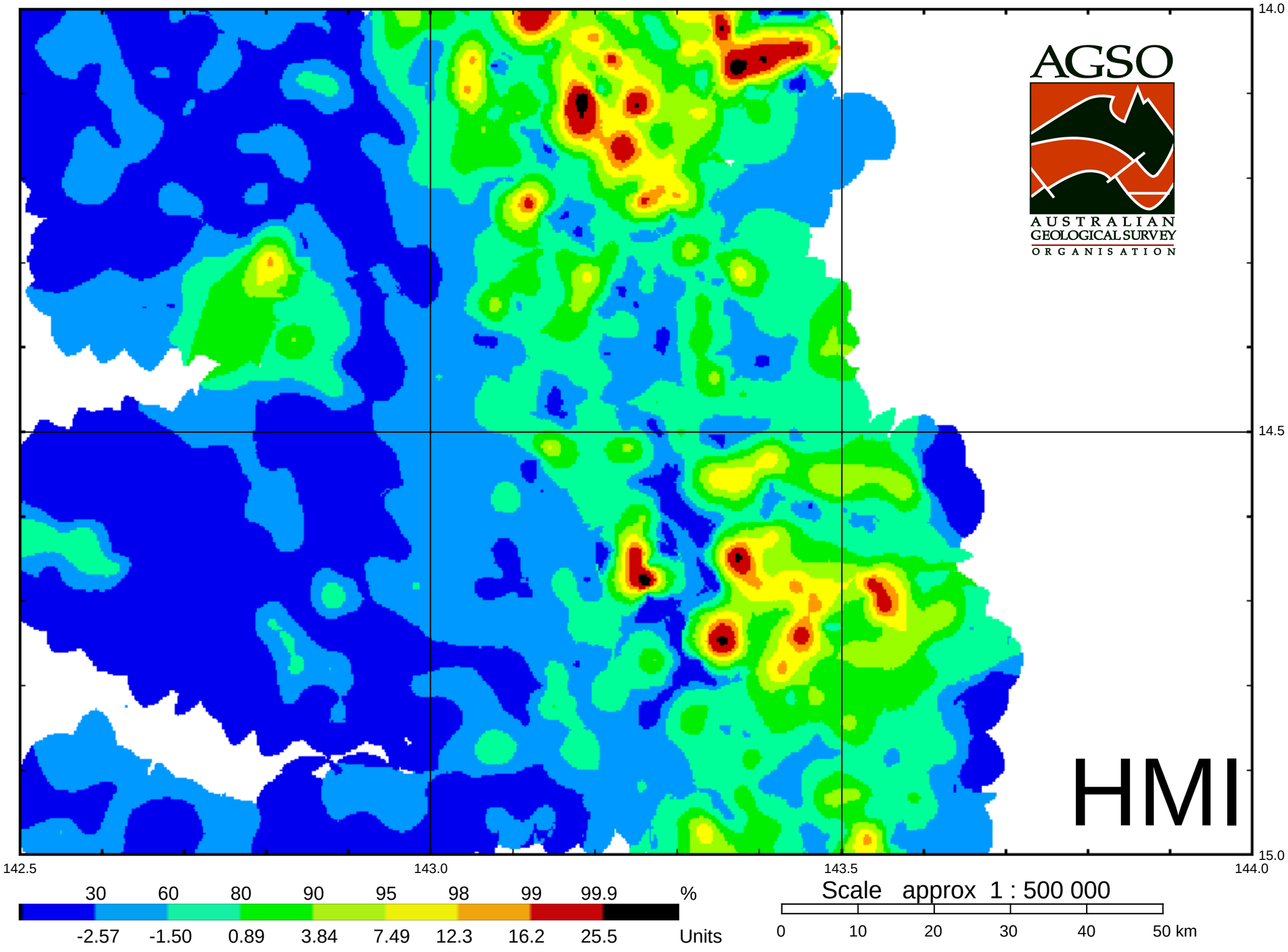

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
RPb
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-3.0 1.5 7.0 13.1 17.7 23.5 27.8 36.1 ppm
Residual Lead
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
RU
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-0.8 0.5 2.8 6.0 11.2 18.7 24.2 36.4 ppm
Residual Uranium
Scale approx 1 : 500 000
0 10 20 30 40 50 km

