From harmonized multidisciplinary data to prospectivity maps in the Góis-Panasqueira-Argemela-Segura strip

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https://mostmeg.rd.ciencias.ulisboa.pt/

ERA-MIN Joint Call 2019 (EU Horizon 2020 ERA-NET Co-fund Project ERA-MIN2, Grant agreement Nº 730238)

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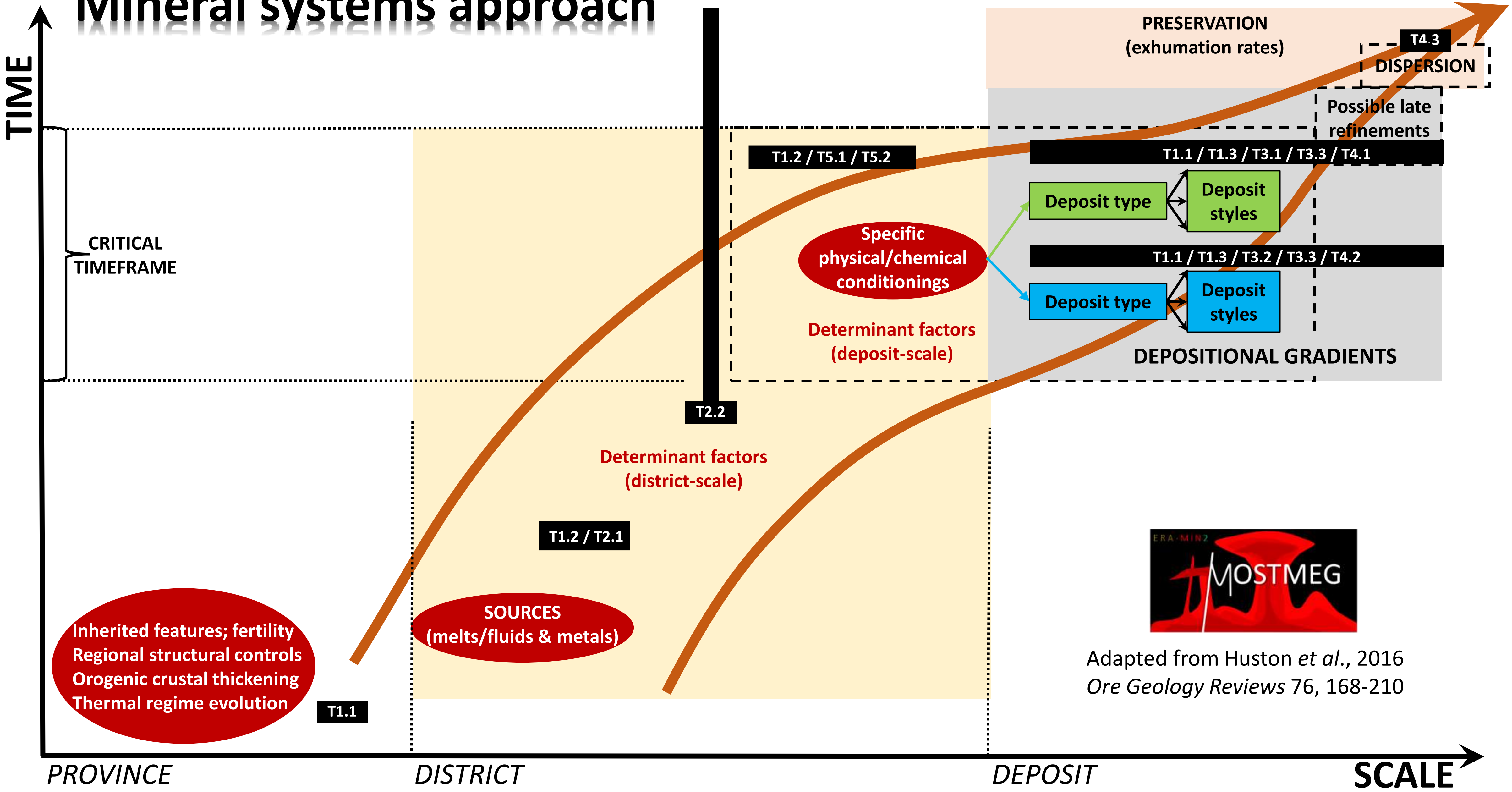
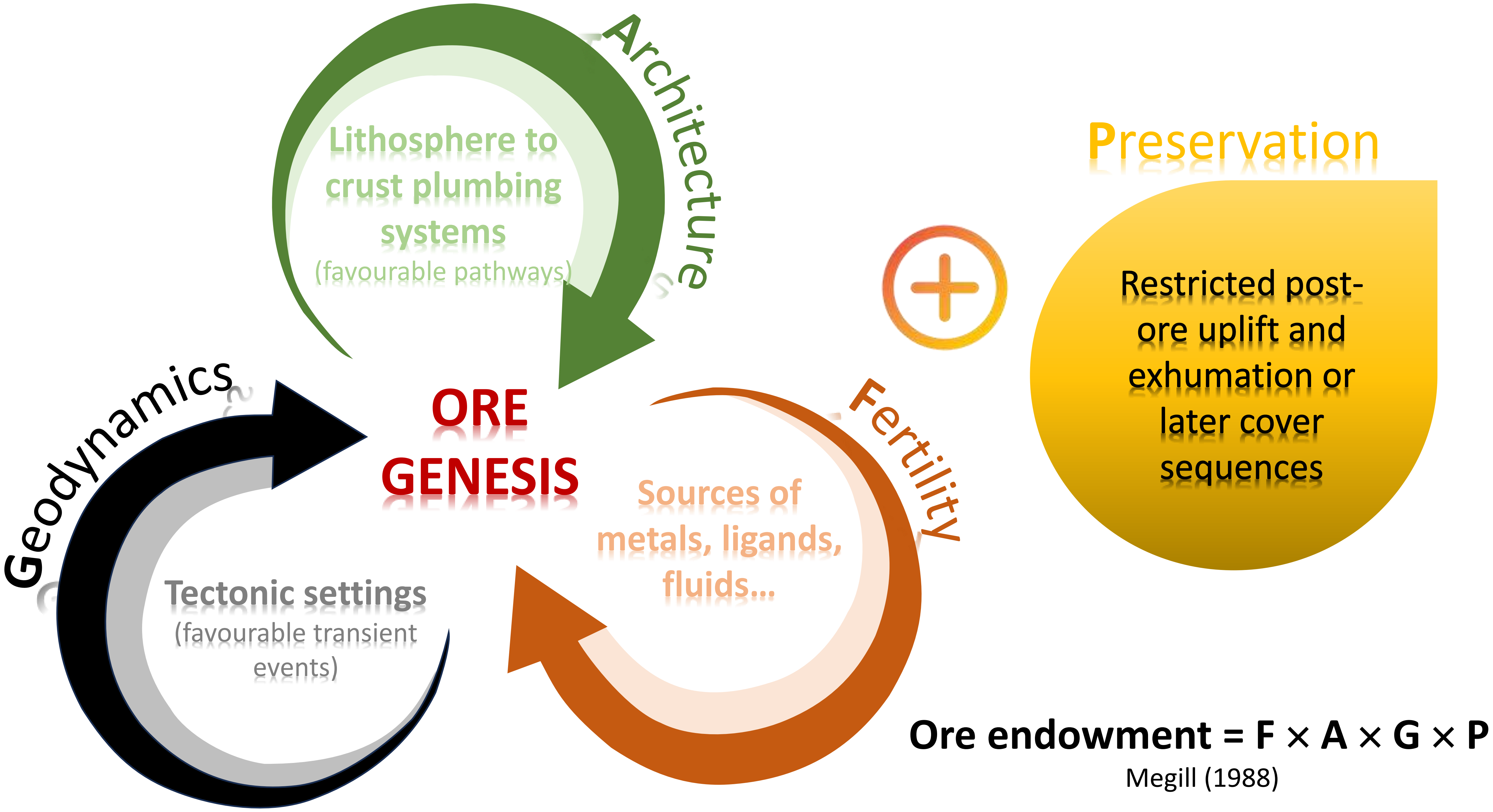
Mineral systems approach



