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Soil geochemical data from Nord-Salten, Nordland

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REPORT

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Soil geochemical data from Nord-Salten, Nordland

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Summary:
The geochemical study presented was carried out in an area dubbed Nord-Salten, which mainly covers the basement rocks of the Tysfjord granite, as well as interleaved and adjacent metasediments of Caledonian nappes. Prior geochemical surveys of surficial deposits on the 1 sample/40km^2 scale, as well as surveys covering smaller areas in higher detail, pointed to this area for a more detailed survey, particularly with focus on rare earth elements . Samples of till and loose weathered material from a total of 877 sites in a loose 2x2 km sampling grid were collected, dried, sieved <2mm and analysed for aqua regia extractable content of 65 elements, including the REE suite of elements, and following tight quality control procedures. The regional distribution of many elements clearly reflects geological boundaries. Maximum concentrations observed for the sum of the REEs is 1490 mg/kg and several clusters of high REE values occur within the granite, as well as within the mangerite in coastal Hamarøy. Several additional geochemical anomalies have been identified.

Området her omtalt som Nord-Salten omfatter grunnfjellbergartene i Tysfjord-granitten med små unntak, og Kaledonske metasedimentære dekkebergarter både midt i granitten og i tilstøtende områder. Tidligere geokjemisk kartlegging av løsmasser i 1 prøve/40km^2- målestokk, i tillegg til undersøkelser som dekker mindre områder i større detalj, har pekt på dette området som aktuelt for en mer detaljert undersøkelse, særlig med tanke på REE. Prøver av morene og forvitringsjord fra i alt 877 lokaliteter i et løst definert 2x2 km rutenett ble samlet, tørket, siktet <2mm og ekstrahert med kongevann før analyse på 65 grunnstoffer, inklusive REE; alt gjennomført i et strengt kvalitetskontrollregime. Den regionale fordelingen av mange av grunnstoffene gjenspeiler tydelig den underliggende berggrunn. Høyeste konsentrasjon målt for sum REE er 1490 mg/kg, og flere områder med høye REE-verdier avtegner seg i granitten, samt i mangeritten på kysten av Hamarøy. Flere andre geokjemiske anomalier er identifisert.

Keywords:	Nordland	till
rare earth elements	geochemistry	Geochemical mapping

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1. INTRODUCTION

This geochemical study covers approximately 3600km^2 of land area located in the Northern part of the Salten region of Nordland county, as well as part of the adjacent region Ofoten. For simplicity, we refer to the area as Nord-Salten. The bedrock of the region is dominated by a unit called the "Tysfjord granite" that includes a number of mapped units all belonging to basement rocks of Precambrian age (Figure 1 and all maps in Appendix 2). A unit that consists of metamorphic sedimentary rocks occurs centrally in the area with a width ranging from 2 to 10 km across the major strike NNE. In the NE part of the area it widens and dominates between the Swedish border and the sea, the Ofoten fjord. The bedrock map coverage is complete in the scale 1:250 000, with the following maps covering the area (from NW to SE): Svolvær (Tveten, 1978), Narvik (Gustavson, 1974), Bodø (Gustavson and Blystad, 1995), and Sulitjelma (Gustavson, 1996). In addition to that, four bedrock map sheets of the scale 1:50 000 are published in this area; to the South, Gjerdalen (Kollung, 1991) and Linnajav'ri (Brattli and Prestvik, 1987), and to the North, Evenes (Boyd et.al, 1986) and Skjomen (Boyd and Søvegjarto, 1983).

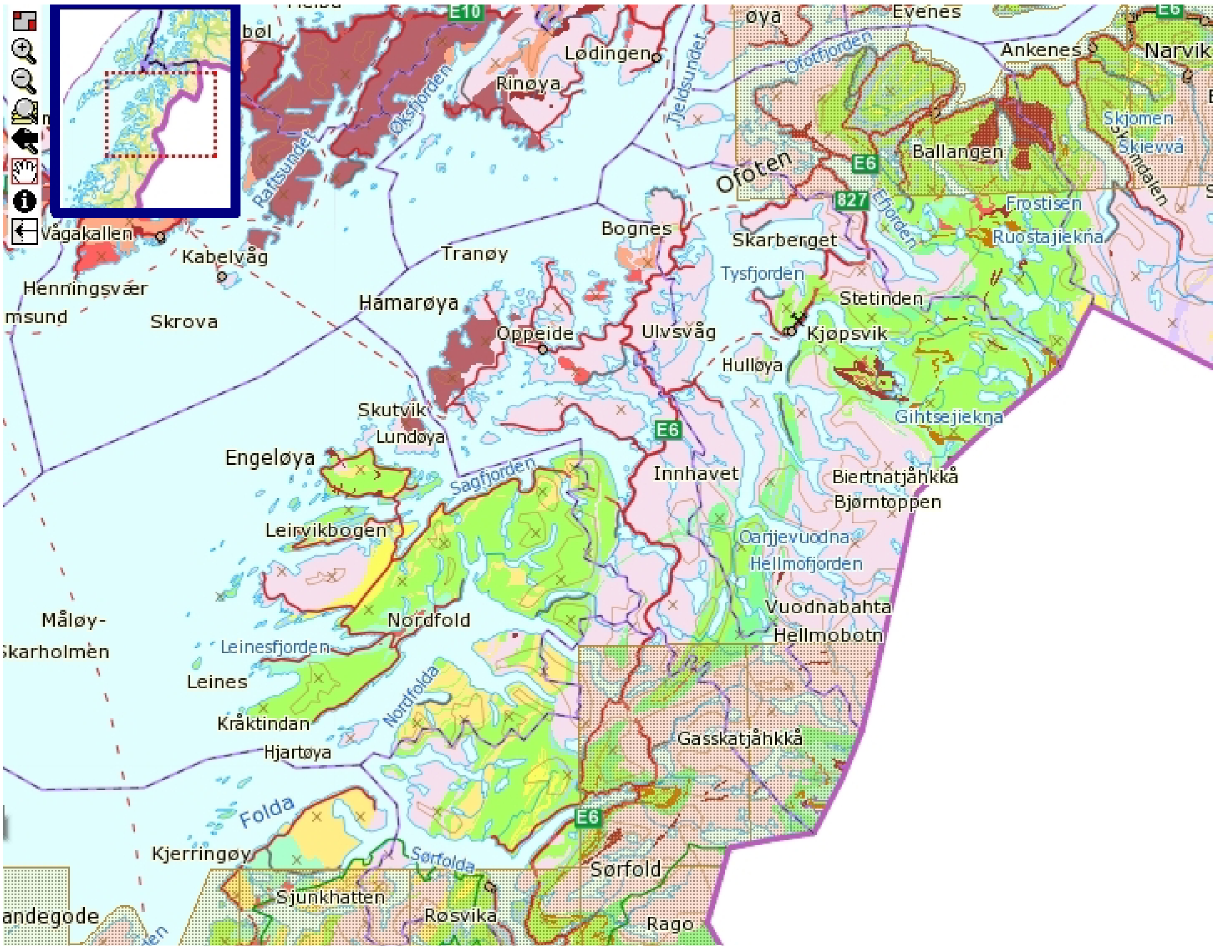


Figure 1. Index map and simplified bedrock geology. Extent of issued bedrock map in scale 1:50 0000 shown as hatched rectangles.

In 1986-1987 a low density (1 sample/40km^2) multimedia geochemical mapping project was carried out in Nordland and Troms counties. Sampling and analysis were performed on stream sediments, stream water and till. Stream sediments were analysed using several techniques: The fine fraction (<0.18mm) was analysed using XRF (Næss, 1988) as well as NAA

(Ekremsæter, 1988) and HNO_3-extraction (Krog, 1987). The heavy minerals of the coarse fraction (> 0.18 mm) were analysed using XRF (Wolden, 1987). The till samples(<0.06mm fraction) were analysed for HNO_3-extractables (Kjeldsen, 1987) and for gold (Kjeldsen and Ottesen, 1988). All till samples were reanalysed at a later date for some 60 elements after aqua regia extraction of the < 2mm fraction (Reimann et al., 2011).

A number of other geochemical studies have been carried out in the area. The NE part of Nord-Salten, as well as adjacent Skjomen was part of a study where stream sediments were collected with a density of 1 sample/5km^2. That study covered an area dominated by Caledonian metasediments. The samples were analysed for the contents of 28 HNO_3-extractable elements (Finne, 1992). In a 245 km^2 area in the SE, samples of bedrock and till/weathering residue were collected in a 1x1 km grid. The samples were analysed for 28 HNO_3-extractable elements, with Be, Ce and La being the elements of prime interest (Korneliussen et al., 1989). Finally, more than 300 samples of bedrock were sampled throughout Nord-Salten during the 1970's and 80's as part of a project assessing radioactivity from naturally occurring materials in Norway (Lindahl and Sørdal, 1991).

Quaternary deposits of the area are dominated by regolith and a thin till layer. The map in Figure 2 displays rather uniform conditions when it comes to surficial deposits, but some smaller areas of marine deposits and glaciofluvial sediments also occur within the area.

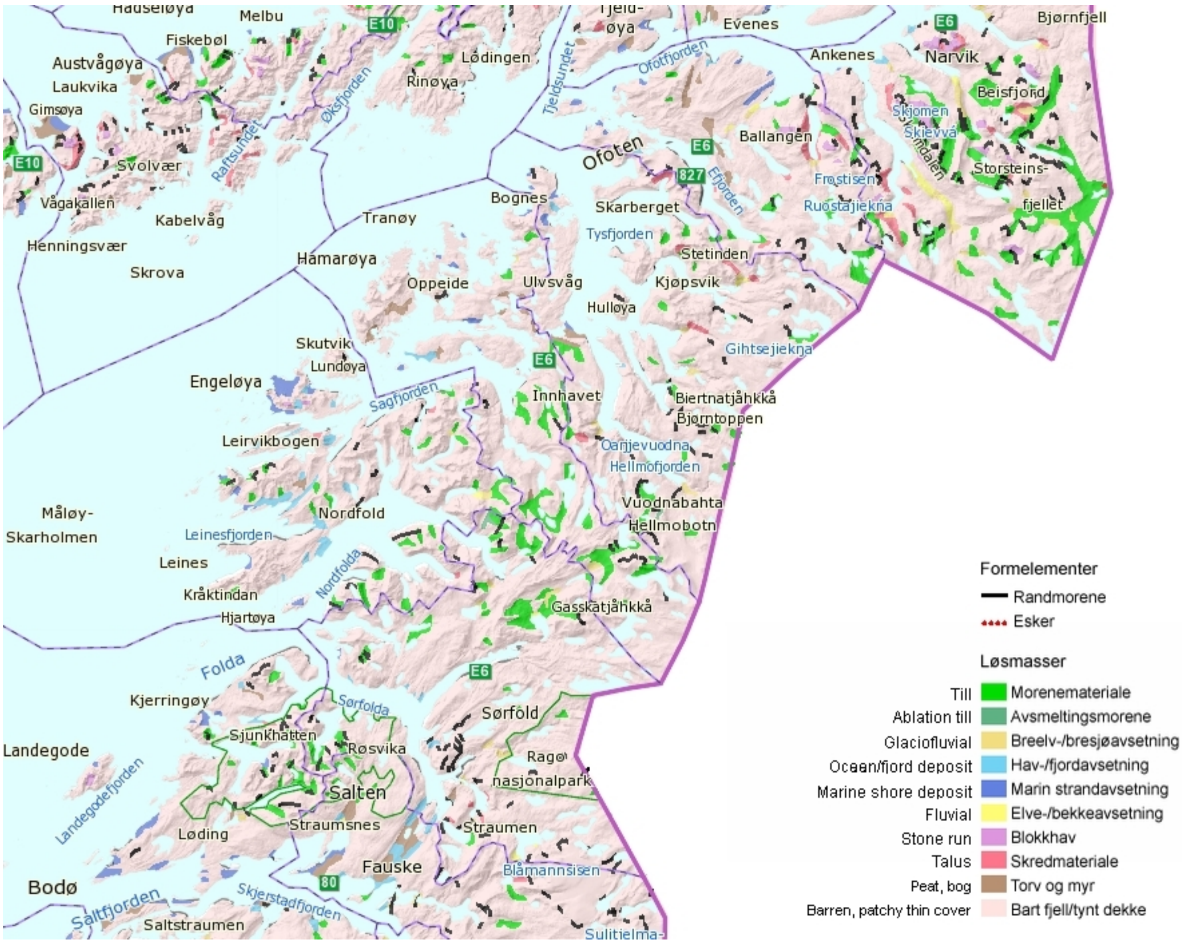


Figure 2. Map of Quaternary deposits from scale 1:1 000 000.

Maps from the various sample media/analytical methods of the 1/40 km^2 survey mentioned above strongly indicated the Tysfjord granite as an interesting target for more detailed investigation for Rare Earth Elements (REEs), confirming the findings of the more unevenly scattered sampling bedrock survey of the 1970's and 80's. The 245 km^2 survey (Korneliussen et. al, 1989) also gave high maxima on Ce and La, but the project lacked the resources to follow up a larger area.

As explained above, the Tysfjord granite and its surroundings have been found interesting with regard to rare earth metals in a number of studies. Conducting a geochemical mapping program with a sampling density "one order of magnitude" higher is the natural next step for such areas.

2. METHODS

2.1 Planning Stage and Field work

Several factors contributed to the choice of sampling area: 1) Previous regional studies pointing to the "Tysfjord Granite" as favorable for a REE follow-up. 2) a wish to cover an area where the Ministry of Environment has been planning a large national park and thus adding to the geochemical knowledge of that area.
Field work had to be executed during a time with no snow cover. The extremely rugged terrain in parts of the area, called for extensive use of helicopter transport. Near 900 planned sample points that cover the granite, interspersed Caledonian sediments, as well as the most remote sediments to the North East were prioritized. A 2x2 km grid was considered a feasible compromise between the size of the area of interest and available resources for the project, and a sampling density adding new information relative to that of the data of the 1/40 km^2-survey.

In the field, sample pits were dug by paint-free steel spade down to well into the mineral soil layer. Glaciofluvial deposits and areas with marine deposits were consciously avoided during sampling. Samples were collected into RILSAN® plastic bags using a small steel trowel. Figure 4 shows a typical sample pit, the equipment used and a typical sample. Sample weight was on average 1.2 kg. Sample contamination was minimized by the field crew not wearing any jewelry during sampling, and tools were wiped clean before collecting the next sample. About 40% of the sample sites were accessed on foot from road, the remaining 60% by assistance of helicopter transport. The four municipalities involved granted exempts from the strict regulations regarding use of off-road motor transport, and upon successful contact with owners of lots larger than 4km^2, access was legally secured.

Figure 3. Typical sample pit with sampling tool and sample.

In total 877 localities were sampled. The samplers worked individually. On average, a sampler was able to collect less than 6 samples per day without helicopter support. The daily sample rate increased ten-fold when helicopter was used, but at the same time cost per sample almost doubled. All in all, the average daily sampling rate was 10. Field work was carried out in the period 31.07 – 22.08.2012, with the crew fluctuating between 2 and 7 people.

At every 25th sampling location a field duplicate sample was collected, resulting in 34 field duplicate pairs.

2.2 Sample preparation

Upon arrival at the NGU laboratories, samples were dried in their original sampling bag for three weeks at temperatures below 40 °C. Subsequently all samples were dry sieved to <2mm (9 mesh), from which 2 aliquots of 90+ g were obtained. Surplus <2mm material as well as the >2mm fraction were saved for possible later usage. From all field duplicates, an additional split was generated.

Nylon sieves were used, and no jewelry was worn during preparation work. Cross contamination via sample dust during sieving was controlled by sieving samples one at a time in a vented box. All sieving equipment was cleaned using a vacuum cleaner in between every sample. Following sample preparation, one series of all samples were randomized in a structured manner, so that for every 25 samples sent to the laboratory, a field duplicate, its split and its ordinary sample as well as a split of the project standard MINN was inserted. The control samples were not always inserted in the same positions within the group. The laboratory inserted further 33 splits of its own QC sample DS9. The laboratory also prepared analytical duplicates of 51 samples.

2.3 Analytical method

The randomized series of 90+ g aliquots were shipped to ACME laboratories in Vancouver, Canada. The MINN 2011-campaign (Reimann et al., 2012) as well as the reanalysis on the Nordland-Troms samples (Reimann et al., 2011) followed the same procedure with successful quality assessment at the named laboratory. A 15 g sample weight was used for extraction. The samples were digested in 90 ml aqua regia and leached for one hour in a hot (95 °C) water bath. After cooling, the solution was made up to a final volume of 300 ml with 5% HCl. The ratio of sample weight to solution volume is 1g per 20 ml. The solutions were analyzed using a Spectro Ciros Vision emission spectrometer (ICP-AES) and a Perkin Elmer Elan 6000/9000 inductively coupled plasma emission mass spectrometer (ICP-MS). Analytical results were returned from the laboratory within one month after receiving the samples. The remainder of the sample material was stored in the event of mishaps with the first weighing, and for possible upcoming analyses following alternative procedures.

2.4 Quality control

To be able to estimate analytical precision based on analytical duplicates and to calculate the practical detection limits, it was agreed with the laboratory that all instrument readings were reported, independent of detection limit. Table 1 and 2 display values for minimum, median and maximum, as well as precision for the analytical results for the standards MINN and DS9. For comparison with prior analytical results of the same standards, the median values from the Nordkinn study (Reimann et al., 2012) are also given in the table. As an illustration of similarity in the MINN standard behavior, Figure 4 shows the values of La vs analytical sequence number for Nordkinn and Nord-Salten, respectively. In laboratory standard DS9 only Ta has so low concentrations that it remains problematic (Table 2). X-charts (for an example see Figure 5) indicate that no problems are present with regards to time trends or breaks in analytical results. All in all most results for the standards were satisfactory. Tables 1-2 identify the problematic elements.

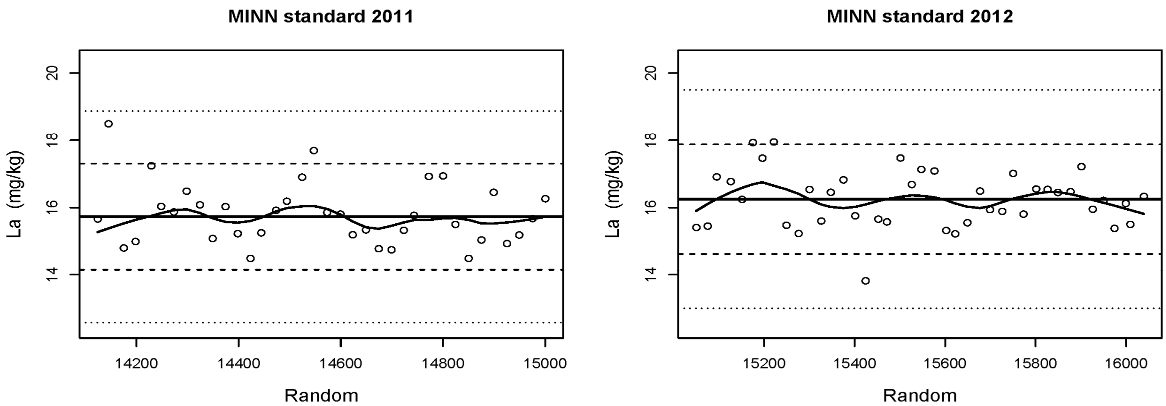


Figure 4. X-chart for La depicting stability for project standard "MINN" in year 2011 Nordkinn and this study, showing similarity in median and precision in the two datasets. Dashed and dotted lines mark ± 10 ± 20 % deviation.

Table 3 shows the estimate of precision based on the analytical duplicates and the field duplicates. In most cases the observed problems with precision were due to very low concentrations as in the case of our project standard MINN, i.e. analytical results at or below the limit of detection. However, the field duplicate results reveal that a large number of elements are plagued by poor reproducibility, and maps should be viewed with care. These include Pt, Au, Sr, U, Pd, Ag, Mo, Re, Te, B, Ta, Cr, Hg, S, Sm, and Cd. The low precision is due to the unfortunate combination of coarse sample material, chosen sample fraction and small sample size. Despite the relatively low overall precision for S in the standard samples, the good results of the duplicates led us to use a lower practical detection limit (PDL) rather than the laboratory's method detection limit (MDL) (see Table 4).

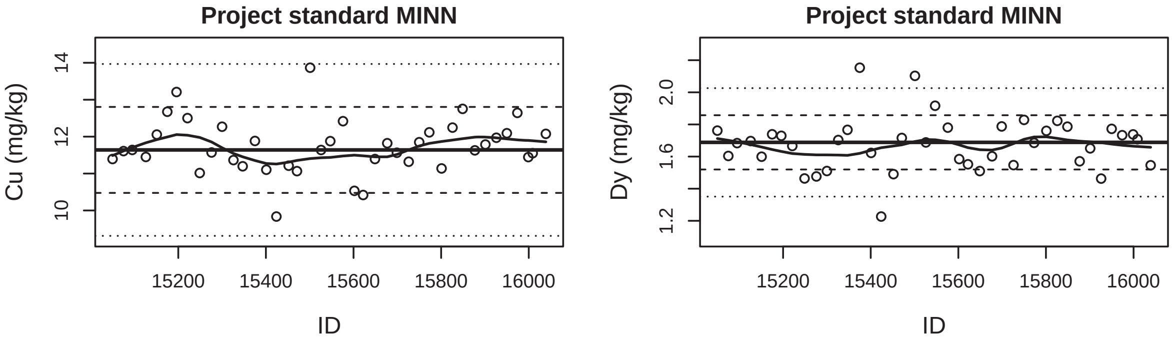


Figure 5. X-chart for Cu and Dy, depicting stability for project standard "MINN". Solid, dashed and dotted (barely visible) lines are median, ± 10 %, and ± 20 %deviation of the Cu and Dy for the samples of the MINN standard inserted at regular intervals in the analysis series

2.5 Data analysis

Geochemical data are compositional data (Aitchison, 1986; Filzmoser et al., 2009) and thus require special care during data analysis. Compositional data do not plot into the standard Euclidian room but rather in the Aitchison geometry of the simplex. Most statistical methods that are based on Euclidian distances (like calculating the mean and the standard deviation or calculating a correlation matrix) will thus return faulty results (Filzmoser et al., 2009, 2010). Thus EDA (exploratory data analysis) techniques and simple order statistics as suggested by Reimann et al., (2008) are used here. All statistical calculations are determined by use of the R software (R development core team, 2011) and the additional StatDA package (Filzmoser and Steiger, 2011).

3. RESULTS AND COMMENTS

3.1 Data tables

A statistical overview for the dataset is provided in Table 4. The table is built around the minimum, maximum and median value, and also provides the values for a number of additional quantiles (percentiles) for the analyzed elements. As an additional measure of variation the "powers" are provided, which provide a direct impression of the orders of magnitude variation for each variable. When using classical statistical methods for calculation of the mean and standard deviation to derive at "thresholds" for anomalies, 2.6% of all data will be identified as anomalies at both ends of the distribution if the dataset has a normal distribution. The data at hand are far from normally distributed and therefore unsuited for classical statistics – thus the quantiles Q2 and Q98 (or Q5 and Q95) can be taken as lower and upper threshold for the data. However, quite often Cumulative Probability (CP) Plots (see below) provide a better means of identifying anomalies in the data by inspection of shape of the curve.

Table 5 displays the analytical results with a more common approach, showing median, 98th percentile value and maximum concentration for the Nord-Salten dataset and data for directly comparable Nordkinn (Reimann et al., 2012) as well as Nordland/Troms datasets (Reimann et al., 2011). They are comparable in terms of grain size, laboratory procedures, and number of samples. The Nordland/Troms dataset differs somewhat from the other datasets as it covers a much larger area and represents a greater variation of geological settings. For median, Q98 and maximum, the highest value between the three datasets is marked in bold print. The table shows that the analytical results for the Nord-Salten samples returned high values for Au, Hg, In, some of the REEs, Mg, Mo, Pb, S, Sc, Se, Th, Ti, U, W and Zn. Particularly Sc, Sn and W show high concentrations, not only relative to Nordkinn and Nordland-Troms. Given that the most of the bedrock in the area is of granitic character, this is hardly surprising

3.2 Cumulative Probability (CP-) Plot

Plots of the cumulative distribution function are one of the most informative displays of geochemical distributions (Reimann et al., 2008). In the plots the concentration is plotted along the X-axis and the cumulative probability is plotted along the Y-axis, and it allows the direct visual recognition of breaks in the curve which may be indicative of different geochemical processes. Breaks in the uppermost few percentiles of the distribution are often used as thresholds for anomaly identification. Readings below the MDL (PDL) are here set to half the MDL value for that element, respectively. Appendix 1 provides the CP-plots for all 65 variables.

3.3 Maps

Many different methods for producing geochemical maps exist (see discussion in Reimann, 2005 or in Chapter 5 of Reimann et al., 2008). In mineral exploration so called “growing dot maps” as introduced by Bjørklund and Gustavsson (1987) are probably most often used. However, they focus the attention almost exclusively on the high values, the “anomalies” and are less well suited to study the data in more detail, e.g., in relation to geology. It may also be argued that the "growing dot map" has limitations in detecting local anomalies as they often do not display especially high values in relation to the whole dataset, but rather high values in relation to their local surroundings. Some of these shortcomings can be helped by giving special attention to the growth increment of the symbols, and the overall size of the symbols in the map image.

The percentiles used for the classes are 25 – 75 – 90 – 98%. All the maps are prepared on a backdrop of a generalized bedrock map based on the available maps in scale 1:250 000 hosted by http://geo.ngu.no/kart/berggrunn/ . An excerpt of the legend for the 1:250 000 scale map series is shown in Figure 6.

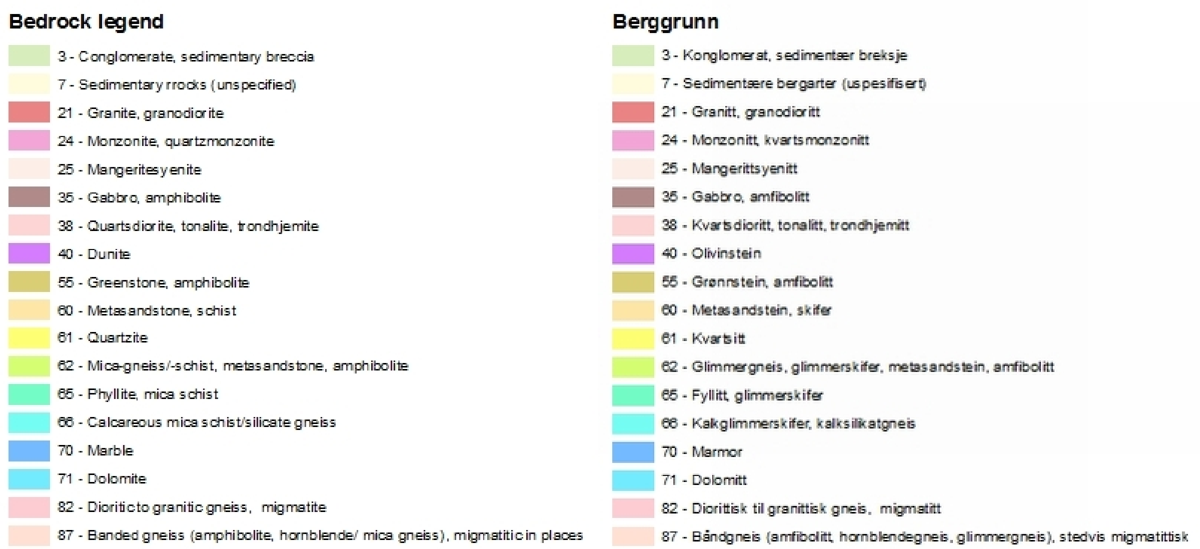


Figure 6. Excerpt from legend of 1:250 000 bedrock maps.

The reader will note that for many elements the chosen classes are able to depict geology accurately, i.e. the symbols' size change abruptly from one rock type to another. Good examples are Al, Ba or Cr.

Throughout the surveyed area, the thickness of the surficial deposits is mostly very thin. To a great extent, the overview Quaternary Deposits map in Figure 2 gives a very correct impression of the conditions, indicating short transport distances of the sampled material. This fits well with the observation that there is a close relation between the bedrock and the sampled material in this survey.

Hf, Zr and to some extent Sb provide a different signature of the Tysfjord granite unit East of the metasediments from Hellmobotn in the South to Gihtsejiekŋa (Frostisen) in the North. In this area, the levels are clearly higher for these elements than in the other parts of the Tysfjord granite.

Cu, Ni and Zn as well as Ba, Co, Cr and V are strongly associated with the metasediments, the only exception being Zn, which also has high values in the mangerite at Skutvik.

The mangerite at Skutvik displays many of the high values of heavy REEs (HREE) in the mapped area. Other locations of high HREE-sums are from highway E6 up Gjerdalen, and in the very North in Ballangen municipality, where one of the samples also shows the extreme Sn-value of 81.3ppm. The 13 samples with sumREE >500ppm all have U-concentrations <14ppm, 9 of them even below 5ppm. On the other hand, Th seems to be well correlated with sumREE, ranging from 11 to 41ppm amongst the high sumREE samples.

All of the top 10% Mo values (53ppm and up) are located in the Tysfjord granite, some of these points are surrounded by Mo values of the second highest class.

A small Pb-anomaly (263-254ppm Pb) near two small islets of the Caledonian nappes close to the Swedish border at Hellmobotn, overshadows the variation of the remaining high values. The anomalous values are generally connected to the rock units "phyllite, mica schist" or "mica-gneiss/schist, metasandstone, amphibolite".

The dataset for this report is provided online (http://www.ngu.no/en-gb/tm/About-NGU/Projects/Mineralressurser-i-Nord-Norge-MINN/ look for “Last ned data her”), and it is therefore possible and up to the reader to use different mapping techniques. Note, however, that in the provided data file all values below detection are marked as “<n”, n being the lowest reported value given by the laboratory, while NGU had the original instrument readings available, i.e. values for every sample. NGU used the instrument reading values as these results often contain valuable information when using large datasets with hundreds of samples. For example, the laboratory’s official detection limit for S is 200 mg/kg, but the QC results indicate that values down to 20 mg/kg are still reliable. Thus a full order of magnitude real, natural variation would have been lost when setting all values below the DL to for instance ½ of the detection limit. Negative instrument readings were set to a very low positive value.

4. CONCLUSIONS

Important features of the maps are:
(1) The area is clearly divided into several geochemically distinct geological units, following by and large the geological units within the geological map.

(2) The study displays clear anomalies for REEs and to a lesser degree for the base metals.

In summary the maps show the power of a detailed geochemical soil survey in aiding geological mapping in an area that is difficult to subdivide based on geological field observations alone.

5. ACKNOWLEDGEMENTS

The municipalities of Sørfold, Hamarøy, Tysfjord and Ballangen granted legal provisions for use of helicopter, and nearly 100 landowners throughout Nord-Salten kindly let us land on their properties. We greatly appreciate the cooperative spirit of the local authorities and population; without it we could have risked the onset of snow before the field work was completed. The field crew did a formidable job: Malin Andersson, Ola Anfin Eggen, Belinda Flem, Tor Erik Finne, Henning K B Jensen, Øystein Jæger, Agnes M Raaness and Julian Schilling of NGU as well as NTNU MS-student Isabel Stubberud Næss. Isabel also sieved many of the samples, well assisted by Jostein Jæger and Iselin Esp Pettersen. Iselin also conducted subsequent handling of sample collection, like the physical randomizing of the samples and packing for shipment at the NGU facilities. Malin Andersson gave valuable advice on the English language and the clarity of the text

6. REFERENCES

Aitchison, John. 1986. The statistical analysis of compositional data. Chapman and Hall, London.

Bjørklund, Alf, Gustavsson, Nils, 1987. Visualization of geochemical data on maps: New options. Journal of Geochemical Exploration 29, 89-103.

Boyd, Ron, Hodges, Kip V., Steltenpohl, Mark, Søvegjarto, Ulrik. 1986. Berggrunnskart Evenes; 13314; 1:50 000; sort/hvitt. Norges geologiske undersøkelse.

Boyd, Ron, Søvegjarto, Ulrik. 1983. Berggrunnskart Skjomen; 13311; 1:50 000; sort/hvitt.. Norges geologiske undersøkelse.

Brattli, Børge, Prestvik, Tore. 1987. Berggrunnskart Linnajavri; 22303; 1:50 000; sort/hvitt. Norges geologiske undersøkelse.

Ekremsæter, Jørgen. 1988. Geokjemisk kartlegging i Nordland og Troms. Dokumentasjon av total- innholdet av grunnstoffer i bekkesedimentenes finfraksjon (NAA analyse). NGU-rapport 87.178. Norges geologiske undersøkelse.

Filzmoser, Peter, Hron, Karel, Reimann, Clemens. 2009. Univariate statistical analysis of environmental (compositional) data – Problems and possibilities. Science of the Total Environment 407, 6100-6108.

Filzmoser, Peter, Hron, Karel, Reimann, Clemens. 2010. The bivariate statistical analysis of environmental (compositional) data. Science of the Total Environment 408, 4230-4238.

Filzmoser, Peter and Steiger, B., 2011. StatDA: Statistical Analysis for Environmental Data. R package version 1.5. http://CRAN.R-project.org/package=StatDA

Finne, Tor Erik. 1999. Geokjemi i bekkesedimenter Ofoten; supplerende kartlegging 1992. NGU-rapport 99.144. 61 s. Norges geologiske undersøkelse.

Gustavson, Magne, Blystad, Per. 1995. Berggrunnskart Bodø; 1:250 000; trykt i farger. Norges geologiske undersøkelse.

Gustavson, Magne. 1974. Berggrunnskart Narvik; 1:250 000; trykt i farger. Norges geologiske undersøkelse.
Gustavson, Magne. 1974. Berggrunnskart Narvik; 1:250 000; trykt i farger. Norges geologiske undersøkelse.
Gustavson, Magne. 1974. Ofoten. Beskrivelse til det berggrunnsgeologiske gradteigskart M 9 - 1:100 000 (med fargetrykt kart). NGU; Skrifter 310; 15. s 1-36 +kart. Norges geologiske undersøkelse.

Gustavson, Magne. 1996. Berggrunnskart Sulitjelma; 1:250 000; trykt i farger. Norges geologiske undersøkelse.

Kjeldsen, Siv, Ottesen, Rolf Tore. 1988. Geokjemisk kartlegging i Nordland og Troms. Data for innholdet av gull i løsmassenes finfraksjon. NGU-rapport 88.084.17 s. Norges geologiske undersøkelse.

Kjeldsen, Siv. 1987. Geokjemisk kartlegging i Nordland og Troms. ICAP-analyse av løsmassenes finfraksjon NGU-rapport 87.142. 69 s. Norges geologiske undersøkelse.

Korneliussen, Are, Krog, Reidar, Furuhaug, Leif, Mathiesen, C.O. 1989. Sjeldne jordartselementer i Hellemobotn-Linnajavrre-regionen, Tysfjord, Hamarøy og Sørfold kommuner, Nordland. NGU-rapport 89.099. 26 s. Norges geologiske undersøkelse.

Krog, Reidar. 1987. Geokjemisk kartlegging i Nordland og Troms. Data for HNO3-løselig innhold av grunnstoffer i bekkesedimentenes finfraksjon. NGU-rapport 87.180. 71 s. Norges geologiske undersøkelse.

Lindahl, Ingvar, Sørdal, Torbjørn. 1991. Måling av naturlig radioaktiv stråling fra berggrunnen, Tysfjord kommune, Nordland NGU-rapport 91.055. 17 s. Norges geologiske undersøkelse.

Lindahl, Ingvar, Nilsson, Lars Petter. 2006. Linnajavri-området. Berggrunnskart 1:15 000. Norges geologiske undersøkelse.

Næss, Gunnar. 1988. Geokjemisk kartlegging i Nordland og Troms. XRF-analyse av bekkesedimentenes finfraksjon. NGU-rapport 87.165. 69 s. Norges geologiske undersøkelse.

R Development Core Team (2011). R: A language and environment for statistical computing. R Foundation for Statistical Computing, Vienna, Austria. ISBN 3-900051-07-0, URL http://www.R-project.org/.

Reimann, Clemens, Demetriades, Alecos, Eggen, OlaAnfin, Filzmoser, Peter and the EuroGeoSurveys Geochemistry Expert Group. 2009. The EuroGeoSurveys geochemical mapping of agricultural and grazing land soils project (GEMAS) – Evaluation of quality control results of aqua regia extraction analysis. NGU report 2009.049.

Reimann, Clemens, Filzmoser, Peter, Garrett, Robert, Dutter, Rudolf. 2008. Statistical data analysis explained. Applied environmental statistics with R. Wiley, Chichester, U.K.

Reimann, Clemens, Finne, Tor Erik, Filzmoser, Peter. 2011. New geochemical data from a collection of till samples from Nordland, Troms and Finnmark. NGU report 2011.45.

Reimann, Clemens, Finne, Tor Erik, Filzmoser, Peter. 2012. Soil geochemical data from the Nordkinn peninsula, Finnmark. NGU Report 2012.016.

Tables 1 – 5

Table 1. Project standard "Minn" - Min. Q50. Max and precision values

MINN n=41						Alphabetical						Sorted by precision			
Element	Min	Q50	Max	Precision	Nordkinn Q50	Element	Min	Q50	Max	Precision	Nordkinn Q50	Element	Precision	Element	Precision
Ag	<0.002	0.007	0.024	54	0.005	Mo	1.7	1.9	2.1	5.1	1.8	Au	n.d.	Pr	7.8
Al	17097	17537	18341	1.9	17085	Na	21	47	65	32	35	B	n.d.	Dy	7.8
As	1.1	2.0	2.5	11	2.2	Nb	1.6	2.2	2.4	6.7	1.8	Cd	n.d.	Sm	6.8
Au	<0.0002	<0.0002	0.0015		<0.0002	Nd	11	13	16	5.5	12	In	n.d.	Ce	6.8
B	<1.0	<1.0	2.6		0.5	Ni	17	20	28	4.3	19	Pd	n.d.	Ca	6.7
Ba	46	53	57	2.9	49	P	320	396	426	5.3	368	Pt	n.d.	U	6.7
Be	0.19	0.35	0.57	24	0.33	Pb	11.1	13.4	15	5.6	13	Re	n.d.	Li	6.7
Bi	0.025	0.081	0.207	18	0.0864	Pd	<0.01	<0.01	0.03		<0.01	Ta	n.d.	Nb	6.7
Ca	648	809	922	6.7	744	Pr	2.48	3.4	4	7.8	3.4	Te	n.d.	Mn	6.1
Cd	<0.01	<0.01	0.03		0.012	Pt	<0.002	<0.002	<0.002		<0.002	W	n.d.	La	5.9
Ce	23	28	32	6.8	26	Rb	64.8	74	81	4.2	67	Hg	78	Pb	5.6
Co	11	13	14	3.9	12	Re	<0.001	<0.001	0.003		<0.001	Sb	72	Sc	5.6
Cr	21	23	25	3.6	23	S	71.2	86	92	4.4	100	Ag	54	Nd	5.5
Cs	4.0	4.7	5.0	3.8	4.2	Sb	<0.02	0.02	0.07	72	0.03	Ge	45	Cu	5.4
Cu	9.8	12	14	5.4	11	Sc	2.0	2.8	3.1	5.6	2.1	Se	41	P	5.3
Dy	1.2	1.7	2.2	7.8	1.6	Se	<0.1	0.15	0.39	41	0.3	Na	32	Mo	5.1
Er	0.74	0.86	1.1	8.4	0.84	Sm	1.9	2.2	2.6	6.8	2.1	Be	24	Tl	4.7
Eu	0.32	0.41	0.49	9.8	0.40	Sn	0.5	0.6	0.7	10	0.6	Hf	21	S	4.4
Fe	30394	31320	32980	2.4	30902	Sr	2.5	3.4	3.9	12	3.6	Bi	18	Ga	4.3
Ga	5.4	6.0	6.5	4.3	5.5	Ta	<0.05	<0.05	<0.05		<0.05	Lu	16	Ni	4.3
Gd	1.4	2.0	2.8	10	1.9	Tb	0.19	0.28	0.36	11	0.27	Tm	15	Rb	4.2
Ge	0.03	0.13	0.26	45	0.08	Te	<0.02	<0.02	0.06		0.01	Sr	12	Ti	4.1
Hf	0.09	0.13	0.20	21	0.09	Th	3.8	4.2	5.3	8.1	3.8	Tb	11	Co	3.9
Hg	<0.005	0.005	0.036	78	<0.005	Ti	2009	2238	2521	4.1	2163	As	11	Cs	3.8
Ho	0.23	0.31	0.37	9.8	0.32	Tl	0.48	0.58	0.63	4.7	0.53	Gd	10	Zn	3.8
In	<0.02	<0.02	0.03		<0.02	Tm	0.07	0.11	0.14	15	0.12	Sn	10	Y	3.8
K	5442	5709	5894	0.96	5544	U	2.3	2.6	3.1	6.7	2.5	Ho	9.8	Cr	3.6
La	14	16	18	5.9	16	V	32	34	38	2.4	33	Eu	9.8	Ba	2.9
Li	14	16	19	6.7	16	W	<0.1	<0.1	<0.1		<0.1	Zr	9.2	V	2.4
Lu	0.06	0.09	0.11	16	0.09	Y	7.6	8.7	9.3	3.8	8.4	Yb	9.0	Fe	2.4
Mg	4890	6088	6242	1.7	5946	Yb	0.52	0.70	0.88	9.0	0.65	Er	8.4	Al	1.9
Mn	180	244	275	6.1	235	Zn	52	61	67	3.8	59	Th	8.1	Mg	1.7
						Zr	4.9	6.1	9.1	9.2	4.1			K	0.96

Major elements right aligned, REEs centered, heavy REEs underlined.

Table 2. Laboratory standard "DS9" - Min. Q50. Max and precision values. Concentrations in mg/kg.

DS9 (laboratory standard) n=36						Alphabetical						Sorted by precision			
Element	Min	Q50	Max	Precision	DS8 (2011) Q50	Element	Min	Q50	Max	Precision	DS8 (2011) Q50	Element	Precision	Element	Precision
Ag	1.7	1.9	2.2	4.3	1.8	Mo	14	15	16	3.6	13	Ta	nd.	Se	5.9
Al	8563	9822	10542	3.1	9574	Na	656	837	1148	8.6	1014	Ge	37	W	5.5
As	23	26	29	3.2	25	Nb	1.4	1.5	1.7	6.2	1.4	B	26	Ti	5.4
Au	0.11	0.12	0.15	4.7	0.11	Nd	8.9	10.0	13	7.5	11	Tm	18	Ba	5.3
B	1.1	2.5	3.6	26	2.6	Ni	36	42	45	3.5	38	Lu	15	Te	5.2
Ba	290	319	346	5.3	276	P	724	853	929	2.8	796	Er	14	Sn	5.1
Be	5.0	5.6	7.1	8.2	5.1	Pb	111	133	141	3.3	124	Hf	14	Au	4.7
Bi	5.3	6.7	7.7	6.8	6.5	Pd	0.09	0.12	0.17	7.0	0.12	Tb	13	Li	4.3
Ca	6763	7315	7705	3.1	7223	Pr	2.0	2.7	3.4	6.0	3.2	Gd	13	Ag	4.3
Cd	2.2	2.5	2.7	4.1	2.3	Pt	0.328	0.367	0.445	6.0	0.34	Re	12	Cd	4.1
Ce	21	24	30	7.3	29	Rb	34	36	37	3.5	38	Ho	12	Y	4.0
Co	7.3	7.9	8.8	4.0	7.4	Re	0.051	0.064	0.081	12	0.06	Zr	11	Co	4.0
Cr	114	121	127	3.0	120	S	1536	1686	1760	2.2	1605	Eu	11	Ga	3.8
Cs	2.4	2.6	2.7	3.2	2.4	Sb	3.0	3.6	4.9	9.5	5.6	Sb	9.5	In	3.7
Cu	98	112	119	3.0	111	Sc	2.1	2.7	3.2	6.5	2.3	Th	9.5	Mo	3.6
Dy	0.85	1.1	1.4	8.0	1.2	Se	4.6	5.4	6.0	5.9	5.0	Na	8.6	Ni	3.5
Er	0.48	0.60	0.75	14	0.61	Sm	1.4	1.8	2.1	7.6	1.9	Be	8.2	Rb	3.5
Eu	0.24	0.35	0.44	11	0.41	Sn	5.9	6.7	7.5	5.1	6.4	La	8.1	Tl	3.5
Fe	22630	24021	25032	2.7	24630	Sr	53	66	77	6.1	66	Dy	8.0	Pb	3.3
Ga	4.3	4.6	5.2	3.8	4.7	Ta	<0.05	<0.05	<0.05		<0.05	Sm	7.6	Cs	3.2
Gd	1.1	1.4	1.7	13	1.5	Tb	0.14	0.19	0.22	13	0.21	Nd	7.5	As	3.2
Ge	<0.1	0.13	0.24	37	<0.1	Te	4.5	5.2	5.5	5.2	5.0	Yb	7.5	Al	3.1
Hf	0.06	0.09	0.13	14	0.09	Th	5.4	6.3	7.6	9.5	6.9	Ce	7.3	Ca	3.1
Hg	0.19	0.22	0.27	6.0	0.19	Ti	969	1053	1266	5.4	1179	Pd	7.0	Cu	3.0
Ho	0.16	0.20	0.25	12	0.24	Tl	5.3	5.8	6.3	3.5	5.3	Bi	6.8	Cr	3.0
In	2.1	2.3	2.6	3.7	2.2	Tm	0.06	0.09	0.12	18	0.09	Sc	6.5	P	2.8
K	3591	4208	4547	2.6	4286	U	2.4	2.7	3.2	6.2	2.8	Nb	6.2	Mn	2.7
La	11	13	16	8.1	16	V	38	40	42	2.2	41	U	6.2	Zn	2.7
Li	23	27	29	4.3	27	W	2.4	2.6	2.9	5.5	2.9	Sr	6.1	Fe	2.7
Lu	0.06	0.09	0.11	15	0.10	Y	5.4	5.8	6.8	4.0	6.2	Pr	6.0	K	2.6
Mg	5866	6328	6596	2.1	6153	Yb	0.47	0.58	0.72	7.5	0.62	Pt	6.0	V	2.2
Mn	551	607	639	2.7	607	Zn	293	317	342	2.7	306	Hg	6.0	S	2.2
						Zr	1.7	1.9	2.8	11	1.9			Mg	2.1

Major elements right aligned, REEs centered, heavy REEs underlined.

Table 3. Precision of analytical duplicates and field duplicates.