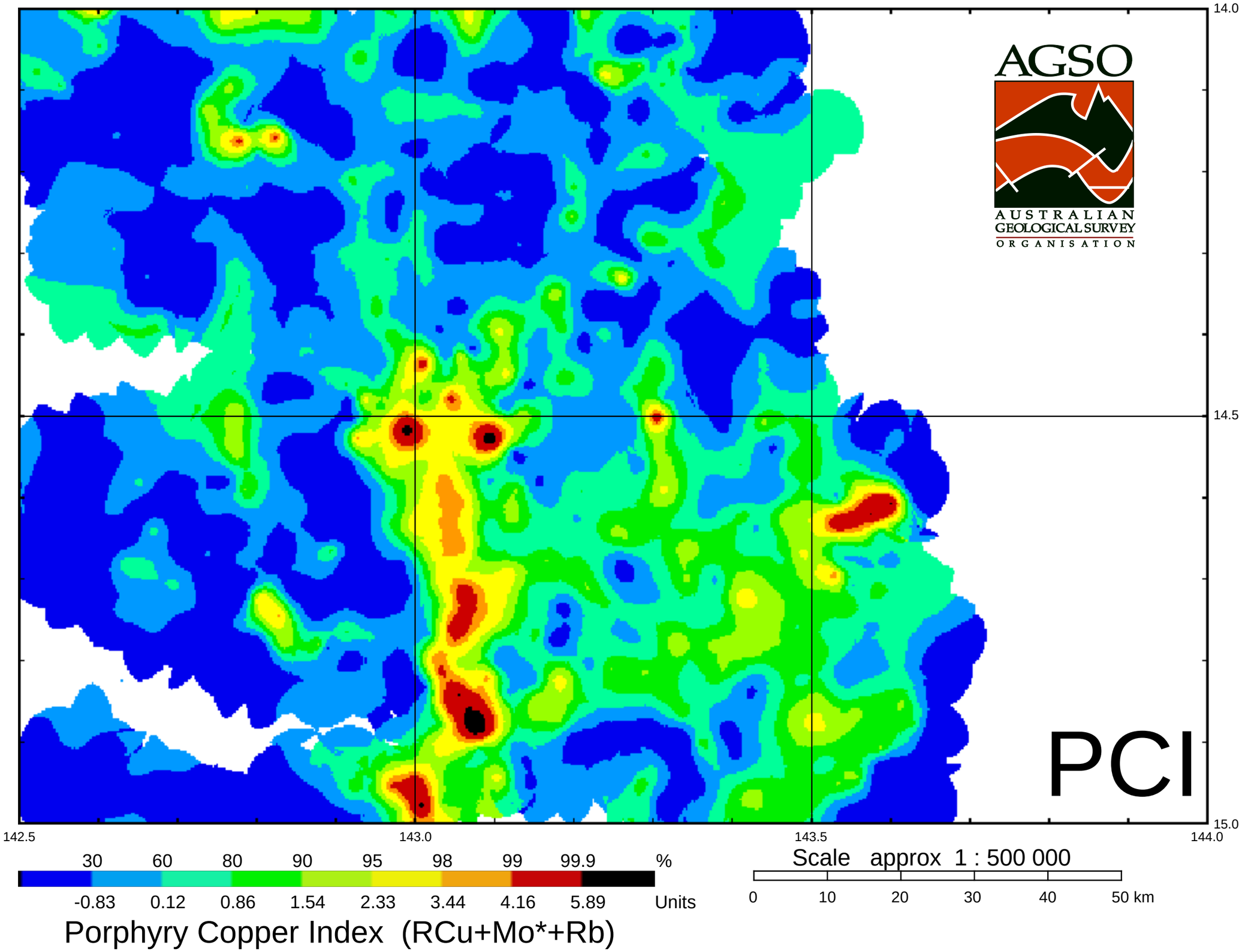

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
RZn
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-2.2 1.5 4.8 8.4 12.3 19.3 29.6 77.8 ppm
Residual Zinc
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
AuI
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-1.09 -0.24 0.78 1.84 2.99 4.55 5.91 10.7 Units
Gold Index (Ag*+As+Au#+Sb*)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