Adapted from Huston *et al.*, 2016
Ore Geology Reviews 76, 168-210


Architecture
Lithosphere to crust plumbing systems
(favourable pathways)
Geodynamics
ORE GENESIS
Tectonic settings
(favourable transient events)
Fertility
Sources of metals, ligands, fluids...
Preservation
Restricted post-ore uplift and exhumation or later cover sequences
Ore endowment = F × A × G × P
Megill (1988)

Granite-related ore-forming systems in the G-P-A-S strip

	SOURCES	ACTIVE PATHWAYS	TRAPS	MODIFICATIONS
CRITICAL FACTORS	**Fertile magmas formation** (energy, protoliths nature, fluxing components) **Extreme fractionation** of pluton-sized batches of granite magma	**Magma transport** (directing flow through the crust and late separation of evolved residual melts or critical fluids)	**Cooling and rapid crystallisation** (chemical transport & differentiation; metal enrichment in residual portions)	**Exhumation vs preservation**

Granite-related ore-forming systems in the G-P-A-S strip

CONSTITUENT PROCESSES

SOURCES

CRITICAL FACTORS

Crustal-melting
(variable degrees of partial melting that could involve the same protolith; mixing of melts generated in different crustal levels and P-T conditions)

Collisional features

Late events able to produce decompression melts

ACTIVE PATHWAYS

CRITICAL FACTORS

Crustal-scale shearing/faulting
(cycles of renewed rock permeability increasing)

TRAPS

CRITICAL FACTORS

Fractional crystallization, filter pressing or rapid diffusion of critical phases

High contents of fluxing agents (P, F, B)

Highly differentiated (and metal-fertile) batches

Supercritical fluids split-up.

Mixing with external fluid components

MODIFICATIONS

CRITICAL FACTORS

Supergene assemblages

Secondary (alluvial) accumulations

Geochemical proxies to granite-related mineral systems using multi-element whole-rock analysis

- **Highly differentiated granitic rocks**
  - Whole-rock enrichments in **P, F, Be, Li, Ta, Sn, Nb** (up to 25×, 15×, 70×, 500×, 150×, 800×, and 20×UCC, respectively).
  - K/Rb < 150; Nb/Ta < 5; Y/Ho ≠ 28; Sr/Eu > 200; Eu/Eu* < 0.1; Zr/Hf < 15, as in many other Sn-W(±Li) provinces worldwide.

- **TE1,3 increasing and co-varying with magmatic differentiation and metal-enrichment**
  - TE1,3 < 1.1 ⇒ peraluminous-high-phosphorus Li-Sn granite systems
  - TE1,3 > 1.1 ⇒ peraluminous-high-phosphorus granite suites Sn-W-Li (lepidolite) (up to 1.4) and peraluminous-low-phosphorus Sn-Ta-Nb granite systems (up to 2.1)