Analytical (weighing) duplicates N=34 pairs				Field duplicates N=34 pairs					Nordkinn (2011)
Alphabetical		Sorted		Alphabetical		Nordkinn	Sorted		N=30
Element	Precision	Element	Precision	Element	Precision	N=30	Element	Precision	Element	Precision
Ag	28.5	Pt	341.6	Ag	122.7	42	Pt	331.0	Re	389
Al	3.7	Au	220.6	Al	26.7	12	Au	288.3	Pt	299
As	11.3	Re	163.2	As	48.5	40	Sr	169.1	Pd	251
Au	220.6	Sr	158.3	Au	288.3	82	U	133.6	Te	99
B	98.8	Pd	116.1	B	90.3	54	Pd	125.2	Au	82
Ba	4.3	B	98.8	Ba	36.8	19	Ag	122.7	Ta	69
Be	23.2	Te	94.7	Be	38.9	32	Mo	121.5	Cd	58
Bi	20.2	Ta	45.6	Bi	33.9	21	Re	116.0	Ge	55
Ca	5.6	Ge	30.5	Ca	24.4	34	Te	109.5	B	54
Cd	25.4	Hg	29.5	Cd	61.6	58	B	90.3	Hg	48
Ce	9.5	Ag	28.5	Ce	52.2	29	Ta	89.3	S	46
Co	8.4	In	28.3	Co	36.4	16	Cr	83.0	Ag	42
Cr	4.3	Cd	25.4	Cr	83.0	15	Hg	65.0	As	40
Cs	4.2	Be	23.2	Cs	17.2	9	S	63.7	In	36
Cu	4.0	Hf	21.0	Cu	42.9	22	Sm	62.9	Mo	35
Dy	6.5	Se	20.5	Dy	44.5	28	Cd	61.6	Gd	35
Er	8.8	Bi	20.2	Er	38.9	29	Pb	60.3	Ca	34
Eu	8.8	W	18.0	Eu	34.0	32	Ni	58.9	La	34
Fe	3.6	S	17.4	Fe	25.6	10	Pr	55.1	Nd	34
Ga	5.3	Sb	15.9	Ga	22.1	11	K	54.0	Pr	34
Gd	12.3	Tm	12.8	Gd	51.8	35	Nd	53.5	Be	32
Ge	30.5	Gd	12.3	Ge	46.2	55	Sc	53.5	Eu	32
Hf	21.0	Ho	12.2	Hf	46.6	27	Tb	52.5	Sm	32
Hg	29.5	Yb	11.4	Hg	65.0	48	Ce	52.2	Se	32
Ho	12.2	As	11.3	Ho	47.4	27	Gd	51.8	Tb	31
In	28.3	Lu	10.3	In	37.7	36	Se	49.7	Y	29
K	4.2	La	1.00	K	54.0	15	As	48.5	Er	29
La	10.0	Ce	9.5	La	45.0	34	Zr	47.7	W	29
Li	6.0	Sn	9.3	Li	17.4	15	Ho	47.4	Ce	29
Lu	10.3	Er	8.8	Lu	43.4	25	Hf	46.6	Dy	28
Mg	2.9	Eu	8.8	Mg	36.2	16	Yb	46.6	Ho	27
Mn	7.9	Mo	8.8	Mn	30.2	22	Ge	46.2	Tm	27
Mo	8.8	Pb	8.6	Mo	121.5	35	W	45.4	Hf	27
Na	7.5	Zr	8.6	Na	28.5	14	La	45.0	Lu	25
Nb	6.6	Co	8.4	Nb	39.2	23	Dy	44.5	P	24
Nd	8	Nd	8.0	Nd	53.5	34	Th	43.9	Yb	24
Ni	5.3	Th	8.0	Ni	58.9	13	Lu	43.4	Nb	23
P	5.0	Mn	7.9	P	31.0	24	Tm	43.2	Cu	22
Pb	8.6	Pr	7.8	Pb	60.3	11	Cu	42.9	Mn	22
Pd	116.1	Tb	7.8	Pd	125.2	251	Nb	39.2	Th	21
Pr	7.8	Na	7.5	Pr	55.1	34	Be	38.9	Bi	21
Pt	-341.6	Sm	6.9	Pt	-331.0	299	Er	38.9	Zr	20
Rb	5.2	Nb	6.6	Rb	26.2	14	V	38.4	Ba	19
Re	-163.2	Dy	6.5	Re	-116.0	389	In	37.7	Sr	19
S	17.4	U	6.1	S	63.7	46	Ba	36.8	Sb	18
Sb	15.9	Li	6.0	Sb	35.4	18	Co	36.4	U	18
Sc	4.7	Ca	5.6	Sc	53.5	11	Y	36.3	Co	16
Se	20.5	Ga	5.3	Se	49.7	32	Mg	36.2	Mg	16
Sm	6.9	Ni	5.3	Sm	62.9	32	Sb	35.4	Tl	15
Sn	9.3	Y	5.3	Sn	22.9	13	Eu	34.0	Li	15
Sr	158.3	Rb	5.2	Sr	169.1	19	Bi	33.9	Cr	15
Ta	45.6	P	5.0	Ta	89.3	69	Ti	32.4	K	15
Tb	7.8	Sc	4.7	Tb	52.5	31	P	31.0	Rb	14
Te	94.7	Tl	4.6	Te	109.5	99	Mn	30.2	Na	14
Th	8.0	Ti	4.4	Th	43.9	21	Na	28.5	Ni	13
Ti	4.4	Ba	4.3	Ti	32.4	11	Al	26.7	Sn	13
Tl	4.6	Cr	4.3	Tl	22.2	15	Rb	26.2	Al	12
Tm	12.8	Cs	4.2	Tm	43.2	27	Fe	25.6	Zn	12
U	6.1	K	4.2	U	133.6	18	Ca	24.4	Ti	11
V	3.0	Zn	4.2	V	38.4	10	Sn	22.9	Ga	11
W	18	Cu	4.0	W	45.4	29	Tl	22.2	Sc	11
Y	5.3	Al	3.7	Y	36.3	29	Ga	22.1	Pb	11
Yb	11.4	Fe	3.6	Yb	46.6	24	Zn	18.5	V	10
Zn	4.2	V	3.0	Zn	18.5	12	Li	17.4	Fe	10
Zr	8.6	Mg	2.9	Zr	47.7	20	Cs	17.2	Cs	9

Major elements right aligned, REEs centered, heavy REEs underlined.

Table 4. Statistical parameters of the mapped dataset. Concentrations in mg/mg. N=877

Majors elements	MDL	PDL	Min	Q2	Q5	Q10	Q25	Q50	Q75	Q90	Q95	Q98	Max	Powers
Al	100	100	<100	399	580	1040	2960	7010	13600	21300	26100	32600	86100	3.2
Ca	100	100	<100	<100	<100	114	288	720	1690	2900	4200	6460	274000	3.7
Fe	100	100	116	568	1190	2600	8480	17300	26300	34900	41100	46400	70300	2.8
K	100	100	<100	<100	151	235	575	1210	2950	5610	7640	10700	18900	2.6
Mg	100	100	<100	<100	<100	162	602	2090	5980	11900	16600	21500	60800	3.1
Mn	1	1	1	5	9	18	53	129	266	457	627	812	2410	3.3
Na	10	10	<10	19	23	26	37	56	93	166	226	376	2530	2.7
P	10	10	<10	24	35	53	114	285	557	825	1050	1580	2970	2.8
S	200	20	<20	<20	24	40	73	126	208	325	449	733	4520	2.7
Ti	10	10	31	228	341	480	761	1280	1900	2500	3100	3710	5540	2.2

Noble element	MDL	PDL	Min	Q2	Q5	Q10	Q25	Q50	Q75	Q90	Q95	Q98	Max	Powers
Ag	0.002	0.002	<0.002	<0.002	<0.002	<0.002	0.005	0.012	0.025	0.049	0.072	0.10	3.1	3.5
Au	0.0002	0.0002	<0.0002	<0.0002	<0.0002	<0.0002	<0.0002	0.0003	0.0008	0.0016	0.0023	0.0037	0.0351	2.5
Pd	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.03	0.7
Pt	0.002	0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	<0.002	0.009	1
Re	0.001	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	0.7

REEs	MDL	PDL	Min	Q2	Q5	Q10	Q25	Q50	Q75	Q90	Q95	Q98	Max	Powers
14REE			1.7	4.6	6.0	11	29	87	150	237	285	448	1490	2.9
Ce	0.1	0.1	0.6	1.7	2.3	4.5	13	38	68	104	136	190	593	3
Dy	0.02	0.02	<0.02	0.15	0.22	0.30	0.62	1.4	2.4	3.6	4.9	6.2	21	3.3
Er	0.02	0.02	<0.02	0.07	0.11	0.15	0.30	0.67	1.1	1.7	2.1	2.7	7.4	2.9
Eu	0.02	0.02	<0.02	<0.02	0.03	0.06	0.12	0.31	0.57	0.87	1.1	1.6	9.7	3
Gd	0.02	0.02	0.03	0.14	0.22	0.33	0.76	2.0	3.5	5.1	7.4	10.0	51	3.2
Ho	0.02	0.02	<0.02	0.02	0.04	0.05	0.11	0.25	0.42	0.61	0.81	1.1	3.0	2.5
La	0.5	0.5	<0.5	0.8	1.2	2.1	6.0	18	33	51	65	91	438	3.2
Lu	0.02	0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.07	0.12	0.20	0.24	0.30	0.74	1.9
Nd	0.02	0.02	0.30	0.75	1.1	1.8	5.2	16	28	44	55	82	386	3.1
Pr	0.02	0.02	0.08	0.18	0.27	0.5	1.3	4.1	7.4	11	14	20	80	3
Sm	0.02	0.02	0.05	0.17	0.23	0.37	0.89	2.6	4.7	7.2	9.4	14	73	3.2
Tb	0.02	0.02	<0.02	<0.02	0.03	0.05	0.10	0.25	0.45	0.66	0.87	1.2	4.8	2.7
Tm	0.02	0.02	<0.02	<0.02	<0.02	<0.02	0.04	0.09	0.15	0.22	0.27	0.35	0.93	2
Yb	0.02	0.02	<0.02	0.06	0.08	0.14	0.26	0.55	0.91	1.4	1.8	2.3	5.5	2.7

Trace elements	MDL	PDL	Min	Q2	Q5	Q10	Q25	Q50	Q75	Q90	Q95	Q98	Max	Powers
As	0.1	0.1	0.01	0.04	0.05	0.05	0.23	0.62	1.5	3.0	4.2	7.8	81	3.2
B	1	1	<1	<1	<1	<1	<1	<1	<1	1	2	2	14	1.4
Ba	0.5	0.5	<0.5	1.9	2.9	4.0	7.3	18	43	96	142	213	596	3.4
Be	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.3	0.5	0.6	0.8	2.4	1.7
Bi	0.02	0.02	<0.02	<0.02	<0.02	0.02	0.05	0.09	0.14	0.22	0.29	0.39	3.3	2.5
Cd	0.01	0.01	<0.01	<0.01	<0.01	<0.01	<0.01	0.02	0.04	0.06	0.08	0.13	0.66	2.1
Co	0.1	0.1	<0.1	<0.1	<0.1	0.19	0.67	2.4	7.6	14	18	23	65	3.1
Cr	0.5	0.5	<0.5	<0.5	<0.5	0.71	2.2	7.7	30	55	79	104	343	3.1
Cs	0.02	0.02	<0.02	0.04	0.12	0.24	0.48	1.1	2.1	3.6	4.7	5.6	9.8	3
Cu	0.01	0.01	0.07	0.21	0.29	0.47	1.2	4.3	16	33	47	66	390	3.8
Ga	0.1	0.1	0.1	0.6	1.1	1.9	3.3	5.4	8.1	11	12	15	27	2.3
Ge	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.3	0.3	0.4	0.9
Hf	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.05	0.07	0.10	0.13	0.39	1.6
Hg	0.005	0.005	<0.005	<0.005	<0.005	<0.005	0.006	0.011	0.019	0.030	0.039	0.052	0.183	1.9
In	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.04	0.05	0.07	0.09	0.23	1.4
Li	0.1	0.1	<0.1	<0.1	0.3	0.6	2.6	7.9	17	29	37	46	83	3.2
Mo	0.01	0.01	<0.01	0.08	0.13	0.20	0.38	0.91	2.7	10	17	28	136	4.4
Nb	0.02	0.02	0.03	0.17	0.37	0.58	1.3	2.4	4.2	6.5	8.5	11	18	2.8
Ni	0.1	0.1	<0.1	<0.1	0.1	0.2	0.6	3.5	15	32	46	60	133	3.4
Pb	0.01	0.01	0.26	1.5	2.3	3.2	4.7	6.6	9.7	14	19	26	454	3.2
Rb	0.1	0.1	0.1	0.7	1.6	3.6	9.2	20	39	63	79	90	195	3.2
Sb	0.02	0.02	<0.02	<0.02	<0.02	<0.02	0.02	0.04	0.07	0.10	0.14	0.21	1.7	2.2
Sc	0.1	0.1	<0.1	0.2	0.2	0.4	0.8	1.9	3.4	5.5	6.8	9.0	21	2.6
Se	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.2	0.5	1.0	1.3	1.8	6.0	2.1
Sn	0.1	0.1	<0.1	<0.1	0.2	0.3	0.5	0.9	1.3	2.0	2.5	3.2	81	3.2
Sr	0.5	0.5	<0.5	<0.5	<0.5	0.6	1.1	2.5	5.3	10.0	14	25	1260	3.7
Ta	0.05	0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	0.09	0.5
Te	0.02	0.02	<0.02	<0.02	<0.02	<0.02	<0.02	<0.02	0.03	0.05	0.07	0.10	0.34	1.5
Th	0.1	0.1	<0.1	0.2	0.3	0.6	2.0	5.1	9.2	15	21	28	51	3
Tl	0.02	0.02	<0.02	<0.02	<0.02	0.03	0.07	0.16	0.29	0.44	0.55	0.69	1.5	2.2
U	0.1	0.1	<0.1	<0.1	0.1	0.2	0.5	1.2	2.5	5.3	9.5	18	120	3.4
V	2	2	<2	<2	<2	2	7	19	39	66	79	105	191	2.3
W	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1	0.1	0.2	0.4	0.6	0.8	2.3	1.7
Y	0.01	0.01	0.12	0.63	0.99	1.4	2.8	6.4	11	16	20	29	81	2.8
Zn	0.1	0.1	0.3	1.4	2.3	4.0	11	28	52	74	89	113	317	3
Zr	0.1	0.1	<0.1	<0.1	<0.1	0.1	0.4	0.9	1.8	2.8	3.6	5.0	16	2.5

Table 5. Comparison of the Tysfjord. Nordkinn and Nordland+Troms datasets.

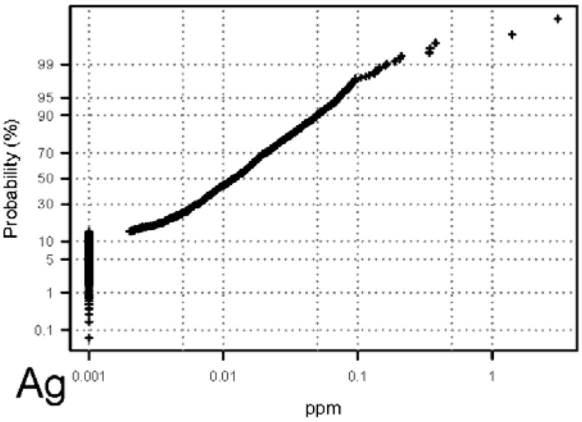
MAJOR ELEMENTS		Nord-Salten N=877			Nordkinn N=808			Nordland + Troms N=982		
ELEMENT	DL	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX
Al	100	7010	32600	86100	15105	25453	32809	9864	27054	44069
Ca	100	720	6460	274000	619	2357	11714	1687	22245	207605
Fe	100	17300	46400	70300	28010	45063	158298	18037	43188	89669
K	100	1210	10700	18900	3712	8298	12902	1659	8487	13630
Mg	100	2090	21500	60800	4933	9280	21057	5044	17559	49350
Mn	1	129	812	2410	229	791	18372	195	751	1558
Na	10	56	376	2530	38	122	373	74	347	2010
P	10	285	1580	2970	357	890	2126	518	1550	7430
S	20	126	733	4520	110	440	1746	<200	467	2655
Ti	10	1280	3710	5540	1527	3060	4303	797	2583	3629

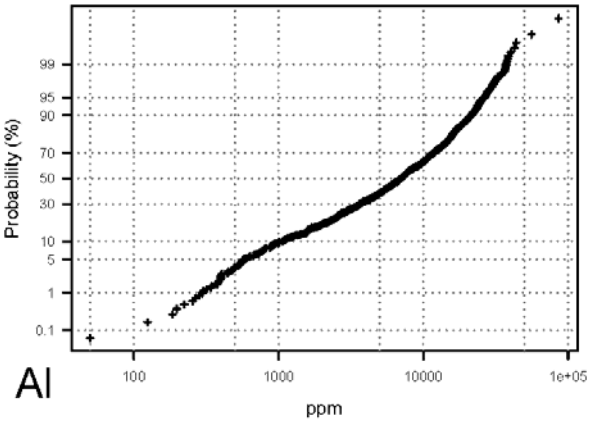
NOBLE ELEMENTS		Nord-Salten N=877			Nordkinn N=808			Nordland + Troms N=982		
ELEMENT	DL	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX
Ag	0.002	0.012	0.10	3.1	0.011	0.077	0.22	0.015	0.12	0.45
Au	0.0002	0.0003	0.0037	0.035	0.001	0.005	0.034	0.001	0.004	0.026
Pd	0.01	<0.01	<0.01	0.03	<0.01	0.01	0.023	<0.01	<0.01	0.03
Pt	0.002	<0.002	<0.002	0.009	<0.002	0.002	0.0036	<0.002	0.002	0.007
Re	0.001	<0.001	0.001	0.002	<0.001	0.002	0.0031	<0.001	0.001	0.003

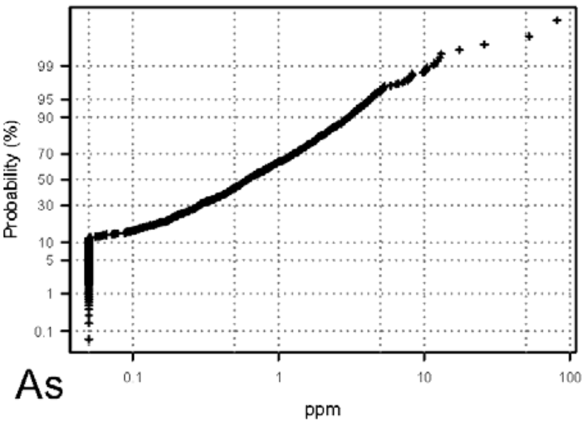
REE		Nord-Salten N=877			Nordkinn N=808			Nordland + Troms N=982		
ELEMENT	DL	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX
Ce	0.1	38	190	593	54	174	799	36	121	685
Dy	0.02	1.4	6.2	21	2	9	49	1	5	20
Er	0.02	0.67	2.7	7.4	1	3.7	17	0.6	2.2	9.2
Eu	0.02	0.31	1.6	9.7	0.6	2.7	22	0.3	1.3	5.4
Gd	0.02	2.0	10	51	3	12	80	2	6	24
Ho	0.02	0.25	1.1	3.0	0.4	1.6	8.1	0.2	0.8	3.4
La	0.5	18	91	438	20	82	408	16	59	413
Lu	0.02	0.07	0.30	0.74	0.1	0.3	1.2	0.1	0.3	1
Nd	0.02	16	82	386	18	79	498	13	48	256
Pr	0.02	4.1	20	80	5	21	131	3	13	65
Sm	0.02	2.6	14	73	3	14	101	2	8	33
Tb	0.02	0.25	1.2	4.8	0.4	1.7	10	0.2	0.8	3.9
Tm	0.02	0.09	0.35	0.93	0.1	0.5	1.9	0.1	0.3	1.2
Yb	0.02	0.55	2.3	5.5	0.8	2.6	9.6	0.5	1.9	7.7

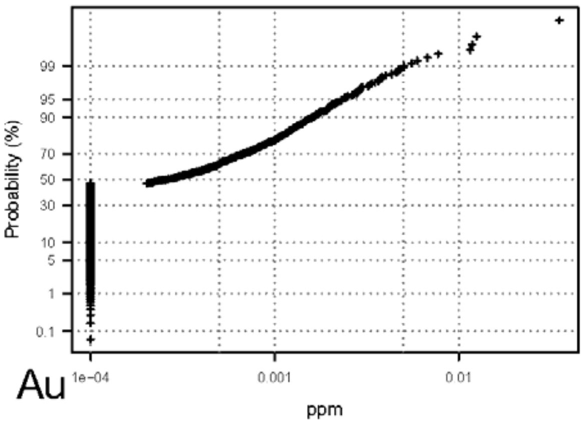
TRACE ELEMENTS		Nord-Salten N=877			Nordkinn N=808			Nordland + Troms N=982		
ELEMENT	DL	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX	MEDIAN	Q98	MAX
As	0.1	0.6	7.8	81	2.3	18	67	1.9	18	376
B	1	<1	1.8	14	<1	2.2	3.8	<1	2.8	9.4
Ba	0.5	18	213	596	45	127	190	31	165	405
Be	0.1	0.2	0.79	2.4	0.3	0.9	1.9	0.2	0.8	3.2
Bi	0.02	0.09	0.39	3.3	0.1	0.4	1	0.1	0.3	4.4
Cd	0.01	0.02	0.13	0.66	0.02	0.13	0.71	0.03	0.2	0.65
Co	0.1	2.4	23	65	10	20	179	8	24	55
Cr	0.5	7.7	104	343	21	43	187	21	88	475
Cs	0.02	1.1	5.6	9.8	2.8	5.9	11	1.2	4.6	8.4
Cu	0.01	4.3	66	390	16	42	660	16	73	123
Ga	0.1	5.4	15	27	5	9	12	3	10	14
Ge	0.1	<0.1	0.30	0.43	<0.1	0.2	0.5	<0.1	0.2	0.77
Hf	0.02	0.03	0.13	0.39	0.09	0.25	0.57	0.03	0.19	0.38
Hg	0.005	0.011	0.052	0.18	0.011	0.04	0.17	0.007	0.033	0.062
In	0.02	0.02	0.09	0.23	<0.02	0.04	0.07	<0.02	0.05	0.12
Li	0.1	7.9	46	83	12	29	59	11	37	76
Mo	0.01	0.91	28	136	0	4	23	0	4	40
Nb	0.02	2.4	11	18	1.6	4.1	6.5	0.5	3	6.5
Ni	0.1	3.5	60	133	18	32	81	14	53	157
Pb	0.01	6.6	26	454	8.9	28	134	4.9	24	180
Rb	0.1	20	90	195	42	83	135	17	73	295
Sb	0.02	0.04	0.21	1.7	0.11	0.38	1.2	0.04	0.33	0.96
Sc	0.1	1.9	9.0	21	1.9	3.6	5.7	1.7	5.8	11
Se	0.1	0.2	1.8	6.0	0.4	1.2	4.1	0.3	1.2	4.3
Sn	0.1	0.9	3.2	81	0.6	1.1	1.7	0.3	1.5	3.5
Sr	0.5	2.5	25	1260	5.6	23	52	7.4	83	934
Ta	0.05	<0.05	<0.05	0.09	<0.05	<0.05	<0.05	<0.05	<0.05	0.07
Te	0.02	<0.02	0.1	0.34	<0.02	0.05	0.08	<0.02	0.08	0.49
Th	0.1	5.1	28	51	5	11	20	5	17	72
Tl	0.02	0.16	0.69	1.5	0.3	0.6	1.9	0.1	0.5	1.4
U	0.1	1.2	18	120	1	4	34	1	4	33
V	2	19	105	191	29	56	89	24	92	209
W	0.1	0.1	0.78	2.3	<0.1	<0.1	0.2	<0.1	0.4	0.94
Y	0.01	6.4	29	81	10	42	163	5.8	23	106
Zn	0.1	28	113	317	49	94	254	32	107	230
Zr	0.1	0.9	5.0	16	4	12	29	1	10	16

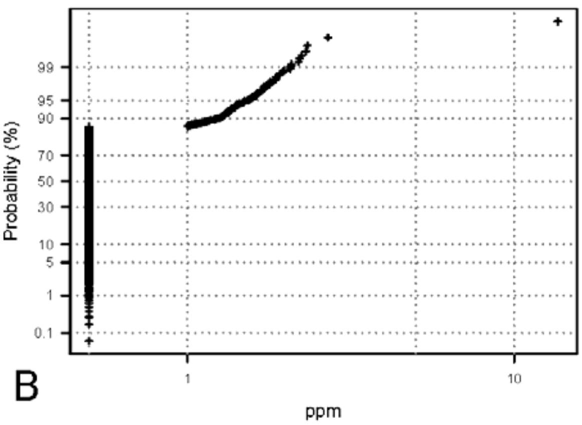
Appendix 1: Cumulative frequency diagrams. Please note that readings blow the detection limit are set to half of the detection limit value.

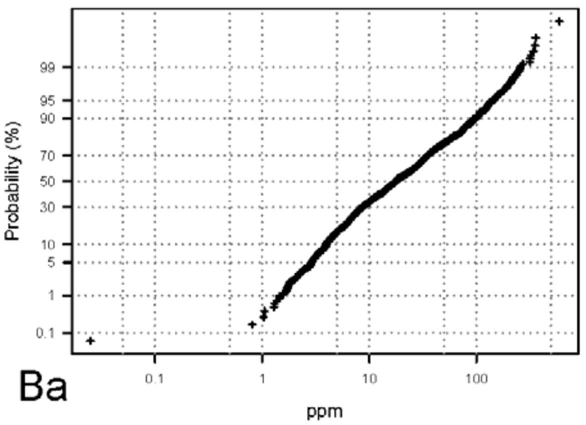

Probability (%)
ppm
Ag

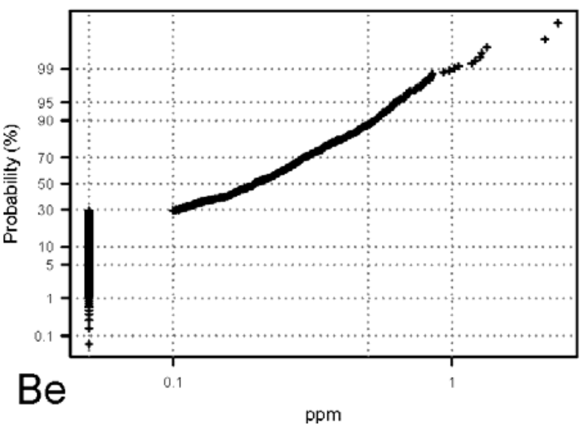

Probability (%)
ppm
Al

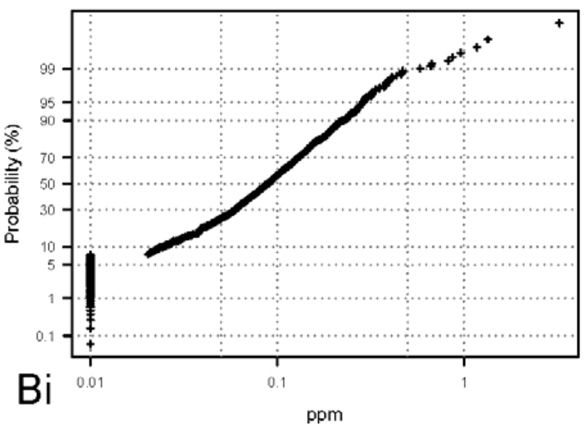

Probability (%)
ppm
As

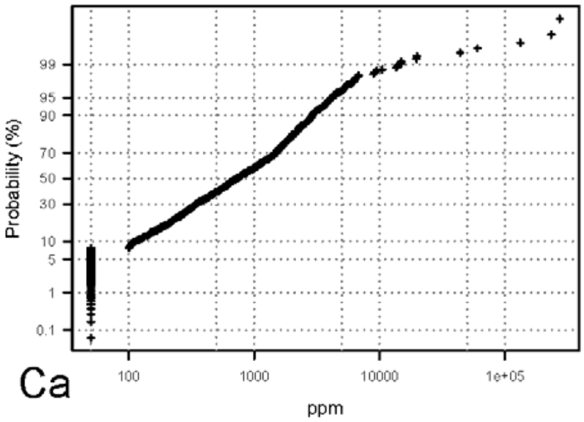

Probability (%)
ppm
Au

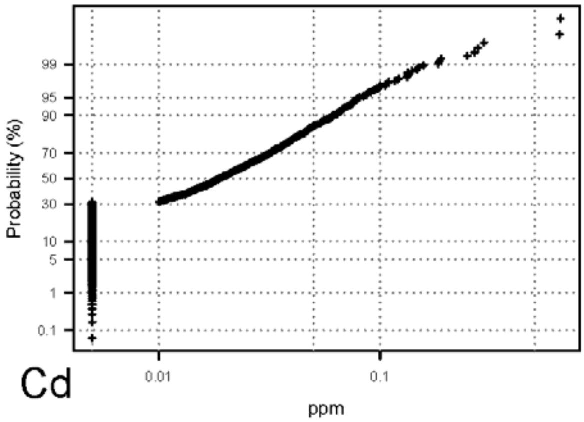

Probability (%)
ppm
B


Probability (%)
ppm
Ba


Probability (%)
ppm
Be


Probability (%)
ppm
Bi


Probability (%)
0.1 1 5 10 30 50 70 90 95 99
100 1000 10000 1e+05
ppm
Ca


Probability (%)
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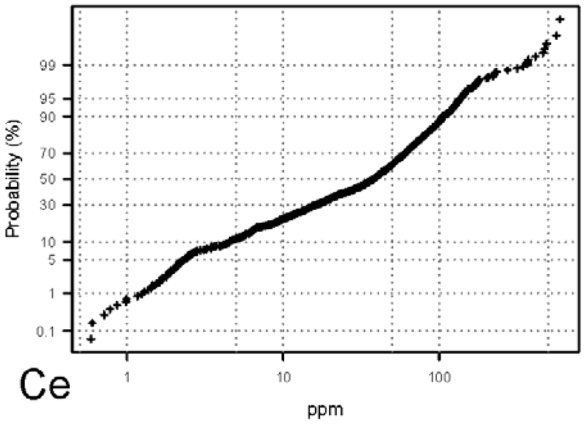
0.01 0.1
ppm
Cd


Probability (%)
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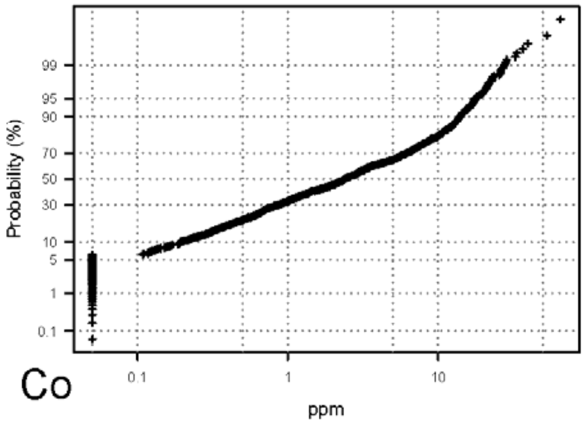
1 10 100
ppm
Ce


Probability (%)
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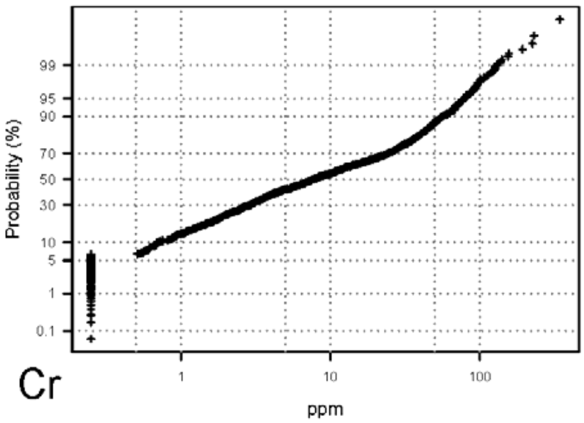
0.1 1 10
ppm
Co


Probability (%)
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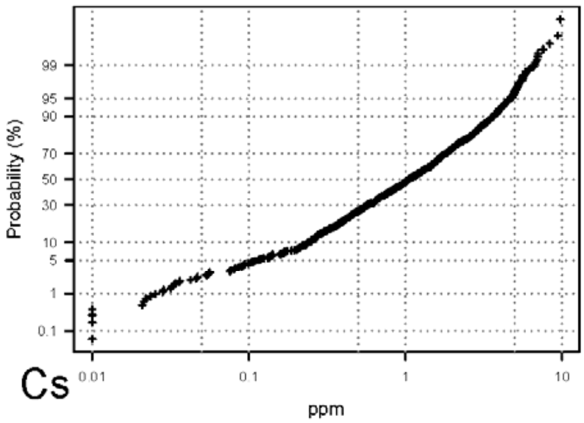
1 10 100
ppm
Cr


Probability (%)
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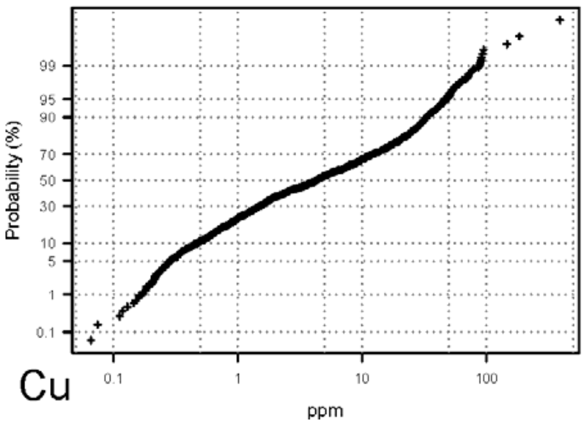
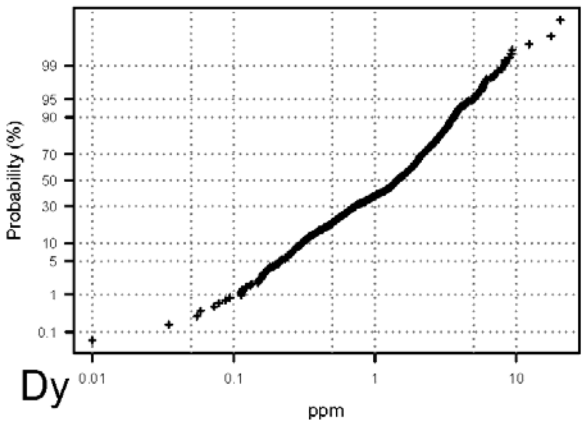
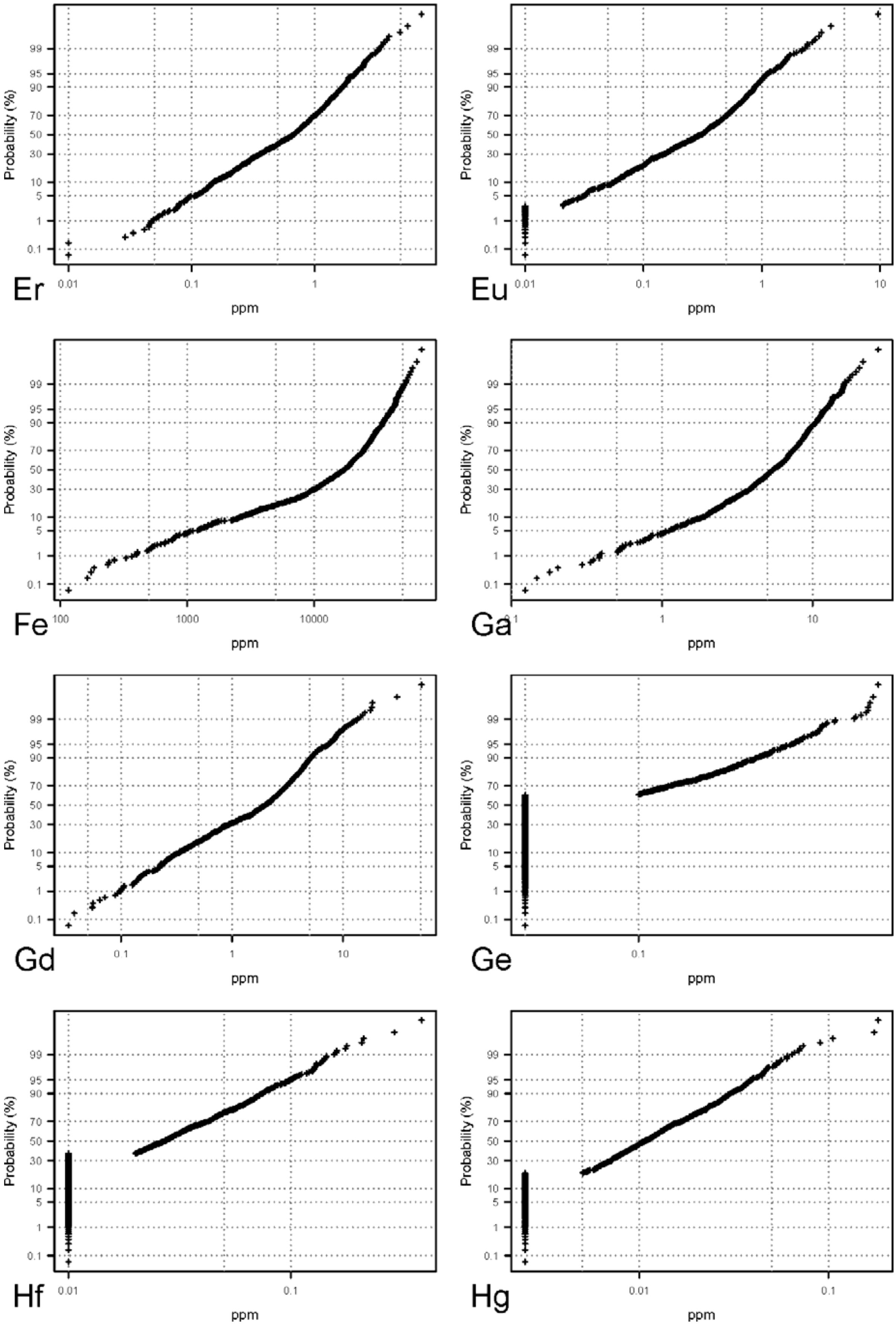
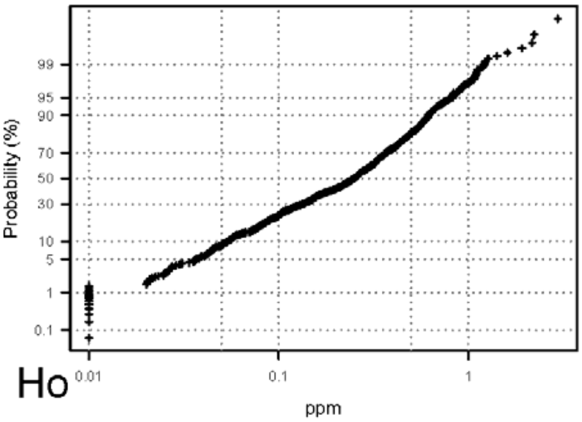
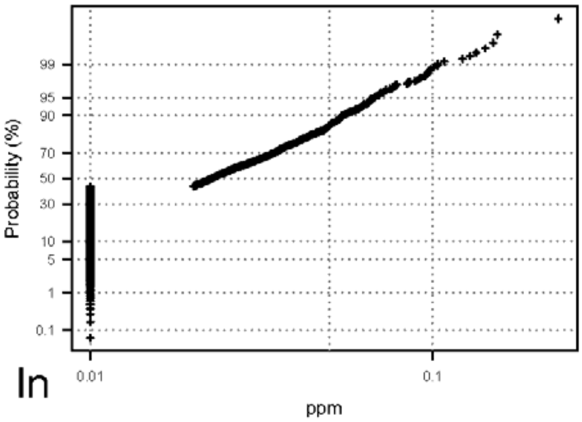
0.01 0.1 1 10
ppm
Cs