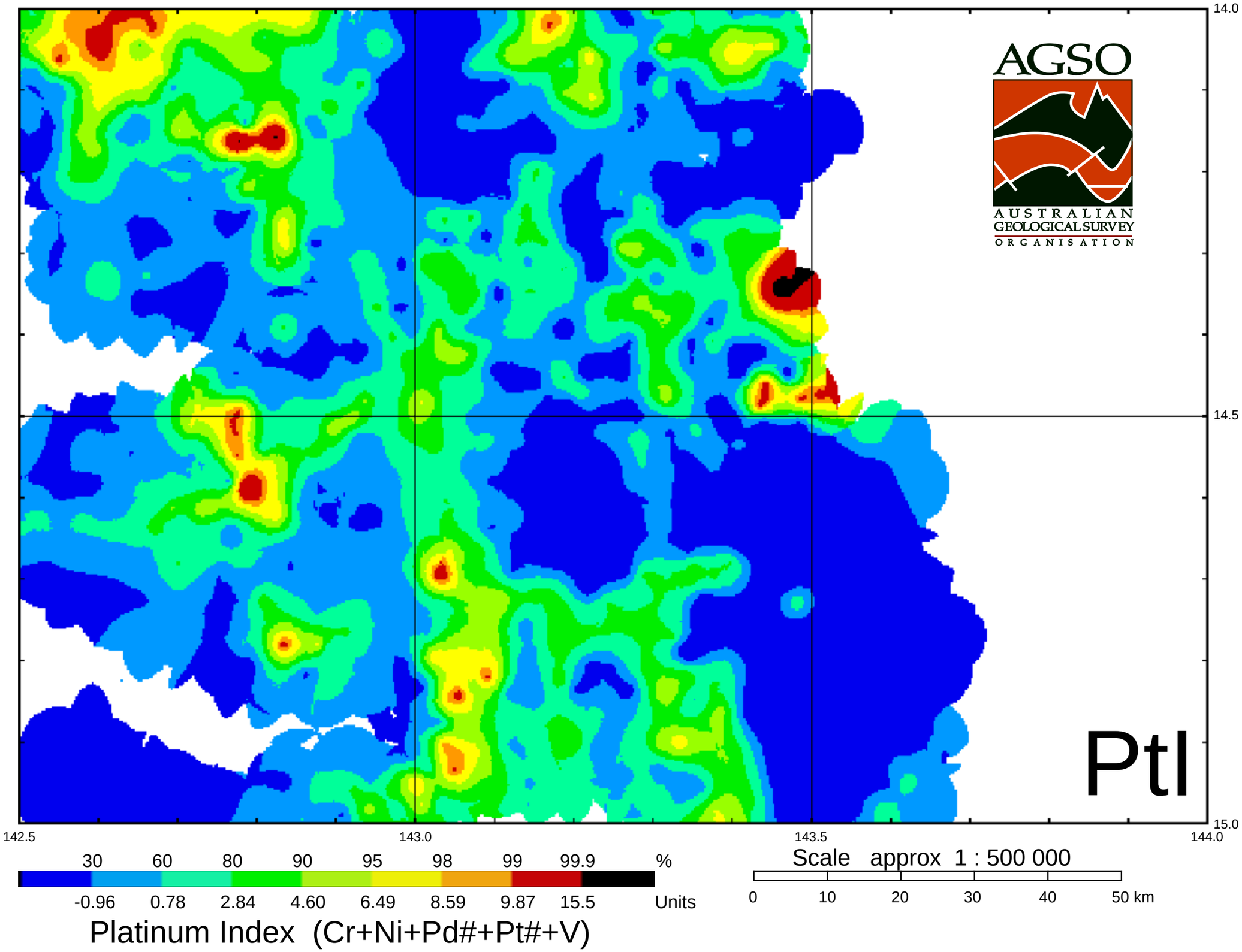

AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
BMI
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-1.50 -0.02 1.37 2.25 2.97 3.89 4.59 7.75 Units
Scale approx 1 : 500 000
0 10 20 30 40 50 km
Base Metal Index (Ba+RCu+RPb+RZn)

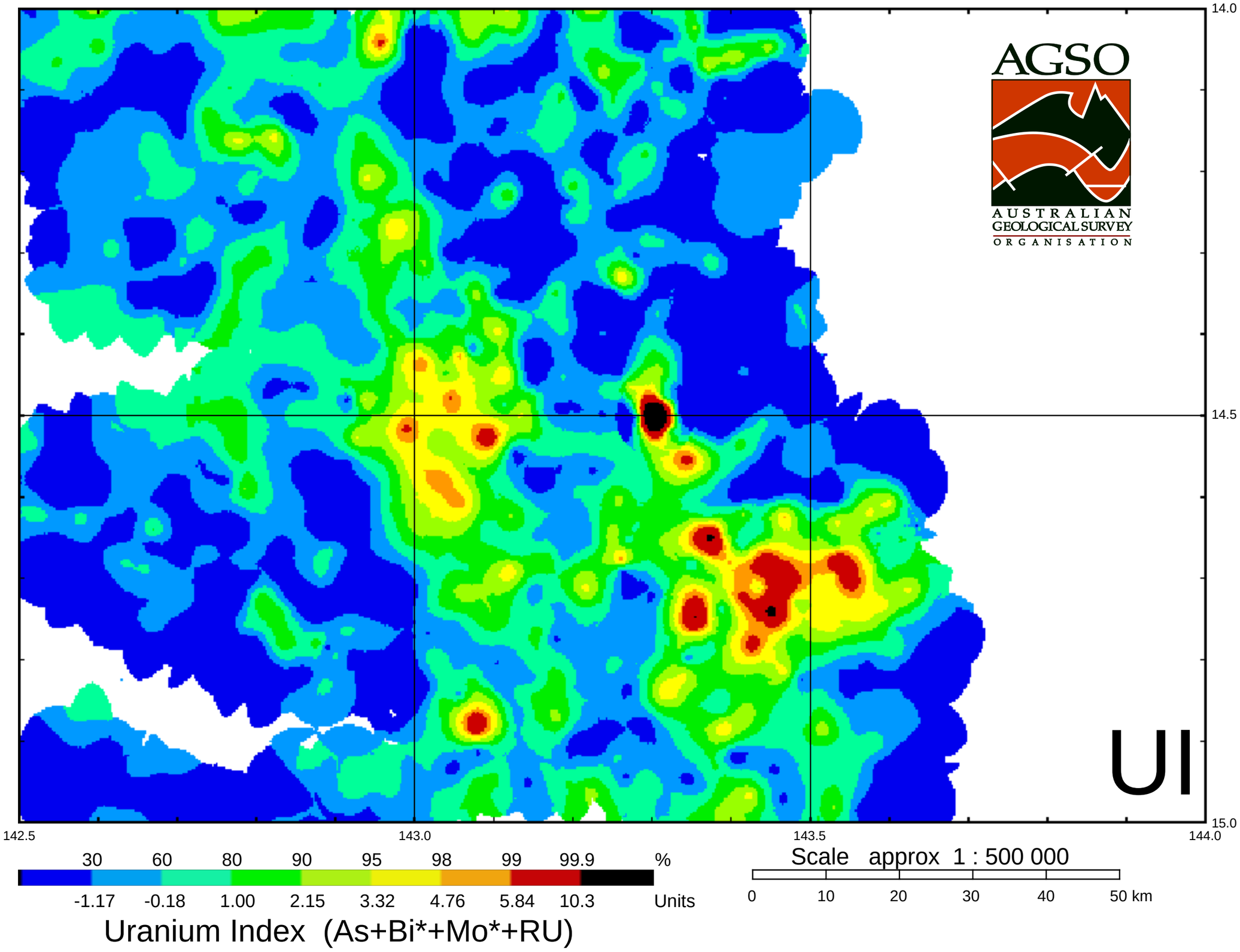


Heavy Mineral Index (Ce+La+Nd+P*+Th+Y)