Granite-related ore-forming systems in the G-P-A-S strip

	SOURCES	ACTIVE PATHWAYS	TRAPS	MODIFICATIONS
	CRITICAL FACTORS	CRITICAL FACTORS	CRITICAL FACTORS	CRITICAL FACTORS
	CONSTITUENT PROCESSES	CONSTITUENT PROCESSES	CONSTITUENT PROCESSES	CONSTITUENT PROCESSES
TARGETING	**Highly differentiated** peraluminous γs, **ferroan leucogranites** enriched in a wide range of incompatible elements **Compositional overprints displayed by contact metamorphism aureoles**	**Network of shear zones** (connection domains of conjugate systems; evidence of multiple reactivation) **Networks of folding-related structural discontinuities**	**Distal and proximal swarms of aplite-pegmatite bodies** **Compositionally and texturally zoned pegmatites.** **Quartz-lode systems** (density, internal connection, evidence of multiple infilling stages)	**Topographic highs and ridges** **Weathering vulnerability of critical mineral phases** **Physical dispersion of heavy minerals**

Granite-related ore-forming systems in the G-P-A-S strip

SOURCES	ACTIVE PATHWAYS	TRAPS	MODIFICATIONS
CRITICAL FACTORS	CRITICAL FACTORS	CRITICAL FACTORS	CRITICAL FACTORS
CONSTITUENT PROCESSES	CONSTITUENT PROCESSES	CONSTITUENT PROCESSES	CONSTITUENT PROCESSES
TARGETING	TARGETING	TARGETING	TARGETING

MAPPEABLE PROXIES

Sources

For granites:
- Mineral attributes
- Textural features
- Geochemical attributes
- Age

Fertility footprints:
- Mineral abundance and composition
- Geochemical ratios and indexes

Active pathways

Structural patterns:
- Density
- Connection
- Mineral infillings
- Age

Alteration pathways in country rocks:
- Mineral guides
- Geochemical guides
- Age

Traps

Mineral/Geochemical attributes

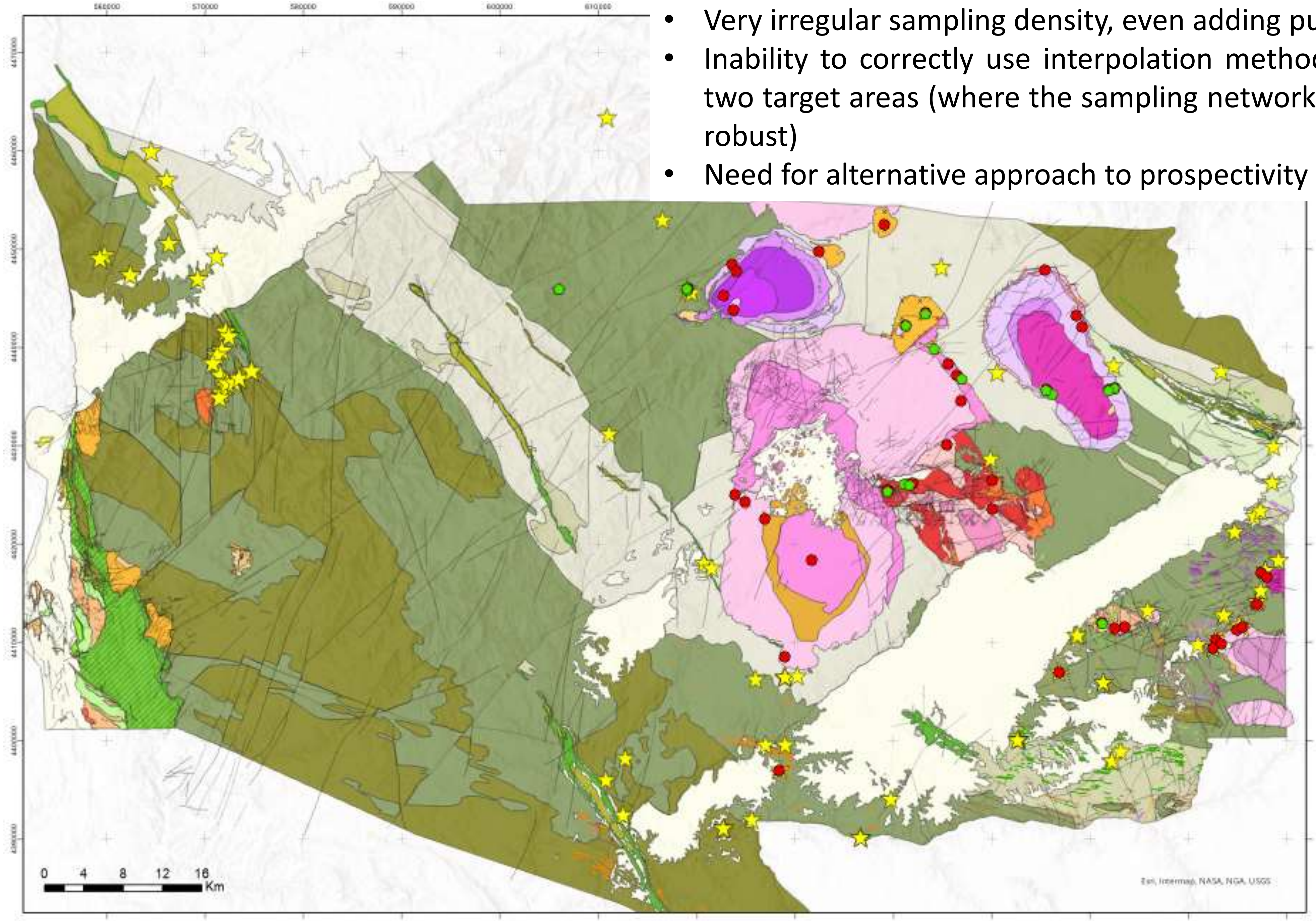
Alteration haloes:
- Mineral guides
- Geochemical guides