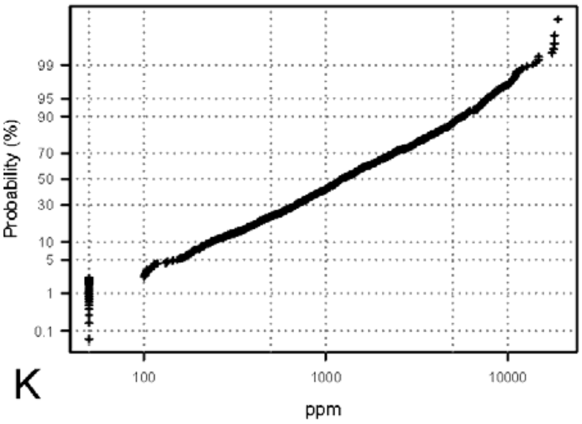

Probability (%)
0.1 1 5 10 30 50 70 90 95 99
0.1 1 10 100
ppm
Cu

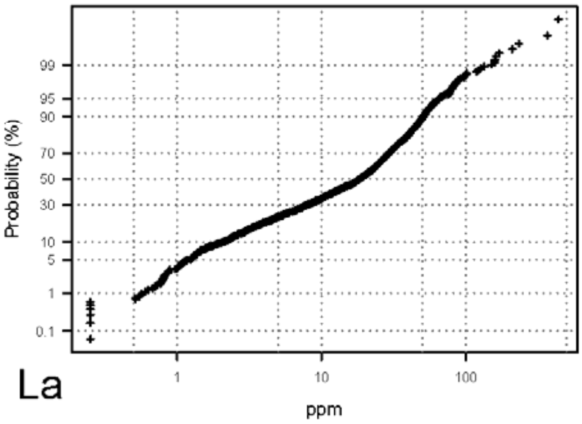

Probability (%)
0.1 1 5 10 30 50 70 90 95 99
0.01 0.1 1 10
ppm
Dy

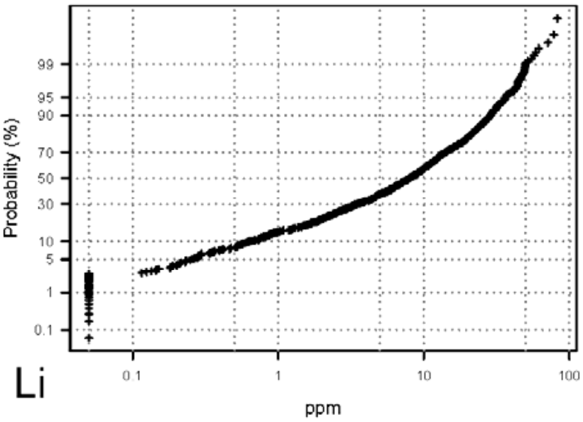

Er
Eu
Fe
Ga
Gd
Ge
Hf
Hg
Probability (%)
ppm

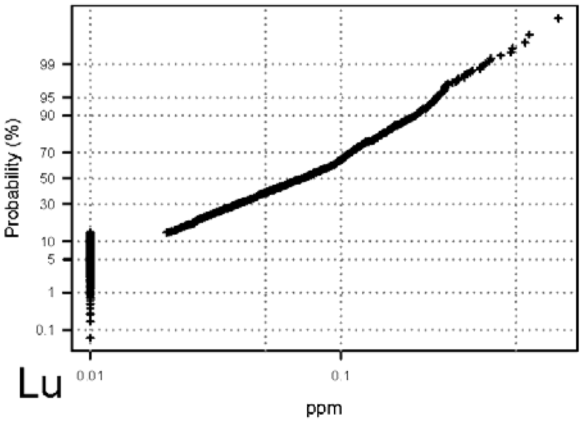

Probability (%)
Ho
ppm

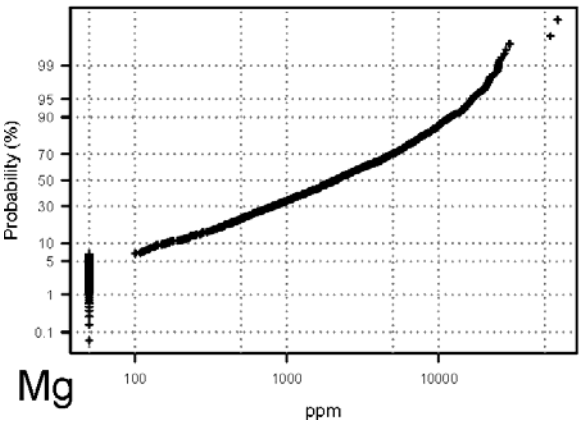

Probability (%)
In
ppm

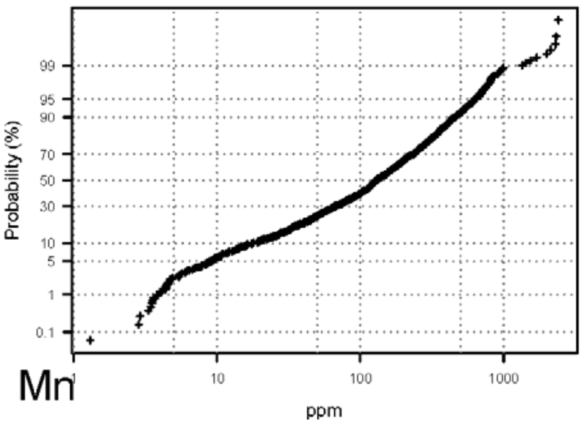

Probability (%)
K
ppm

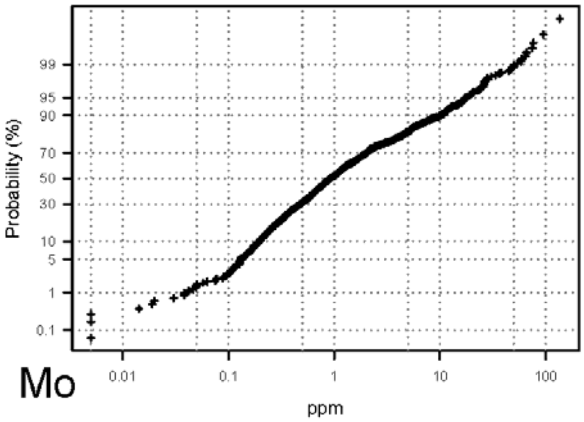

Probability (%)
La
ppm

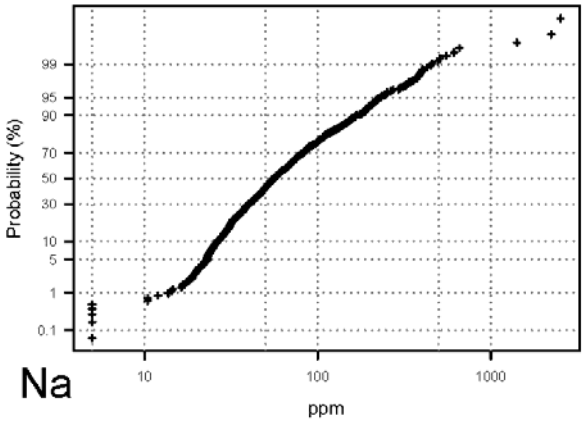

Probability (%)
Li
ppm

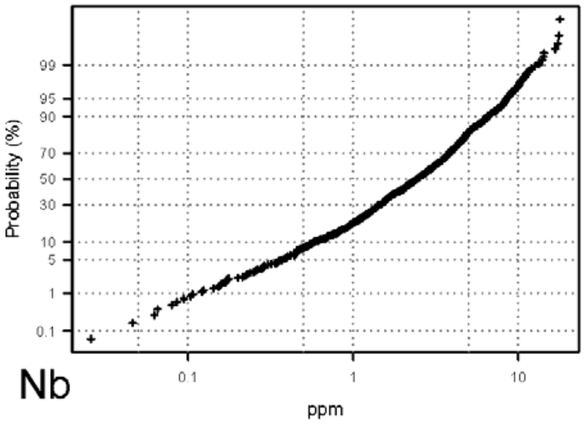

Probability (%)
Lu
ppm

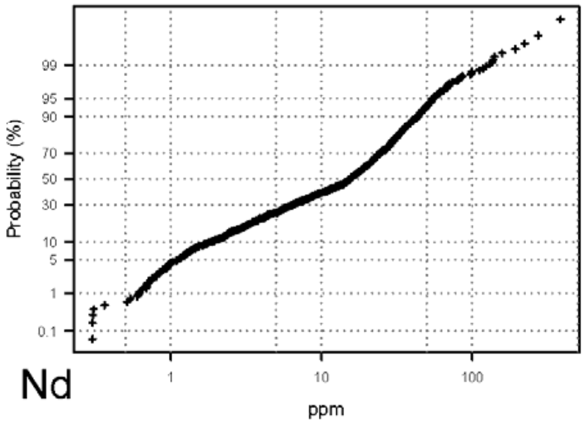

Probability (%)
Mg
ppm

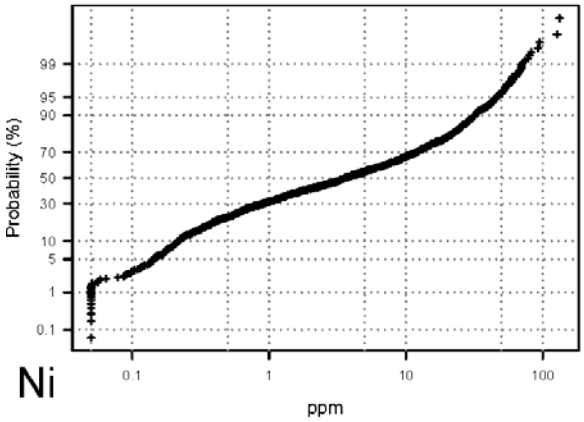

Probability (%)
Mn
ppm

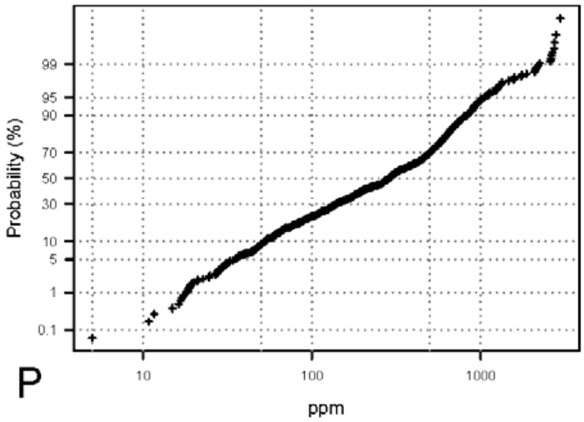

Probability (%)
ppm
Mo

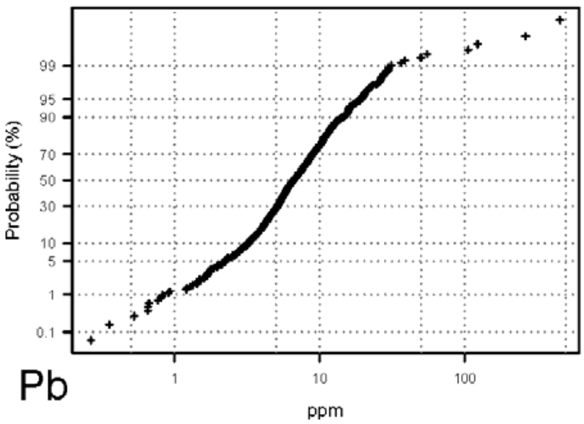

Probability (%)
ppm
Na

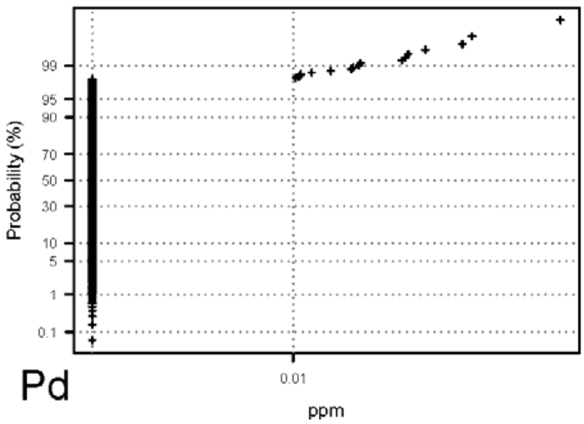

Probability (%)
ppm
Nb

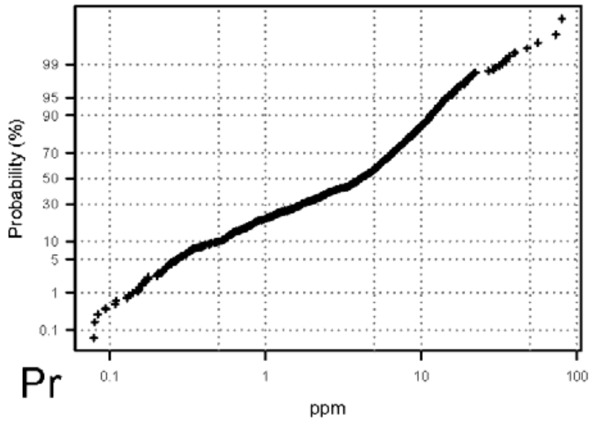

Probability (%)
ppm
Nd


Probability (%)
ppm
Ni


Probability (%)
ppm
P


Probability (%)
ppm
Pb


Probability (%)
ppm
Pd


Pr
Probability (%)
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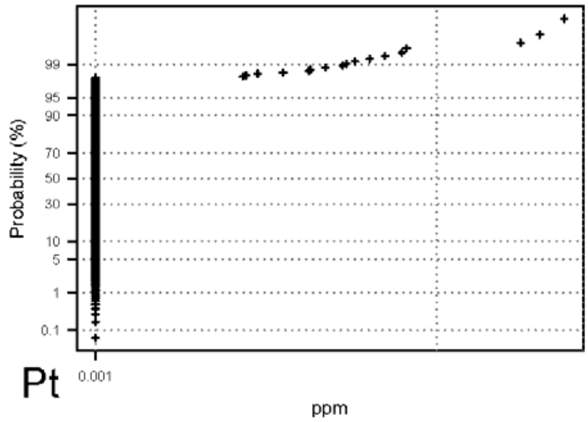
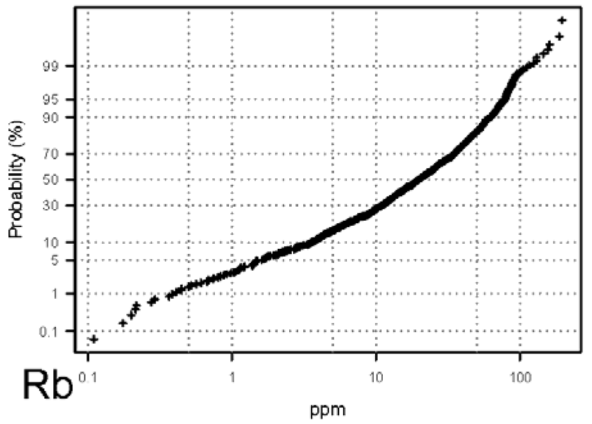
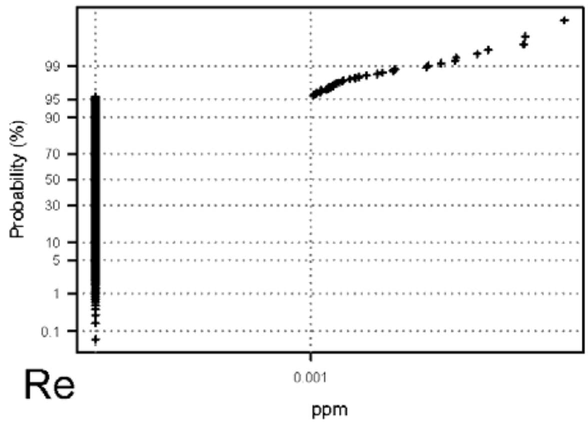
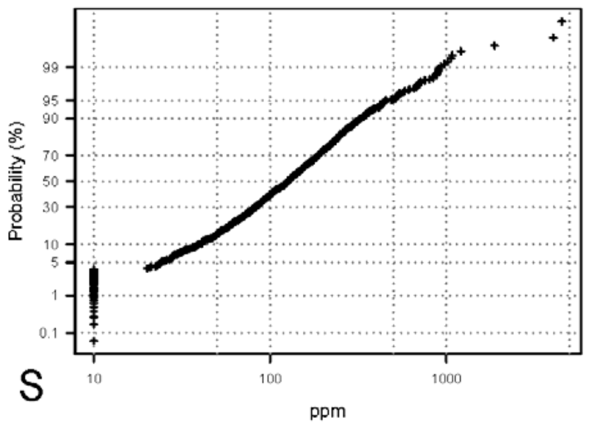
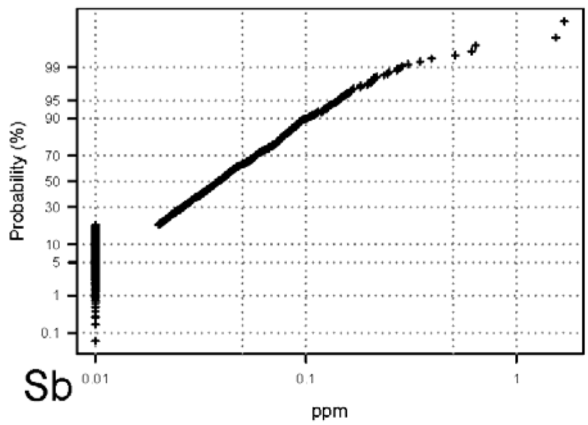
95
90
70
50
30
10
5
1
0.1
0.1
1
10
100
ppm

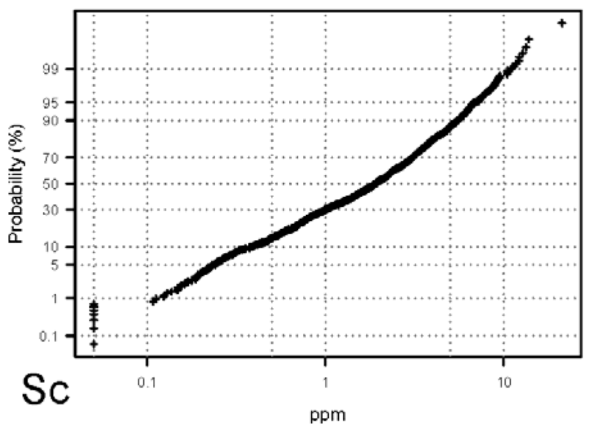

Pt
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.001
ppm

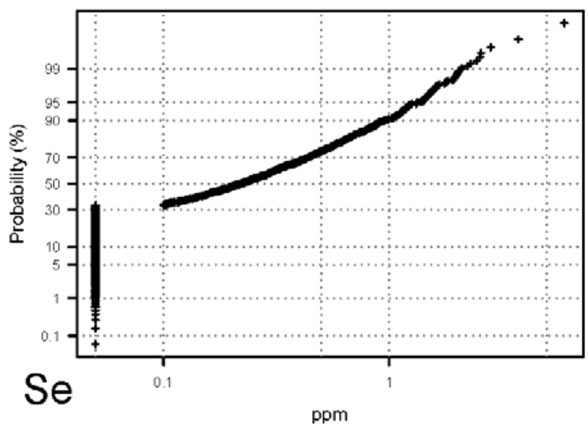

Rb
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.1
1
10
100
ppm

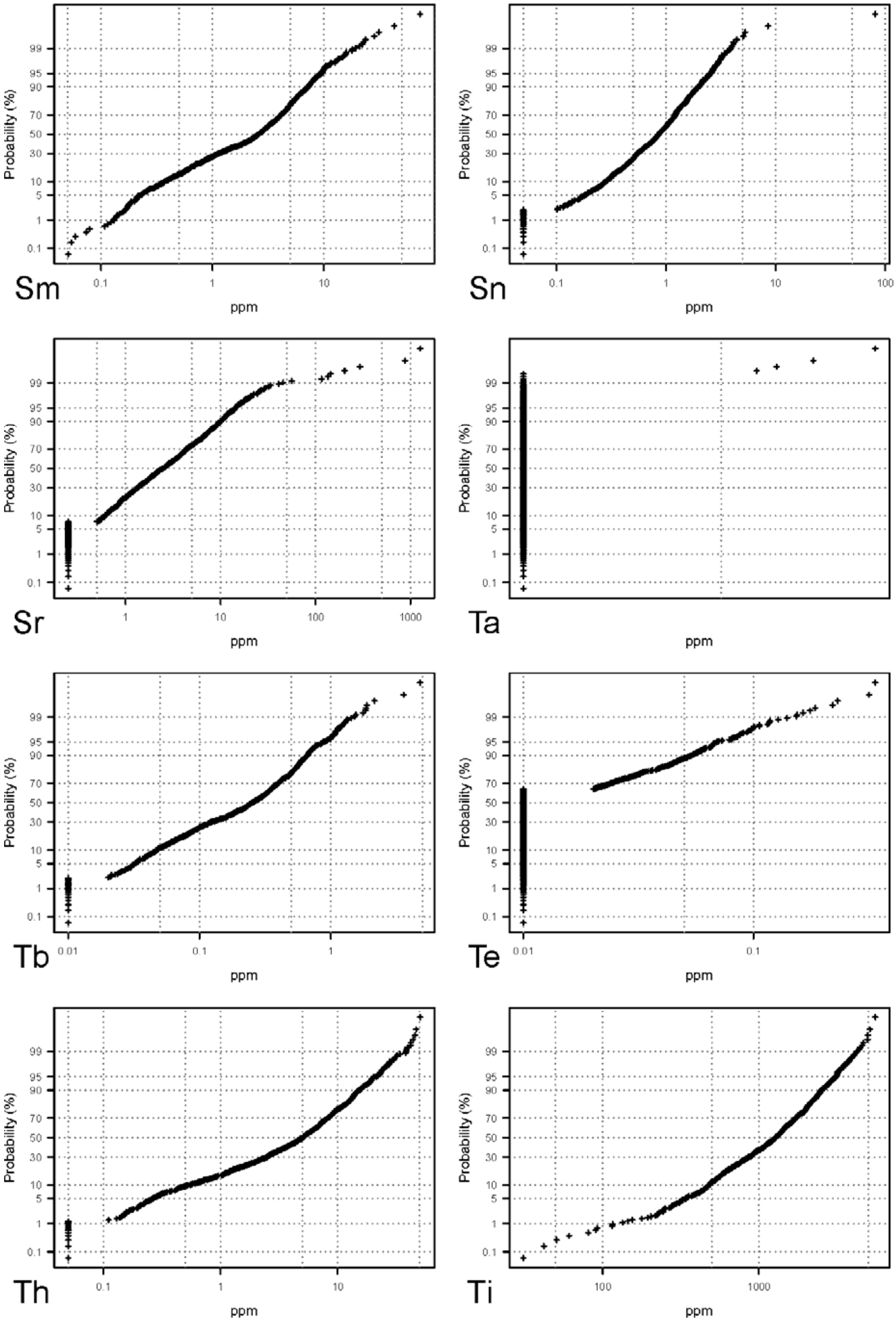

Re
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.001
ppm

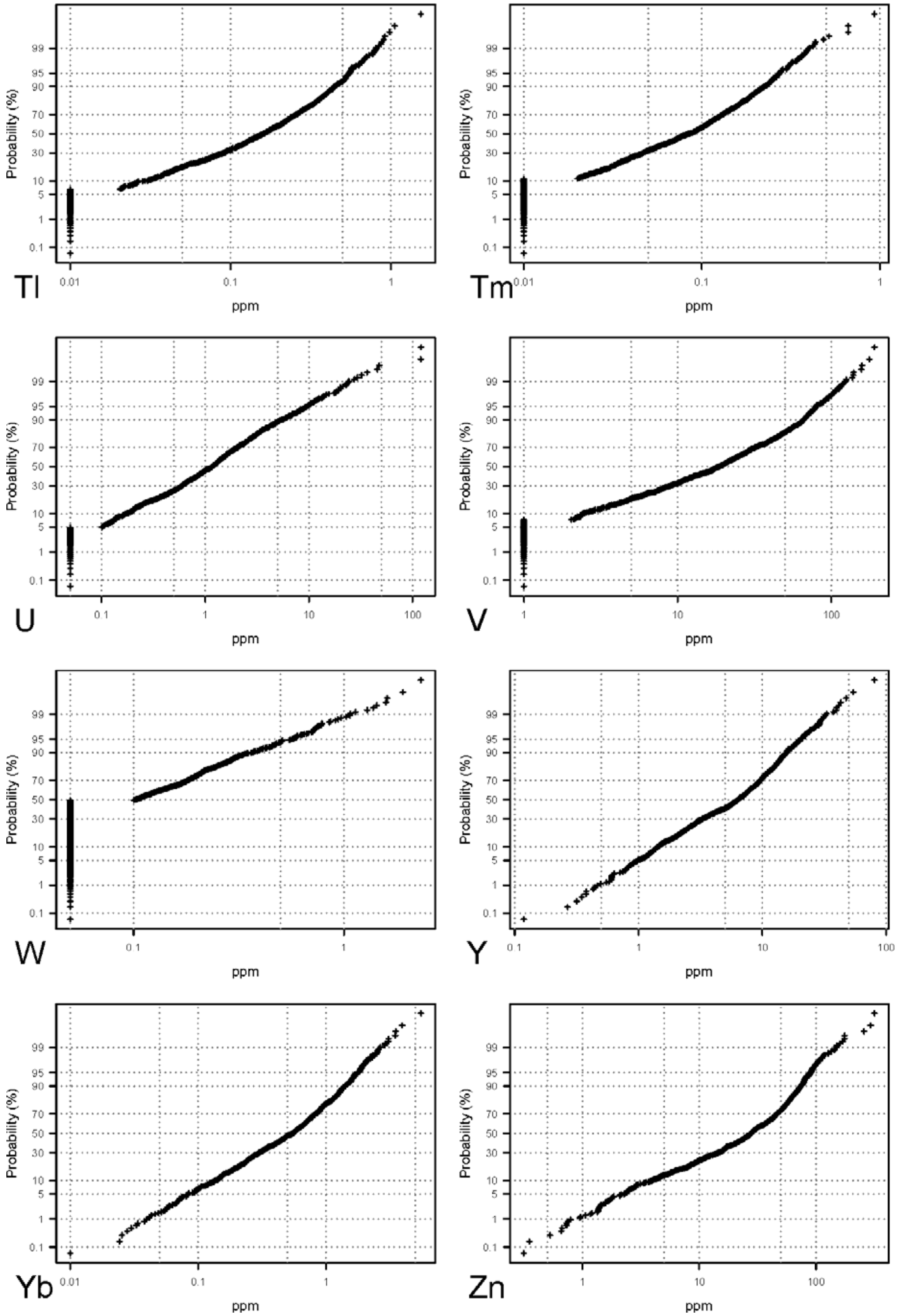

S
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
10
100
1000
ppm

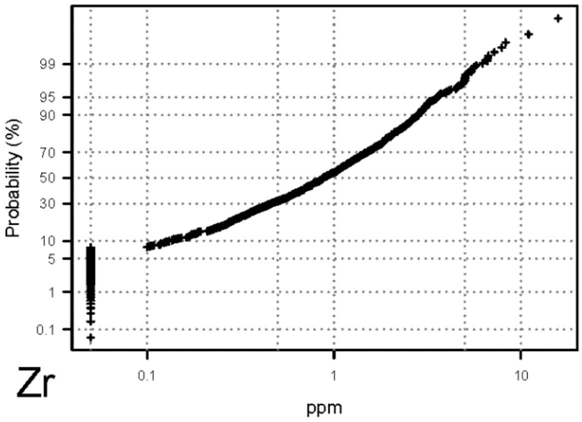

Sb
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.01
0.1
1
ppm


Sc
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.1
1
10
ppm


Se
Probability (%)
99
95
90
70
50
30
10
5
1
0.1
0.1
1
ppm


Sm
Sn
Sr
Ta
Tb
Te
Th
Ti
Probability (%)
ppm

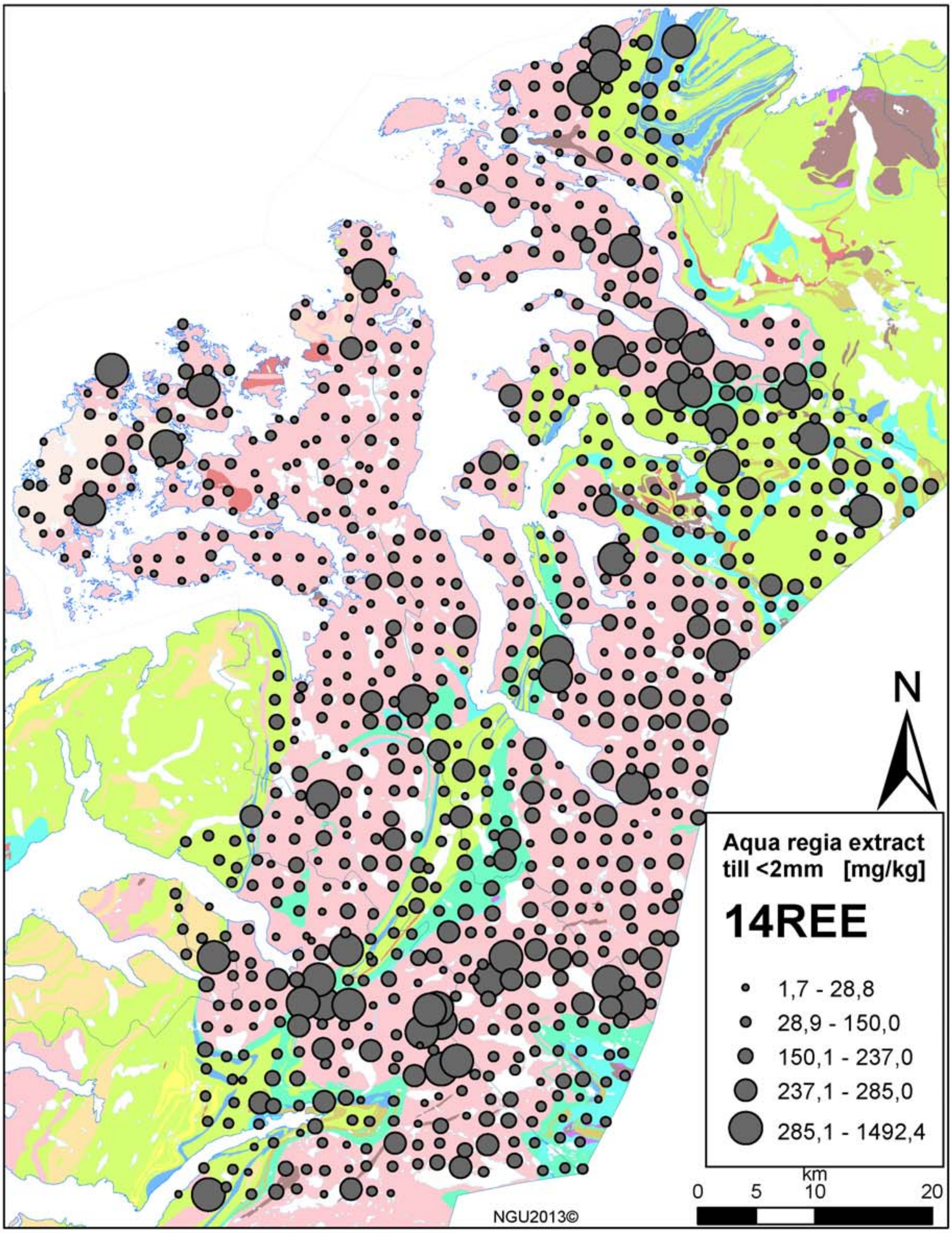

Tl
Tm
U
V
W
Y
Yb
Zn
Probability (%)
ppm
0.1
1
5
10
30
50
70
90
95
99
0.01
0.1
1
10
100

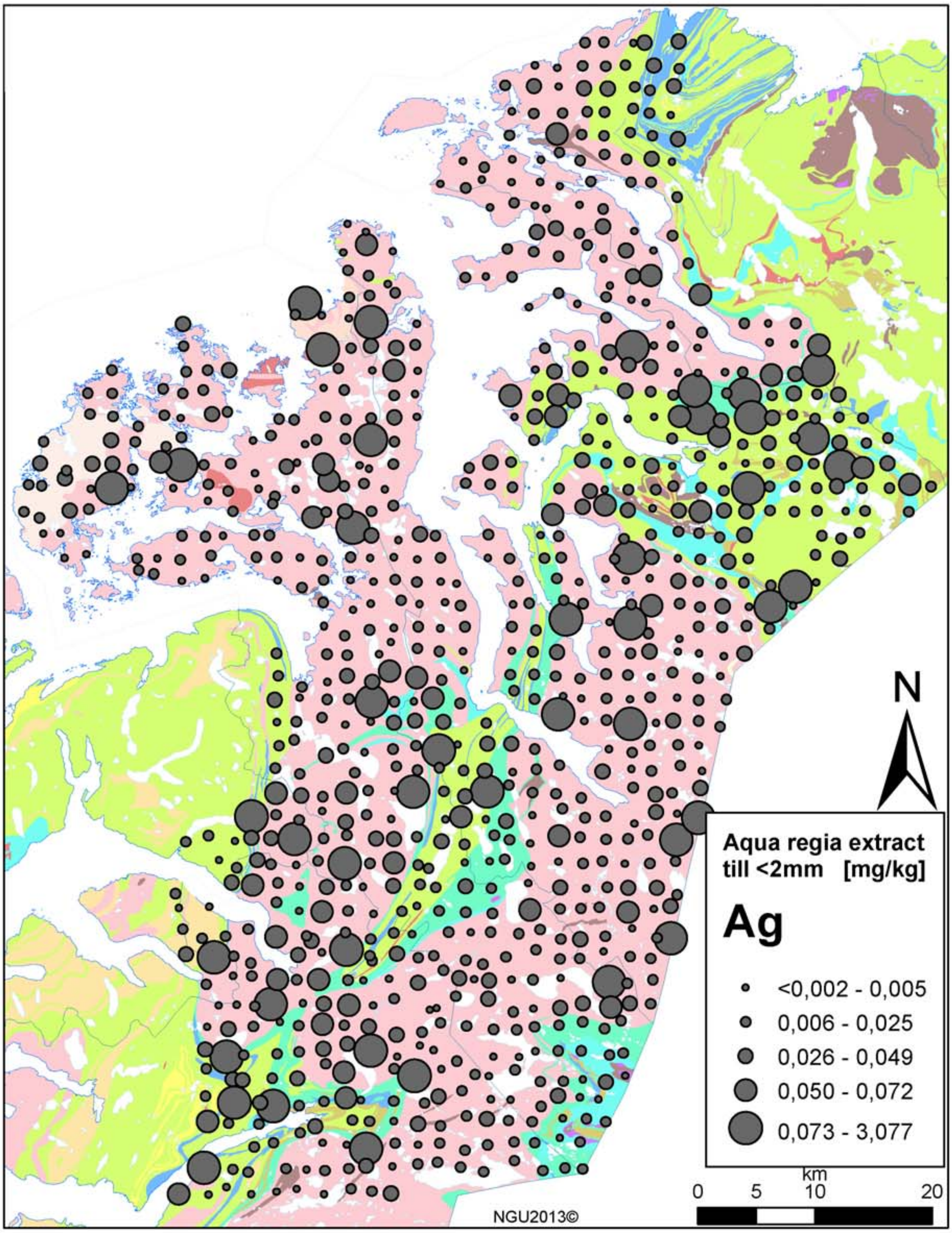

Probability (%)
99
95
90
70
50
30
10
5
1
0.1
Zr
0.1
1
10
ppm

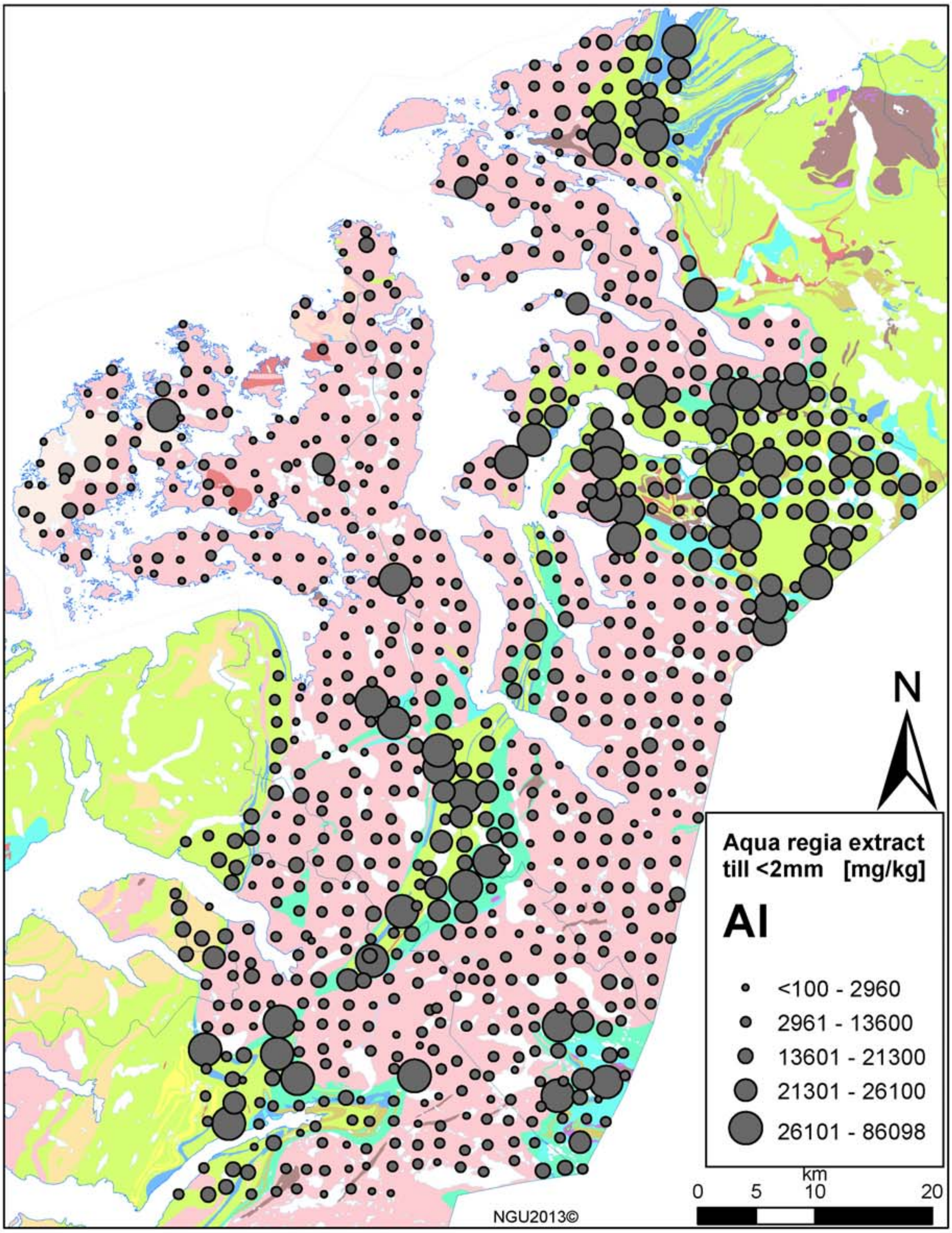
Appendix 2

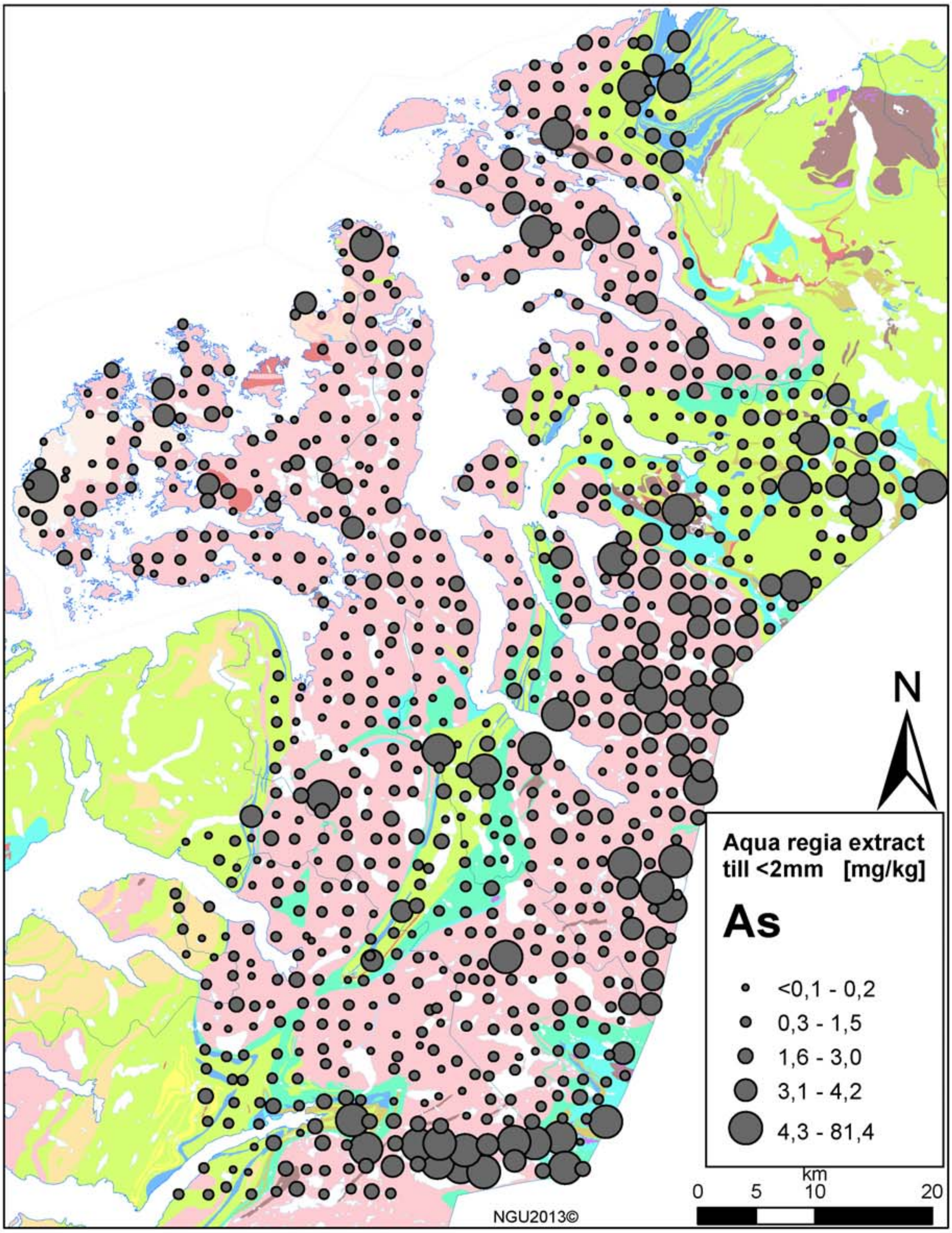
Maps of concentration in soil samples < 2mm after aqua regia extraction

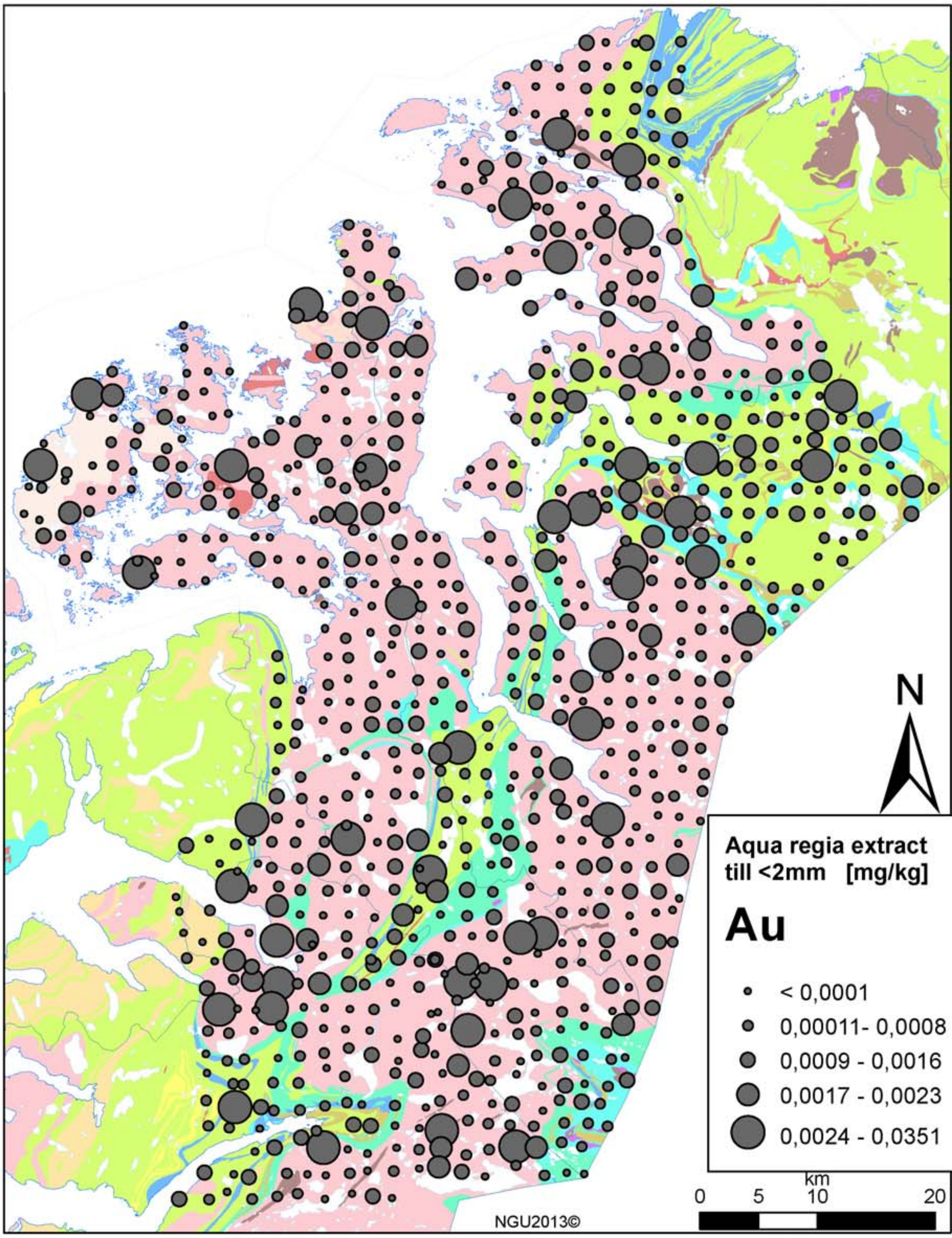
ppm sum14 REE, ppmAg, ppmAl, ppmAs, ppmAu, ppmB, ppmBa, ppmBe, ppmBi, ppmCa, ppmCd, ppmCe, ppmCo, ppmCr, ppmCs, ppmCu, ppmDy, ppmEr, ppmEu, ppmFe, ppmGa, ppmGd, ppmGe, ppmHf, ppmHg, ppmHo, ppmIn, ppmK, ppmLa, ppmLi, ppmLu, ppmMg, ppmMn, ppmMo, ppmNa, ppmNb, ppmNd, ppmNi, ppmP, ppmPb, ppmPd, ppmPr, ppmPt, ppmRb, ppmRe, ppmS, ppmSb, ppmSc, ppmSe, ppmSm, ppmSn, ppmSr, ppmTa, ppmTb, ppmTe, ppmTh, ppmTi, ppmTl, ppmTm, ppmU, ppmV, ppmW, ppmY, ppmYb, ppmZn, ppmZr


N
Aqua regia extract
till <2mm [mg/kg]
14REE
1,7 - 28,8
28,9 - 150,0
150,1 - 237,0
237,1 - 285,0
285,1 - 1492,4
km
0 5 10 20
NGU2013©

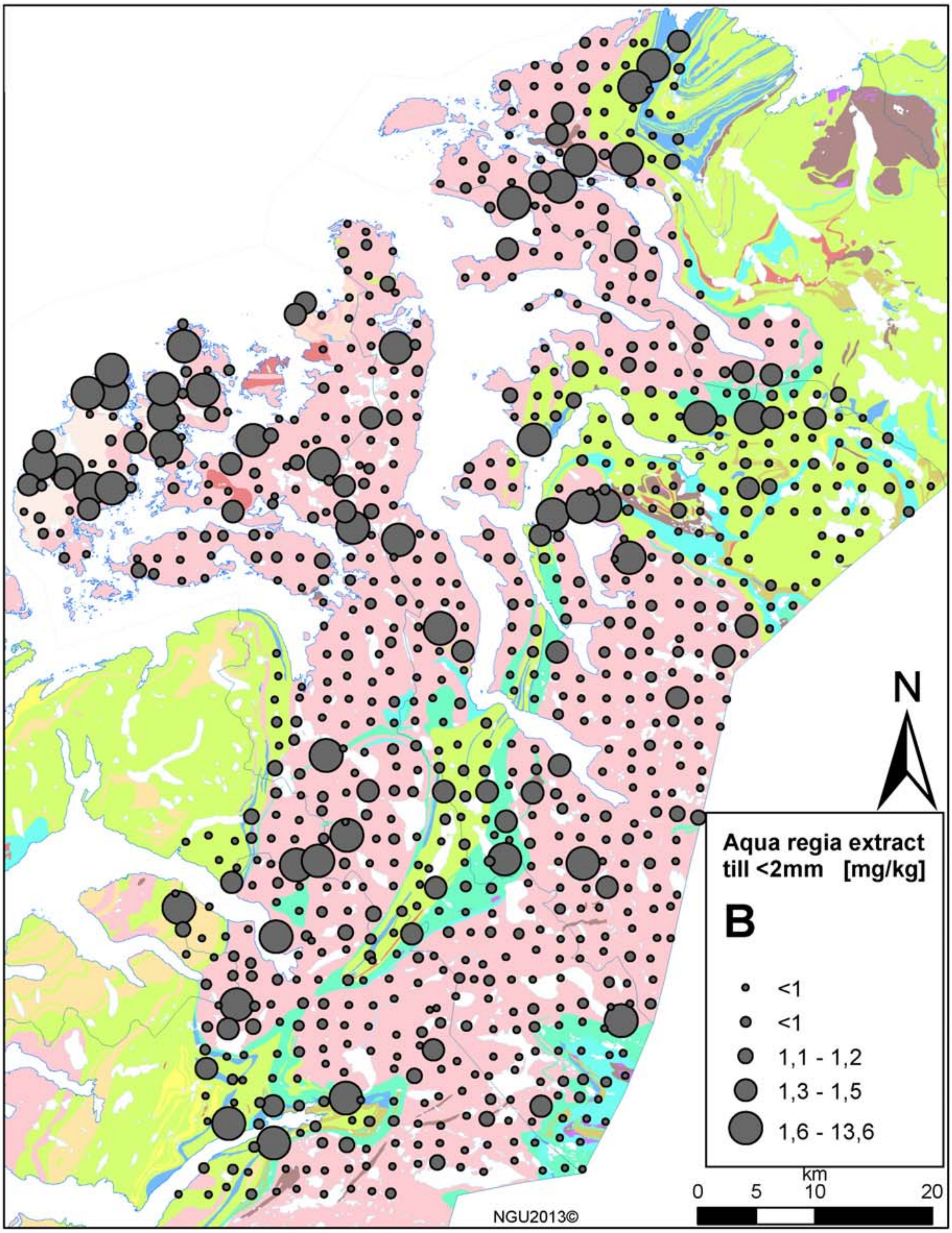

N
Aqua regia extract
till <2mm [mg/kg]
Ag
<0,002 - 0,005
0,006 - 0,025
0,026 - 0,049
0,050 - 0,072
0,073 - 3,077
km
0 5 10 20
NGU2013©