Porphyry Copper Index (RCu+Mo*+Rb)


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
PtI
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-0.96 0.78 2.84 4.60 6.49 8.59 9.87 15.5 Units
Platinum Index (Cr+Ni+Pd#+Pt#+V)
Scale approx 1 : 500 000
0 10 20 30 40 50 km


AGSO
AUSTRALIAN GEOLOGICAL SURVEY ORGANISATION
UI
14.0
14.5
15.0
142.5
143.0
143.5
144.0
30 60 80 90 95 98 99 99.9 %
-1.17 -0.18 1.00 2.15 3.32 4.76 5.84 10.3 Units
Uranium Index (As+Bi*+Mo*+RU)
Scale approx 1 : 500 000
0 10 20 30 40 50 km

APPENDIX 1

Basic statistical parameters for EBAGOOLA sheet area data (N=744). Concentrations are in 'ppm' (parts per million) except for Au#, Pd# and Pt# which are in 'ppt' (parts per trillion).

				Raw data		Log-transformed data	
Element	Min.	Max.	Median	Mean	Stand. Devn	Mean	Geom. Devn
Ag*	-0.10	5.71	0.31	0.40	0.47	0.28	2.349
As	-0.5	77.5	2.0	2.82	3.78	1.93	2.357
Au#	-10	11200	50	158.4	584.9	39.2	5.307
Ba	23	1694	422.5	501.6	344.9	369.4	2.366
Be*	-0.10	5.56	1.29	1.42	0.78	1.22	1.774
Bi	-2	6	-2				
Bi*	-0.10	1.59	0.22	0.27	0.21	0.21	2.084
Cd*	-0.10	1.76	0.15	0.16	0.11	0.14	1.680
Ce	10	1946	78.5	153.0	225.3	92.3	2.454
Cr	-1	332	21	27.25	28.06	15.9	3.276
Cu	-1	37	2	4.12	5.65	1.97	3.413
Fe	2000	75000	10000	12975	10005	9897	2.118
Ga	-1	19	7	6.98	3.26	6.08	1.785
Ge	-0.5	3	1.5	1.56	0.30	1.53	1.224
Hf	-2	251	10	14.27	15.11	10.8	2.008
La	4	1028	39.5	77.70	116.1	46.3	2.495
Mn	9	3064	253	354.2	373.4	225.2	2.795
Mo	-2	5	-2				
Mo*	-0.10	3.18	0.49	0.56	0.40	0.41	2.454
Nb	3	127	13	15.57	10.75	13.29	1.706
Nd	4	840	32	64.21	95.96	37.79	2.532
Ni	-1	73	3	5.30	7.33	2.71	3.232
P*	-20	2710	181	292.2	361.2	164.5	3.141
Pb	3	75	21	26.53	16.76	21.38	1.978
Pd#	-10	10	-10				
Pt#	-10	10	-10				
Rb	-1	287	71	92.98	75.47	52.32	3.834
Sb*	-0.05	4.32	0.43	0.52	0.42	0.39	2.391
Sc	-1	25	4	5.08	3.68	3.75	2.361
Se	-1	1	-1				
Sn	-2	348	-2	4.95	18.43	2.10	2.728
Sr	3	216	53	62.61	44.04	43.69	2.659
Ta	-2	49	-2				
Th	-2	505	17	41.09	65.49	21.53	2.812
Ti	314	46779	3359	4178	4004	3072	2.231
Tl*	-0.5	2.29	0.67	0.76	0.51	0.59	2.094
U	-0.5	80.5	3.5	6.65	9.39	3.97	2.565
V	-2	262	29	38.38	35.01	24.81	2.837
W	-3	50	4	4.94	4.53	3.77	2.044
W*	-0.10	48.2	1.58	1.85	2.13	1.33	2.513
Y	4	1014	31	61.01	93.77	38.36	2.302
Zn	2	201	15	18.08	14.53	14.20	2.021
Zr	54	13994	423.5	654.3	806.0	466.2	2.144

- signifies element analysed by Bulk Cyanide Leach method (Australian Laboratory Services, Brisbane)

* - signifies element analysed by ICP-MS (Analabs, Perth)