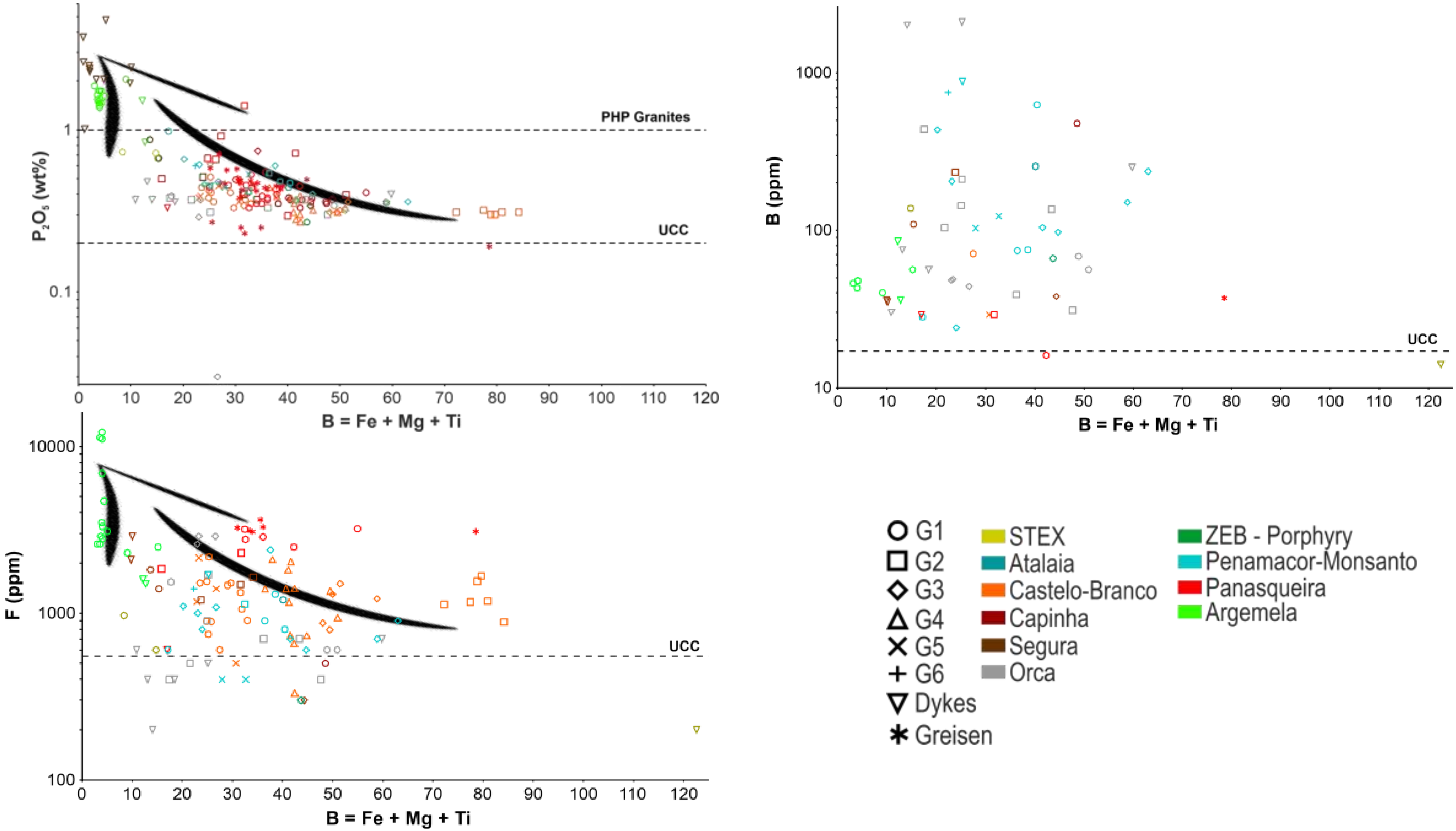
Modifications

Heavy minerals in alluvial sediments:
- Classification
- Composition

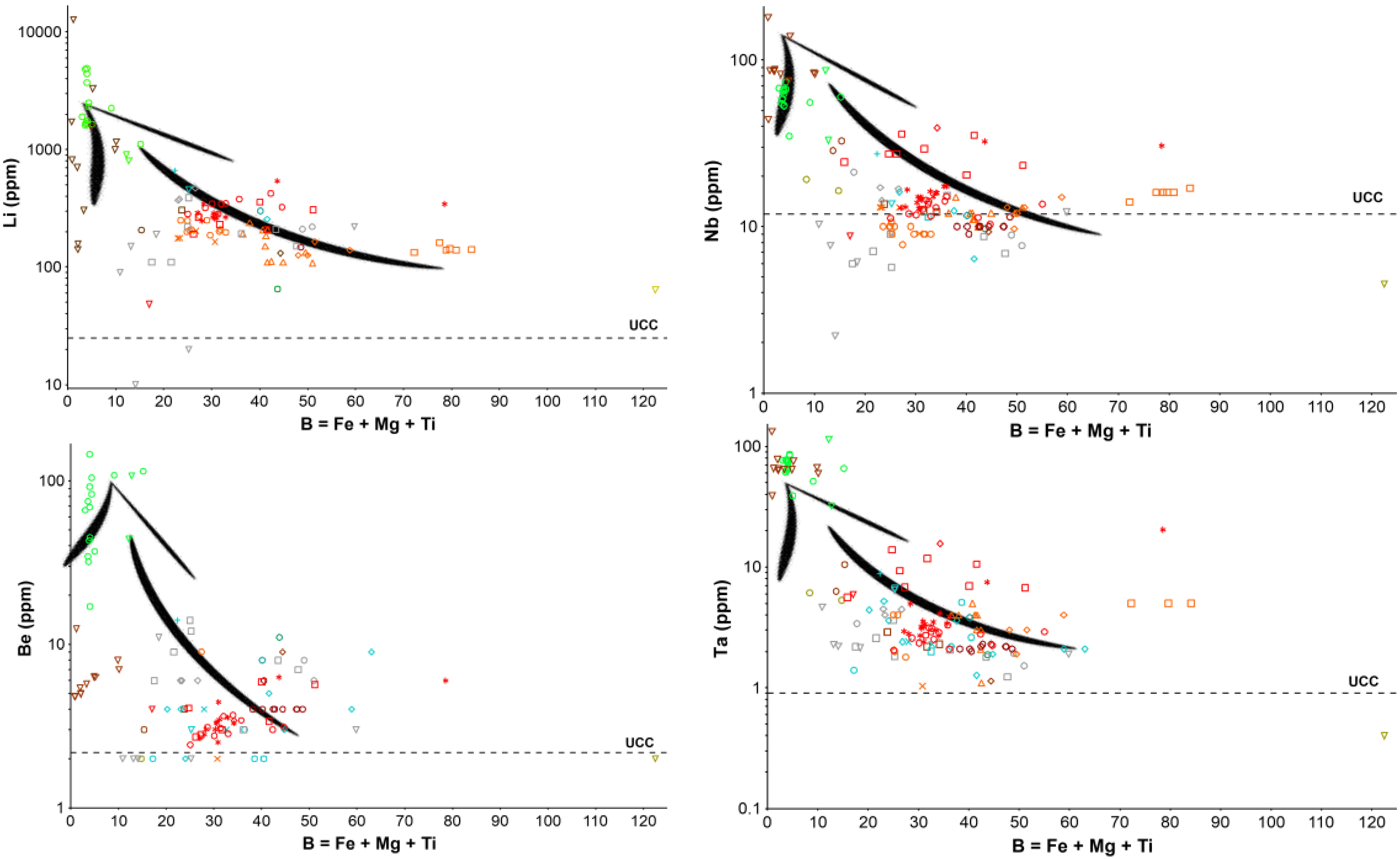
Soil or stream sediment geochemistry

- Very irregular sampling density, even adding published data.
- Inability to correctly use interpolation methods, except for two target areas (where the sampling network is sufficiently robust)
- Need for alternative approach to prospectivity maps.