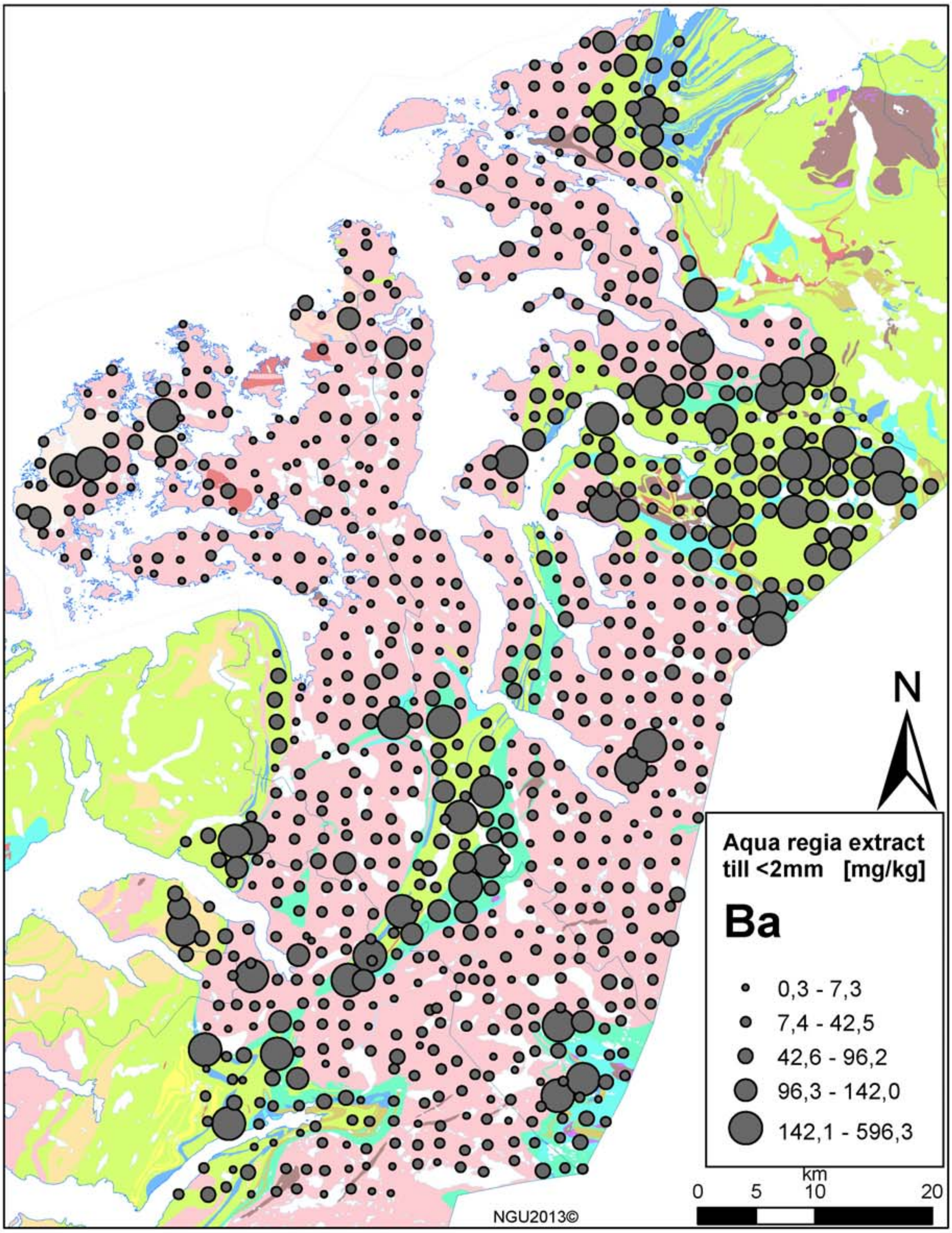

N
Aqua regia extract
till <2mm [mg/kg]
Al
<100 - 2960
2961 - 13600
13601 - 21300
21301 - 26100
26101 - 86098
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
As
<0,1 - 0,2
0,3 - 1,5
1,6 - 3,0
3,1 - 4,2
4,3 - 81,4
km
0
5
10
20
NGU2013©

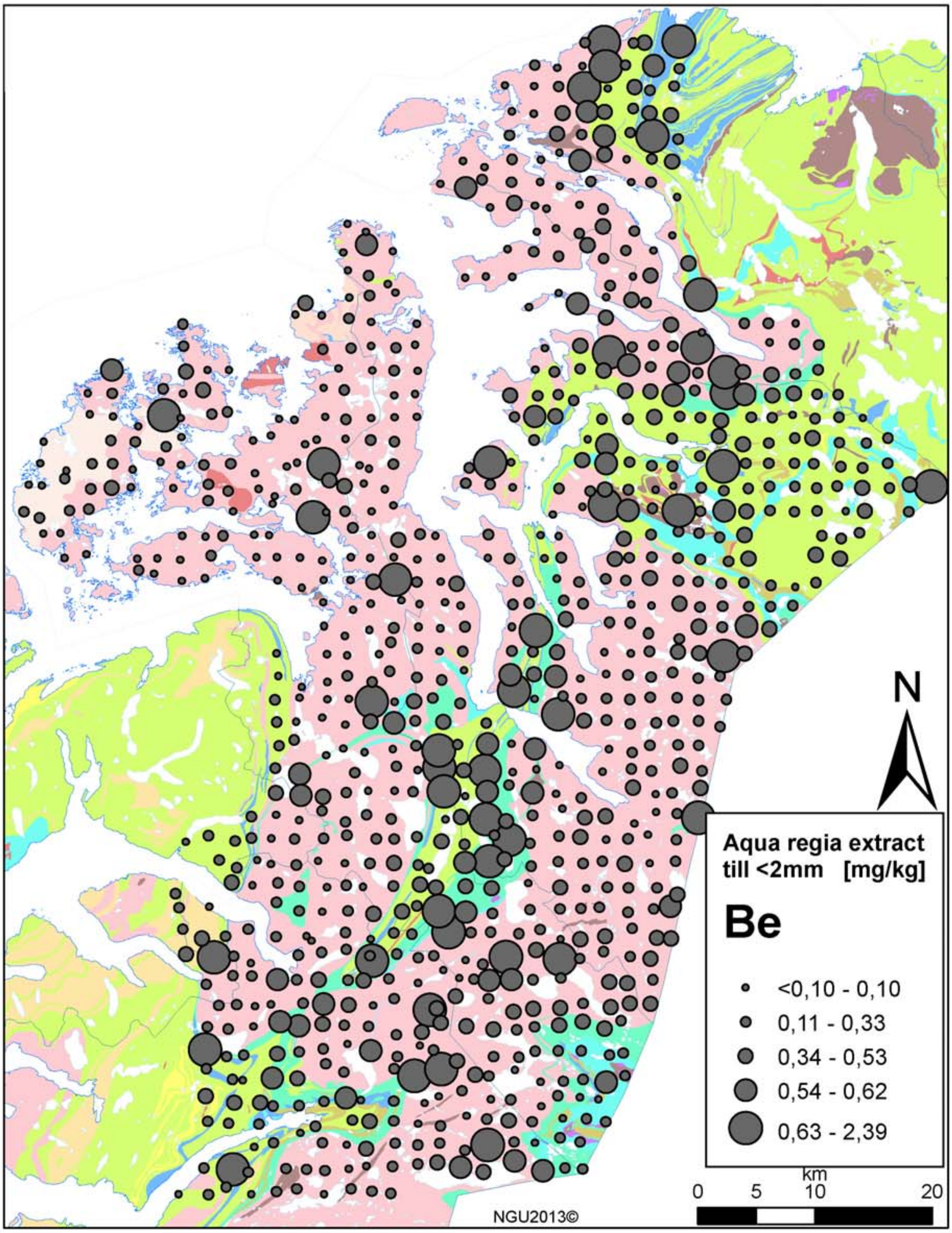


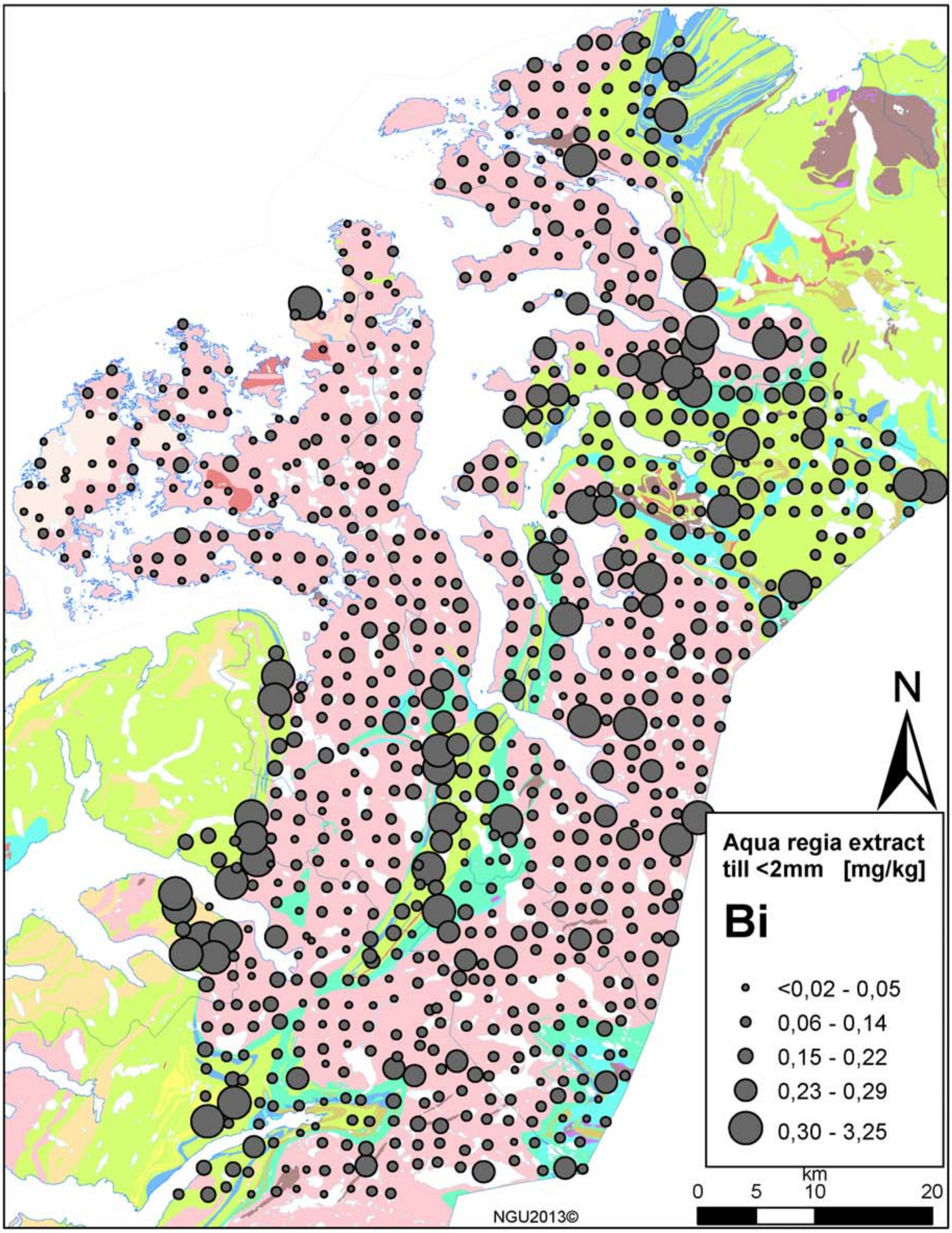
Attention: QC results indicate rather poor reproducibiblty

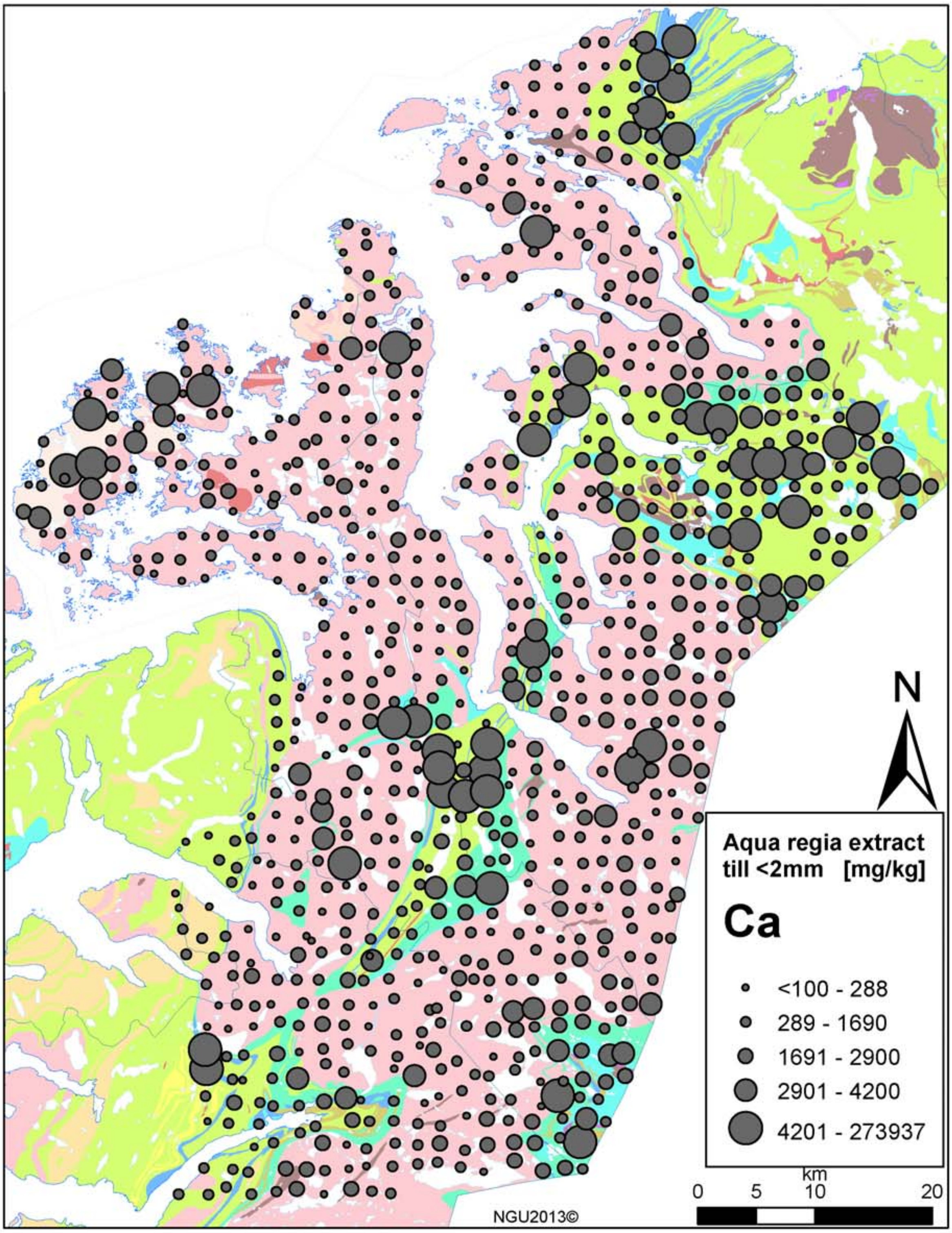

N
Aqua regia extract
till <2mm [mg/kg]
B
<1
<1
1,1 - 1,2
1,3 - 1,5
1,6 - 13,6
km
0 5 10 20
NGU2013©

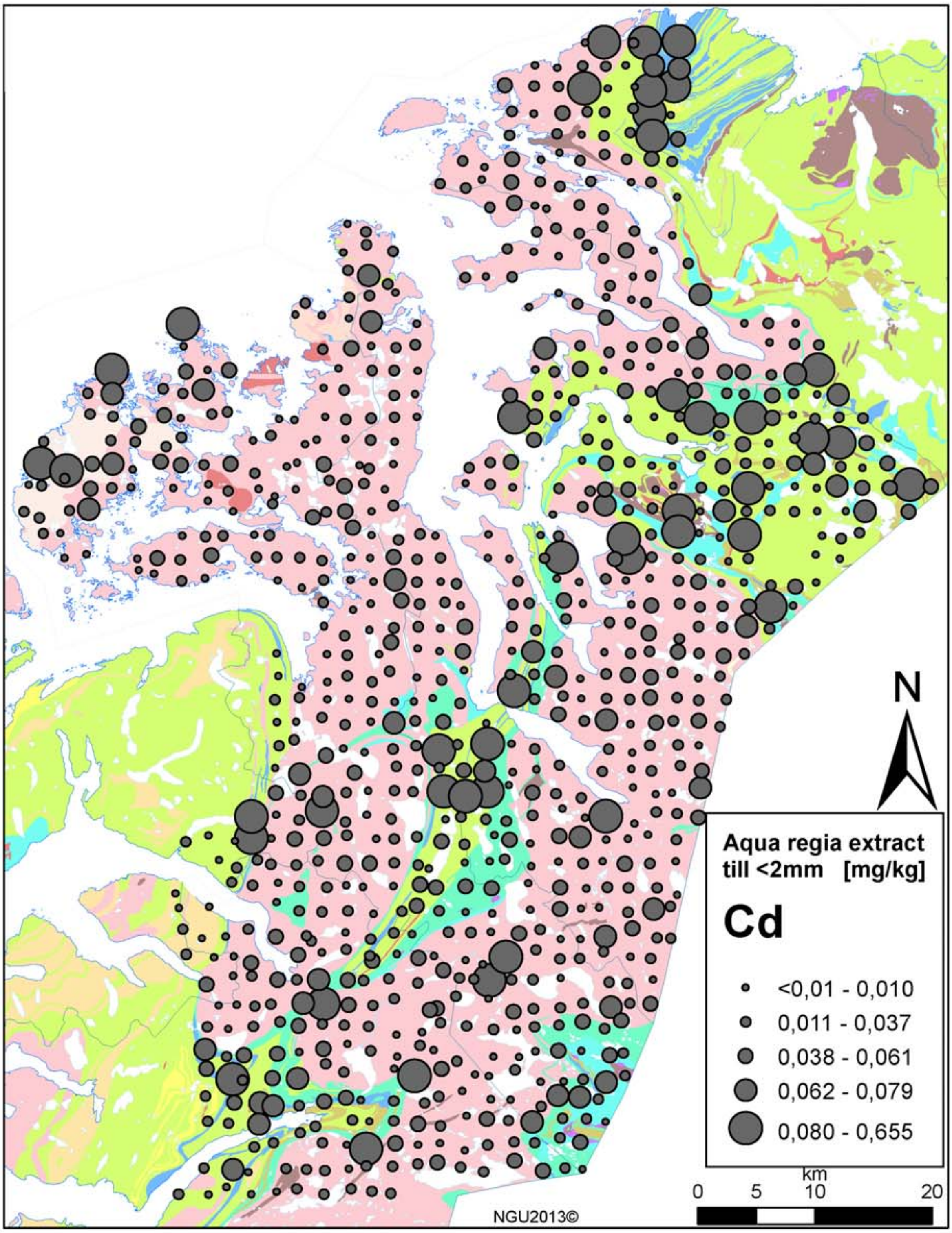


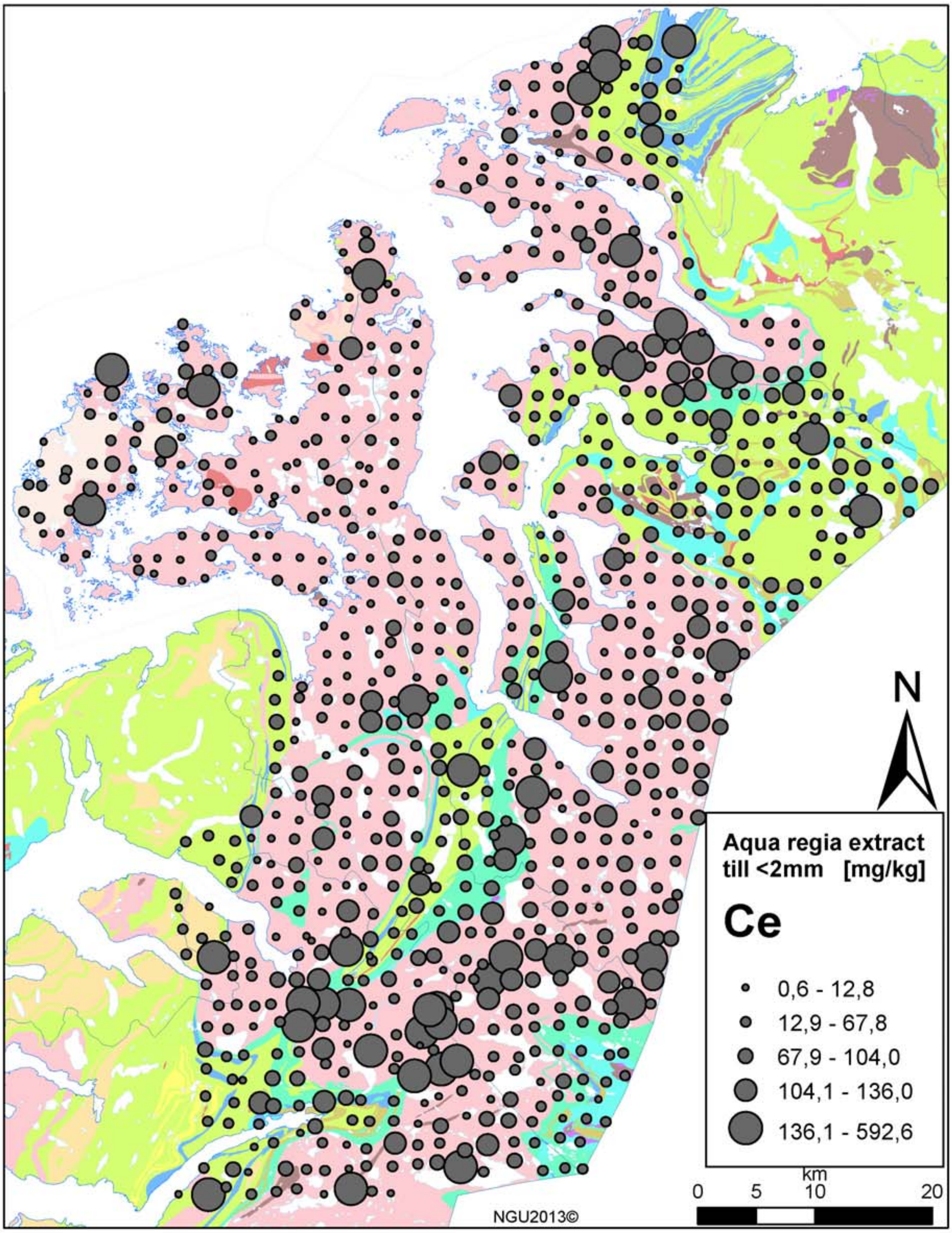
Attention: QC results indicate rather poor reproducibiblty

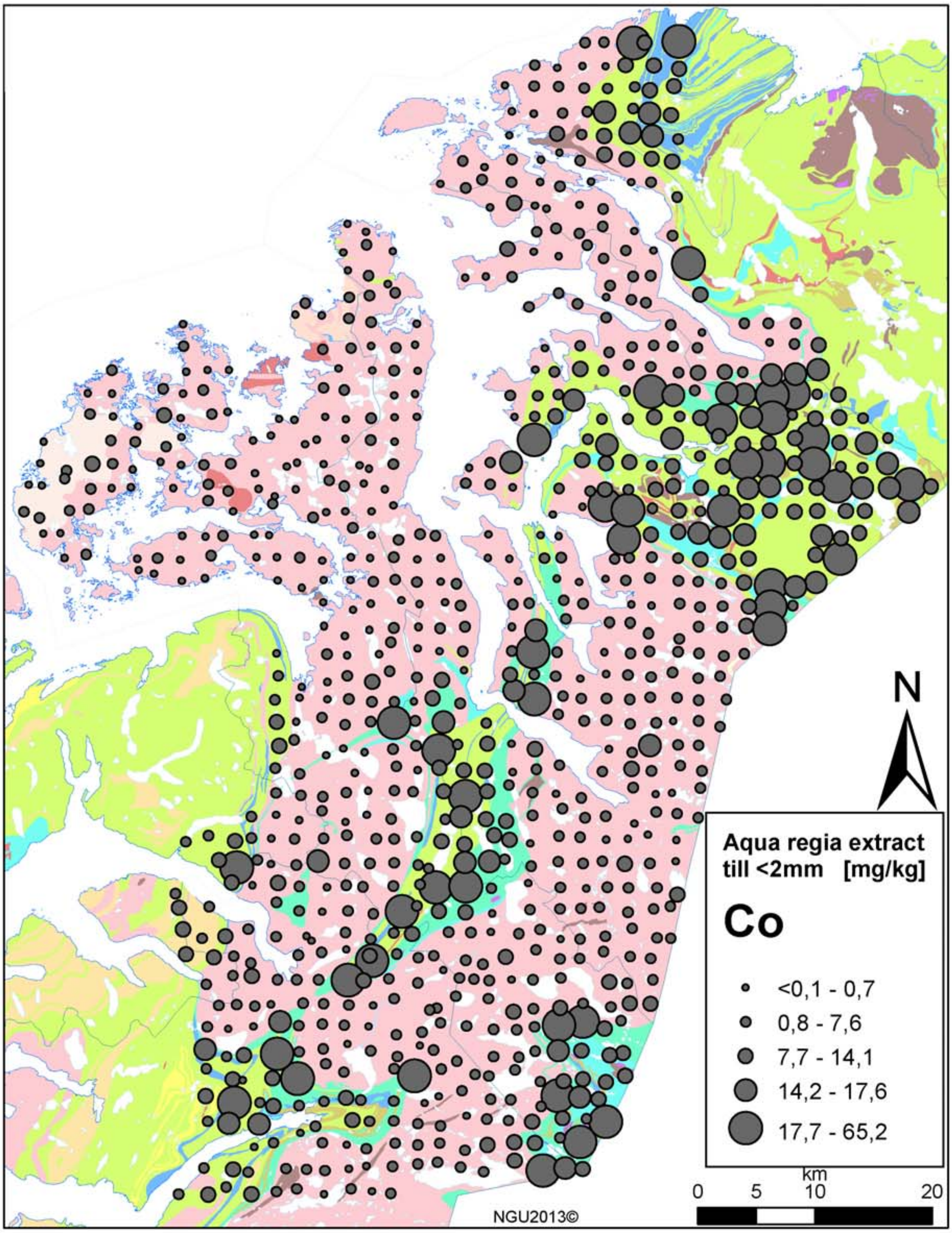

N
Aqua regia extract
till <2mm [mg/kg]
Be
<0,10 - 0,10
0,11 - 0,33
0,34 - 0,53
0,54 - 0,62
0,63 - 2,39
km
0 5 10 20
NGU2013©

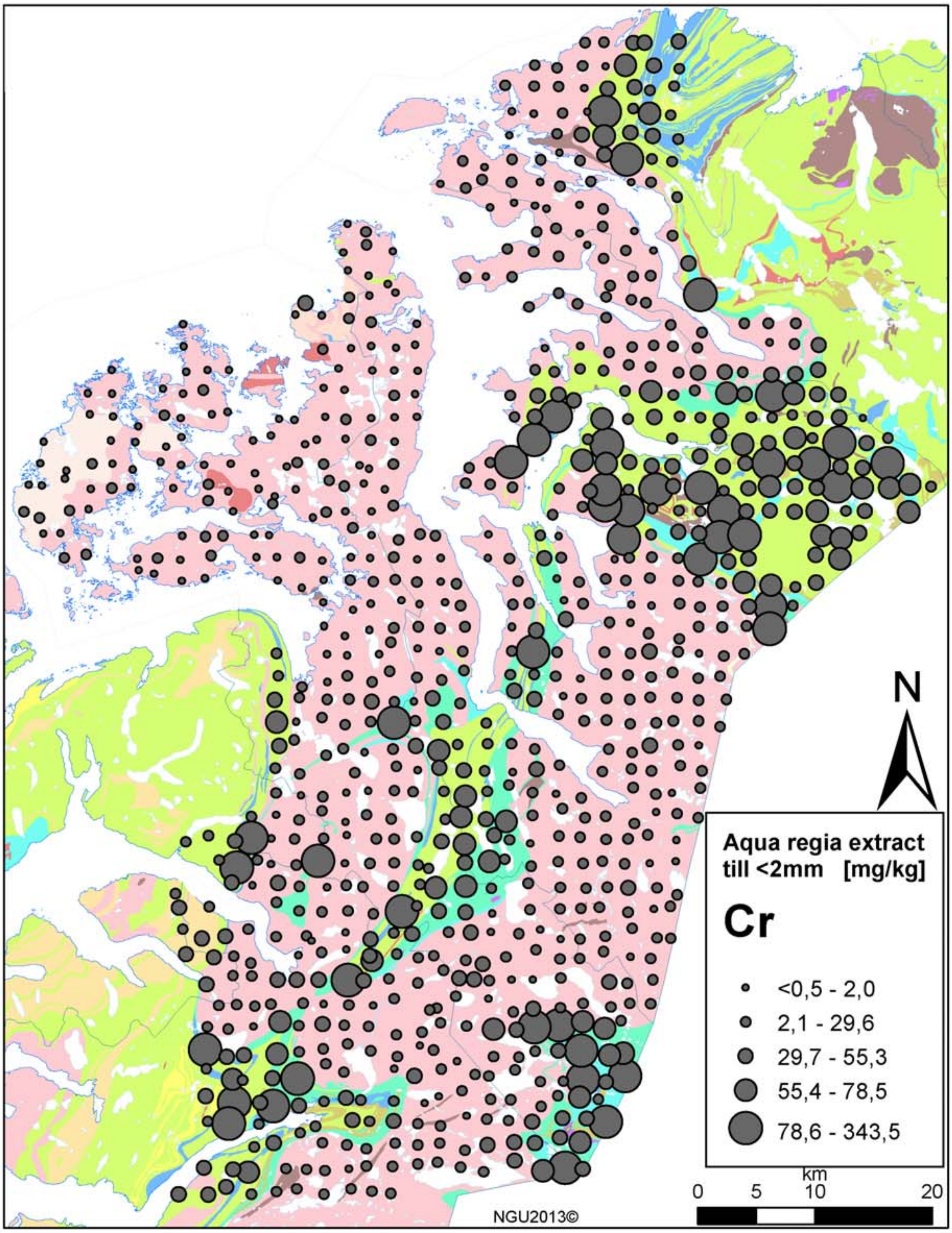

N
Aqua regia extract
till <2mm [mg/kg]
Bi
<0,02 - 0,05
0,06 - 0,14
0,15 - 0,22
0,23 - 0,29
0,30 - 3,25
km
0 5 10 20
NGU2013©

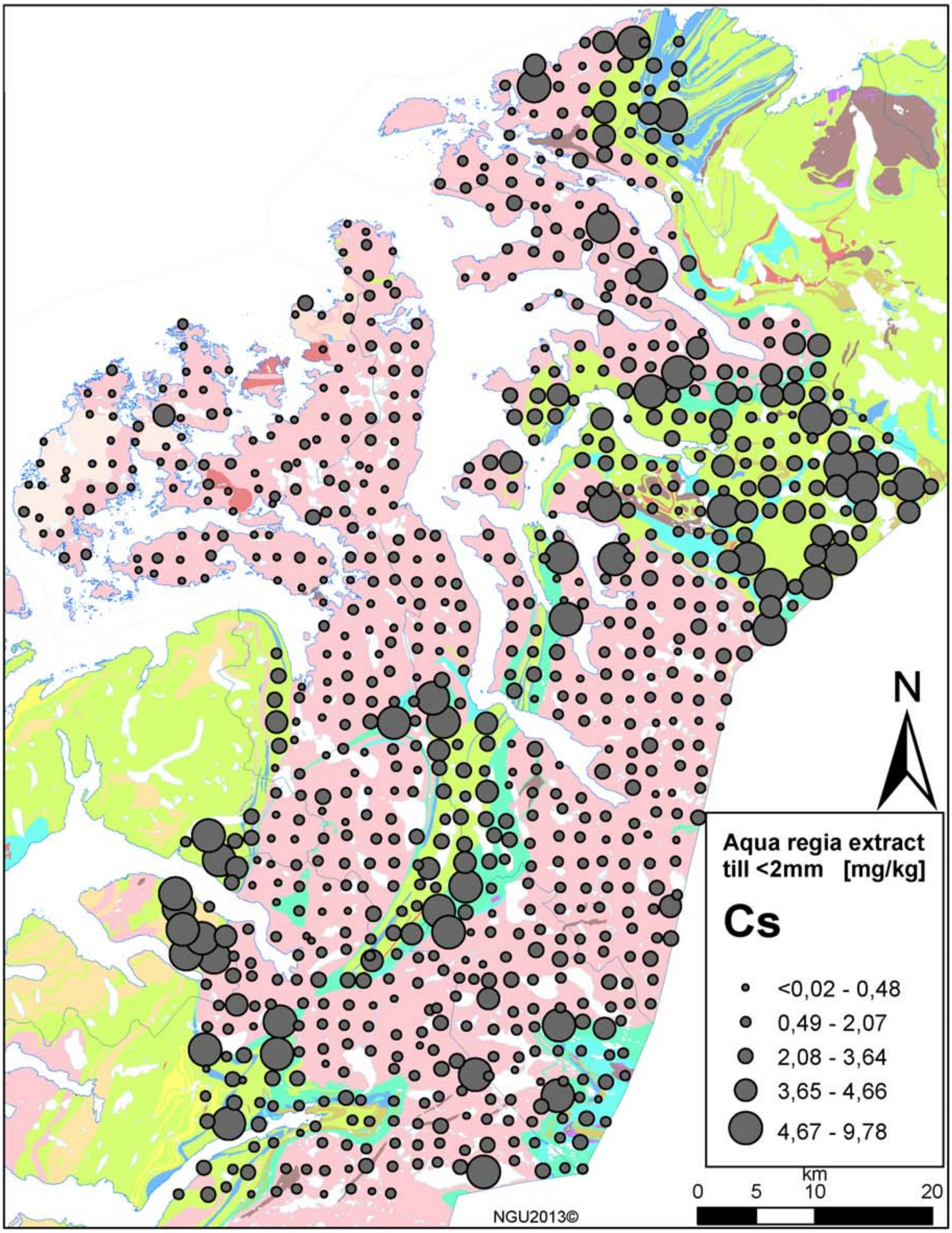

N
Aqua regia extract
till <2mm [mg/kg]
Ca
<100 - 288
289 - 1690
1691 - 2900
2901 - 4200
4201 - 273937
km
0 5 10 20
NGU2013©

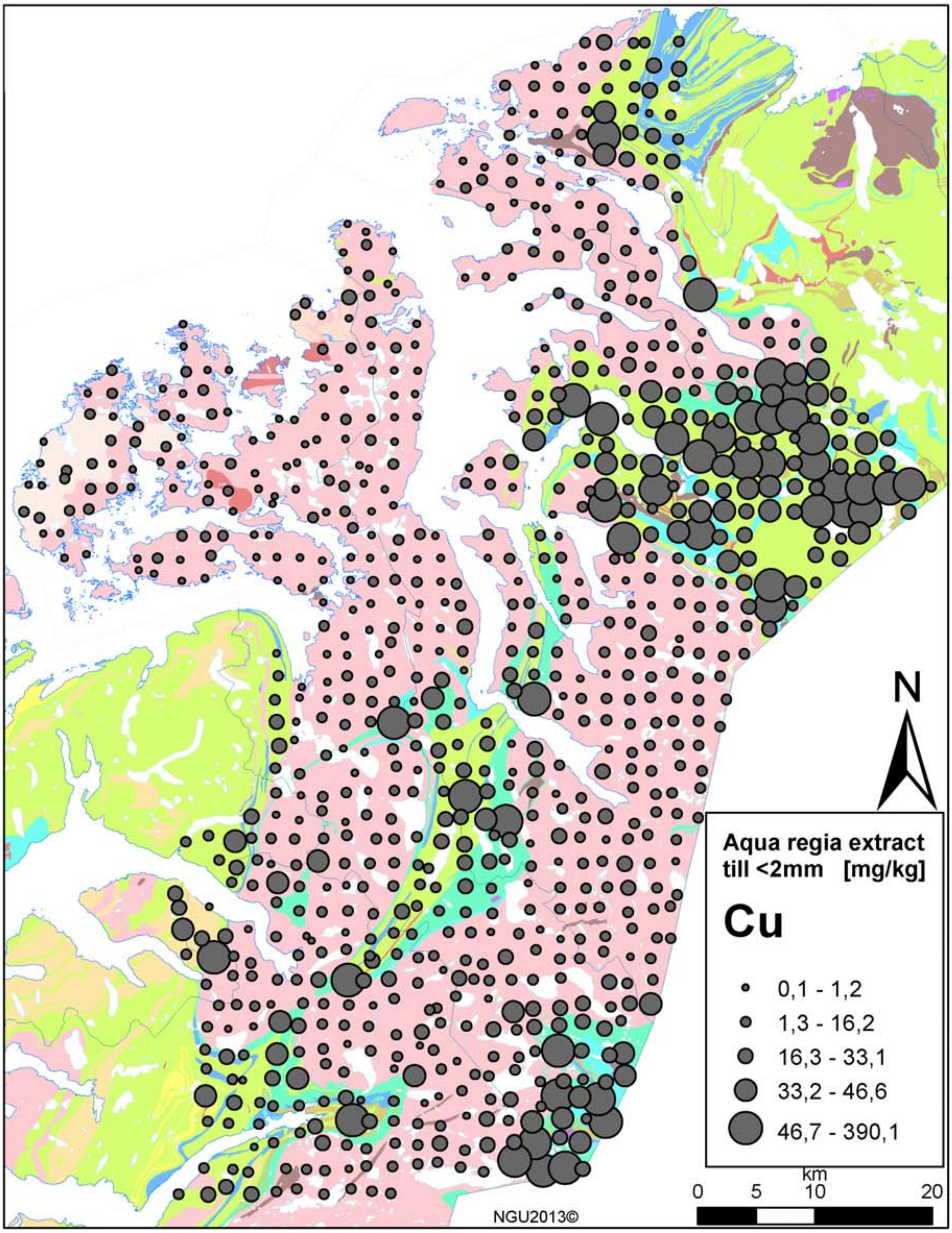

N
Aqua regia extract
till <2mm [mg/kg]
Cd
<0,01 - 0,010
0,011 - 0,037
0,038 - 0,061
0,062 - 0,079
0,080 - 0,655
km
0 5 10 20
NGU2013©

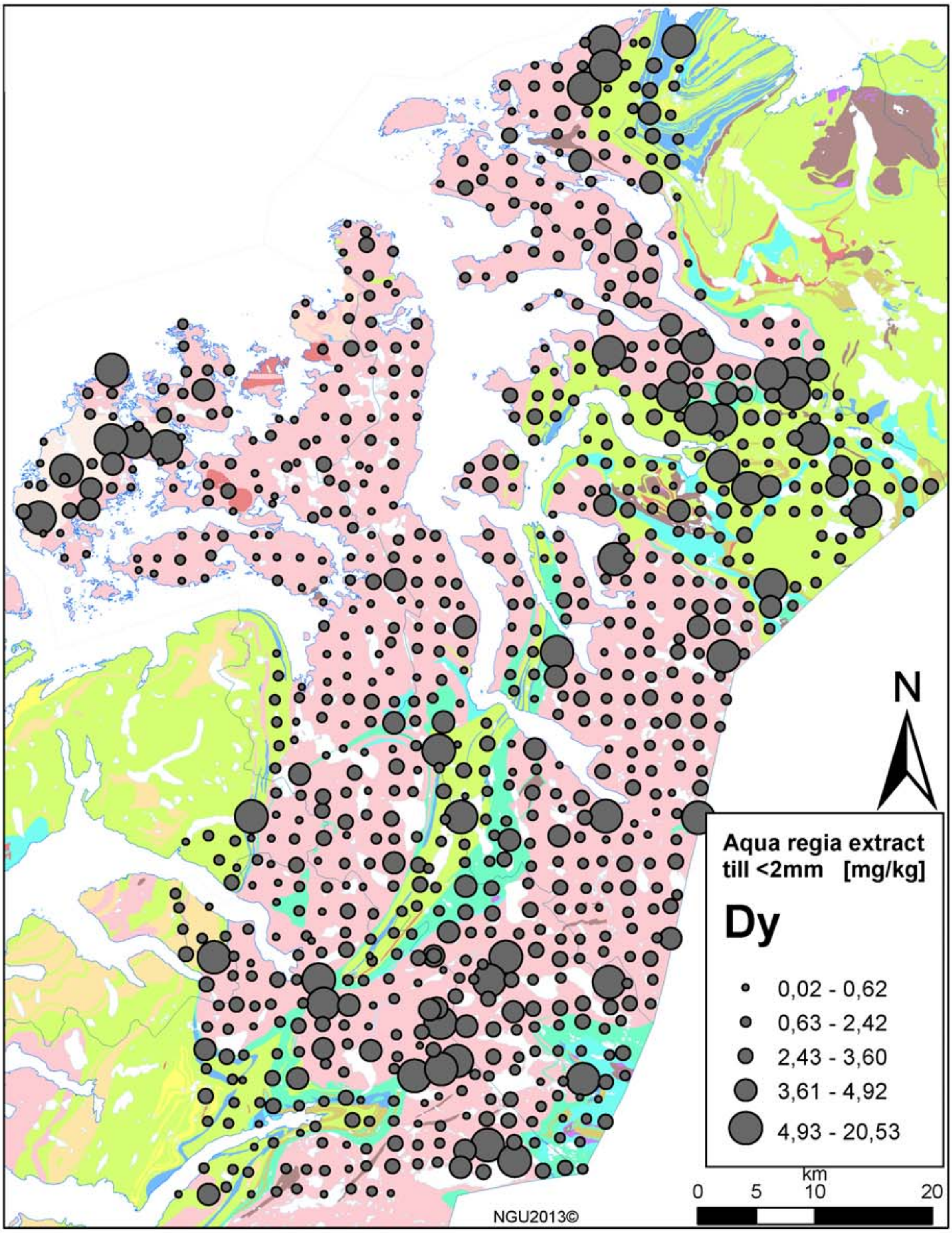

N
Aqua regia extract
till <2mm [mg/kg]
Ce
0,6 - 12,8
12,9 - 67,8
67,9 - 104,0
104,1 - 136,0
136,1 - 592,6
km
0 5 10 20
NGU2013©

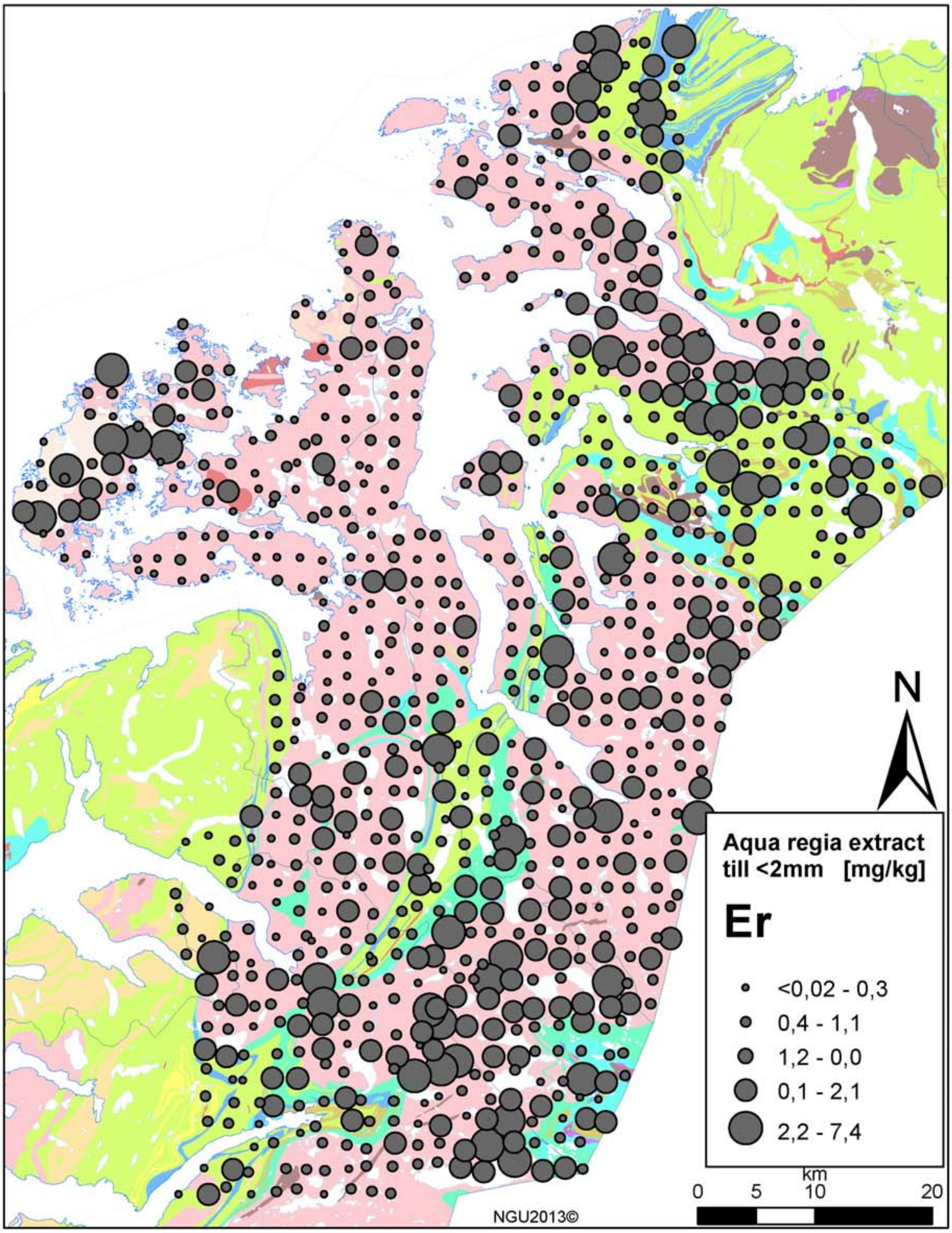

N
Aqua regia extract
till <2mm [mg/kg]
Co
<0,1 - 0,7
0,8 - 7,6
7,7 - 14,1
14,2 - 17,6
17,7 - 65,2
km
0 5 10 20
NGU2013©