All other elements analysed by AGSO (formerly BMR) laboratories in Canberra

APPENDIX 2

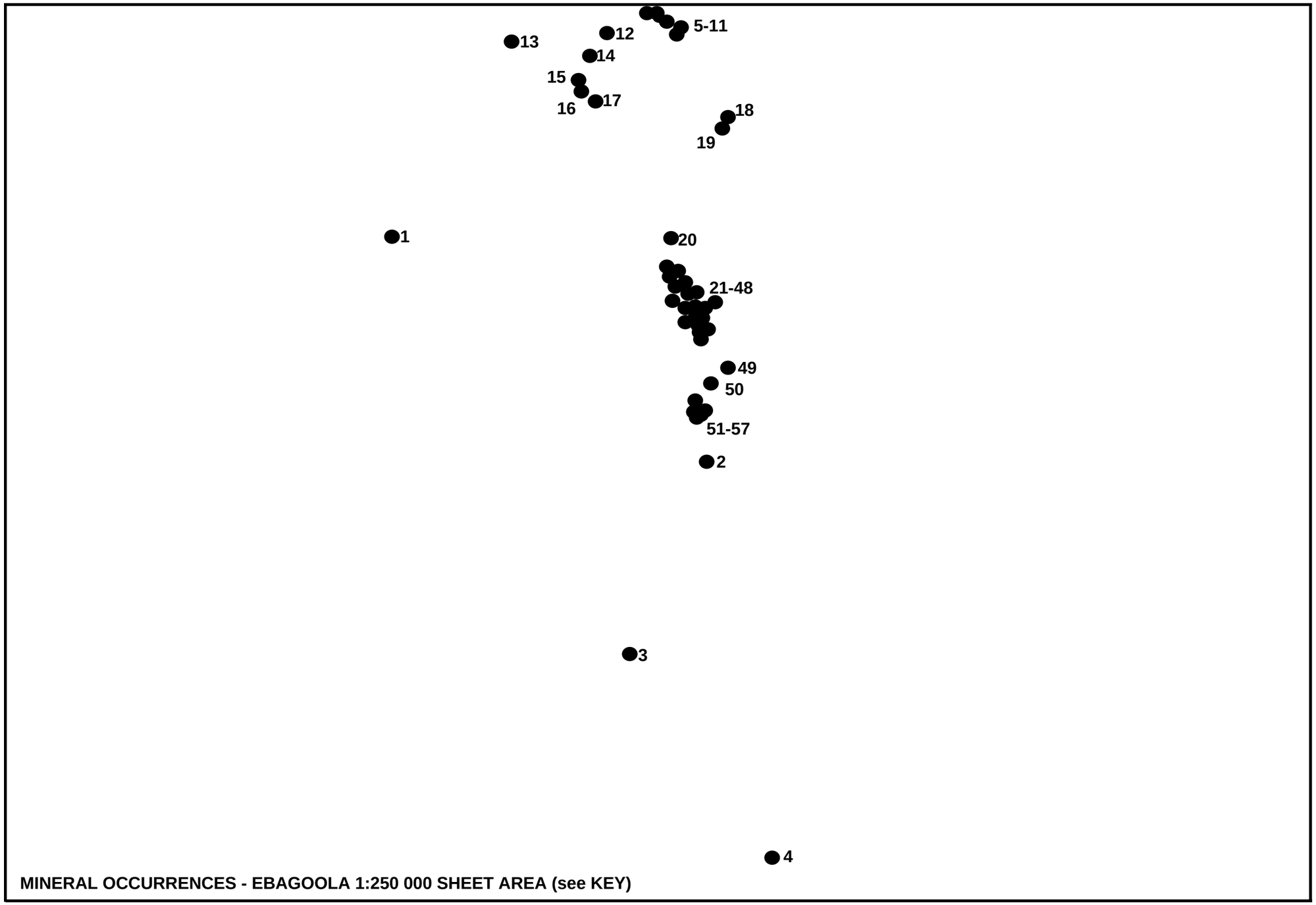
Rotated factor loadings, eigenvalues and communalities for EBAGOOLA sheet area log-transformed data (N=744).

	Communalities	F1	F2	F3	F4	F5	F6	F7
Ag*	0.421					0.329		0.413
As	0.583		0.599					
Au#	0.315					0.491		
Ba	0.929			0.872				
Be*	0.824			0.727		0.414		
Bi*	0.739					0.734		
Cd*	0.812							0.883
Ce	0.966	0.920		0.323				
Cr	0.836		0.812	-0.354				
Cu	0.882		0.913					
Fe	0.924		0.941					
Ga	0.756			0.777				
Ge	0.555					0.720		
Hf	0.905	0.300					0.850	
La	0.961	0.918		0.321				
Mn	0.691		0.525	0.550				
Mo*	0.800				0.869			
Nb	0.780	0.539	0.509	-0.333			0.334	
Nd	0.964	0.917		0.328				
Ni	0.867		0.905					
P*	0.795	0.672		0.559				
Pb	0.912	0.356	-0.351	0.793				
Rb	0.889	0.321		0.788			-0.334	
Sb*	0.663				0.746			
Sc	0.794		0.820					
Sn	0.583		0.310				0.625	
Sr	0.917			0.912				
Th	0.957	0.915		0.308				
Ti	0.830	0.338	0.695	-0.368				
Tl*	0.792		-0.452	0.691				
U	0.903	0.883						
V	0.907		0.845				0.321	
W	0.557	0.638				0.310		
W*	0.794				0.846			
Y	0.897	0.872						
Zn	0.810		0.757	0.324				
Zr	0.937	0.321					0.847	
Eigenvalues		10.53	8.14	4.77	2.41	1.40	1.16	1.02
Proportion of original variance (%)		28.4	22.0	12.9	6.5	3.8	3.1	2.8
Cumulative (%)		28.4	50.4	63.3	69.8	73.6	76.7	79.5

Primary intercorrelations for Factors above.