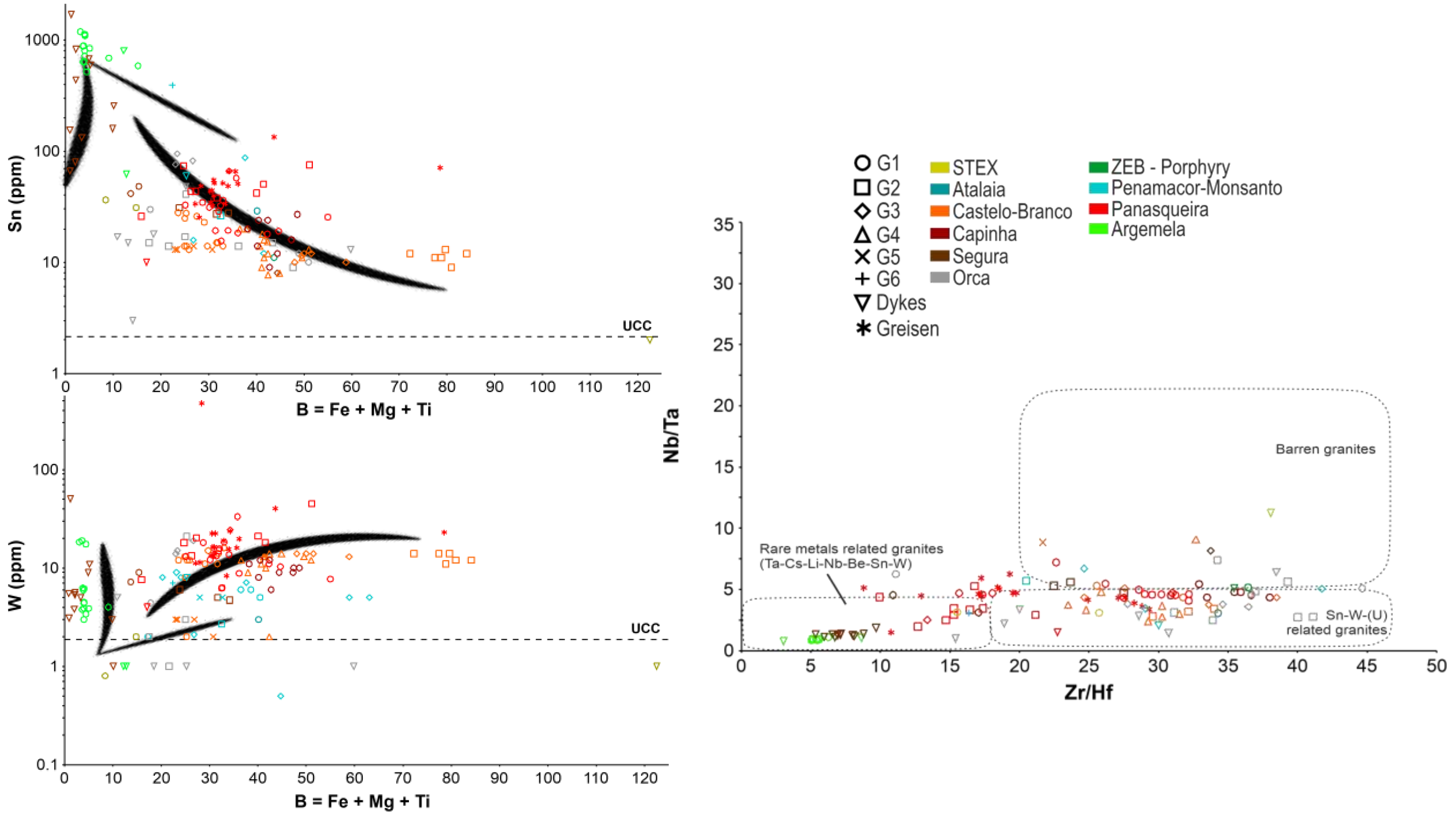




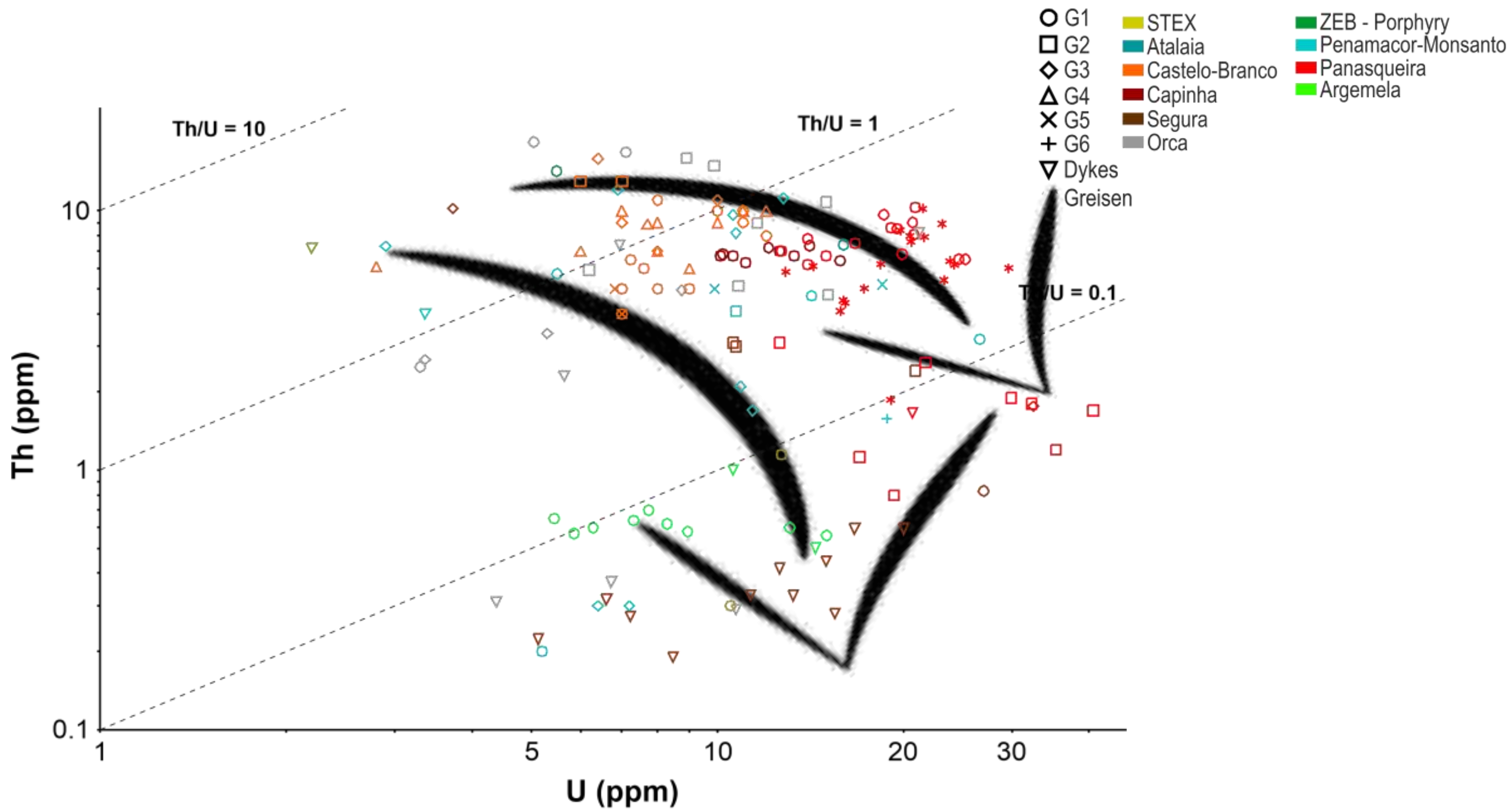
PHP Granites
UCC
P2O5 (wt%)
B = Fe + Mg + Ti
F (ppm)
B (ppm)
G1
G2
G3
G4
G5
G6
Dykes
Greisen
STEX
Atalaia
Castelo-Branco
Capinha
Segura
Orca
ZEB - Porphyry
Penamacor-Monsanto
Panasqueira
Argemela