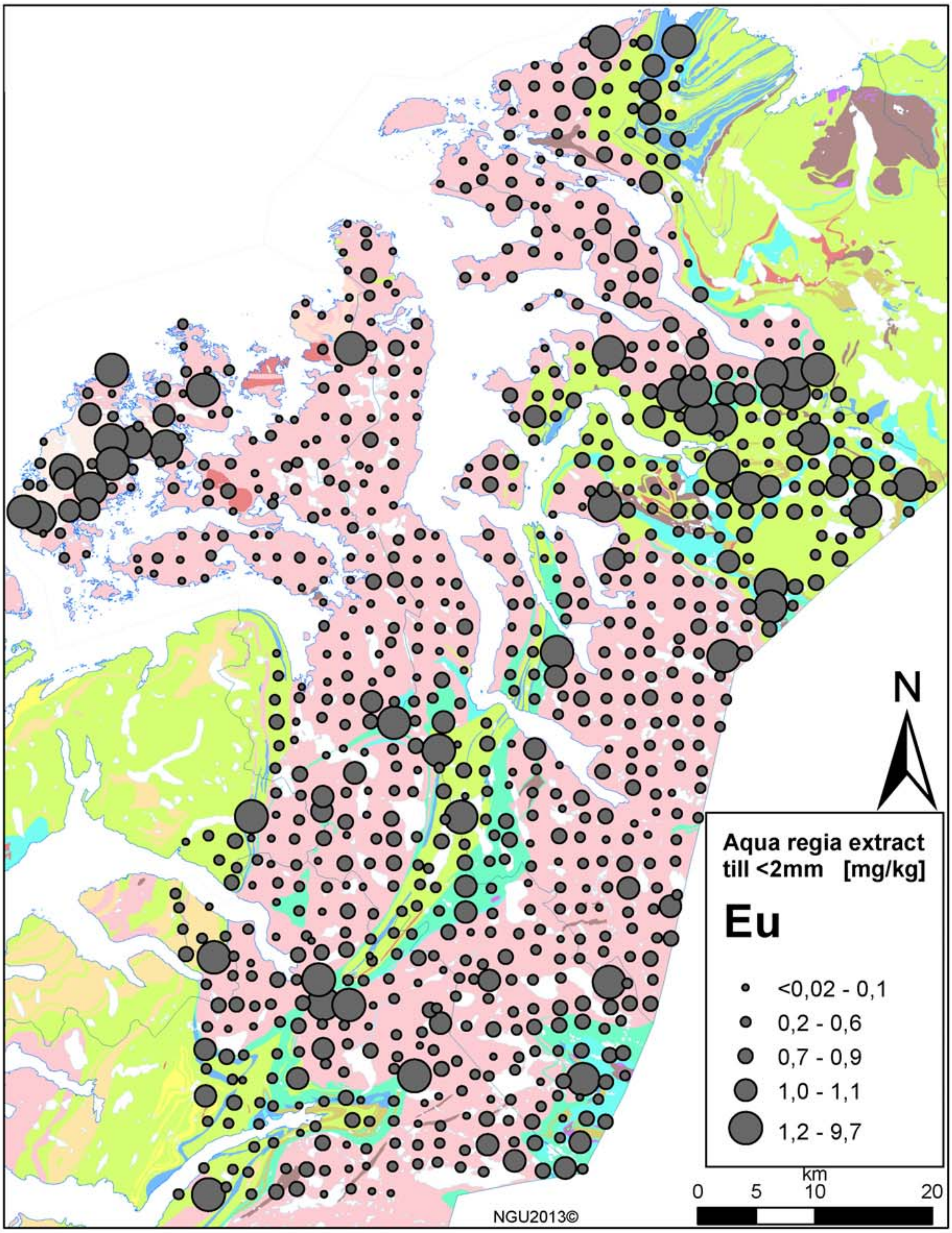

N
Aqua regia extract
till <2mm [mg/kg]
Cr
<0,5 - 2,0
2,1 - 29,6
29,7 - 55,3
55,4 - 78,5
78,6 - 343,5
km
0 5 10 20
NGU2013©

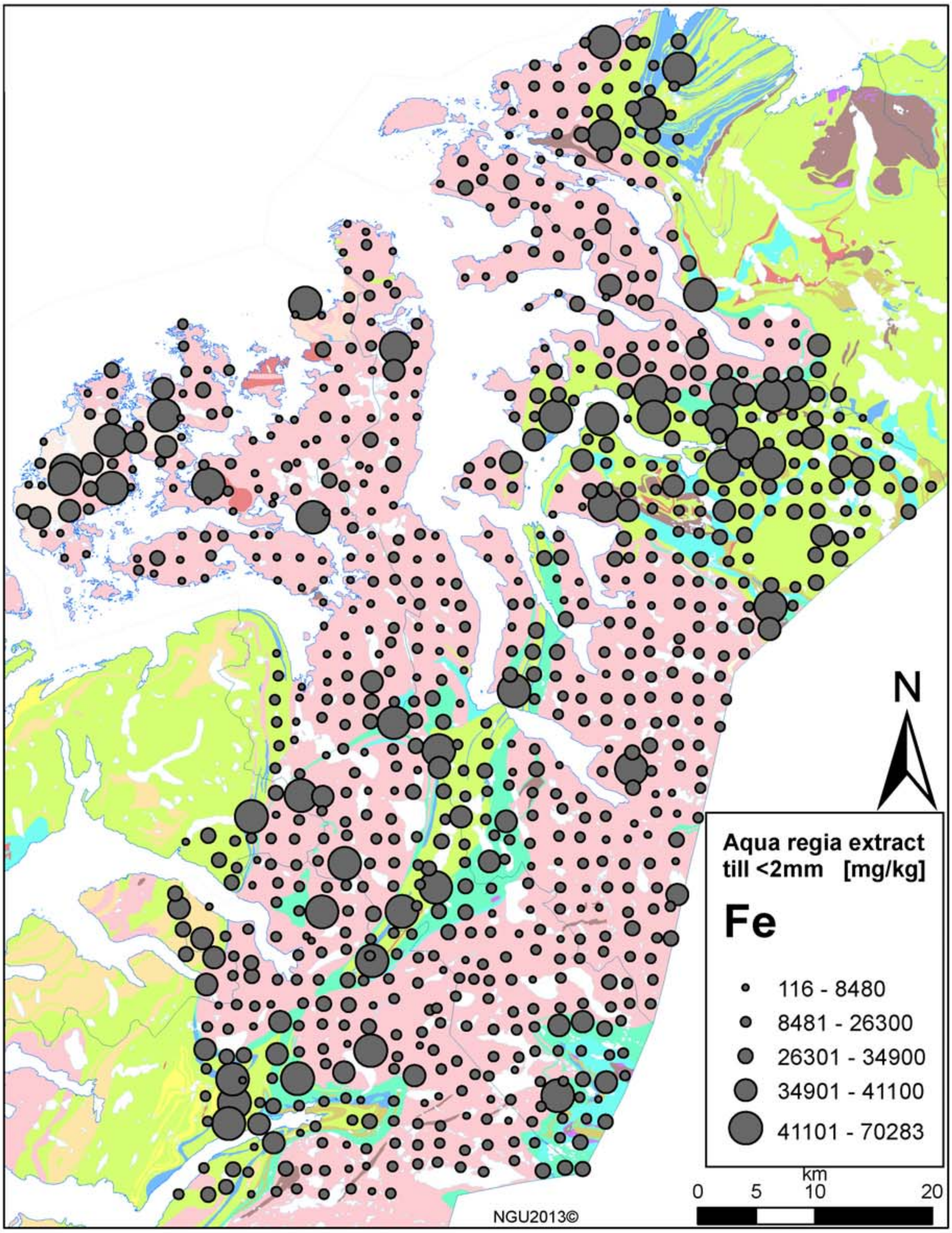

N
Aqua regia extract
till <2mm [mg/kg]
Cs
<0,02 - 0,48
0,49 - 2,07
2,08 - 3,64
3,65 - 4,66
4,67 - 9,78
km
0
5
10
20
NGU2013©

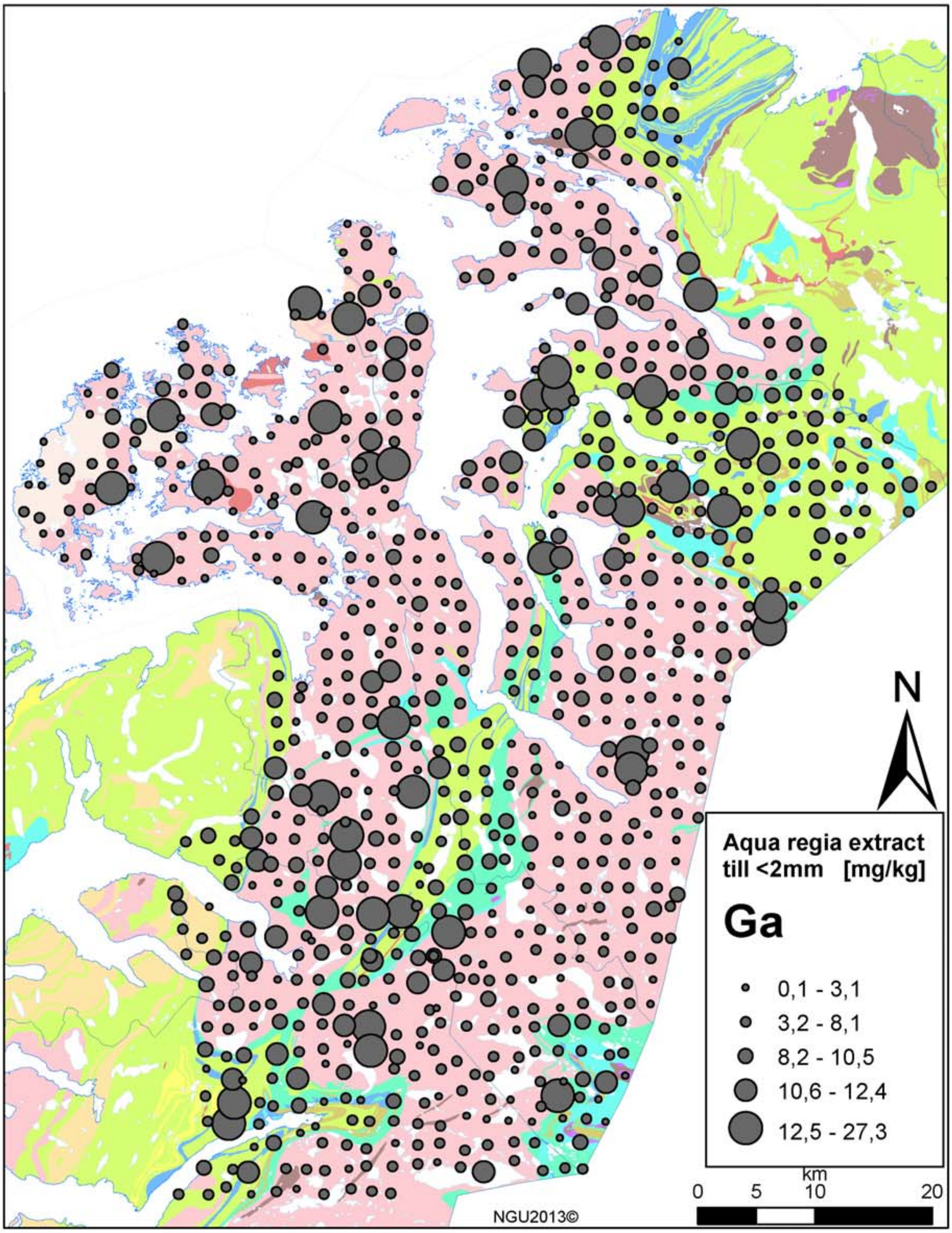

N
Aqua regia extract
till <2mm [mg/kg]
Cu
0,1 - 1,2
1,3 - 16,2
16,3 - 33,1
33,2 - 46,6
46,7 - 390,1
km
0
5
10
20
NGU2013©

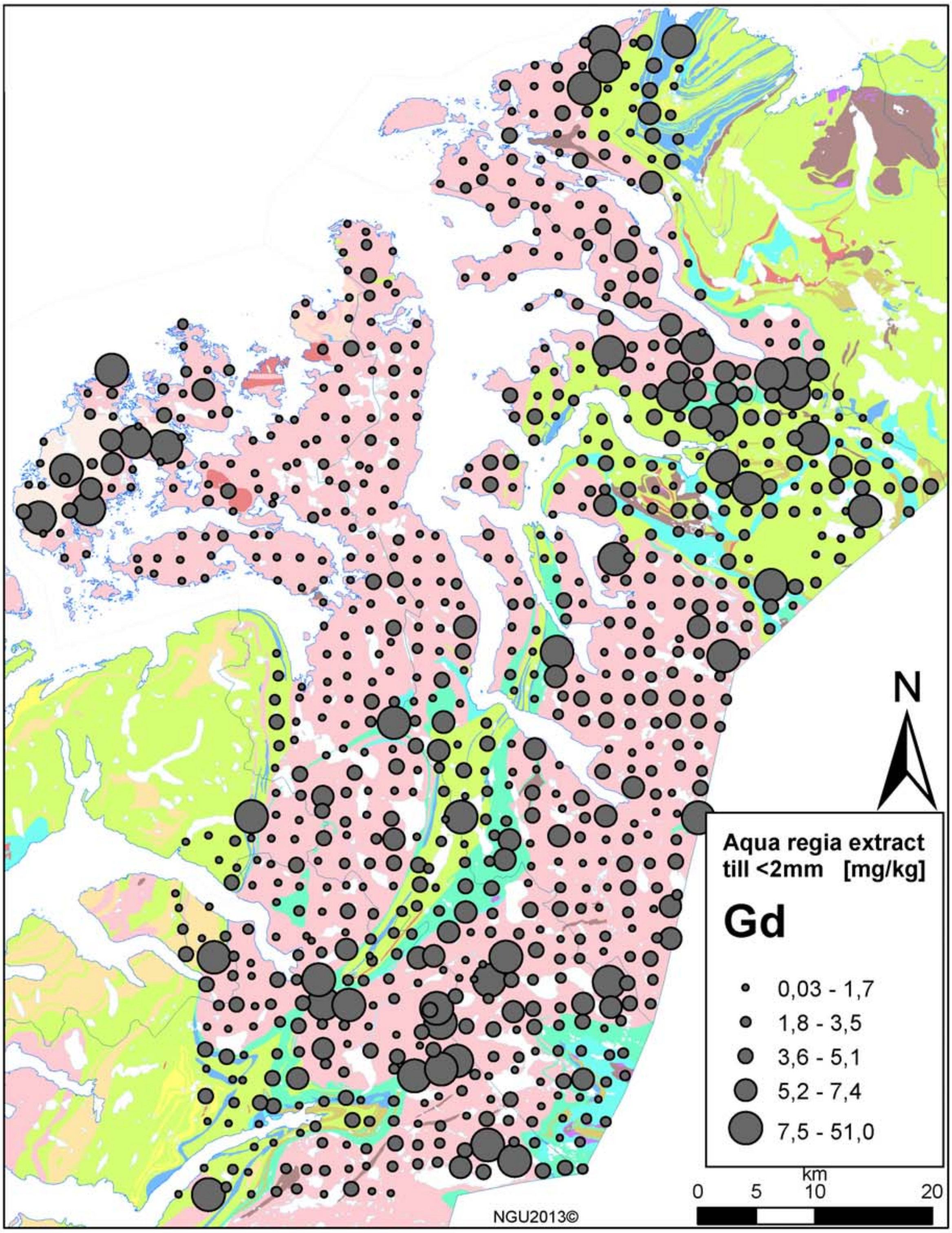

N
Aqua regia extract
till <2mm [mg/kg]
Dy
0,02 - 0,62
0,63 - 2,42
2,43 - 3,60
3,61 - 4,92
4,93 - 20,53
km
0
5
10
20
NGU2013©

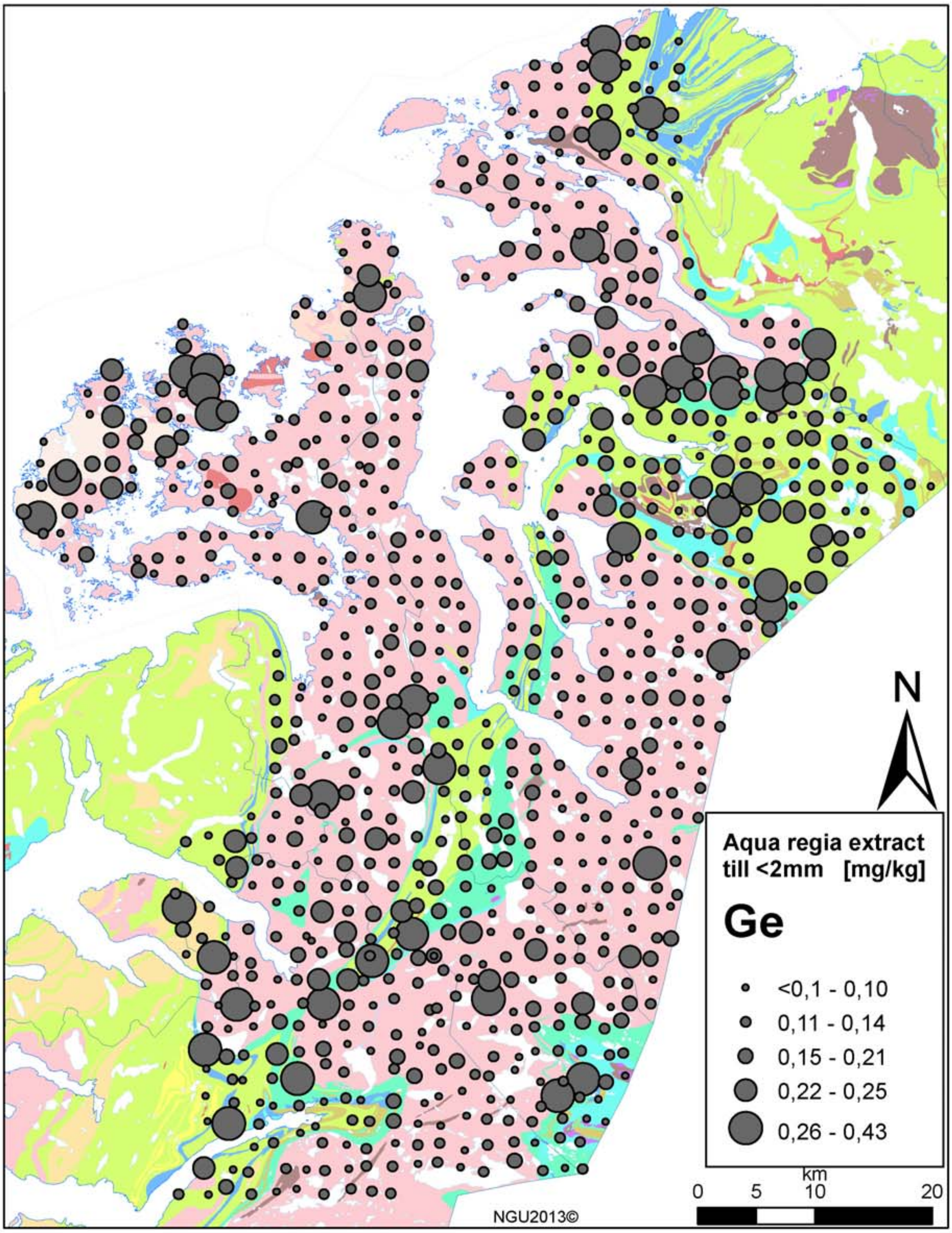

N
Aqua regia extract
till <2mm [mg/kg]
Er
<0,02 - 0,3
0,4 - 1,1
1,2 - 0,0
0,1 - 2,1
2,2 - 7,4
km
0 5 10 20
NGU2013©

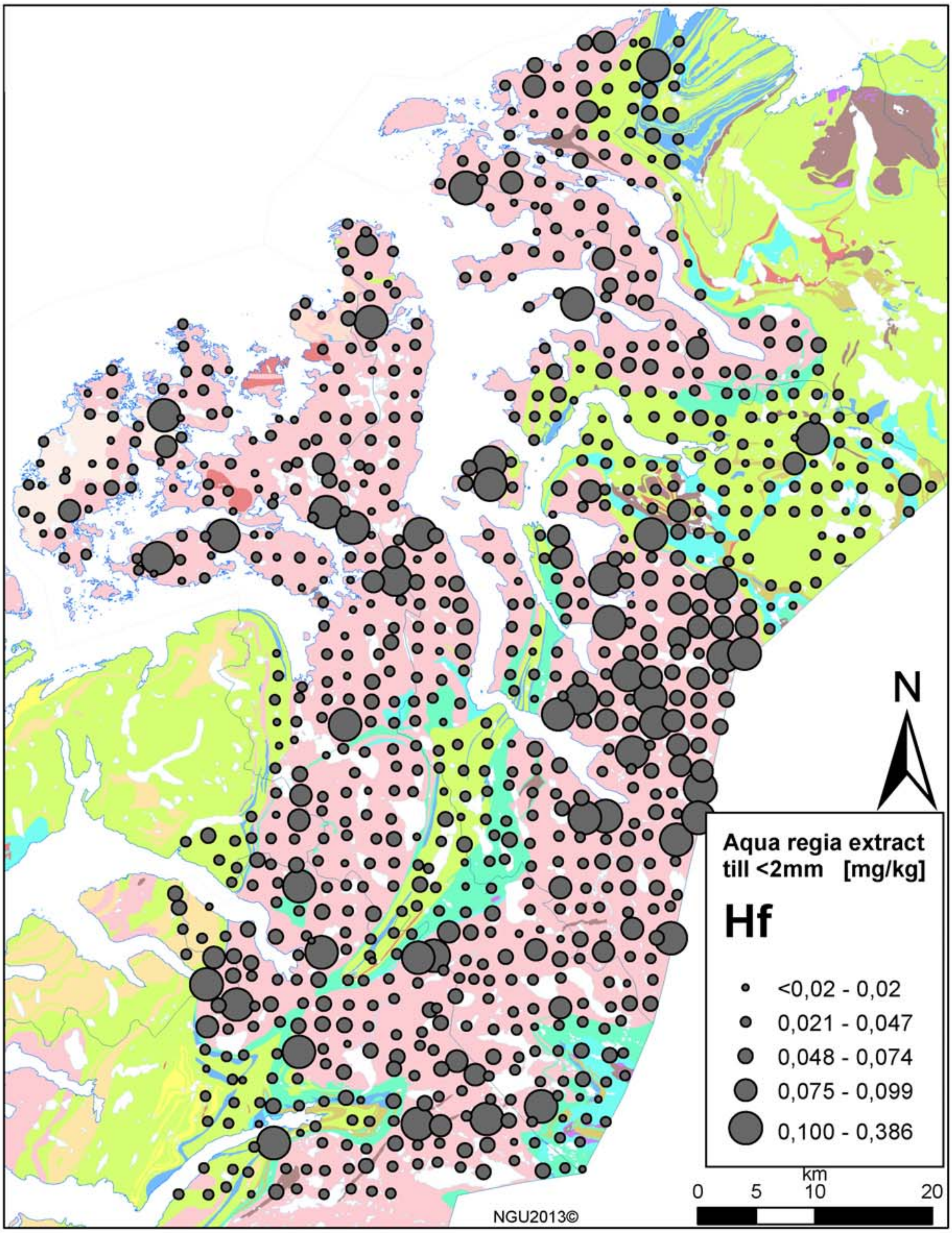

N
Aqua regia extract
till <2mm [mg/kg]
Eu
<0,02 - 0,1
0,2 - 0,6
0,7 - 0,9
1,0 - 1,1
1,2 - 9,7
km
0 5 10 20
NGU2013©

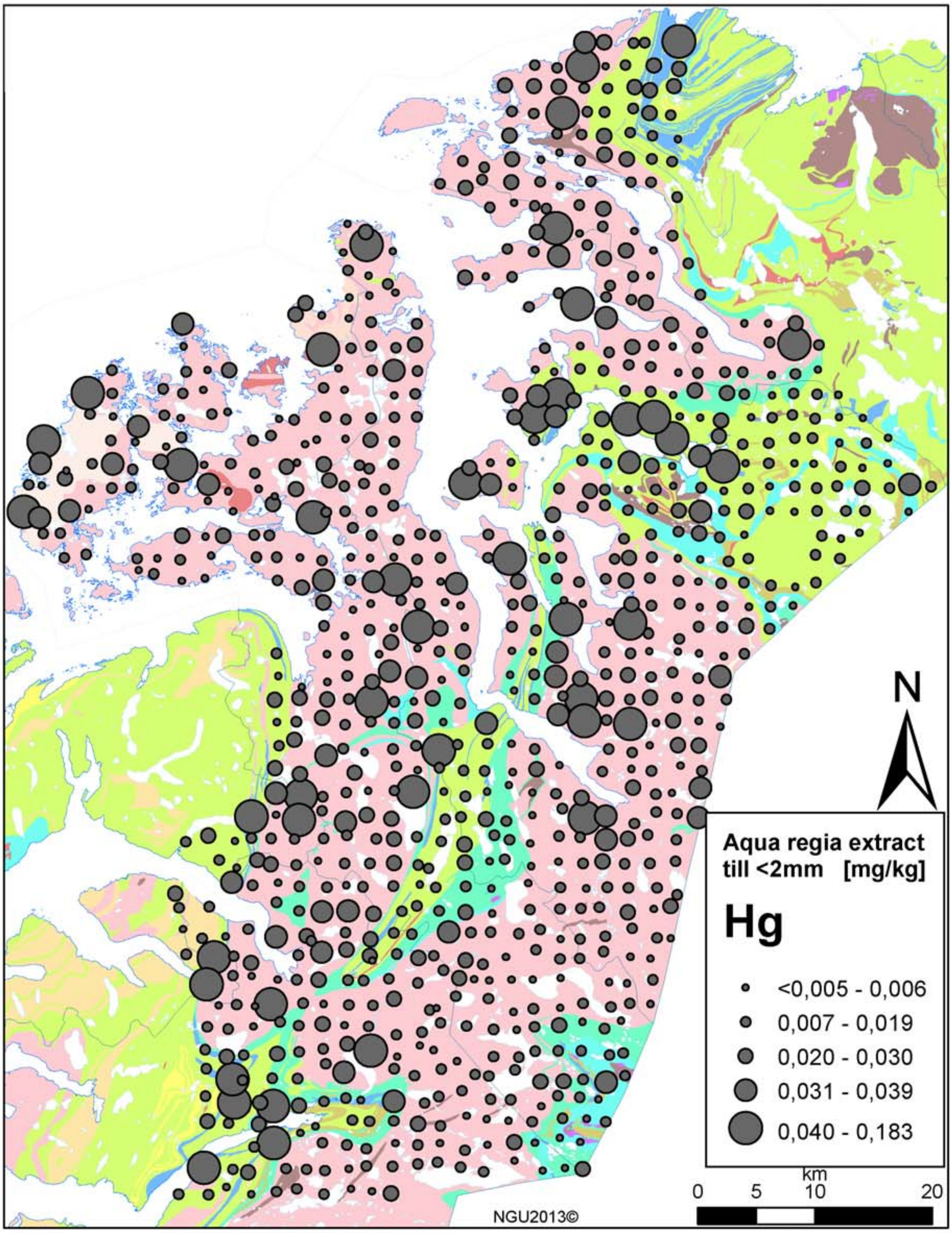

N
Aqua regia extract
till <2mm [mg/kg]
Fe
116 - 8480
8481 - 26300
26301 - 34900
34901 - 41100
41101 - 70283
km
0 5 10 20
NGU2013©

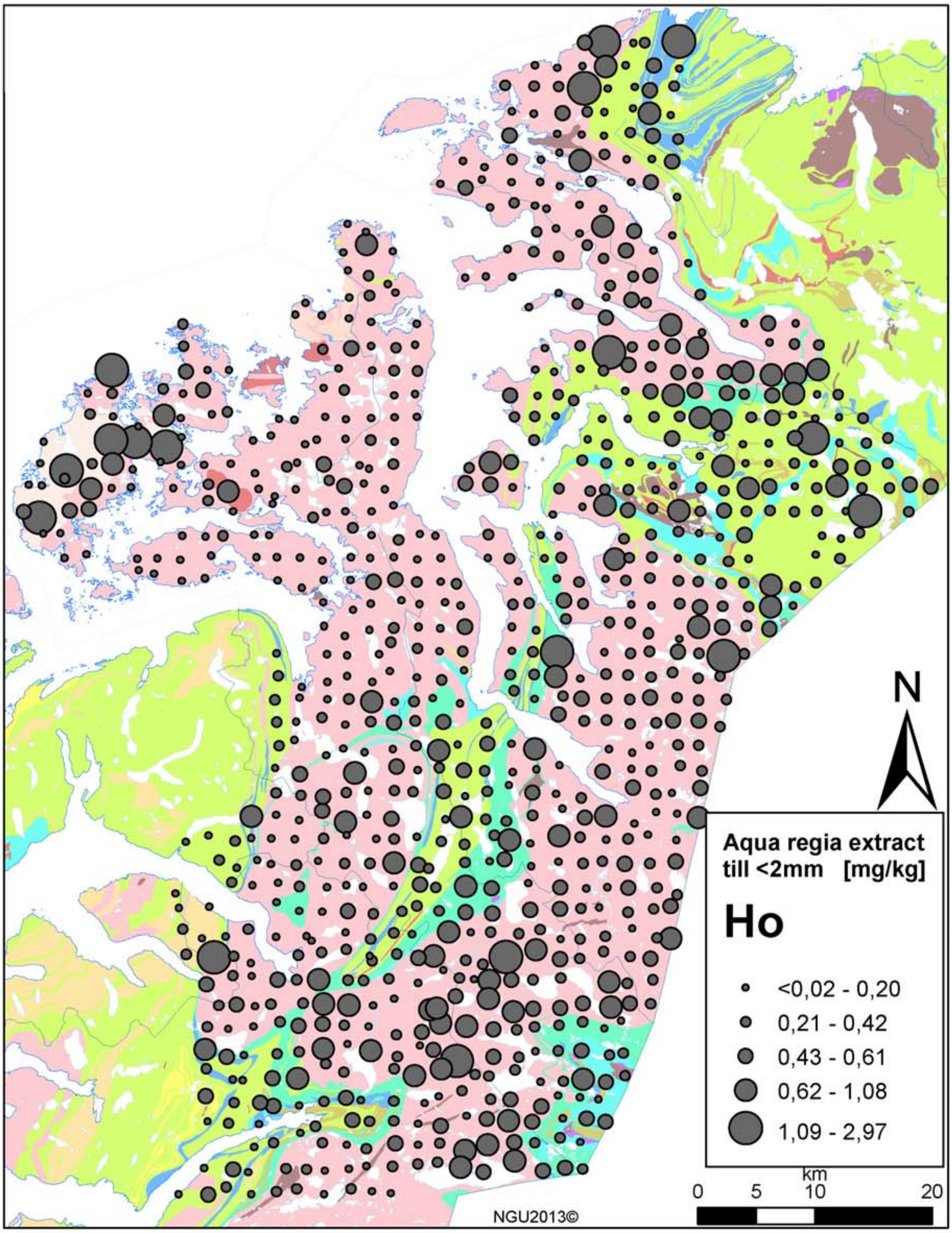

N
Aqua regia extract
till <2mm [mg/kg]
Ga
0,1 - 3,1
3,2 - 8,1
8,2 - 10,5
10,6 - 12,4
12,5 - 27,3
km
0 5 10 20
NGU2013©

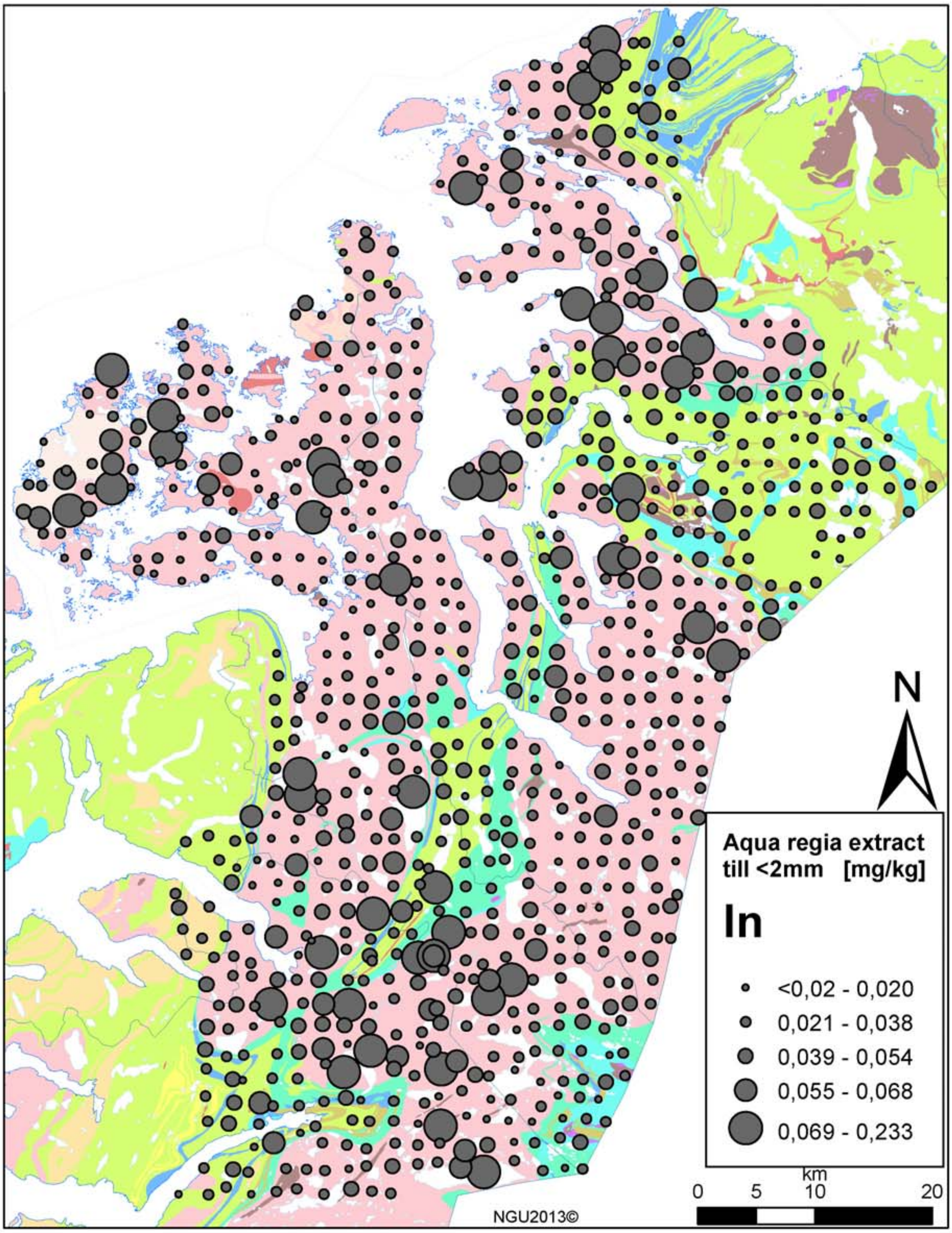

N
Aqua regia extract
till <2mm [mg/kg]
Gd
0,03 - 1,7
1,8 - 3,5
3,6 - 5,1
5,2 - 7,4
7,5 - 51,0
km
0 5 10 20
NGU2013©

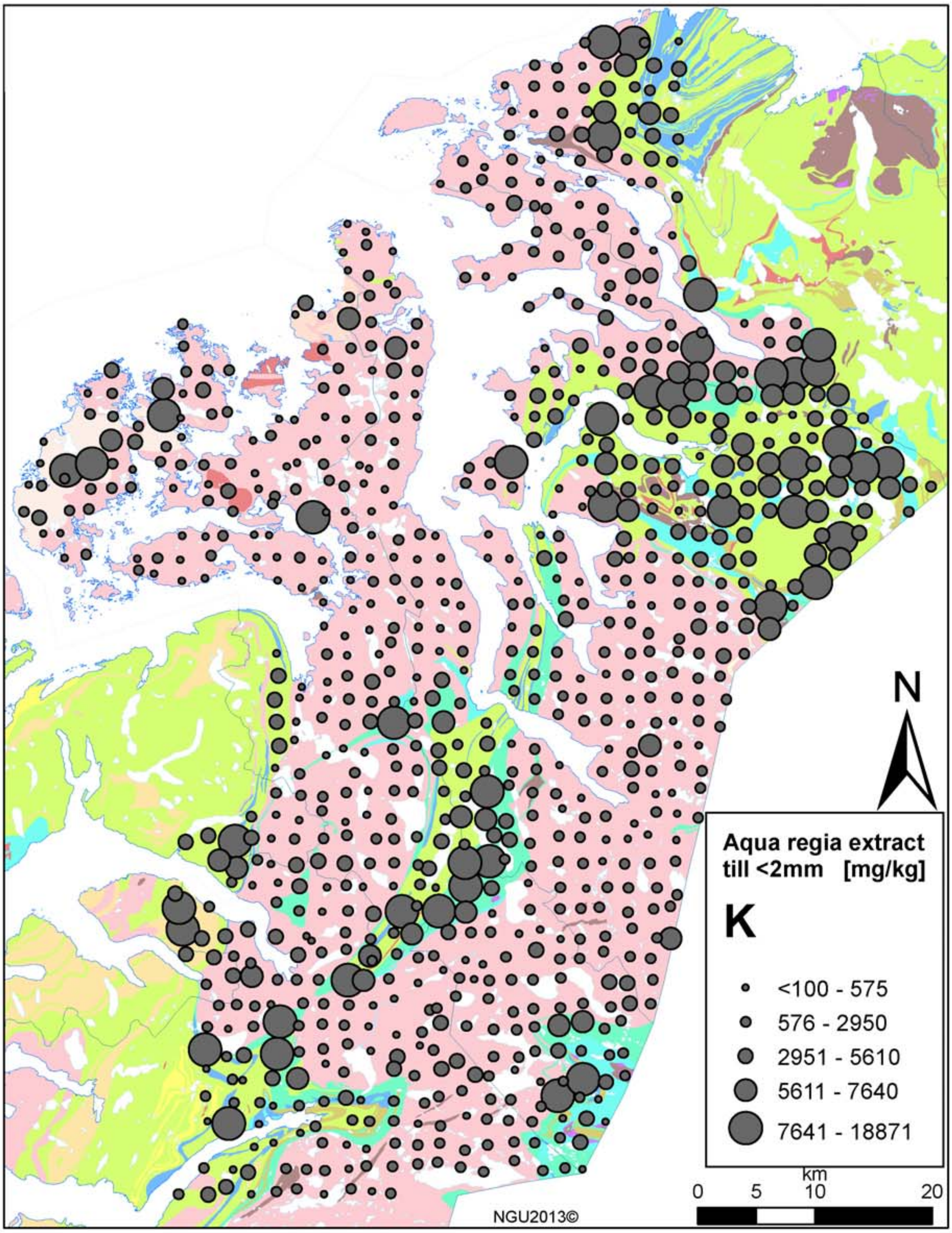

N
Aqua regia extract
till <2mm [mg/kg]
Ge
<0,1 - 0,10
0,11 - 0,14
0,15 - 0,21
0,22 - 0,25
0,26 - 0,43
km
0
5
10
20
NGU2013©

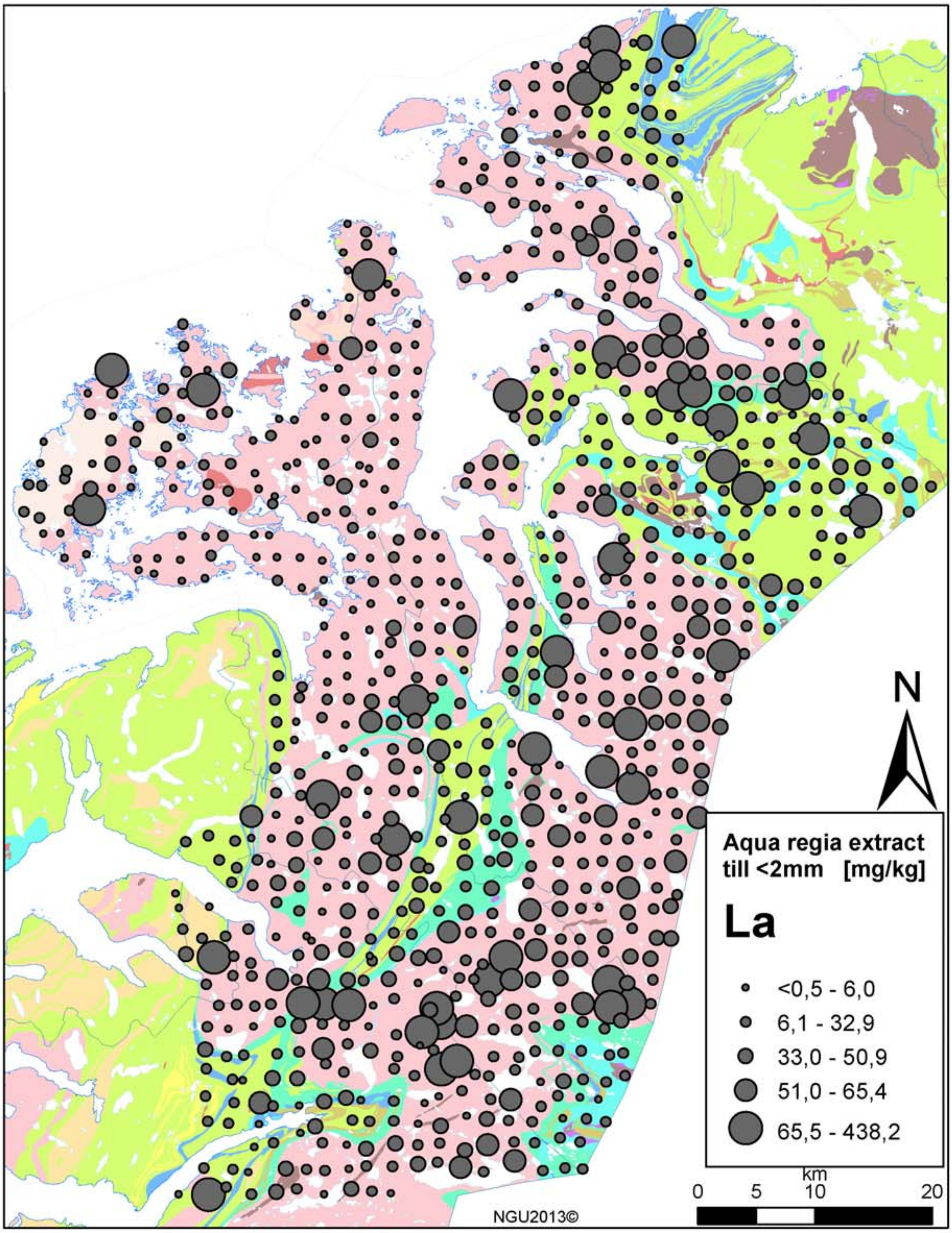

N
Aqua regia extract
till <2mm [mg/kg]
Hf
<0,02 - 0,02
0,021 - 0,047
0,048 - 0,074
0,075 - 0,099
0,100 - 0,386
km
0 5 10 20
NGU2013©

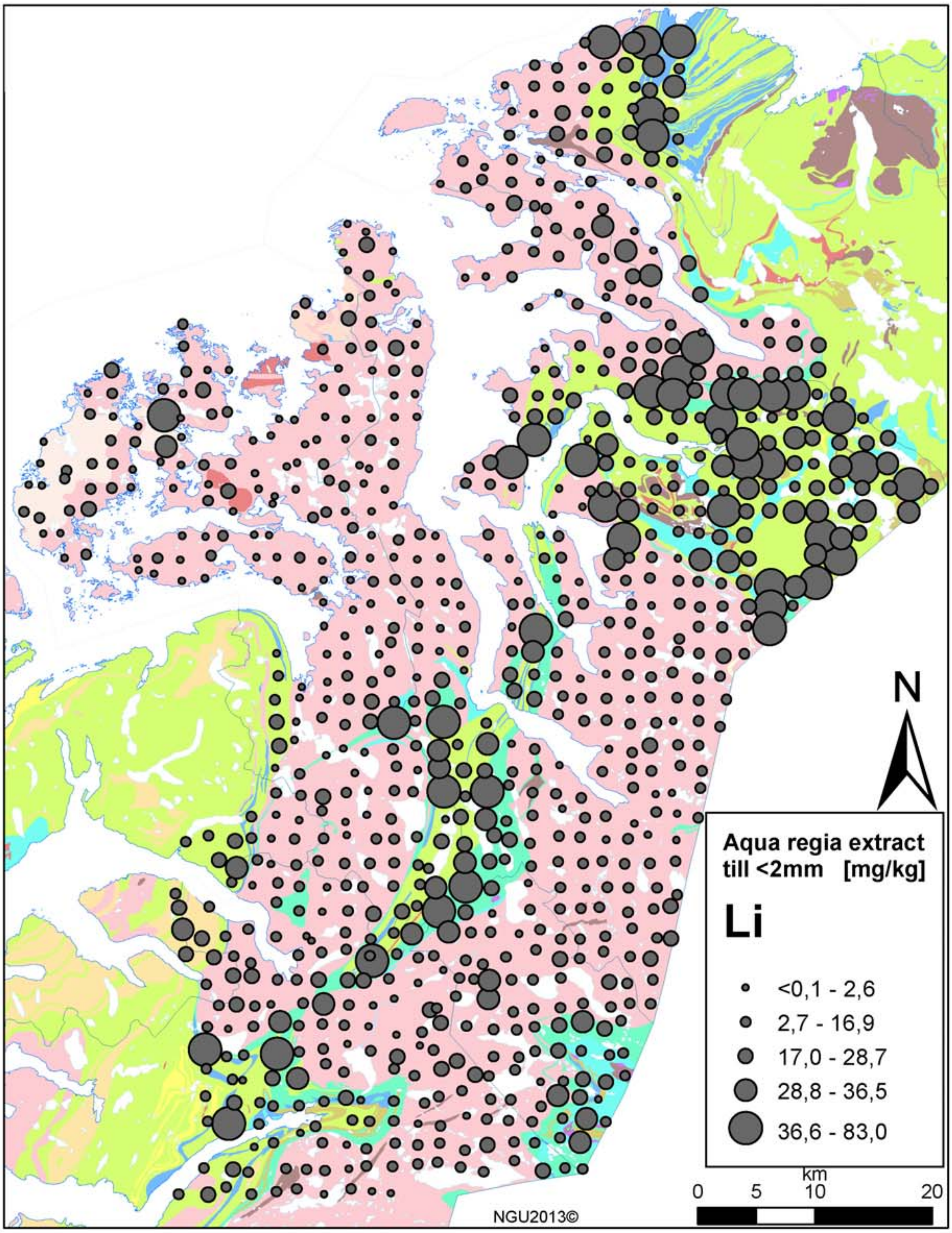

N
Aqua regia extract
till <2mm [mg/kg]
Hg
<0,005 - 0,006
0,007 - 0,019
0,020 - 0,030
0,031 - 0,039
0,040 - 0,183
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Ho
<0,02 - 0,20
0,21 - 0,42
0,43 - 0,61
0,62 - 1,08
1,09 - 2,97
km
0 5 10 20
NGU2013©