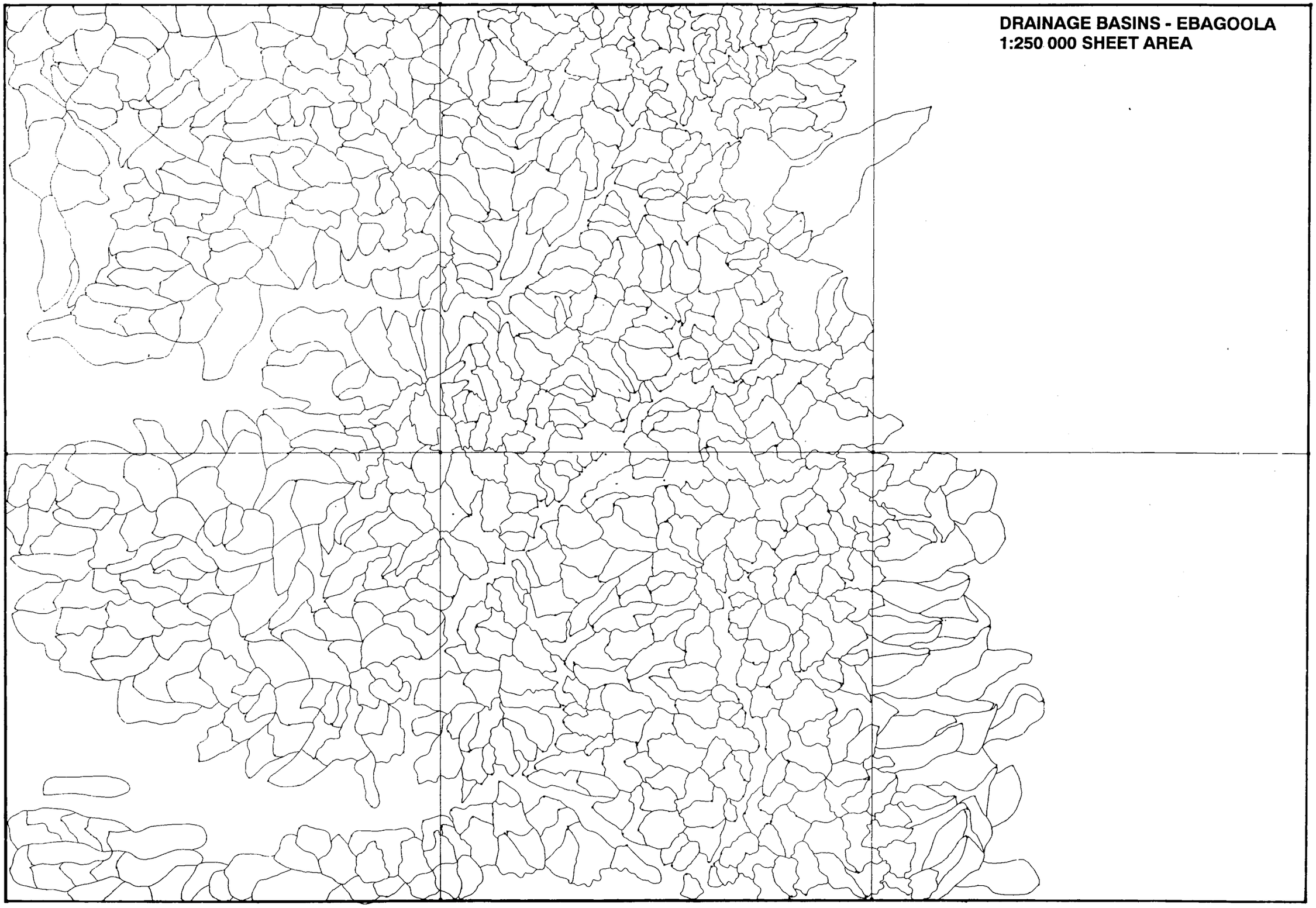
	F1	F2	F3	F4	F5	F6	F7
F1							
F2	-0.117						
F3	0.544	-0.239					
F4	0.021	0.172	0.132				
F5	0.127	0.102	0.346	0.346			
F6	0.056	0.297	-0.475	-0.027	-0.177		
F7	0.282	0.007	0.329	0.189	0.257	-0.074	