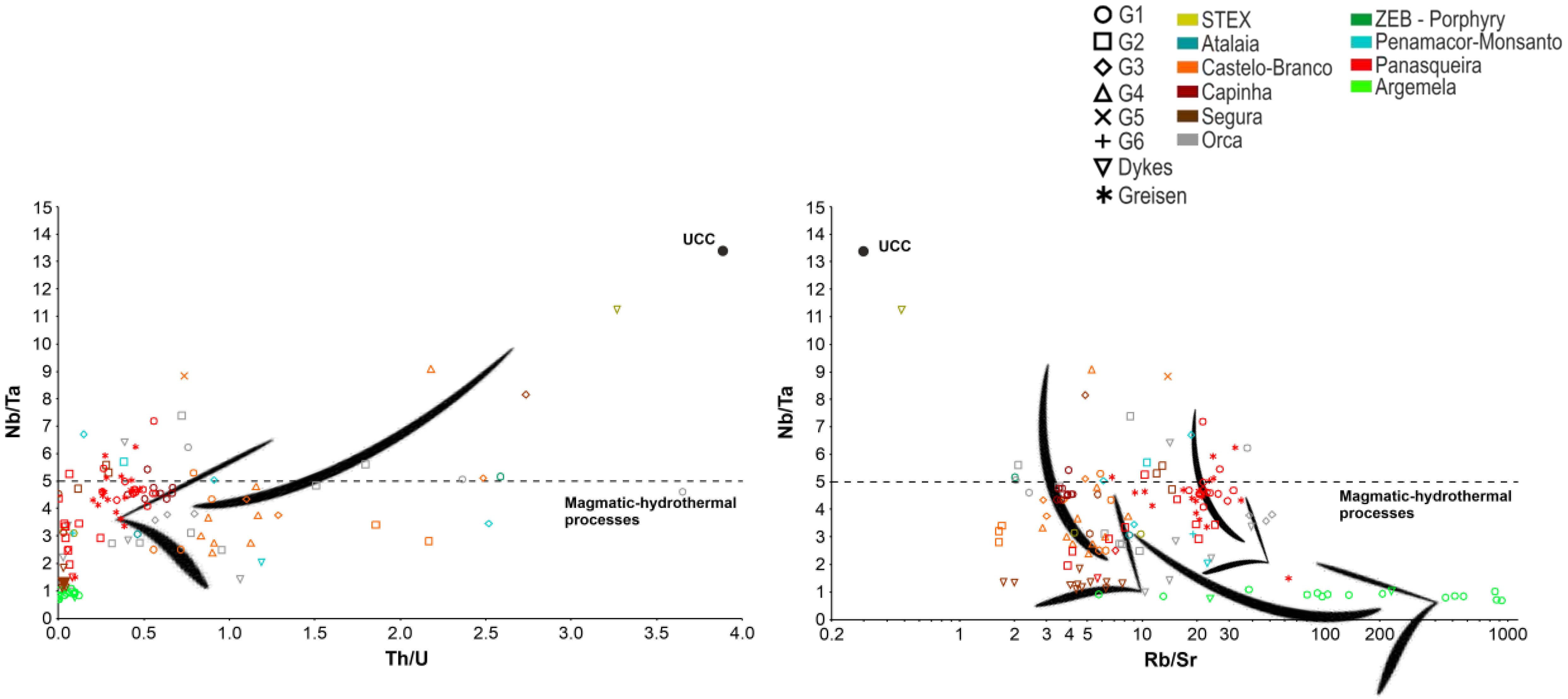
Li (ppm)
10000
1000
100
10
UCC
0
10
20
30
40
50
60
70
80
90
100
110
120
B = Fe + Mg + Ti
Nb (ppm)
100
10
1
UCC
B = Fe + Mg + Ti
Be (ppm)
100
10
1
UCC
B = Fe + Mg + Ti
Ta (ppm)
100
10
1
0.1
UCC
B = Fe + Mg + Ti