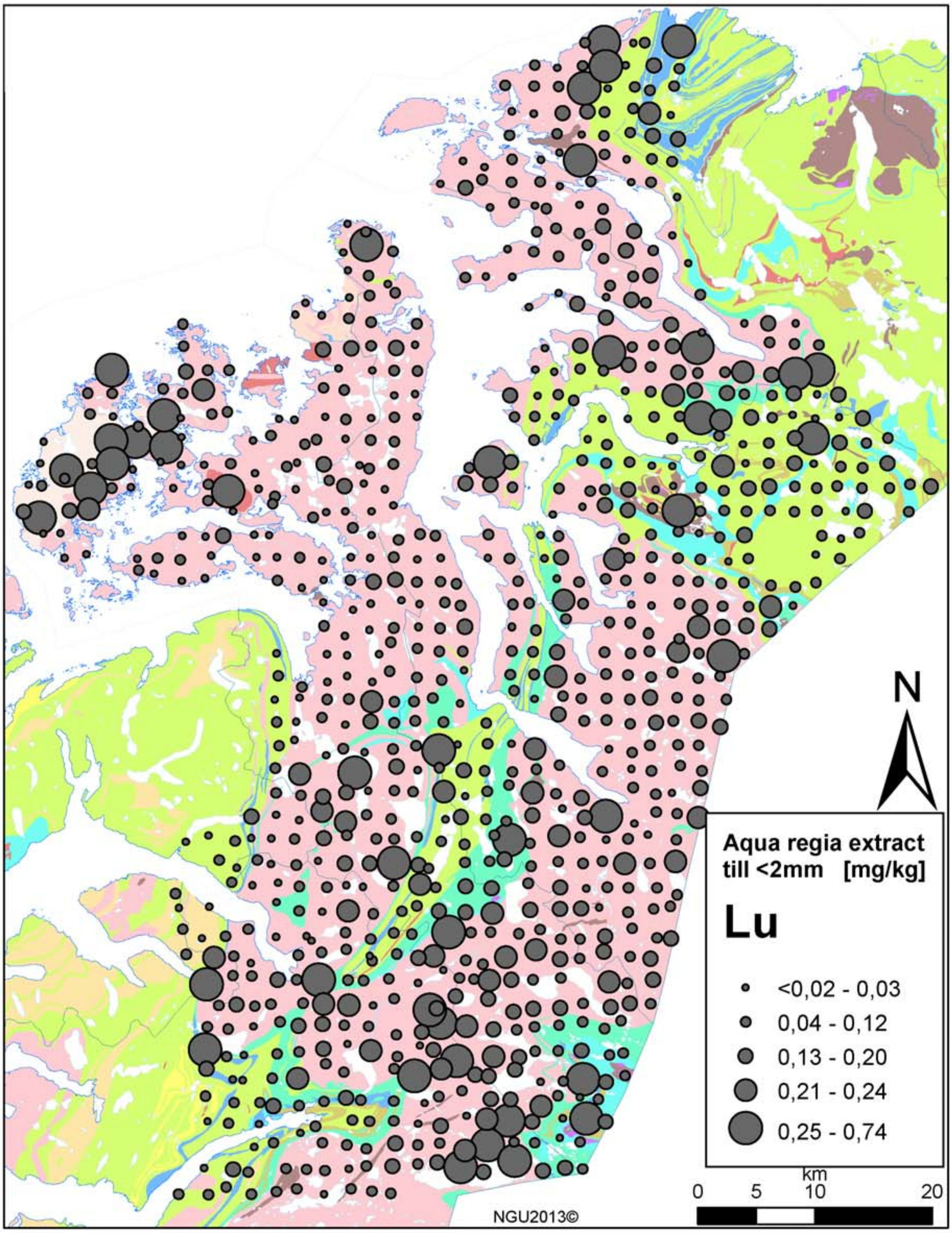

N
Aqua regia extract
till <2mm [mg/kg]
In
<0,02 - 0,020
0,021 - 0,038
0,039 - 0,054
0,055 - 0,068
0,069 - 0,233
km
0 5 10 20
NGU2013©

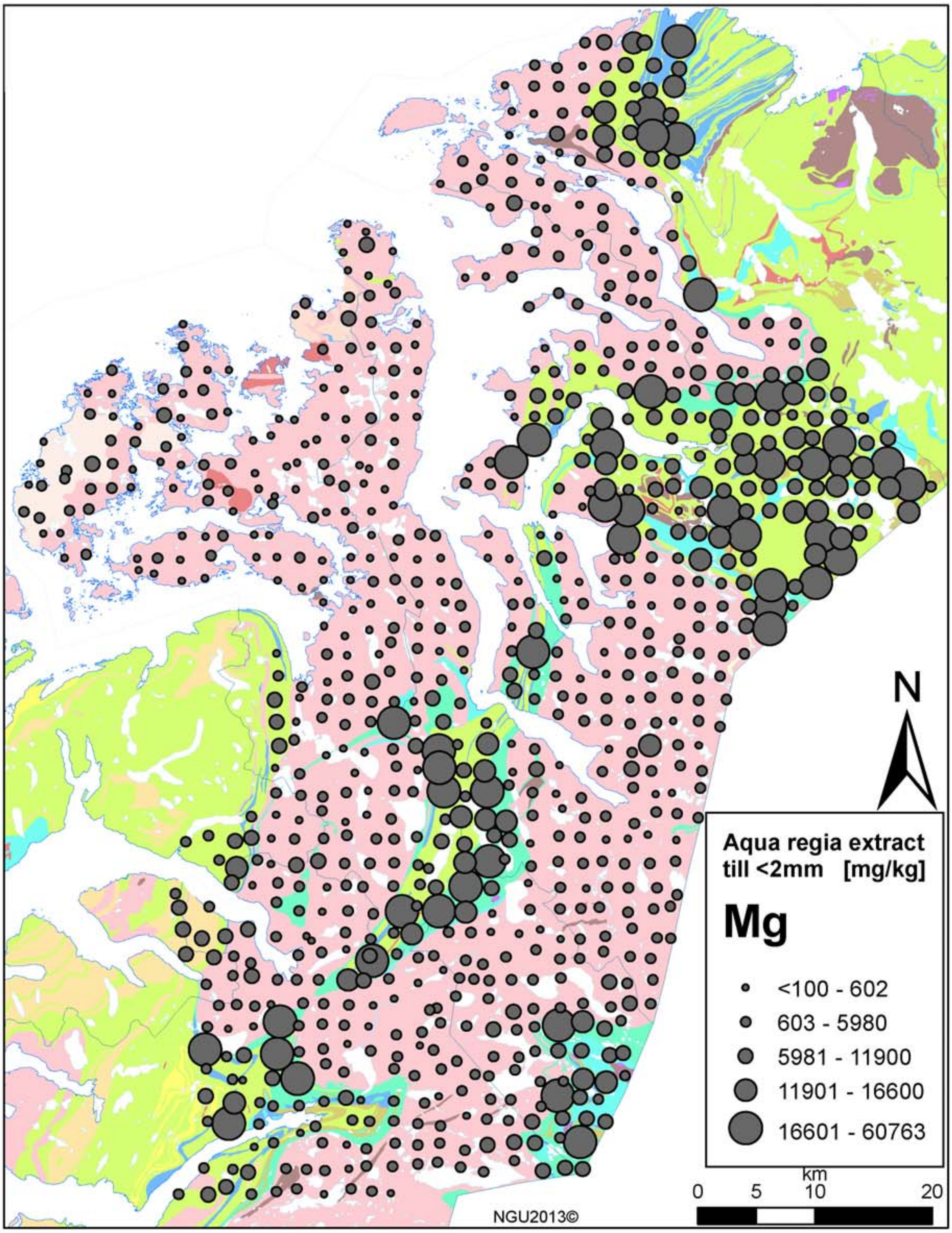

N
Aqua regia extract
till <2mm [mg/kg]
K
<100 - 575
576 - 2950
2951 - 5610
5611 - 7640
7641 - 18871
km
0
5
10
20
NGU2013©

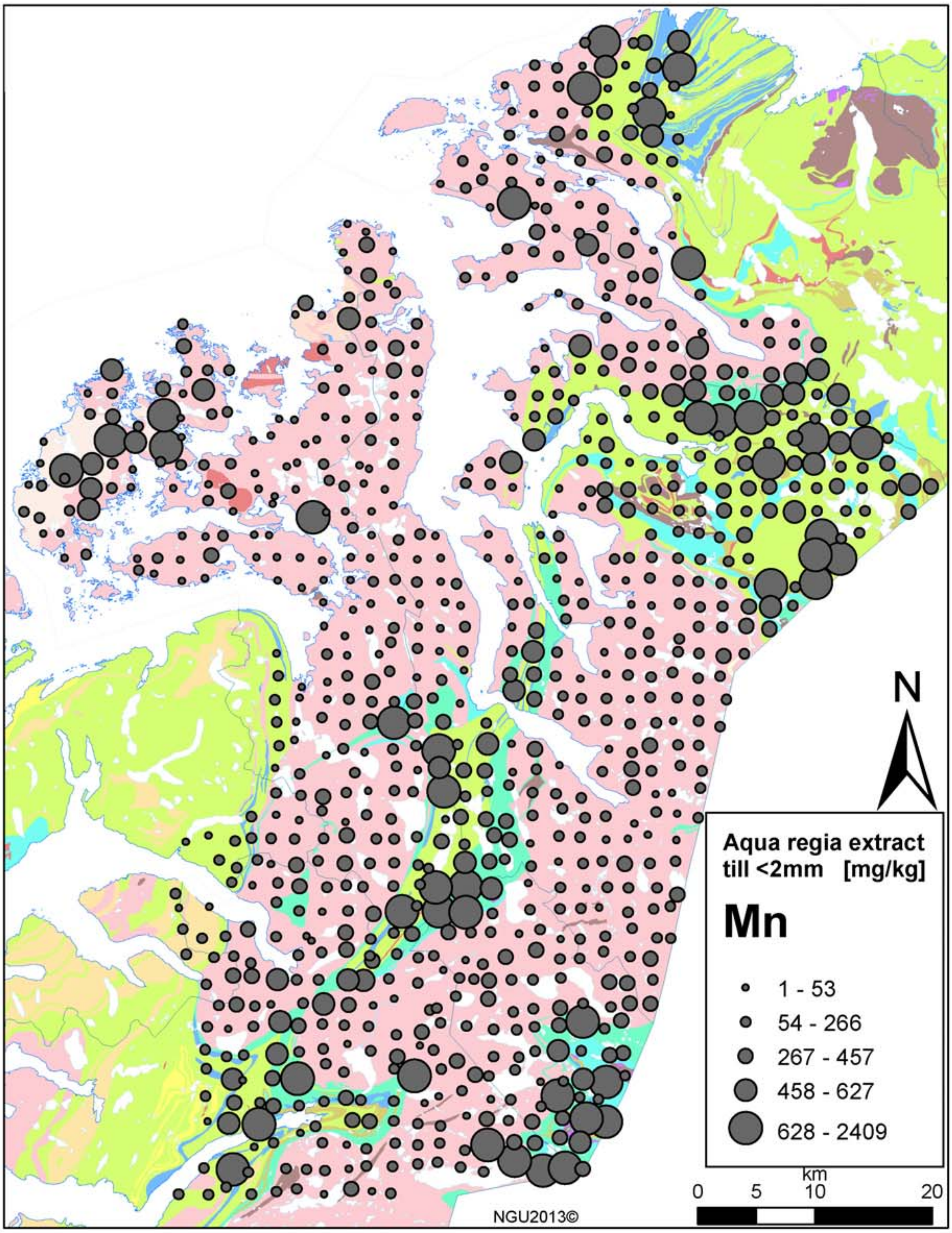

N
Aqua regia extract
till <2mm [mg/kg]
La
<0,5 - 6,0
6,1 - 32,9
33,0 - 50,9
51,0 - 65,4
65,5 - 438,2
km
0 5 10 20
NGU2013©

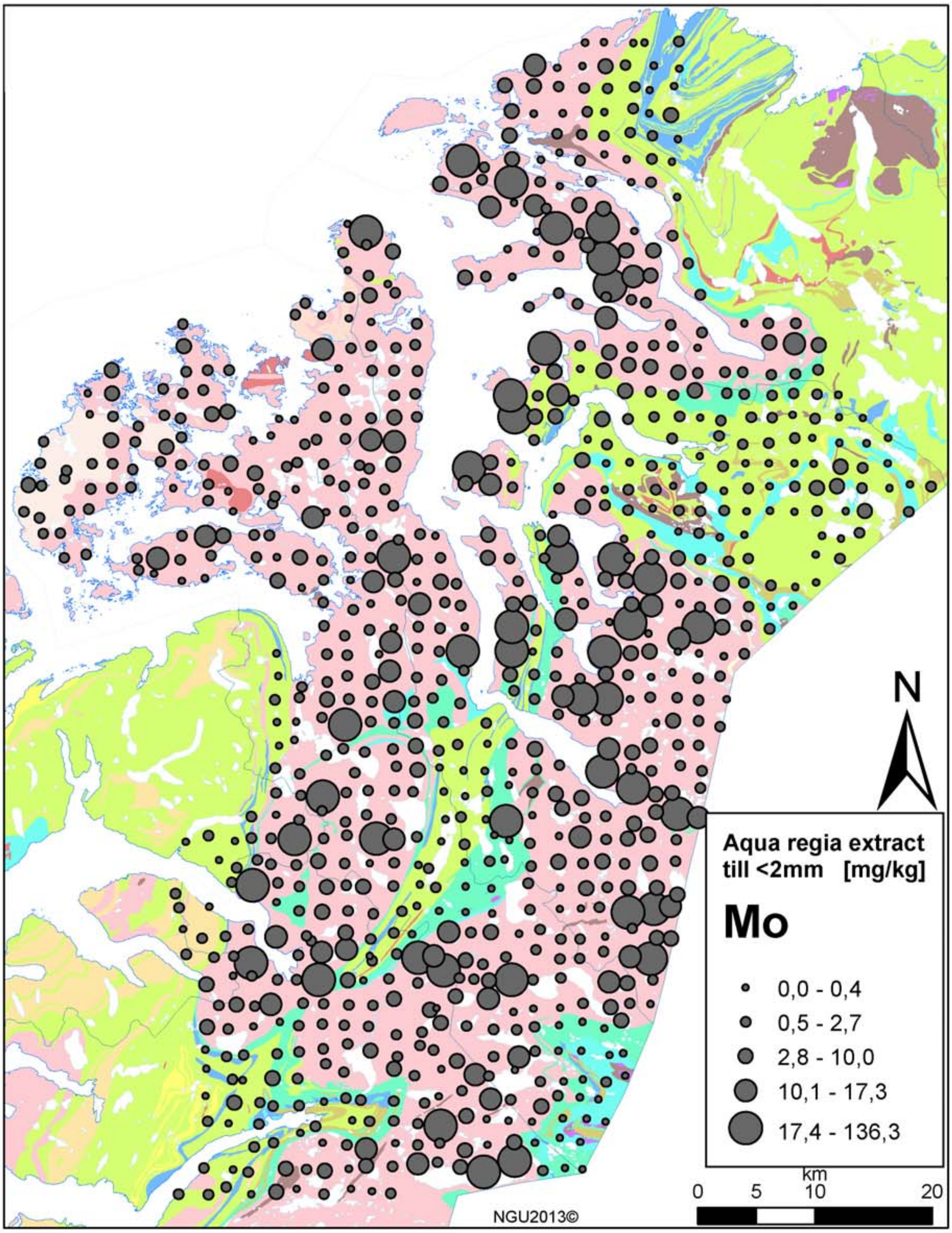


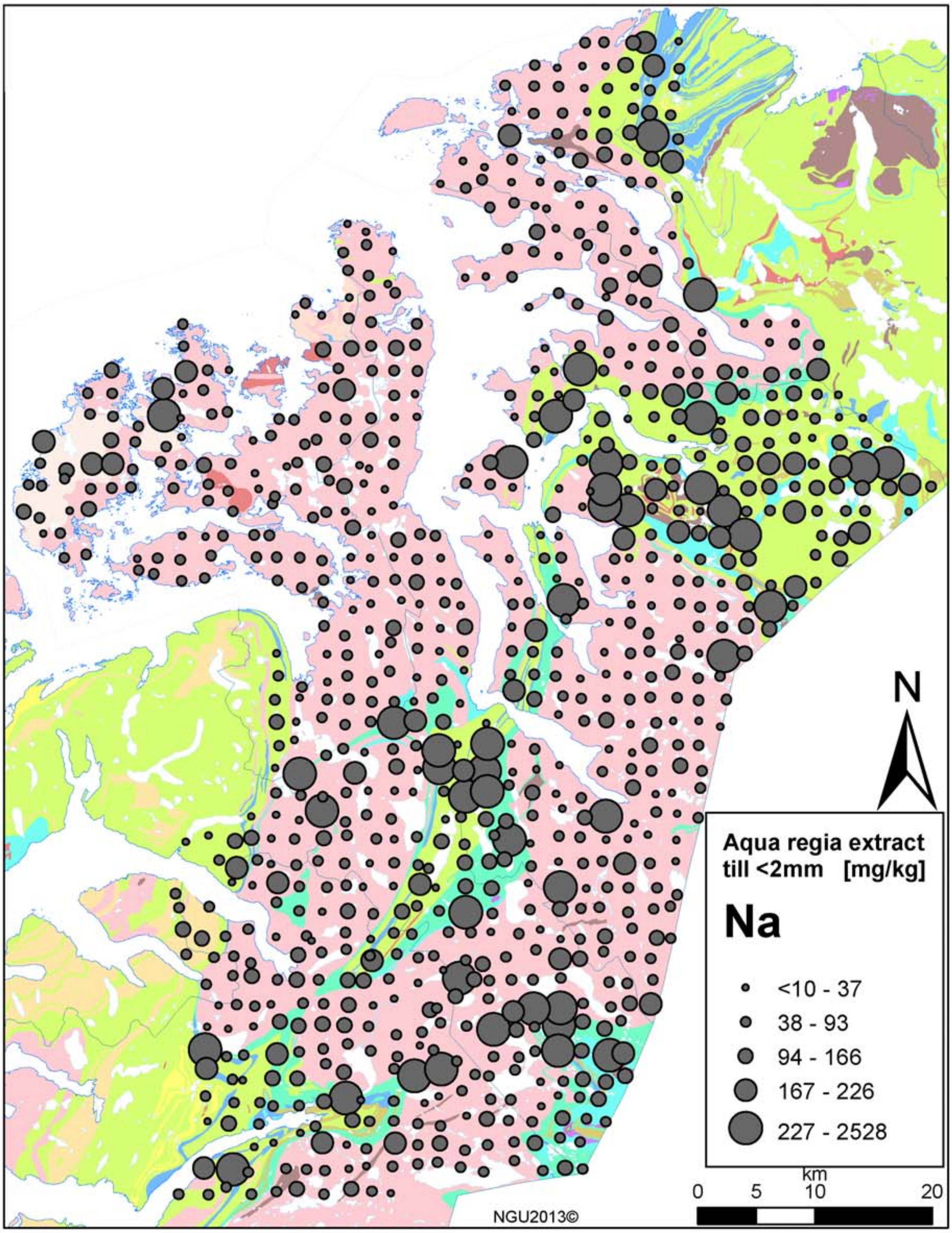
N
Aqua regia extract
till <2mm [mg/kg]
Li
<0,1 - 2,6
2,7 - 16,9
17,0 - 28,7
28,8 - 36,5
36,6 - 83,0
km
0 5 10 20
NGU2013©

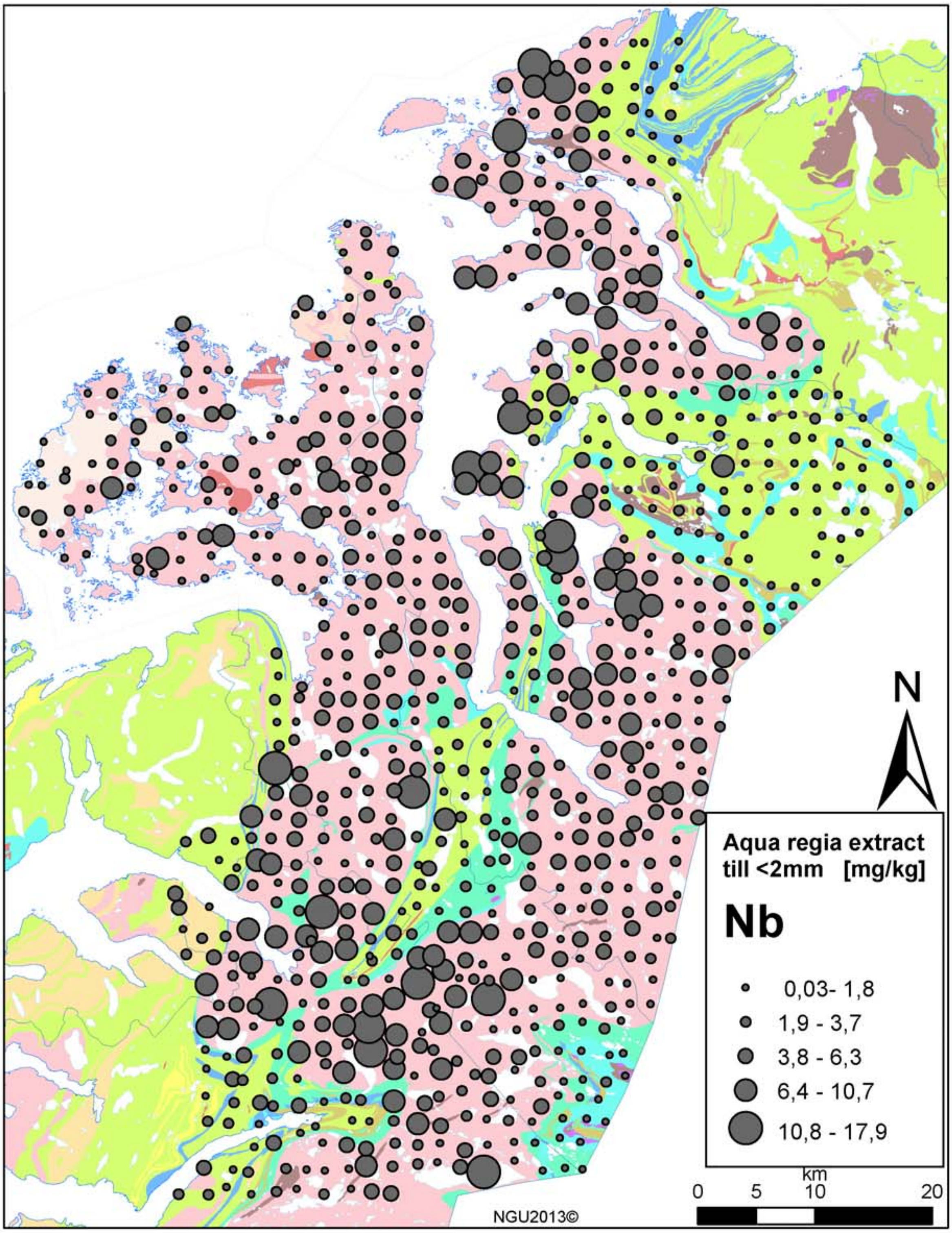

N
Aqua regia extract
till <2mm [mg/kg]
Lu
<0,02 - 0,03
0,04 - 0,12
0,13 - 0,20
0,21 - 0,24
0,25 - 0,74
km
0
5
10
20
NGU2013©

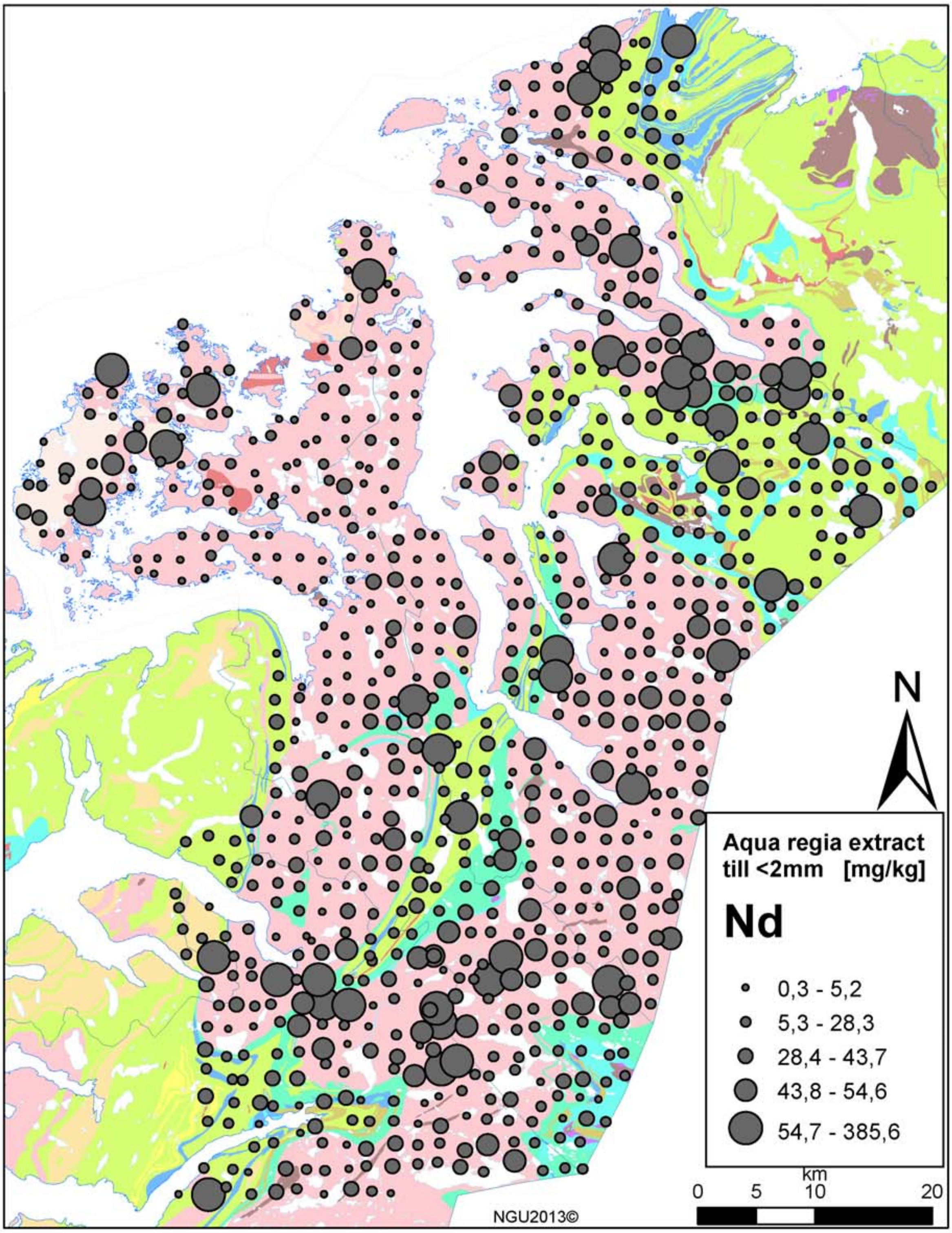

N
Aqua regia extract
till <2mm [mg/kg]
Mg
<100 - 602
603 - 5980
5981 - 11900
11901 - 16600
16601 - 60763
km
0 5 10 20
NGU2013©

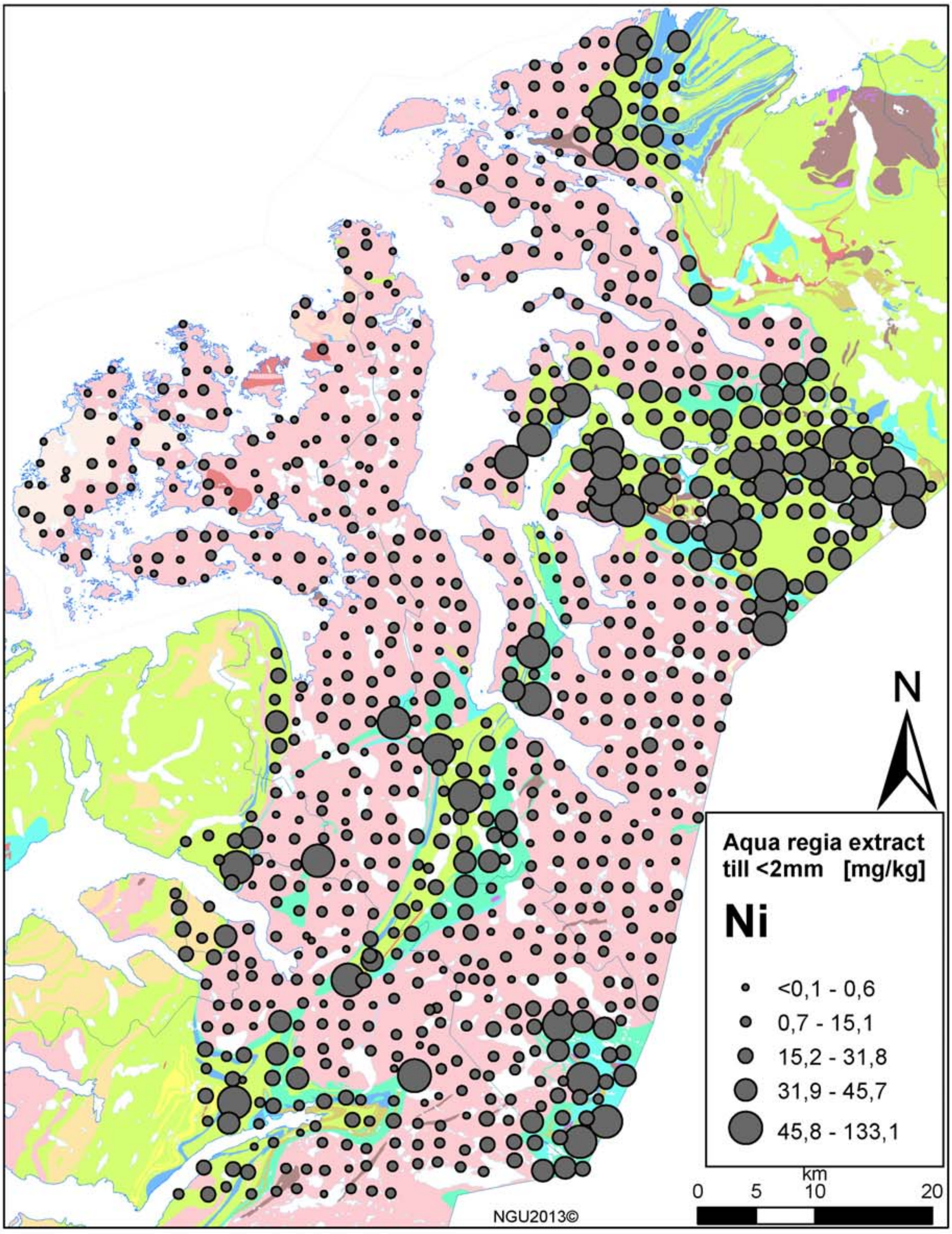

N
Aqua regia extract
till <2mm [mg/kg]
Mn
1 - 53
54 - 266
267 - 457
458 - 627
628 - 2409
km
0 5 10 20
NGU2013©

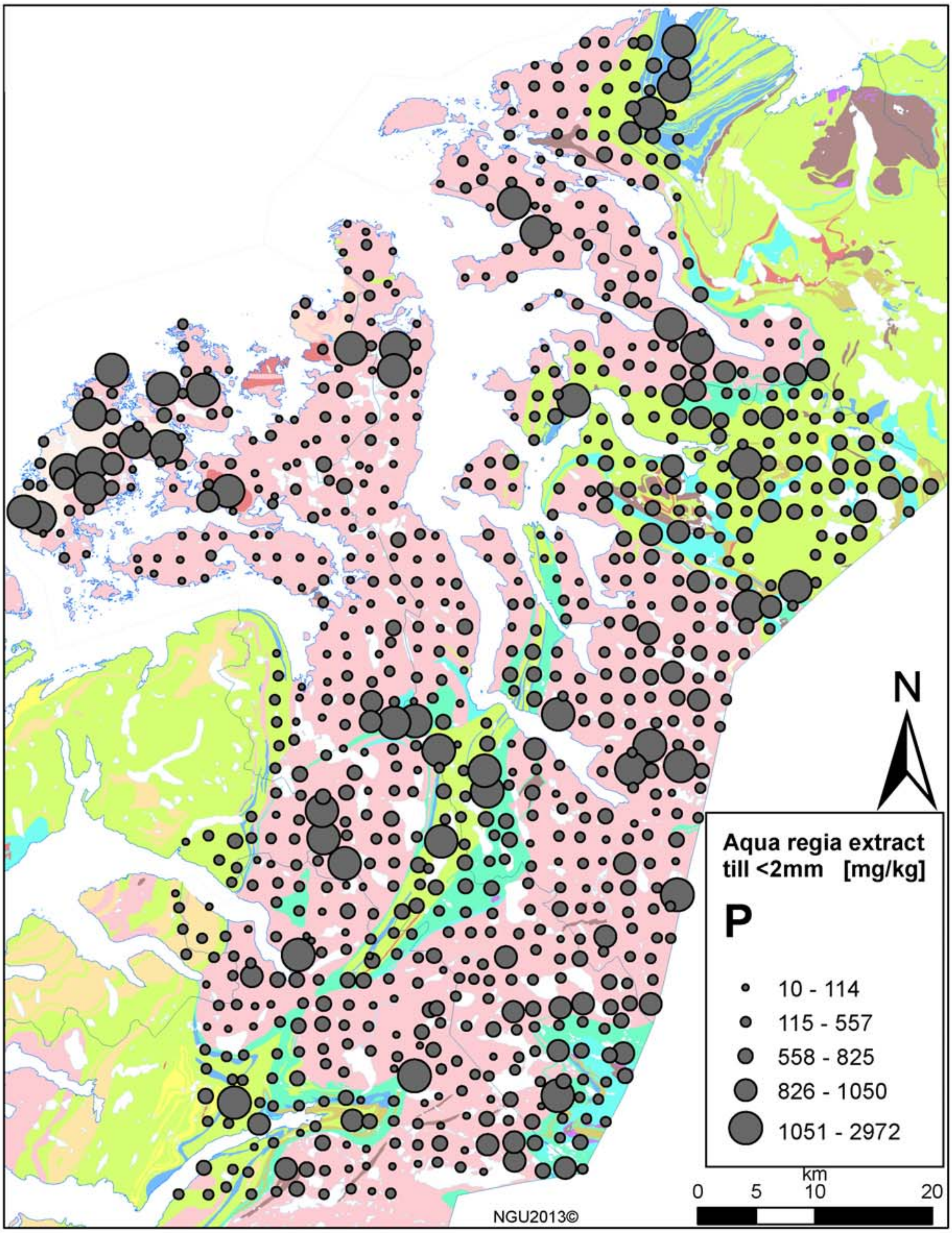

N
Aqua regia extract
till <2mm [mg/kg]
Mo
0,0 - 0,4
0,5 - 2,7
2,8 - 10,0
10,1 - 17,3
17,4 - 136,3
km
0
5
10
20
NGU2013©

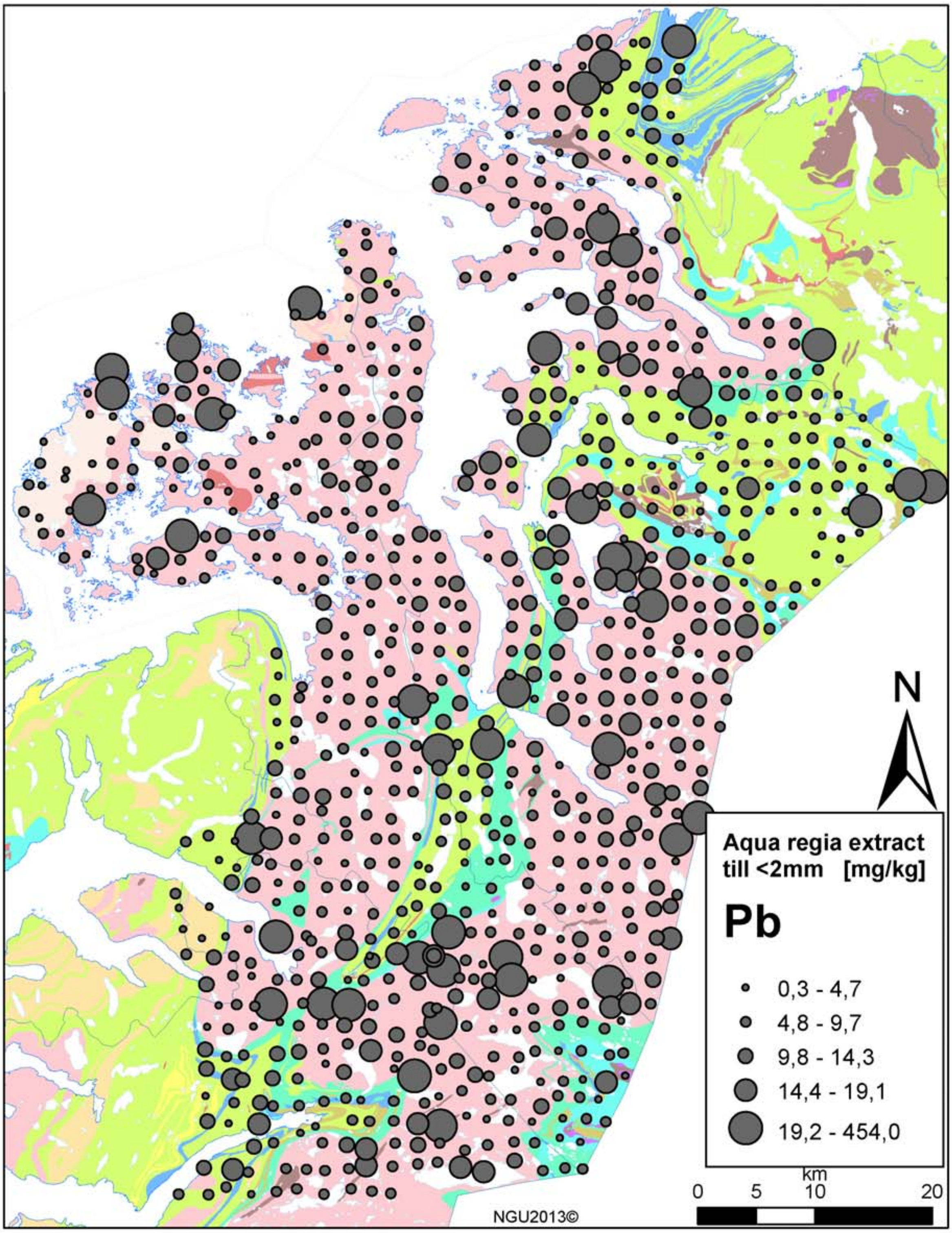

N
Aqua regia extract
till <2mm [mg/kg]
Na
<10 - 37
38 - 93
94 - 166
167 - 226
227 - 2528
km
0 5 10 20
NGU2013©

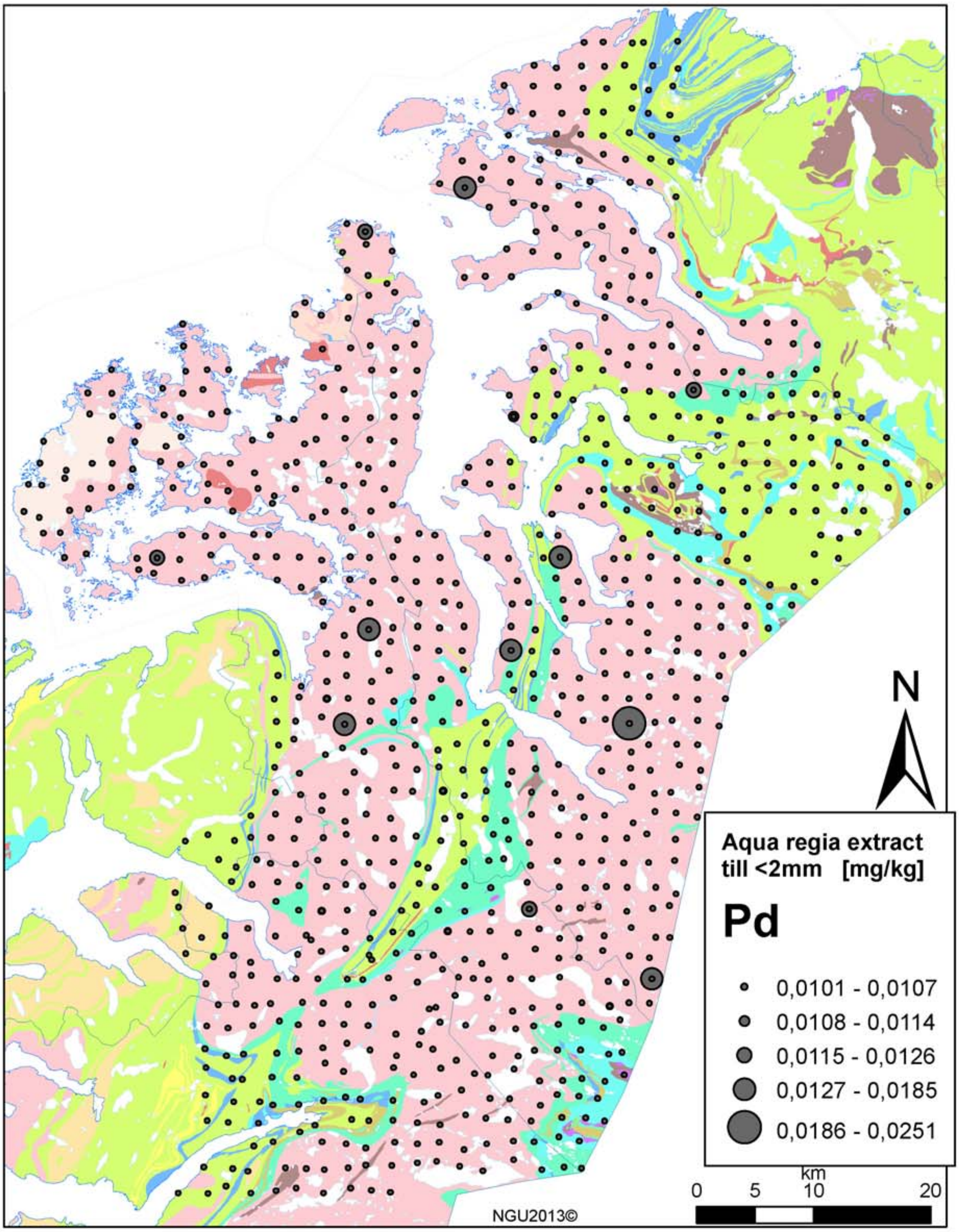

N
Aqua regia extract
till <2mm [mg/kg]
Nb
0,03- 1,8
1,9 - 3,7
3,8 - 6,3
6,4 - 10,7
10,8 - 17,9
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Nd
0,3 - 5,2
5,3 - 28,3
28,4 - 43,7
43,8 - 54,6
54,7 - 385,6
km
0
5
10
20
NGU2013©

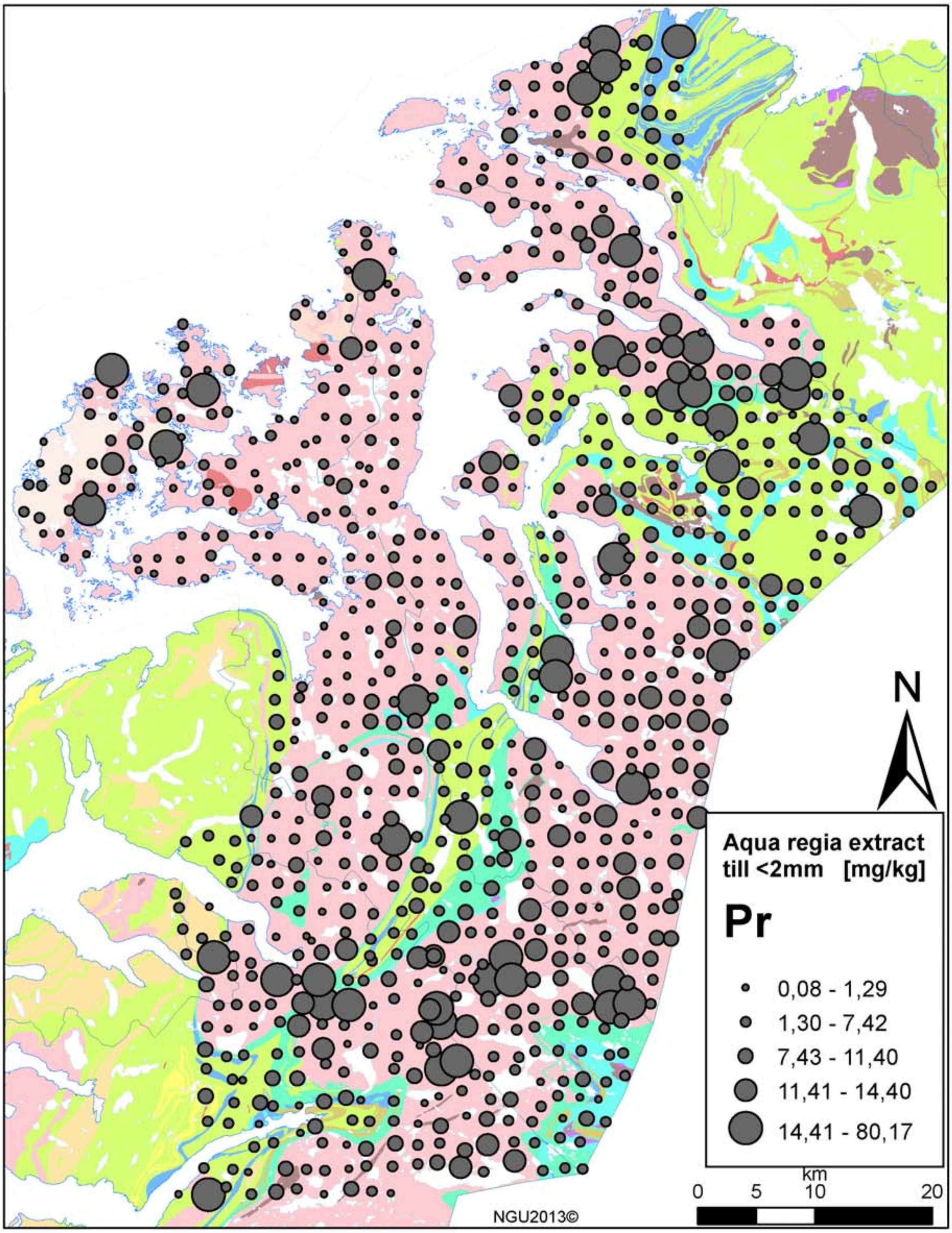

N
Aqua regia extract
till <2mm [mg/kg]
Ni
<0,1 - 0,6
0,7 - 15,1
15,2 - 31,8
31,9 - 45,7
45,8 - 133,1
km
0 5 10 20
NGU2013©