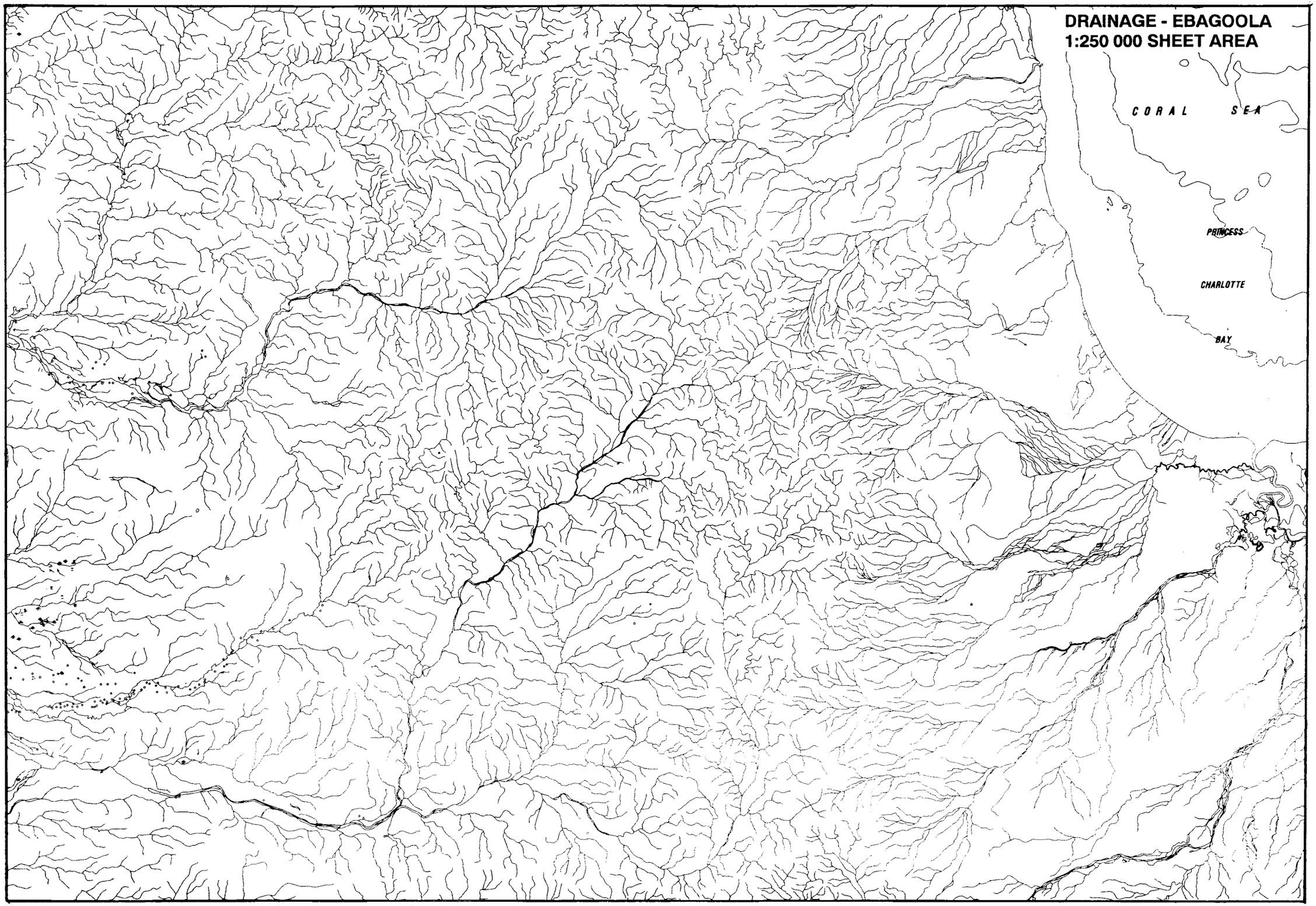
Note The values in this table differ slightly from those in Table 9 of the data record due to the deletion of Ta from these calculations.