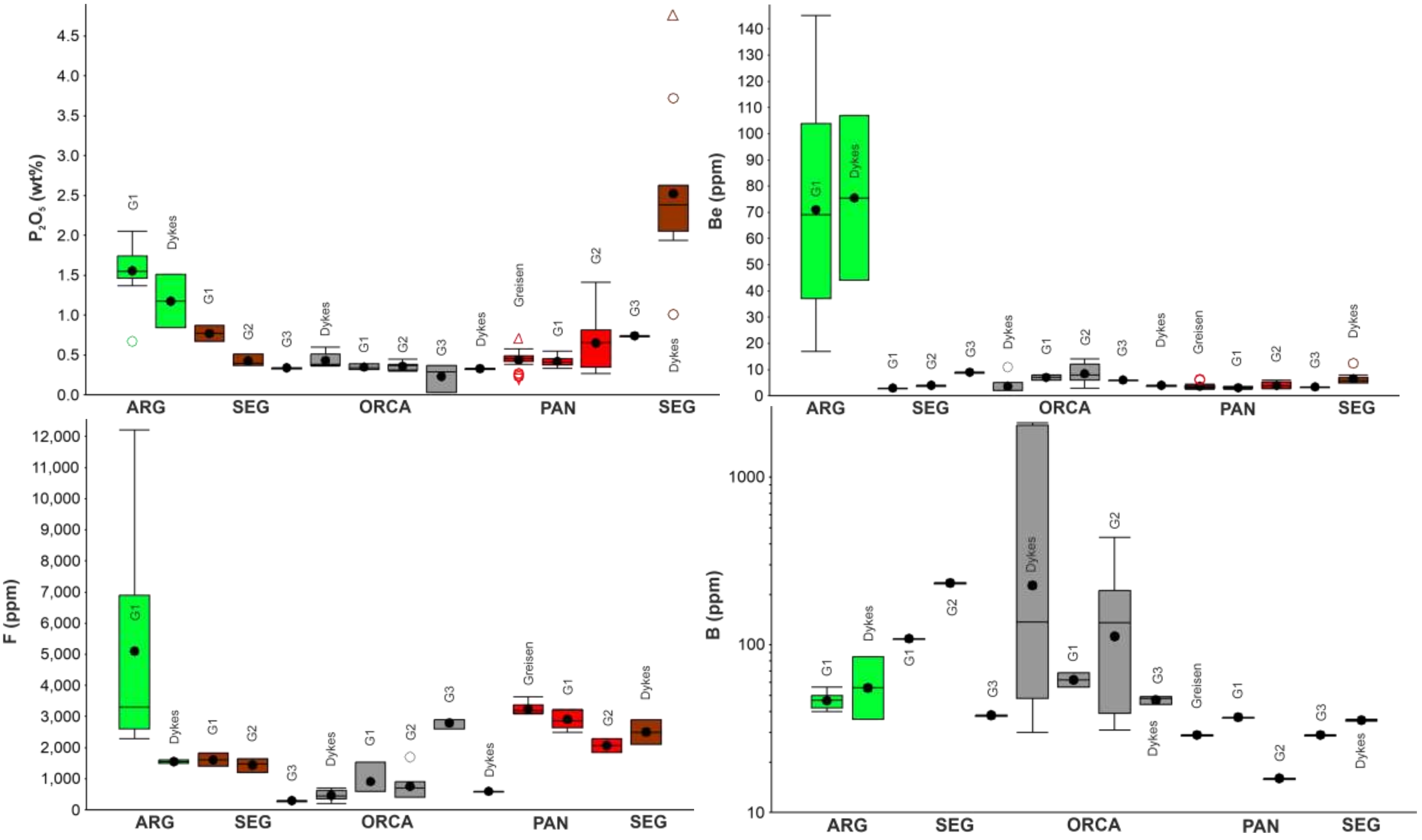


Sn (ppm)
1000
100
10
1
UCC
0 10 20 30 40 50 60 70 80 90 100 110 120
B = Fe + Mg + Ti
W (ppm)
100
10
1
0.1
UCC
0 10 20 30 40 50 60 70 80 90 100 110 120
B = Fe + Mg + Ti
G1
G2
G3
G4
G5
G6
Dykes
Greisen
STEX
Atalaia
Castelo-Branco
Capinha
Segura
Orca
ZEB - Porphyry
Penamacor-Monsanto
Panasqueira
Argemela
Nb/Ta
35
30
25
20
15
10
5
0