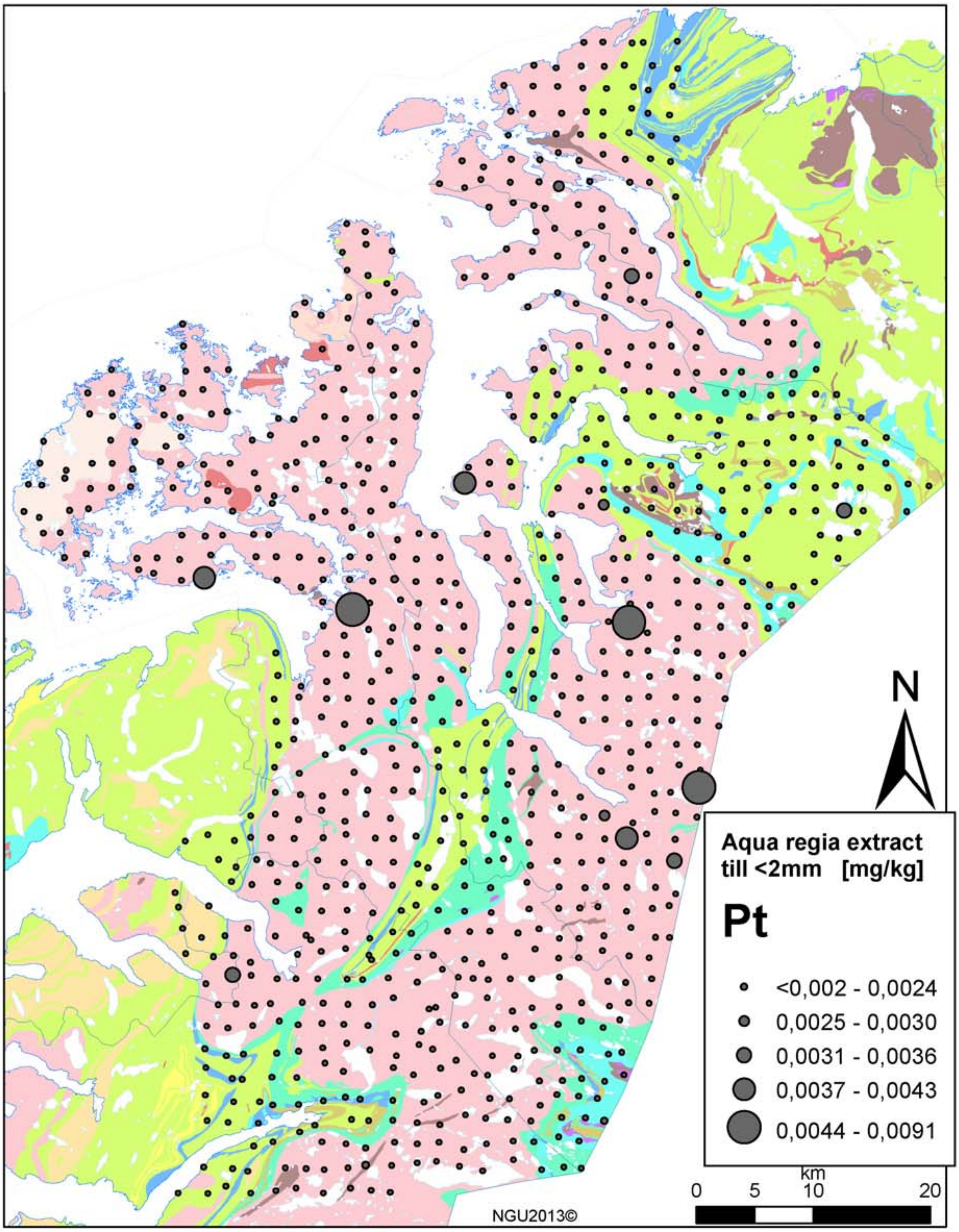

N
Aqua regia extract
till <2mm [mg/kg]
P
10 - 114
115 - 557
558 - 825
826 - 1050
1051 - 2972
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Pb
0,3 - 4,7
4,8 - 9,7
9,8 - 14,3
14,4 - 19,1
19,2 - 454,0
km
0 5 10 20
NGU2013©



Attention: QC results indicate rather poor reproducibiblty


N
Aqua regia extract
till <2mm [mg/kg]
Pr
0,08 - 1,29
1,30 - 7,42
7,43 - 11,40
11,41 - 14,40
14,41 - 80,17
km
0 5 10 20
NGU2013©



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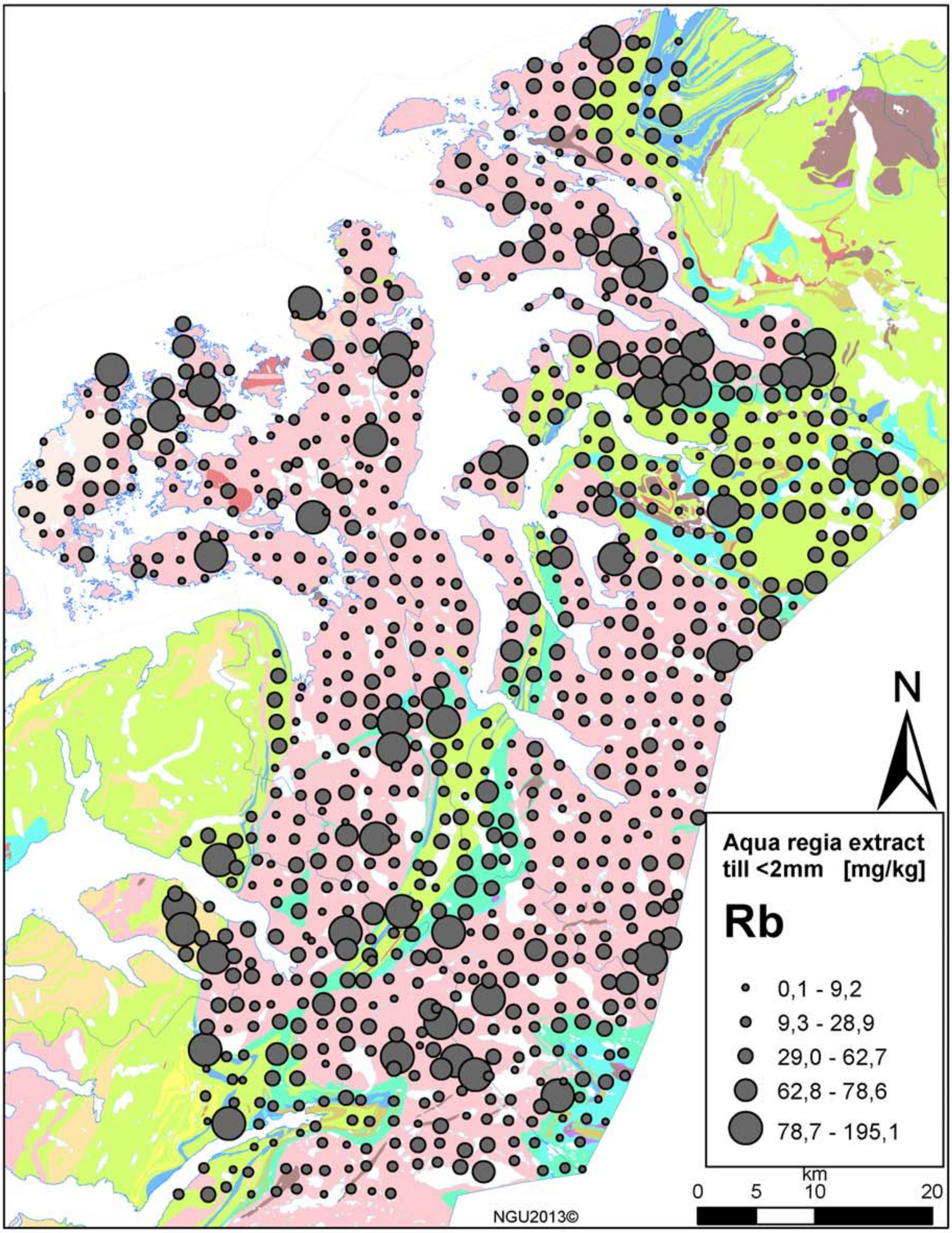
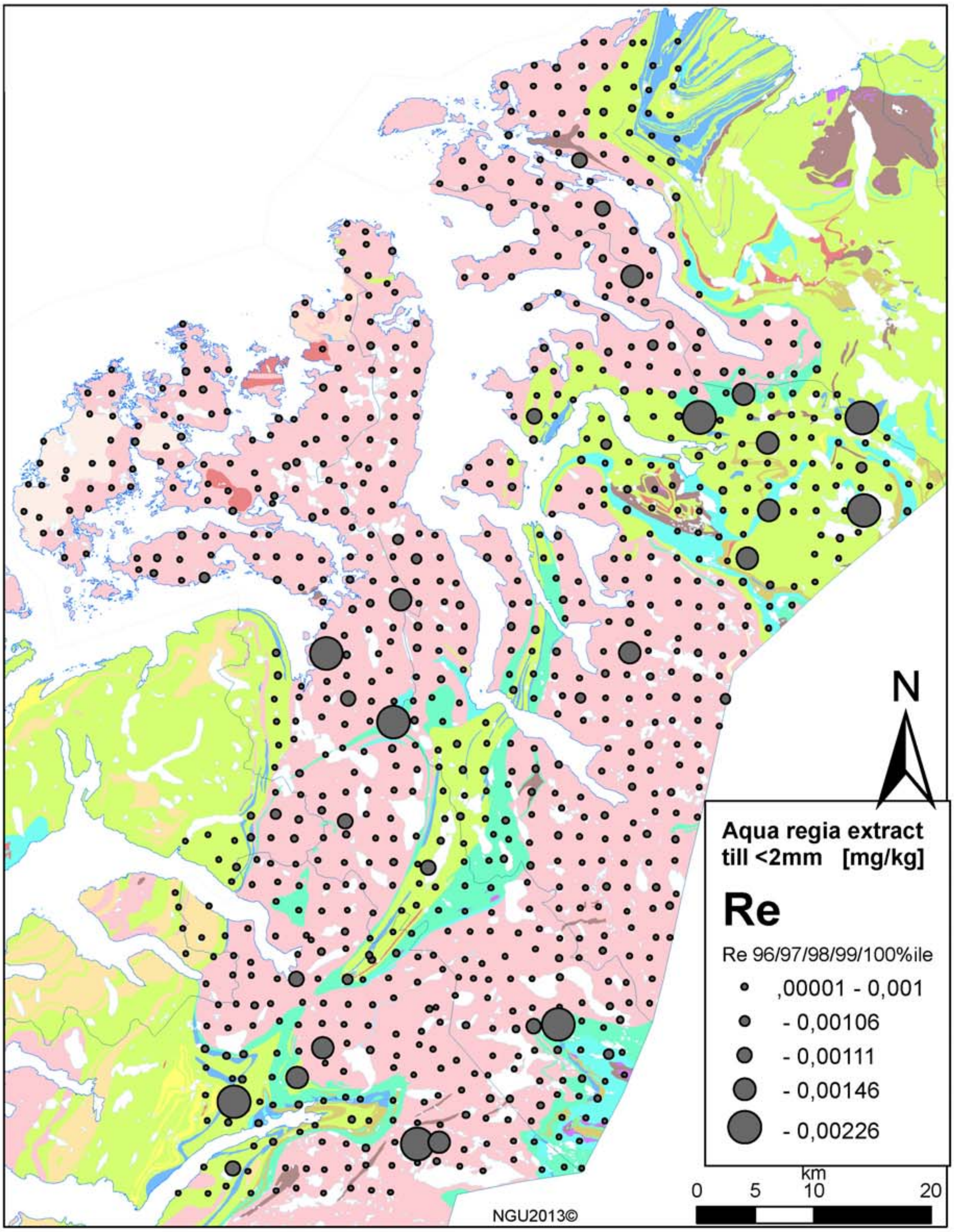
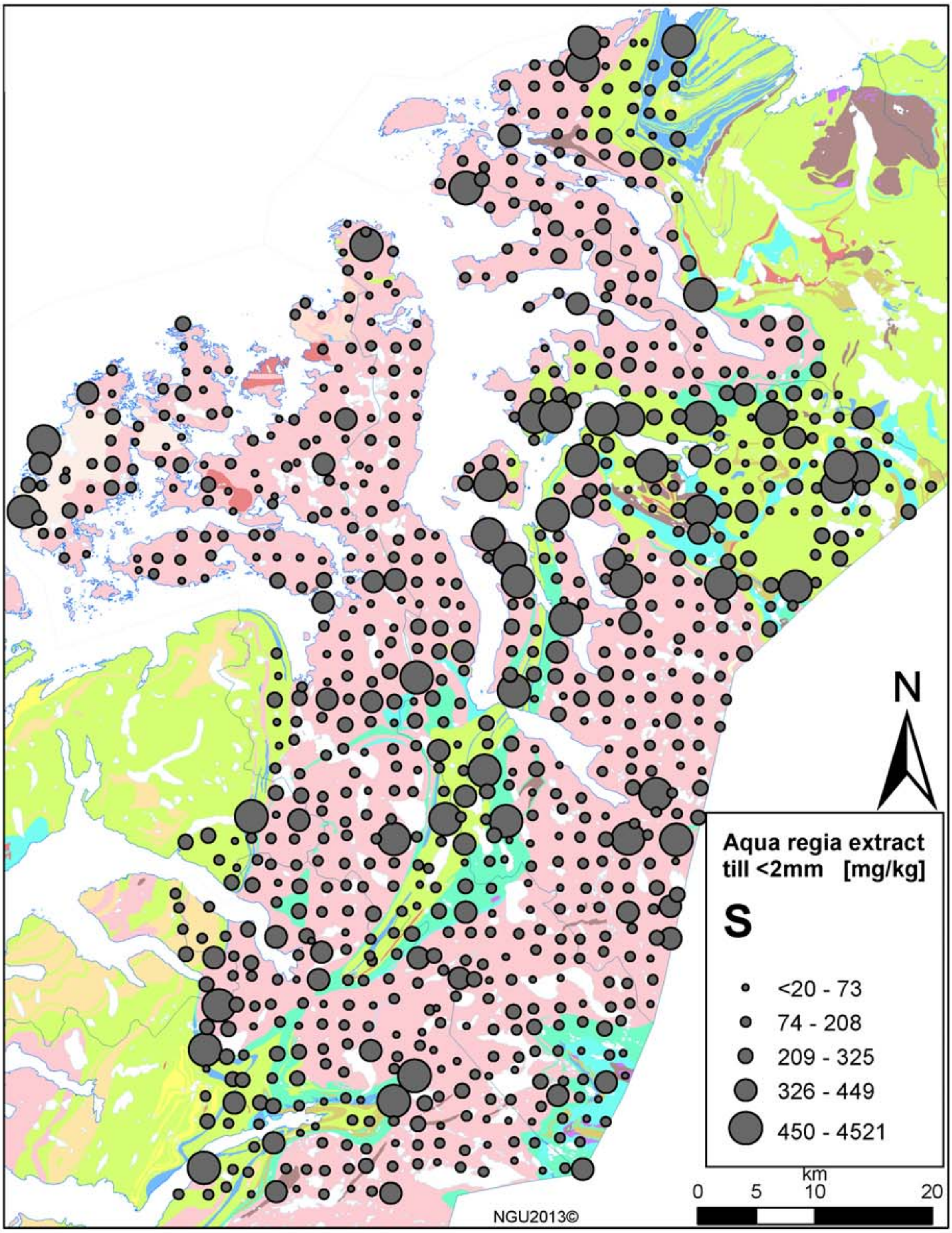
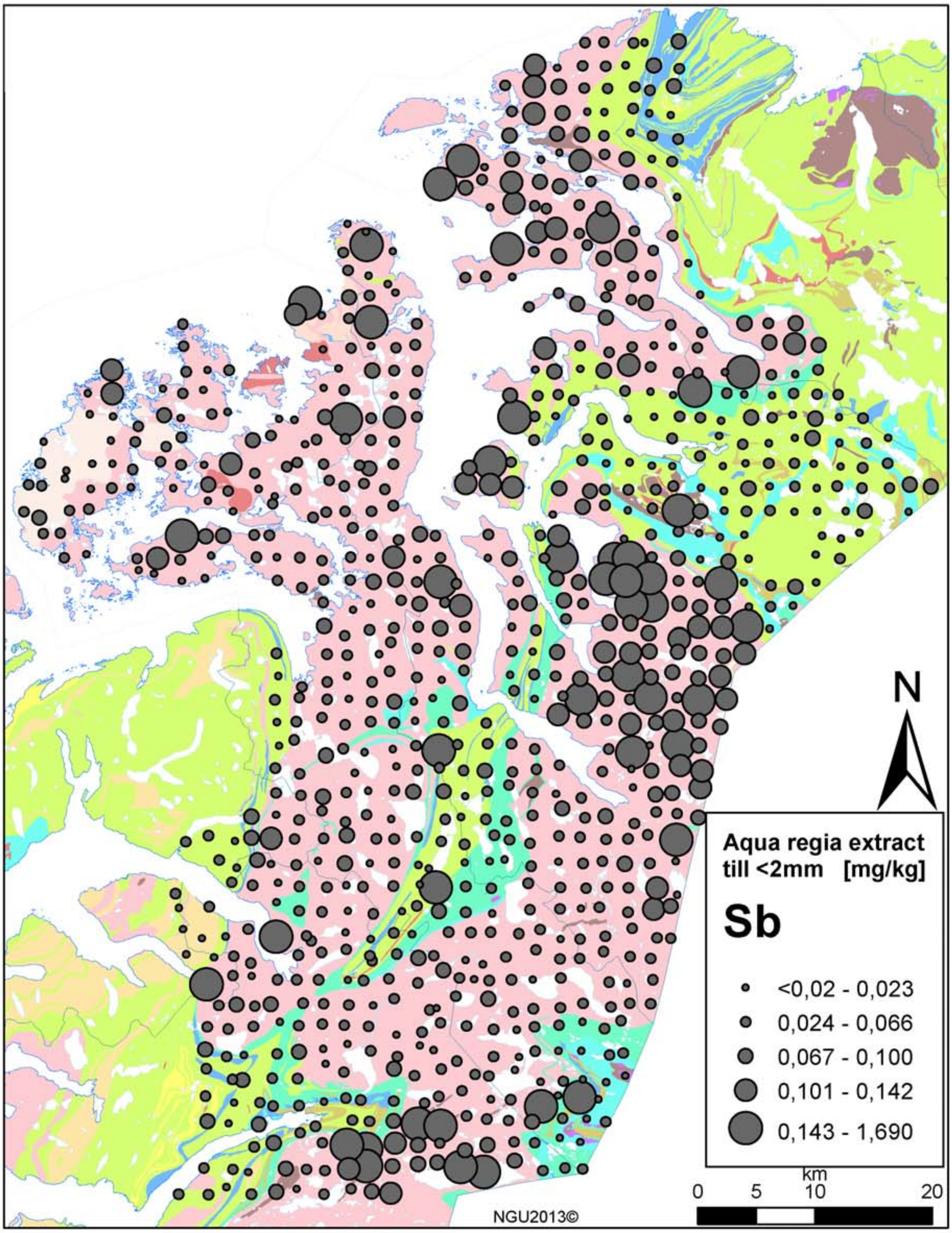
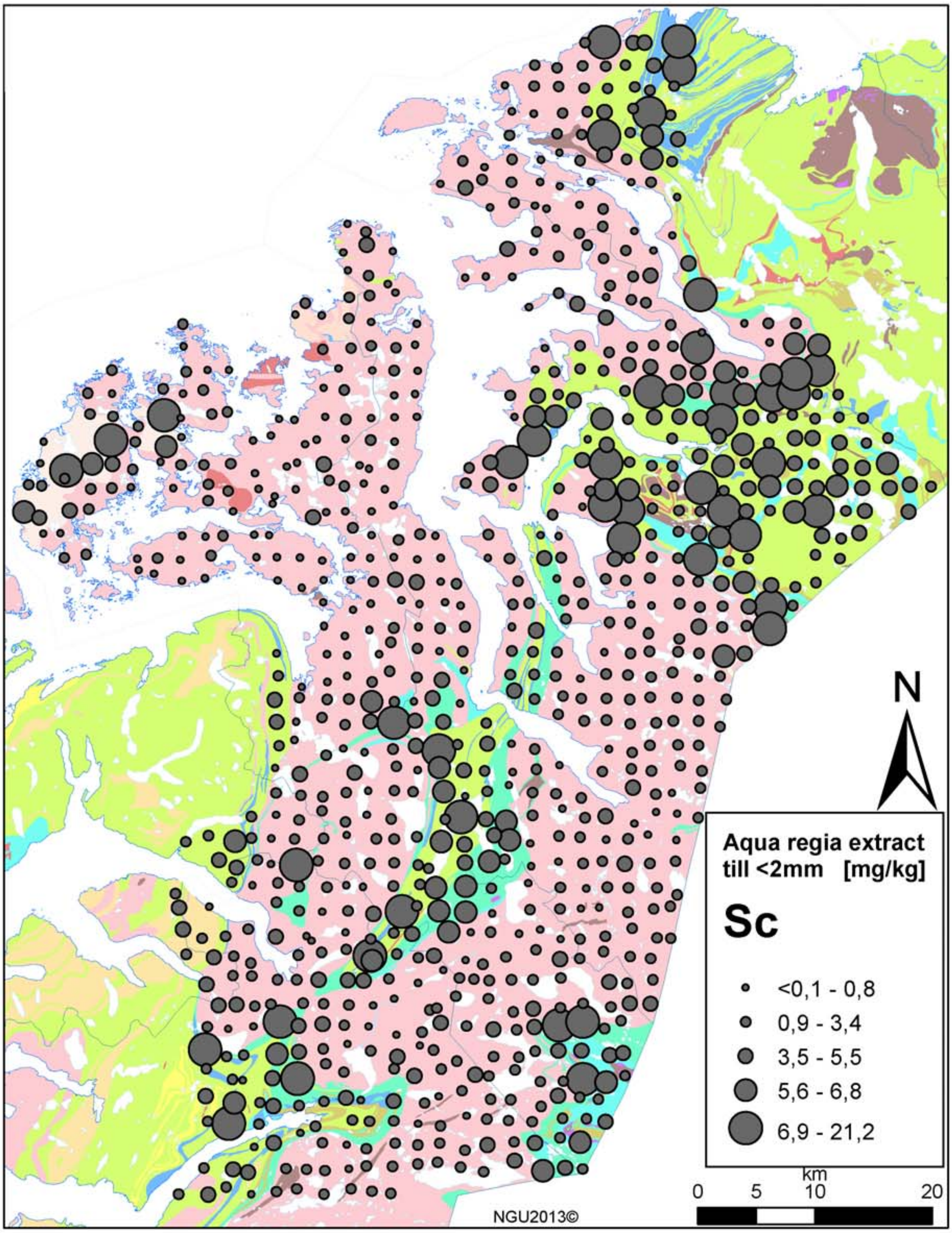

N
Aqua regia extract
till <2mm [mg/kg]
Rb
0,1 - 9,2
9,3 - 28,9
29,0 - 62,7
62,8 - 78,6
78,7 - 195,1
km
0 5 10 20
NGU2013©

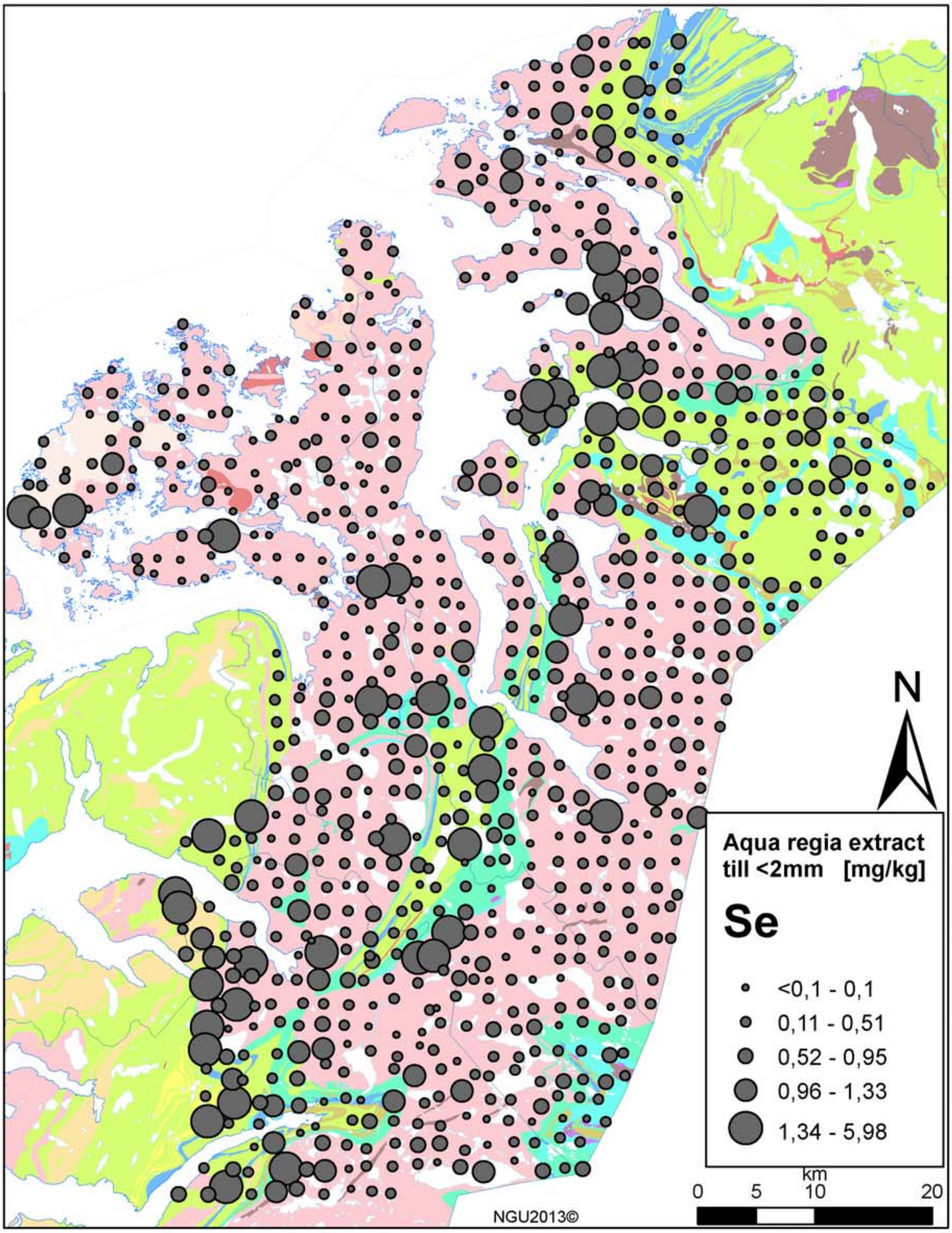


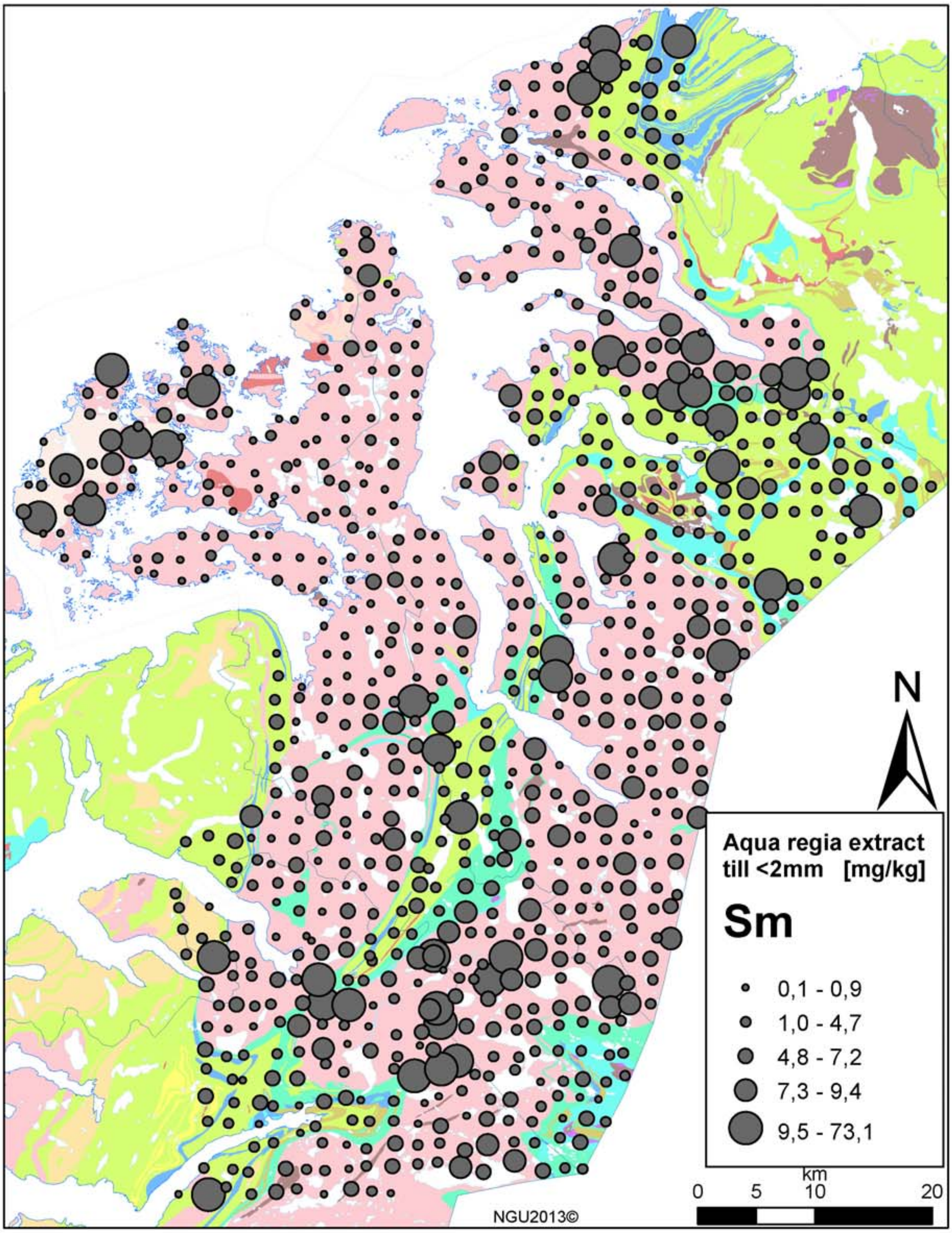
Attention: QC results indicate rather poor reproducibiblty

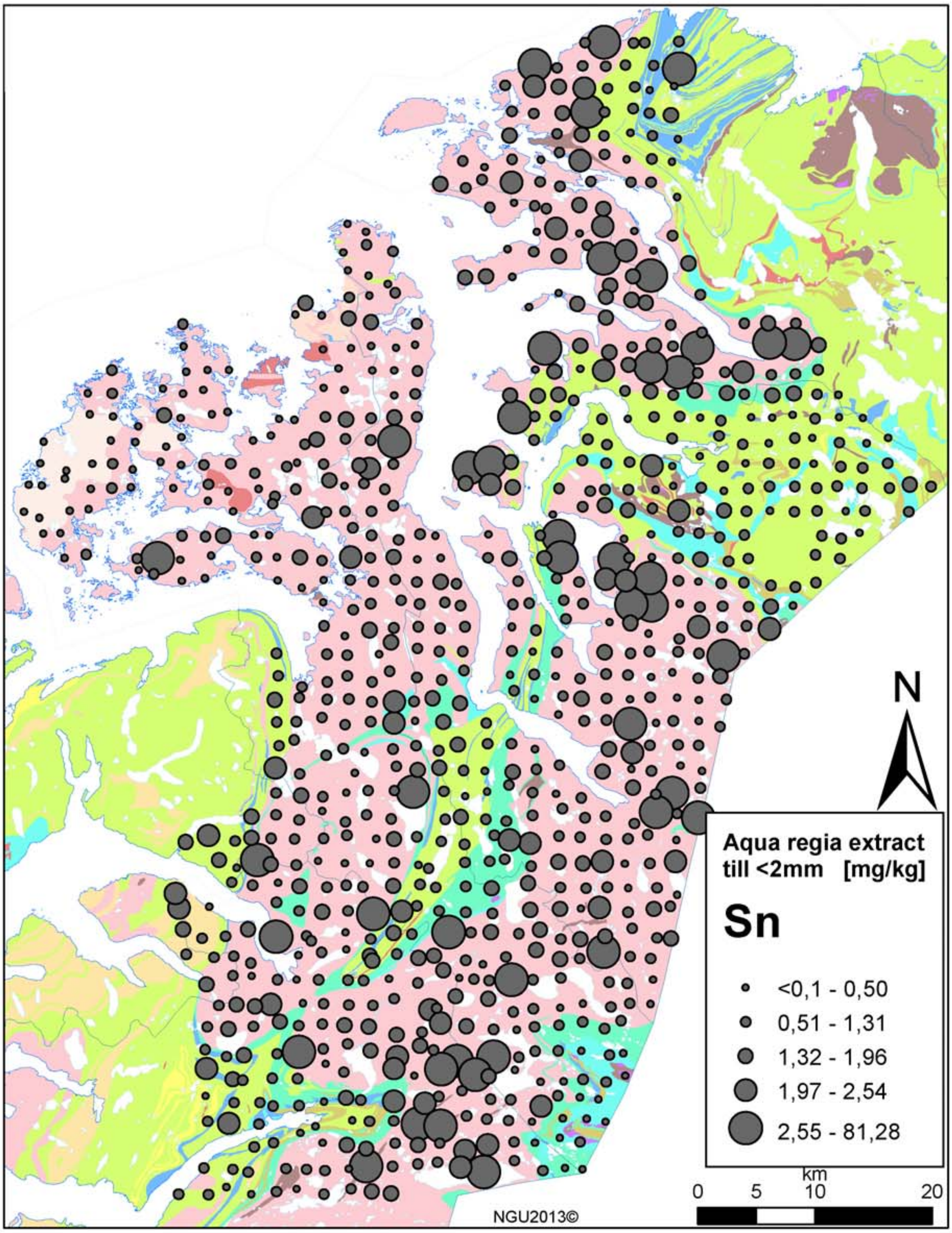

N
Aqua regia extract
till <2mm [mg/kg]
S
<20 - 73
74 - 208
209 - 325
326 - 449
450 - 4521
km
0 5 10 20
NGU2013©

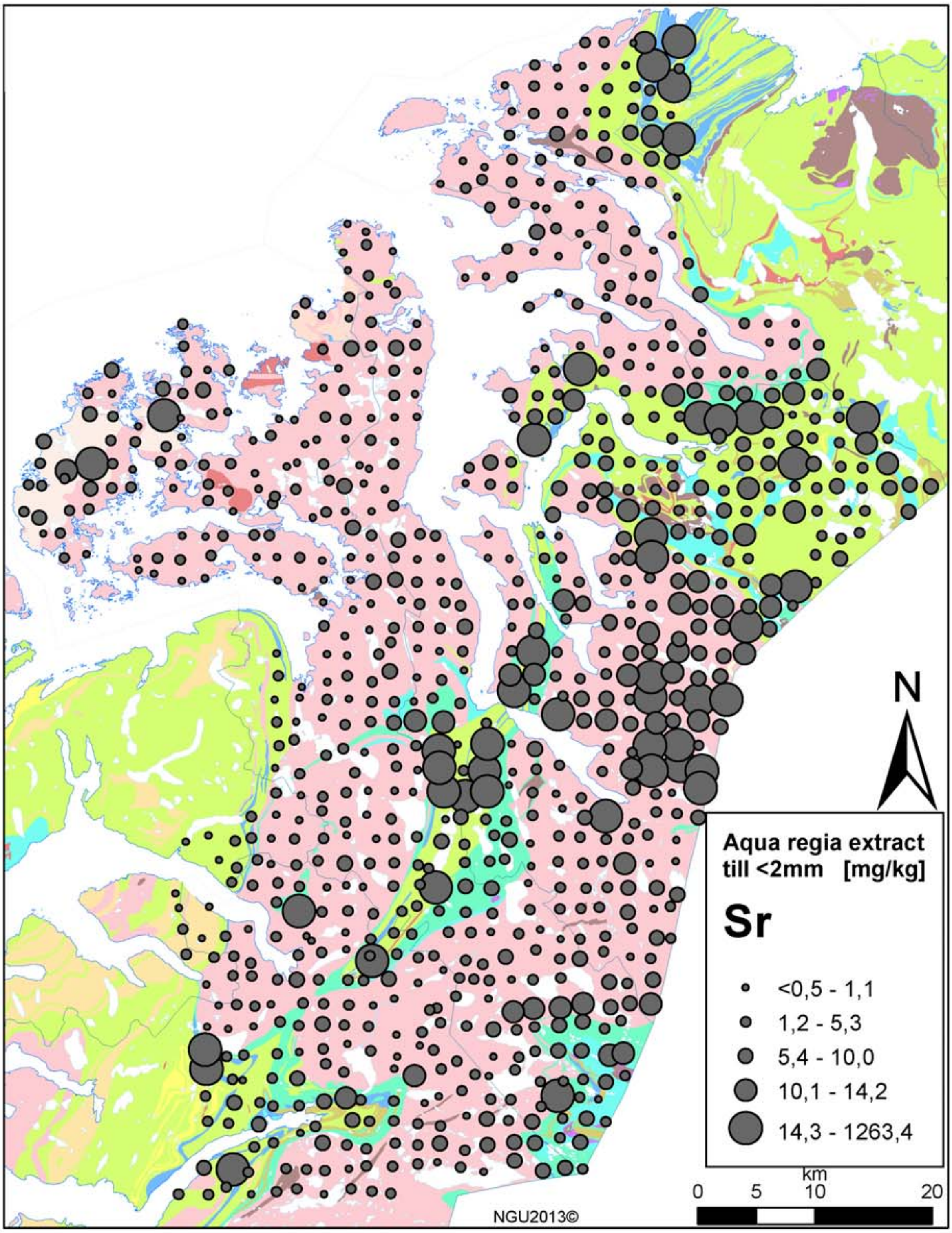

N
Aqua regia extract
till <2mm [mg/kg]
Sb
<0,02 - 0,023
0,024 - 0,066
0,067 - 0,100
0,101 - 0,142
0,143 - 1,690
km
0 5 10 20
NGU2013©

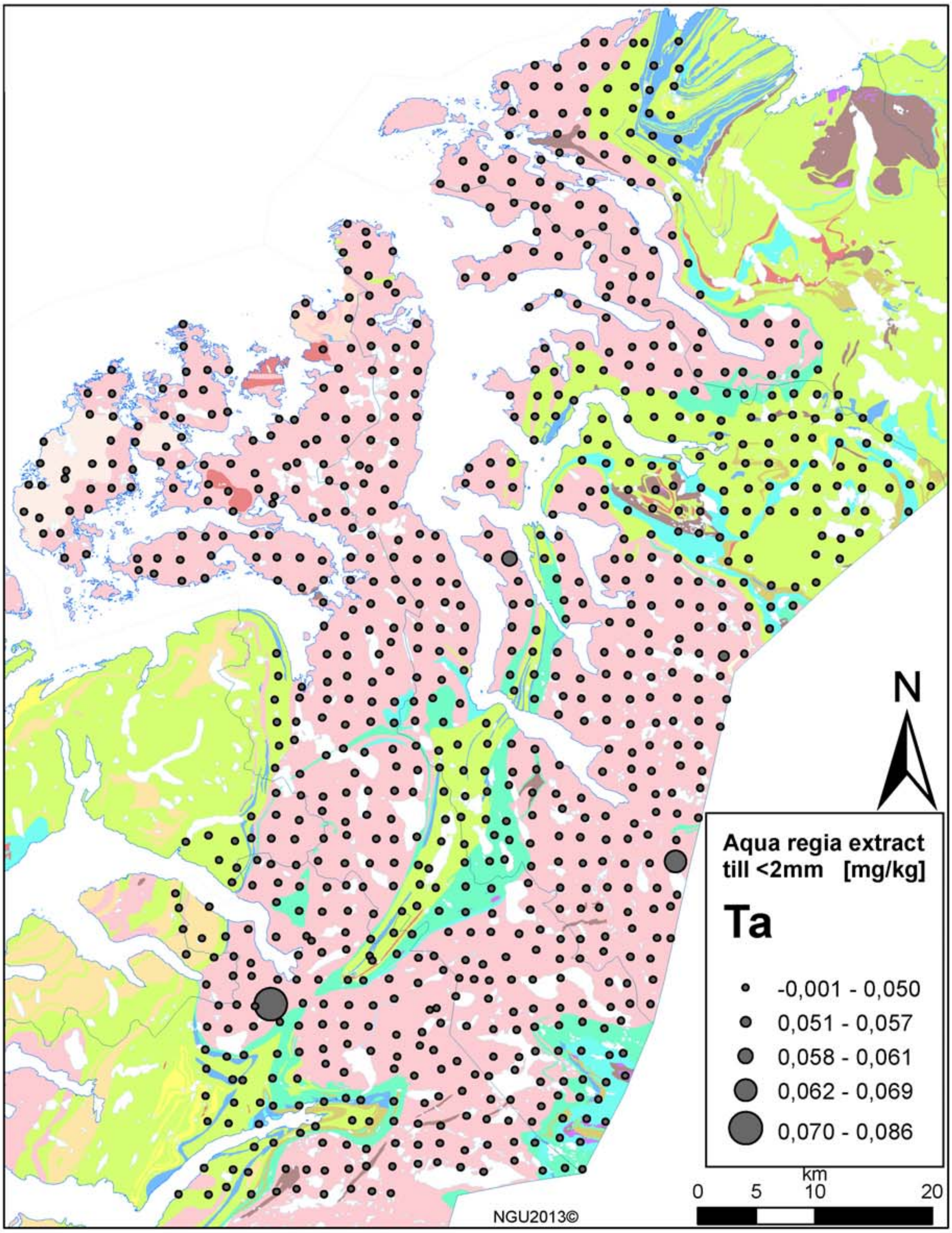

N
Aqua regia extract
till <2mm [mg/kg]
Sc
<0,1 - 0,8
0,9 - 3,4
3,5 - 5,5
5,6 - 6,8
6,9 - 21,2
km
0
5
10
20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Se
<0,1 - 0,1
0,11 - 0,51
0,52 - 0,95
0,96 - 1,33
1,34 - 5,98
km
0
5
10
20
NGU2013©

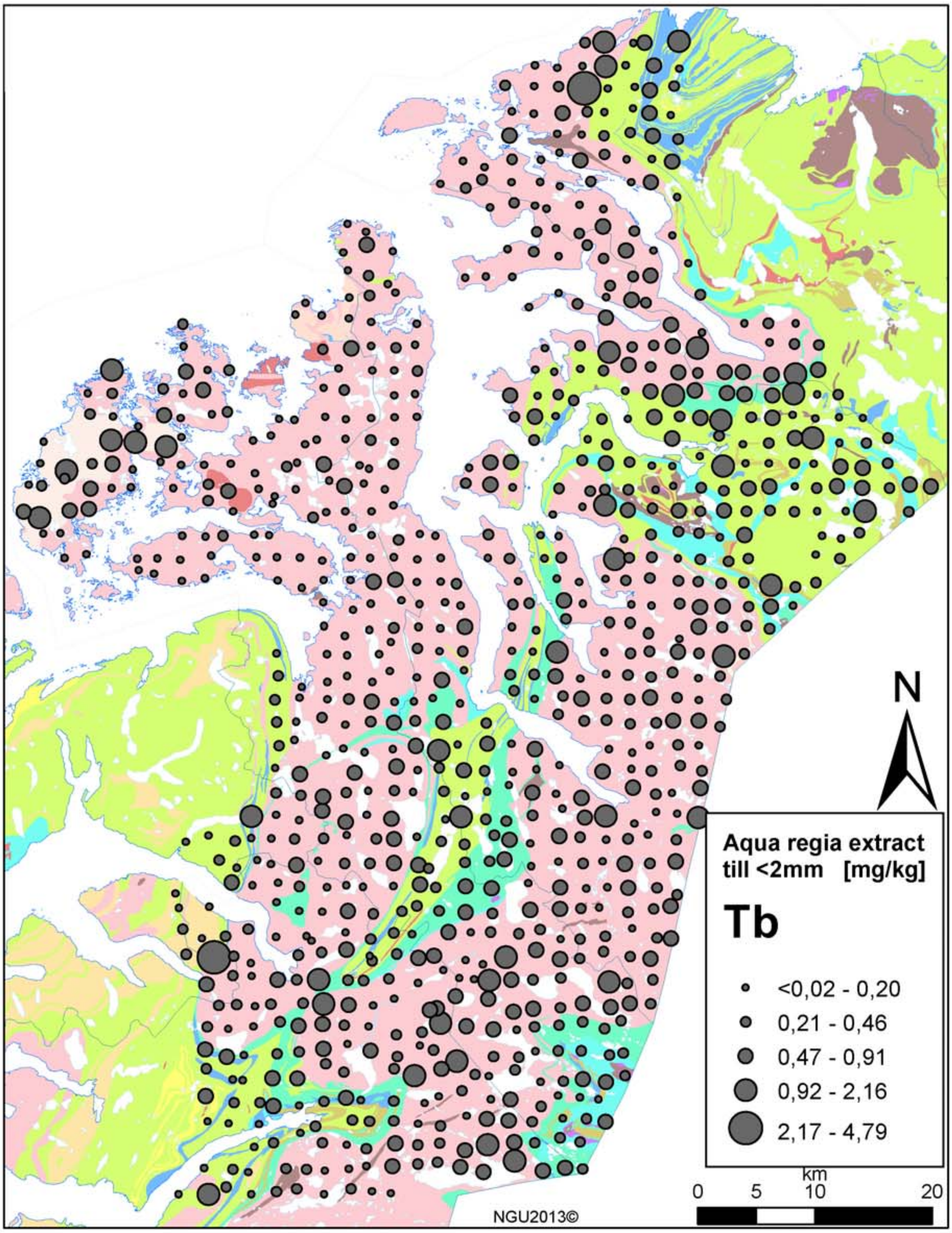

N
Aqua regia extract
till <2mm [mg/kg]
Sm
0,1 - 0,9
1,0 - 4,7
4,8 - 7,2
7,3 - 9,4
9,5 - 73,1
km
0
5
10
20
NGU2013©