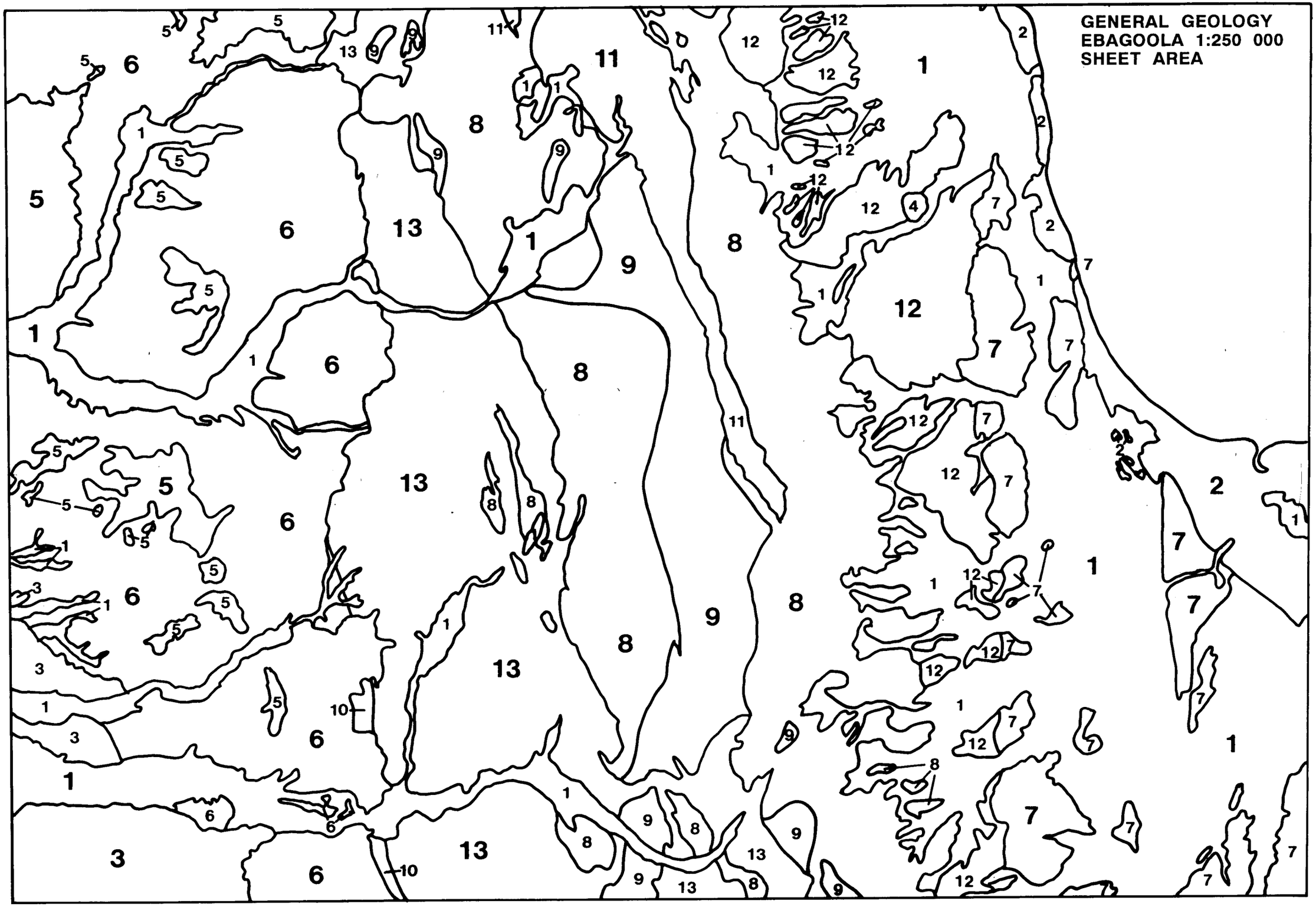


MINERAL OCCURRENCES - EBAGOOLA 1:250 000 SHEET AREA (see KEY)

DRAINAGE BASINS - EBAGOOLA
1:250 000 SHEET AREA




DRAINAGE - EBAGOOLA
1:250 000 SHEET AREA
CORAL SEA
PRINCESS
CHARLOTTE
BAY


GENERAL GEOLOGY
EBAGOOLA 1:250 000
SHEET AREA

GENERAL GEOLOGY

1 - Alluvium (Quaternary)
2 - Coastal deposits (Quaternary)
3 - Wyaaba Beds (alluvium - Tertiary)
4 - Basalt (Tertiary)
5 - Bulimba Formation (Cretaceous)
6 - Rolling Downs Group (Cretaceous)
7 - Laura Basin sandstone (Mesozoic)
8 - Kintore Supersuite (S-type granites - Silurian/Devonian)
9 - Flyspeck Supersuite (I-type granites - Silurian/Devonian)
10 - Edward River Metamorphic Group (Proterozoic)
11 - Coen Metamorphic Group (Proterozoic)
12 - Newberry Metamorphic Group (Proterozoic)
13 - Holroyd Metamorphic Group (Proterozoic)

MINERALISATION

Mineral occurrances and mines, Ebagoola 1:250 000 sheet area (sourced from the MINOCC/MINLOC digital database, August 1992).

	1 Goanna Creek	Sn
	2 Spion Kop	Au
	3 Flying Fox Hill	Au
	4 The Bustard	Cu,Pb,Zn
	5 Saddle Skarn	Au
	6 Goolha-Goolha	Au
	7 Westralia P.C.	Au
	8 Westralia No.1 South	Au
	9 Horseshoe Creek	Au
	10 unnamed	Au?
	11 Sirdar	Au
	12 Windmill Reef	Au
	13 Tadpole Creek	U,Au
	14 Thornbury Creek	Au
	15 Thornbury North	Au
	16 Thornbury	Au
	17 Gossan Hill	Au
	18 Stewart Cataracts	Au
	19 Little Stewart River	Au
Hamilton Goldfield		
	20 Ebagoola South	Au
	21 unnamed	Au?
	22 All Nationa Creek	Au
	23 Rhys Demon	Au
	24 Caledonia	Au
	25 Rats	Au
	26 Hidden Treasure	Au
	27 Hamilton King	Au
	28 All Nations	Au
	29 St Albans	Au
	30 Golden Treasure	Au
	31 St Albans South	Au
	32 May Queen	Au
	33 Hit or Miss	Au
	34 Racecourse Creek	Au,Mn,Ag
	35 Good Luck	Au
	36 Last Hit	Au
	37 Red	Au,Lst,Mar
	38 Queenslander North	Au
	39 Never	Au,Lst
	40 Queenslander	Au
	41 Queenslander East	Au
	42 True Blue	Au
	43 Johannesburg	Au
	44 Station Creek	Au
	45 Trafalgar	Au
	46 De Gem	Au
	47 Random	Au
	48 Violet	Au
Yarraden Goldfield		
	49 Gold Mount	Au
	50 Lukin King	Au
	51 Golden King North	Au
	52 Lady Jayne	Au
	53 Savannah	Au
	54 Golden King	Au
	55 Savannah South	Au,Mn
	56 J & B Sinters Grid	Au,Lst
	57 Golden King South	Au