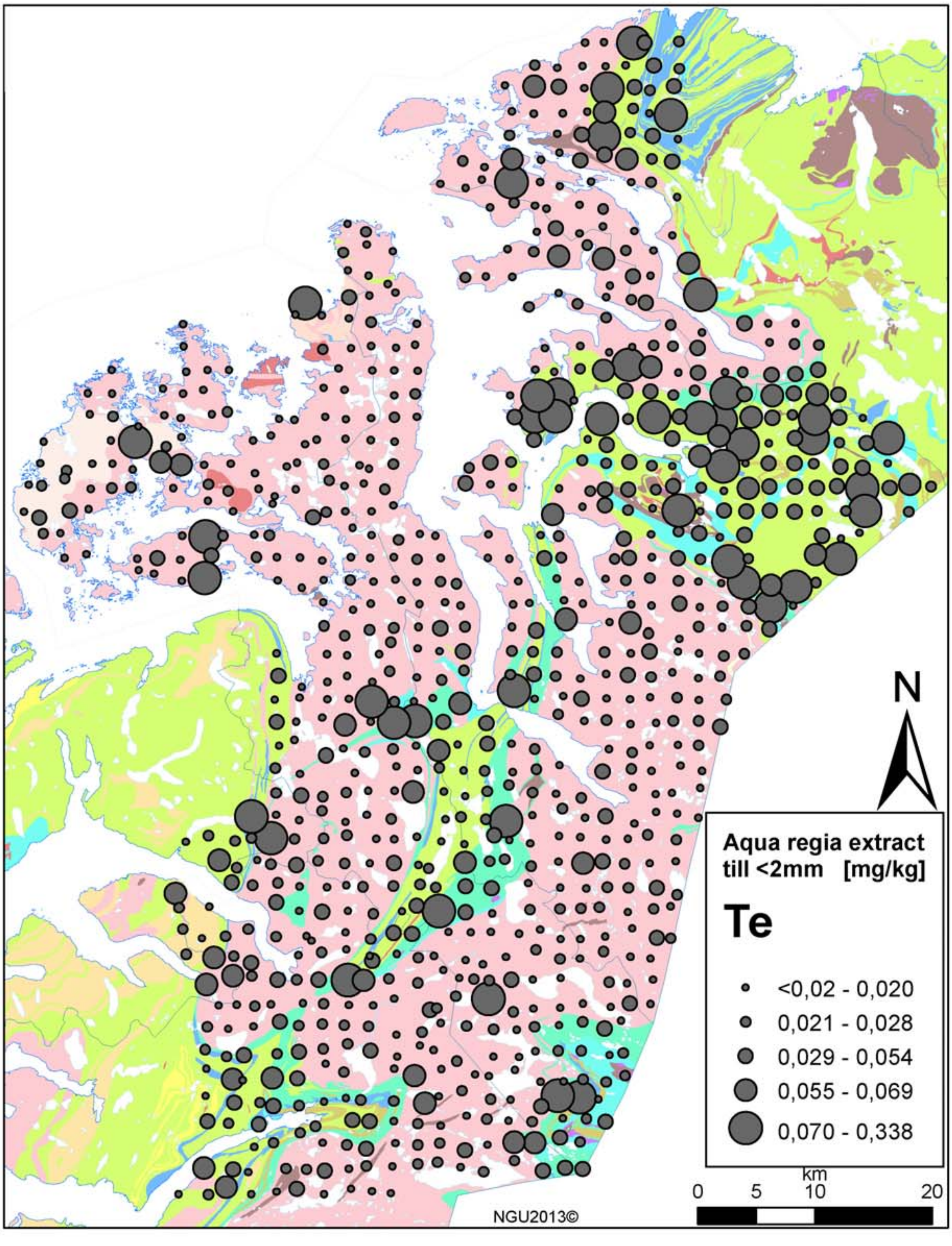

N
Aqua regia extract
till <2mm [mg/kg]
Sn
<0,1 - 0,50
0,51 - 1,31
1,32 - 1,96
1,97 - 2,54
2,55 - 81,28
km
0 5 10 20
NGU2013©

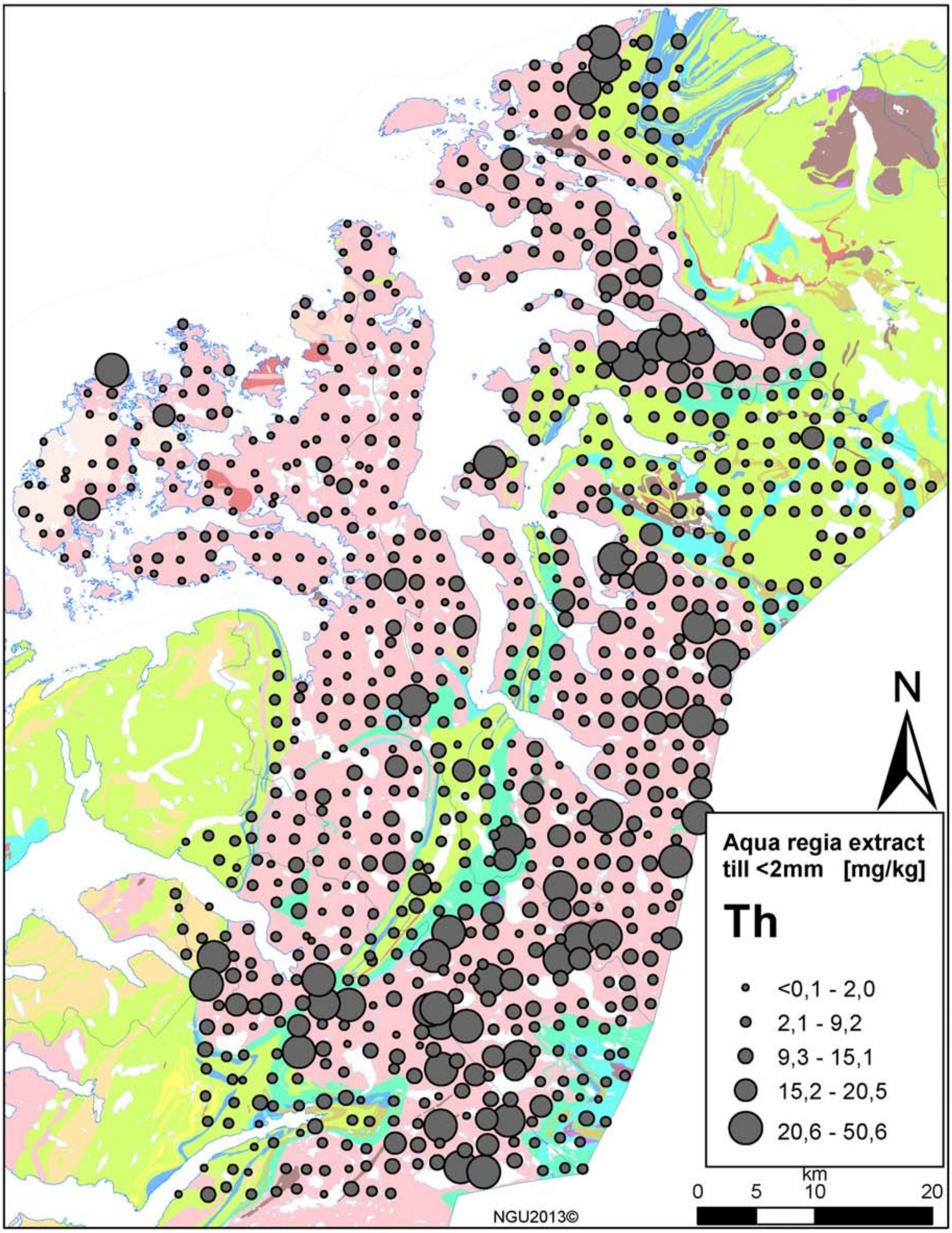

N
Aqua regia extract
till <2mm [mg/kg]
Sr
<0,5 - 1,1
1,2 - 5,3
5,4 - 10,0
10,1 - 14,2
14,3 - 1263,4
km
0 5 10 20
NGU2013©

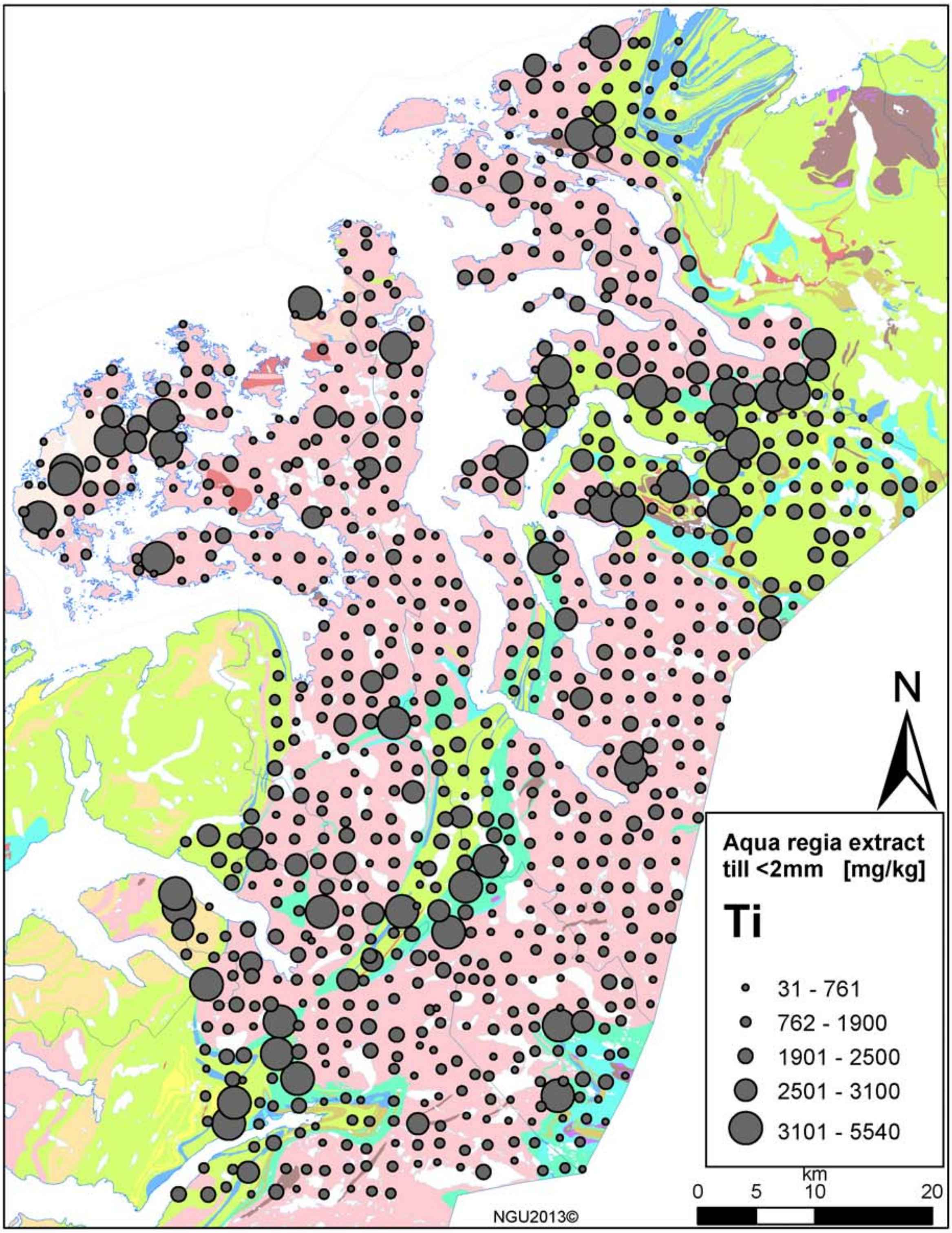


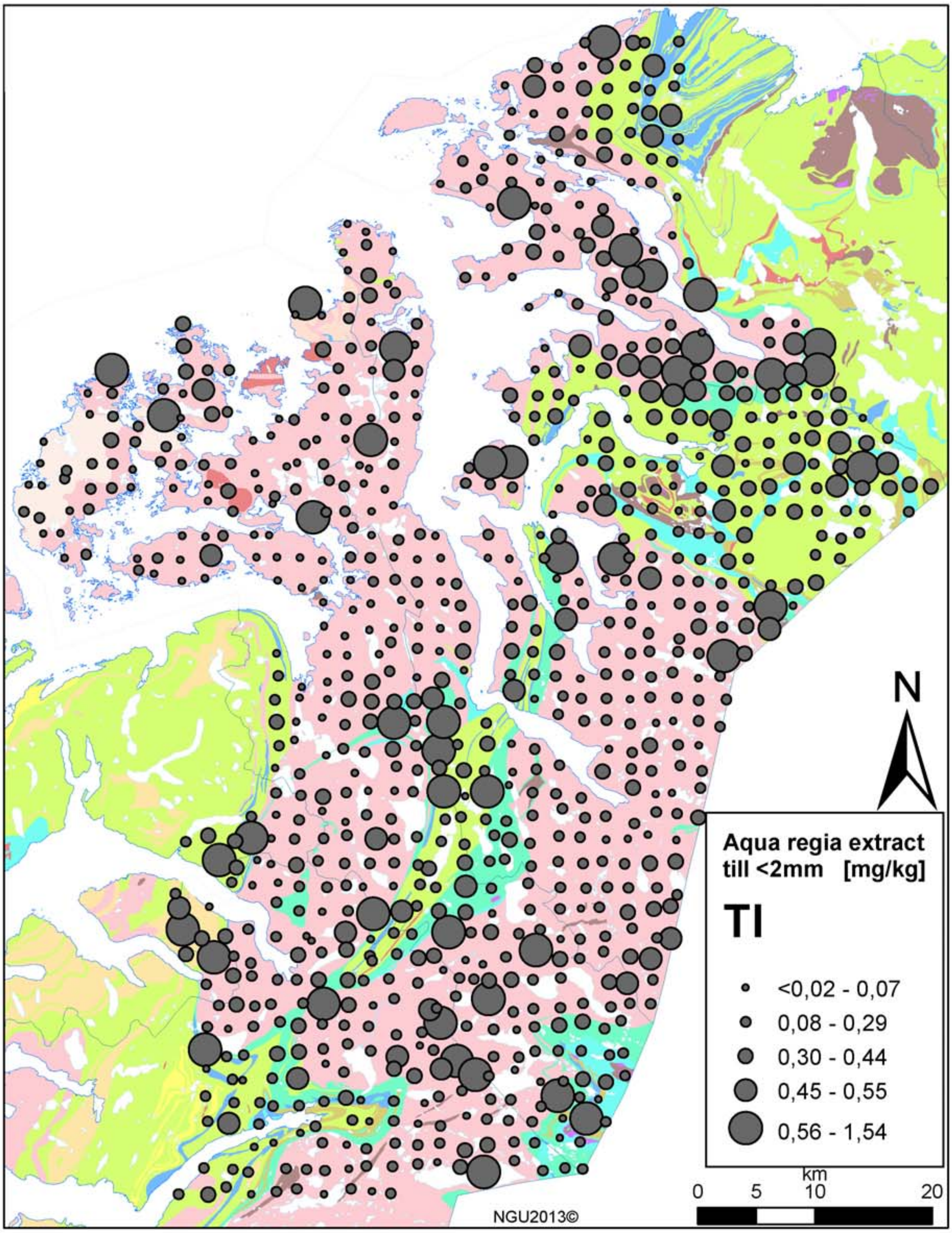
Attention: QC results indicate rather poor reproducibiblty

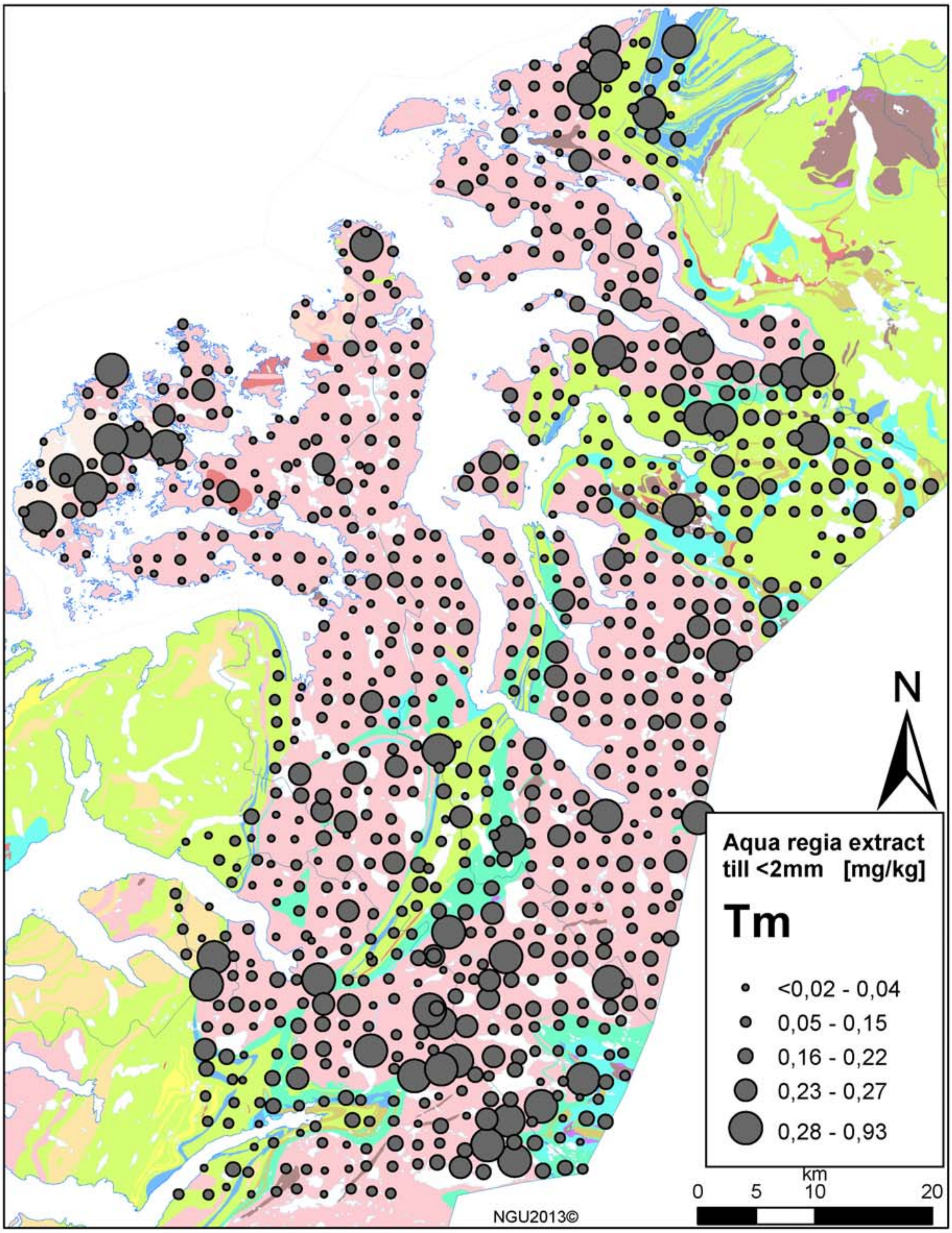

N
Aqua regia extract
till <2mm [mg/kg]
Tb
<0,02 - 0,20
0,21 - 0,46
0,47 - 0,91
0,92 - 2,16
2,17 - 4,79
km
0 5 10 20
NGU2013©

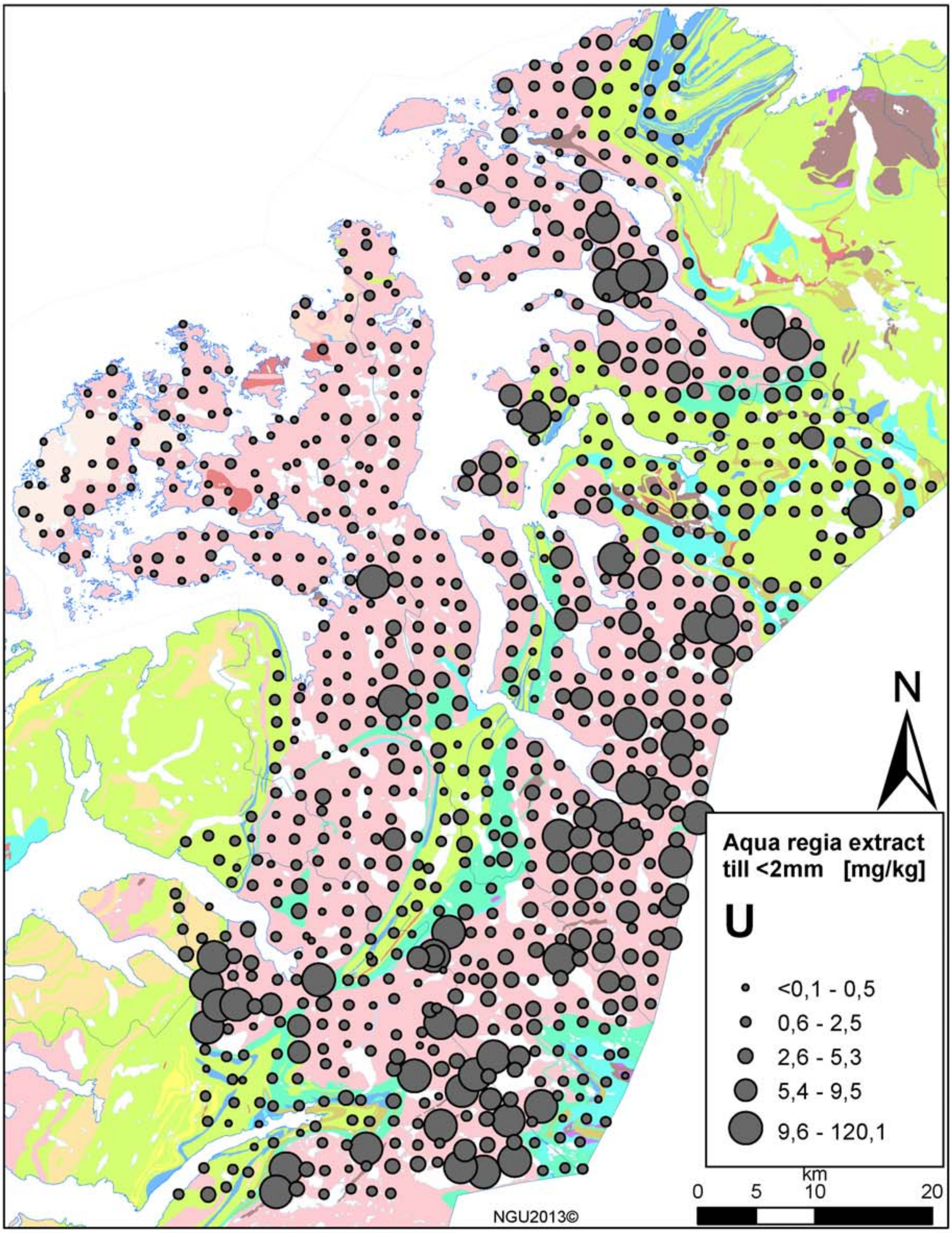

N
Aqua regia extract
till <2mm [mg/kg]
Te
<0,02 - 0,020
0,021 - 0,028
0,029 - 0,054
0,055 - 0,069
0,070 - 0,338
km
0
5
10
20
NGU2013©

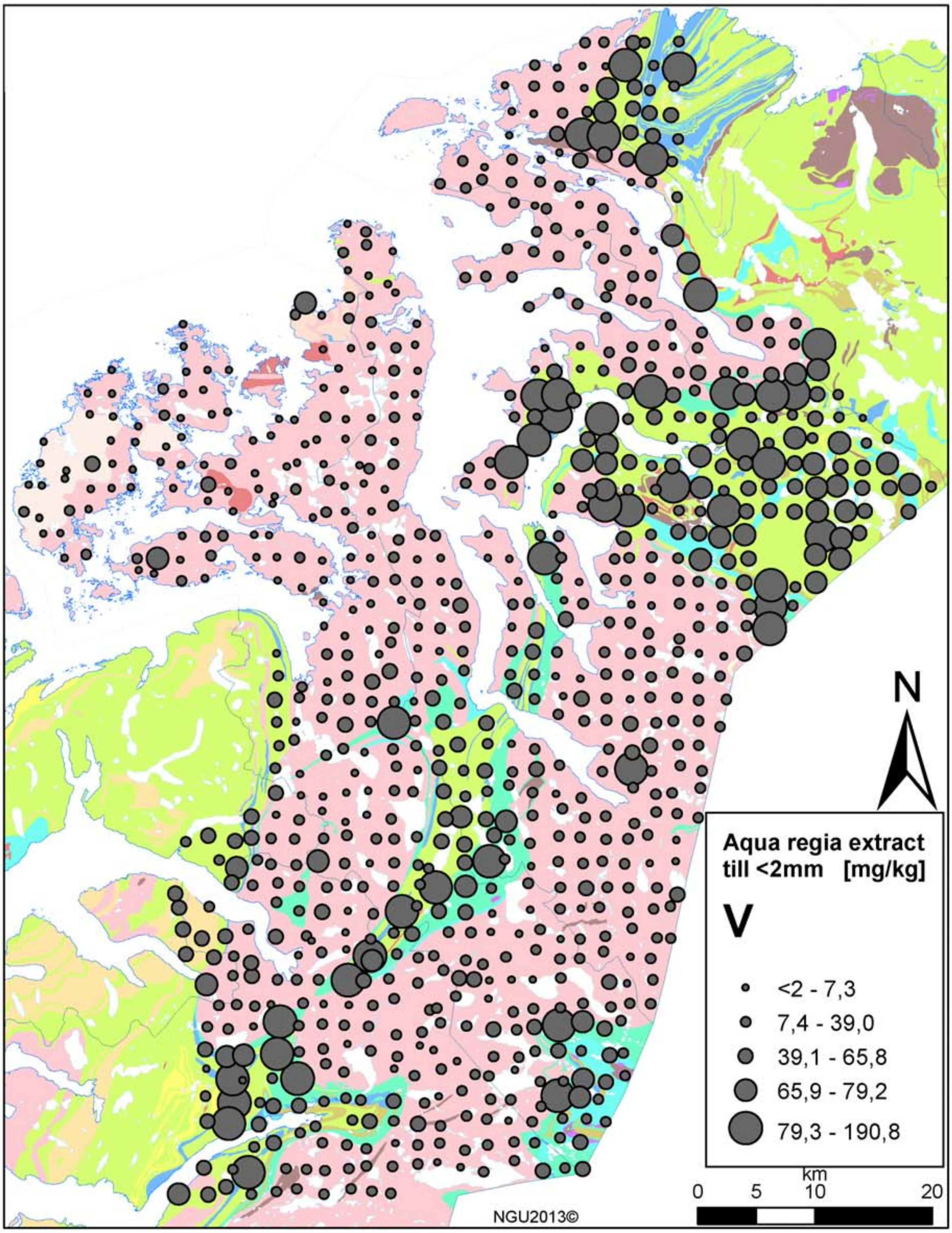

N
Aqua regia extract
till <2mm [mg/kg]
Th
<0,1 - 2,0
2,1 - 9,2
9,3 - 15,1
15,2 - 20,5
20,6 - 50,6
km
0
5
10
20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Ti
31 - 761
762 - 1900
1901 - 2500
2501 - 3100
3101 - 5540
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Tl
<0,02 - 0,07
0,08 - 0,29
0,30 - 0,44
0,45 - 0,55
0,56 - 1,54
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Tm
<0,02 - 0,04
0,05 - 0,15
0,16 - 0,22
0,23 - 0,27
0,28 - 0,93
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
U
<0,1 - 0,5
0,6 - 2,5
2,6 - 5,3
5,4 - 9,5
9,6 - 120,1
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
V
<2 - 7,3
7,4 - 39,0
39,1 - 65,8
65,9 - 79,2
79,3 - 190,8
km
0
5
10
20
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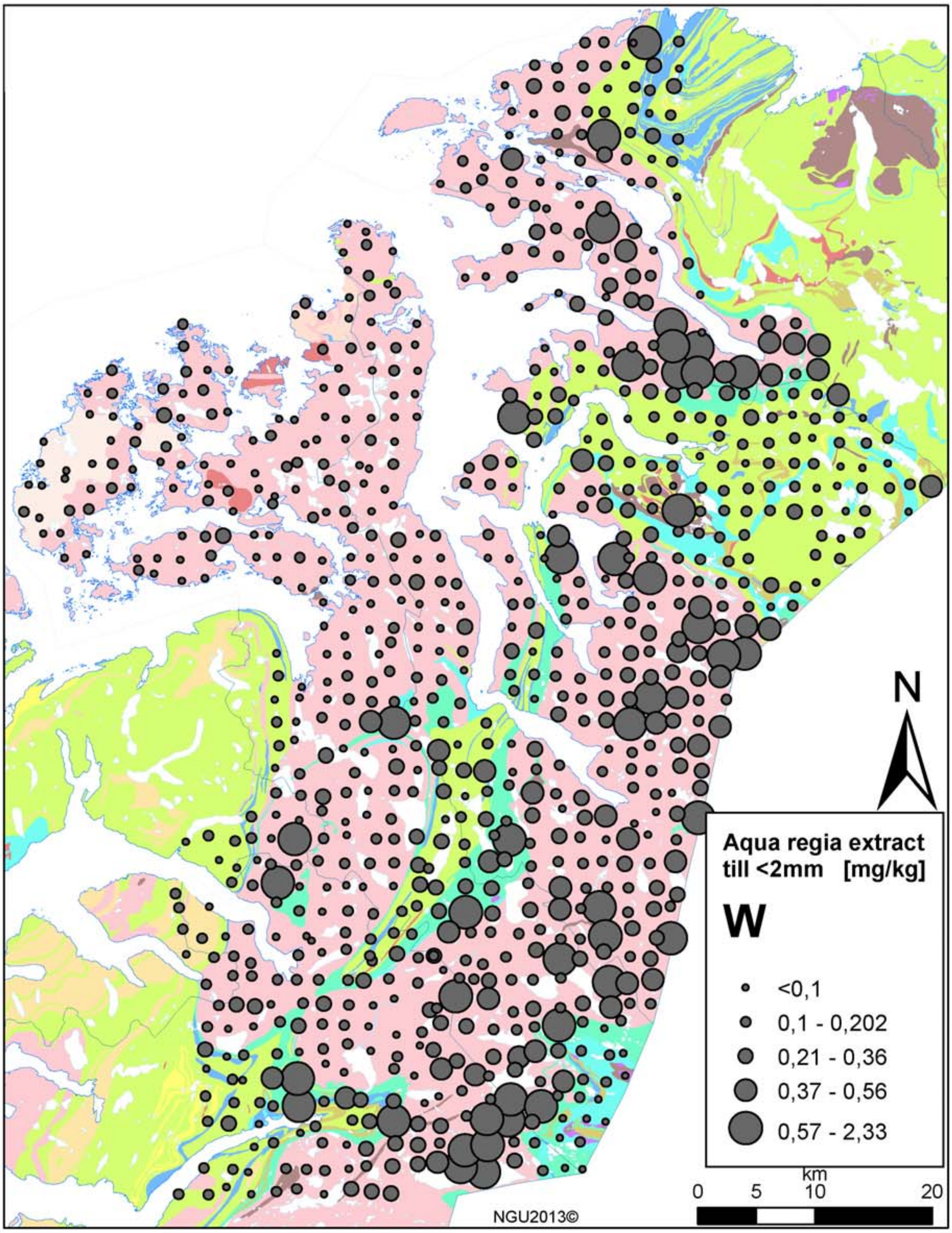
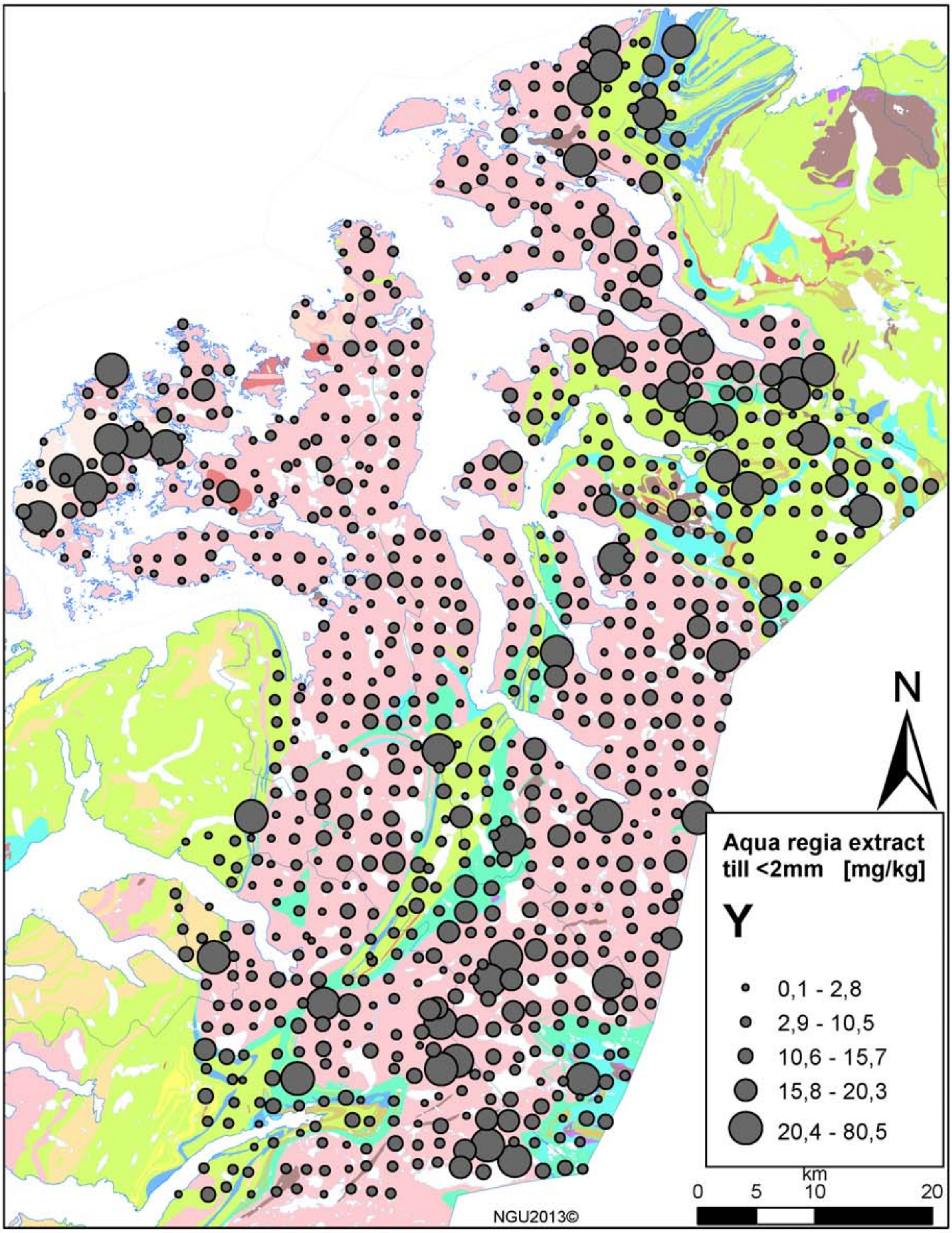
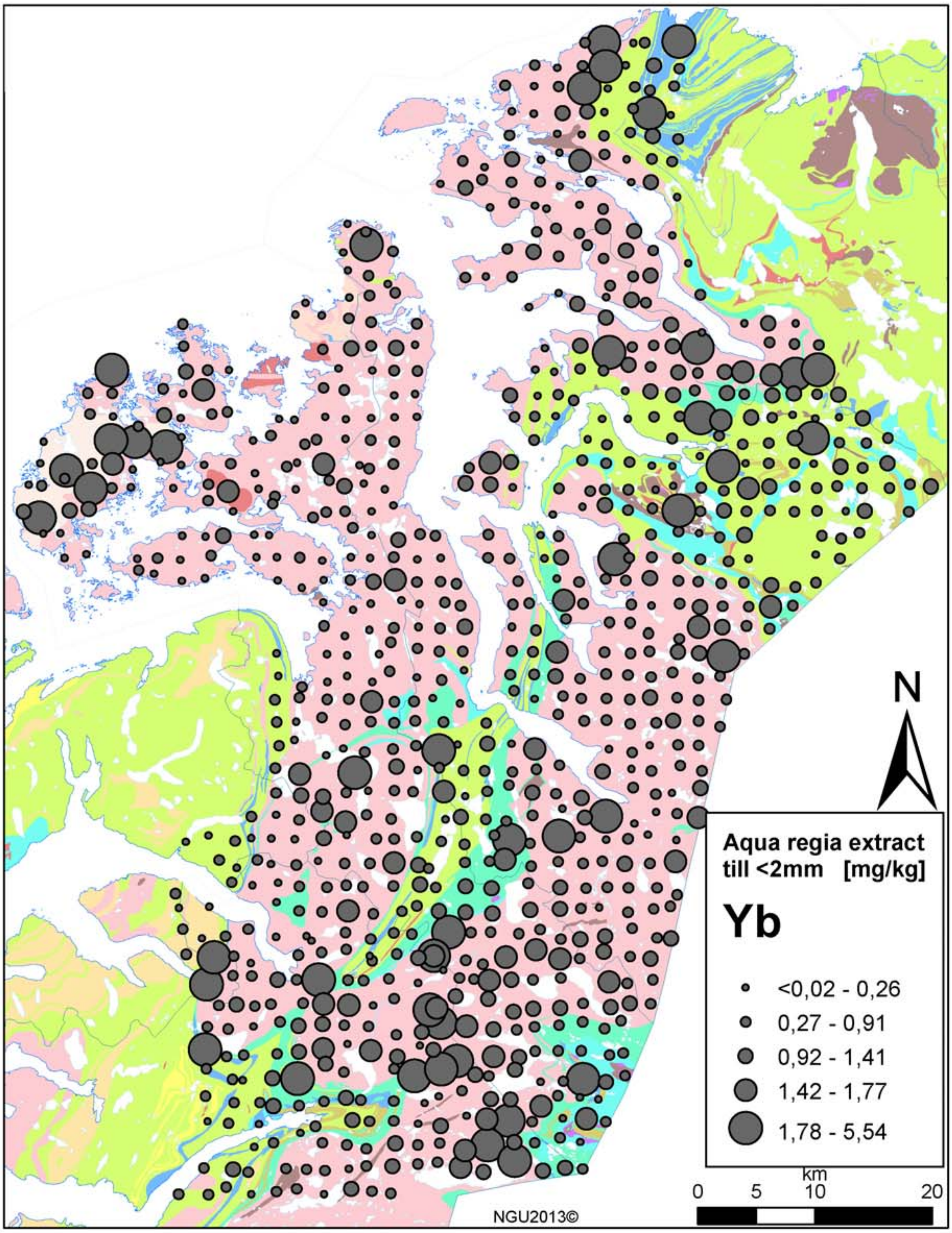
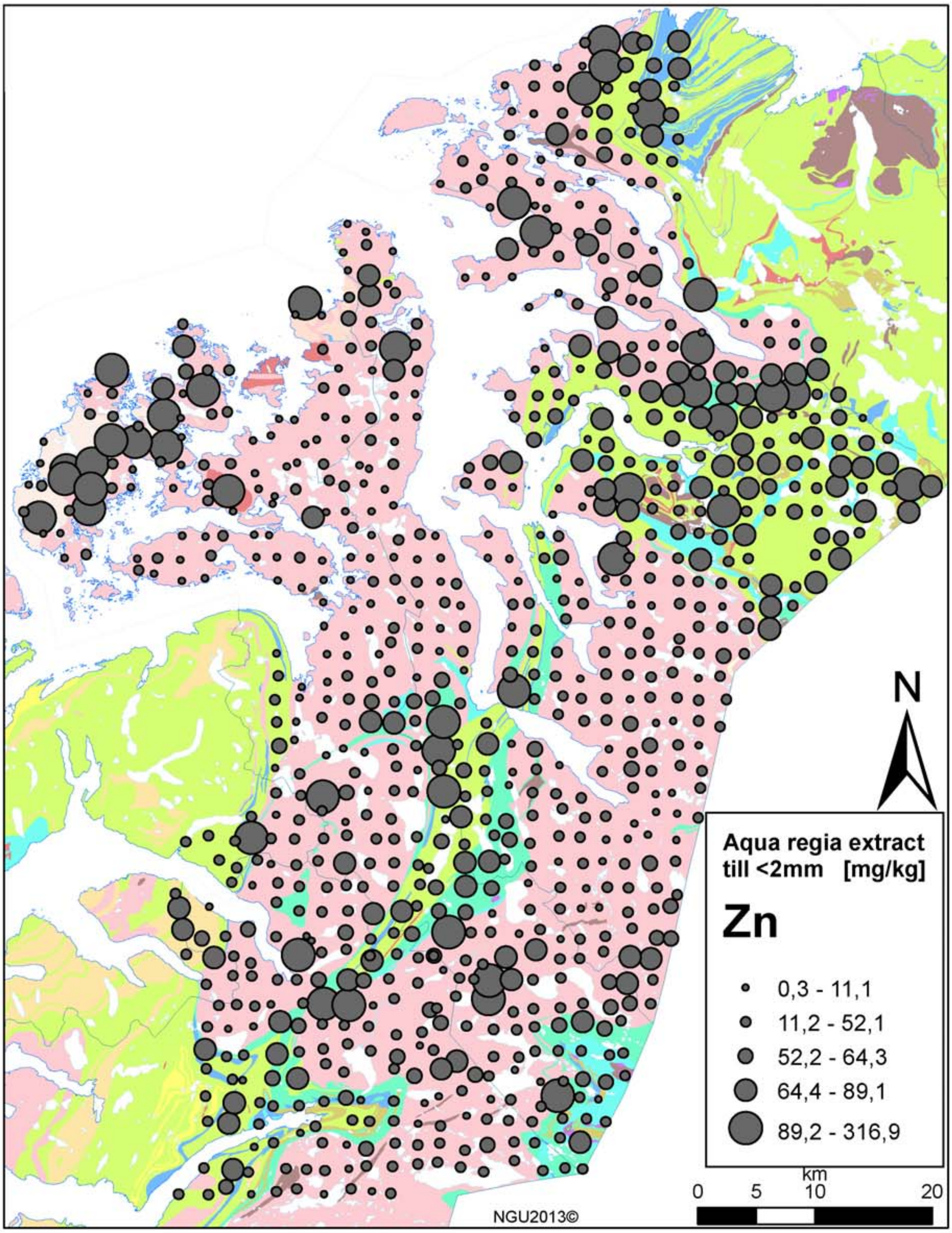
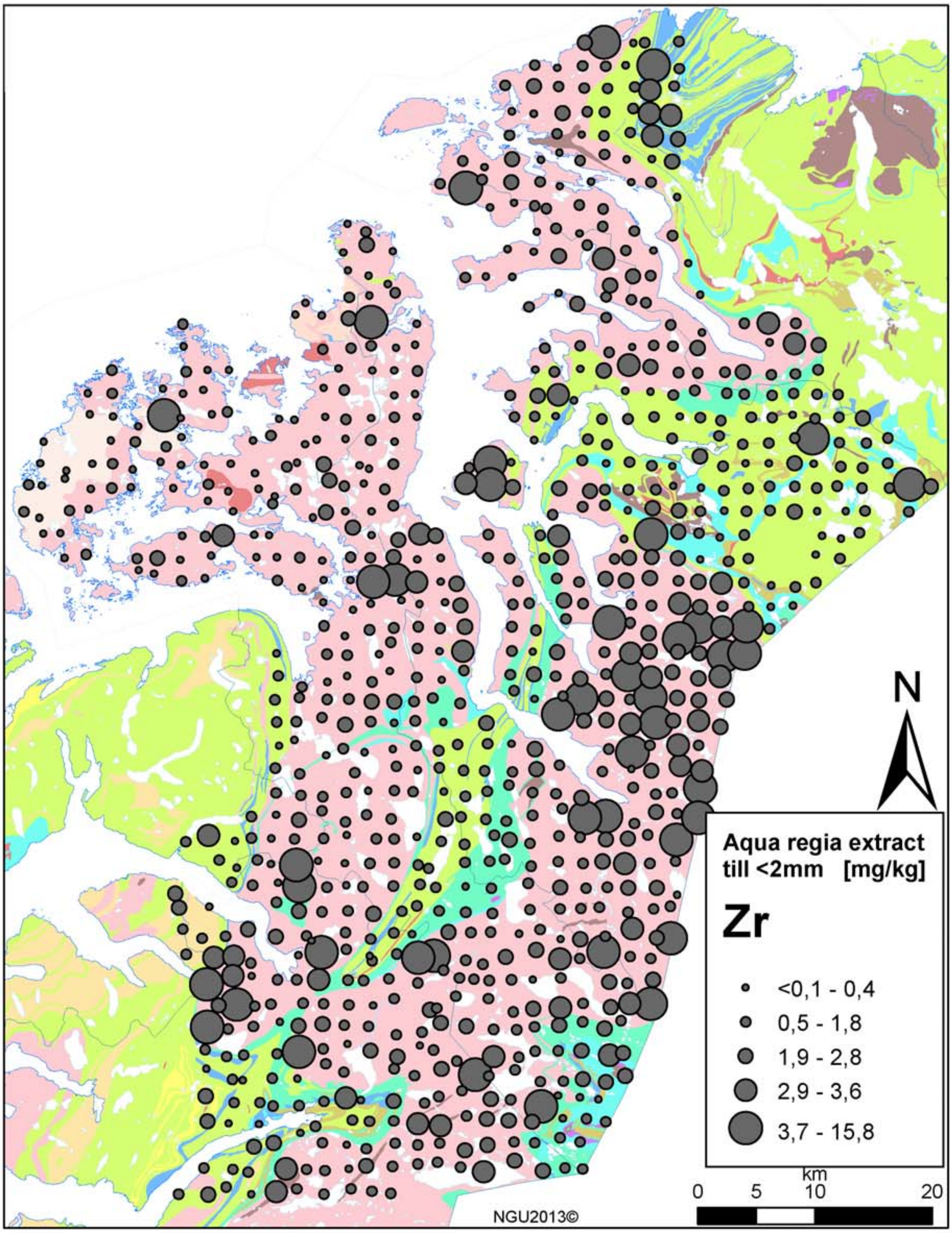

N
Aqua regia extract
till <2mm [mg/kg]
W
<0,1
0,1 - 0,202
0,21 - 0,36
0,37 - 0,56
0,57 - 2,33
km
0
5
10
20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Y
0,1 - 2,8
2,9 - 10,5
10,6 - 15,7
15,8 - 20,3
20,4 - 80,5
km
0
5
10
20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Yb
<0,02 - 0,26
0,27 - 0,91
0,92 - 1,41
1,42 - 1,77
1,78 - 5,54
km
0 5 10 20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Zn
0,3 - 11,1
11,2 - 52,1
52,2 - 64,3
64,4 - 89,1
89,2 - 316,9
km
0
5
10
20
NGU2013©


N
Aqua regia extract
till <2mm [mg/kg]
Zr
<0,1 - 0,4
0,5 - 1,8
1,9 - 2,8
2,9 - 3,6
3,7 - 15,8
km
0 5 10 20
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Geological Survey of Norway

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