Barren granites
Rare metals related granites
(Ta-Cs-Li-Nb-Be-Sn-W)
Sn-W-(U)
related granites
0 5 10 15 20 25 30 35 40 45 50
Zr/Hf

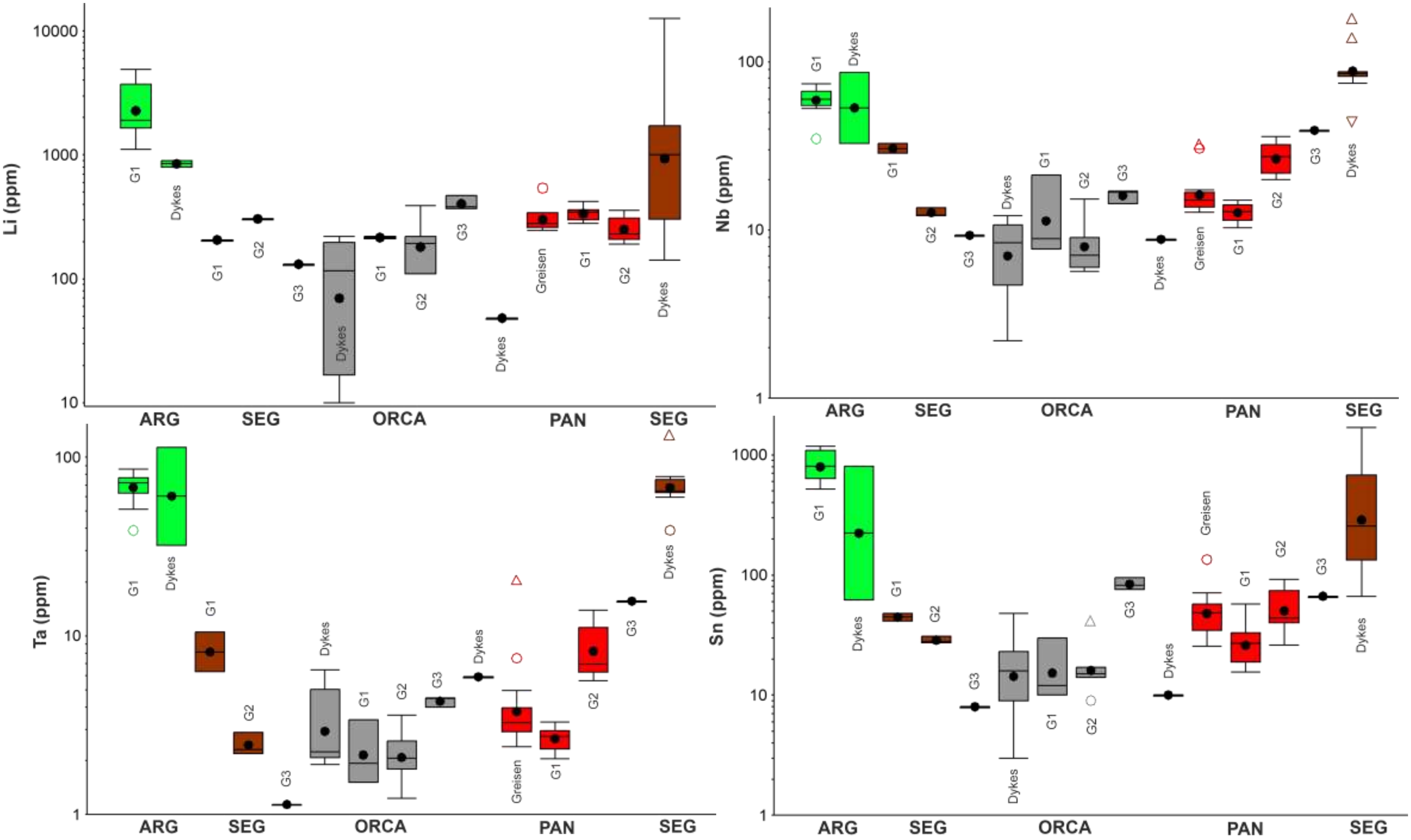


G1
G2
G3
G4
G5
G6
Dykes
Greisen
STEX
Atalaia
Castelo-Branco
Capinha
Segura
Orca
ZEB - Porphyry
Penamacor-Monsanto
Panasqueira
Argemela
Th/U = 10
Th/U = 1
Th/U = 0.1
Th (ppm)
U (ppm)
0.1
1
10
1
5
10
20
30

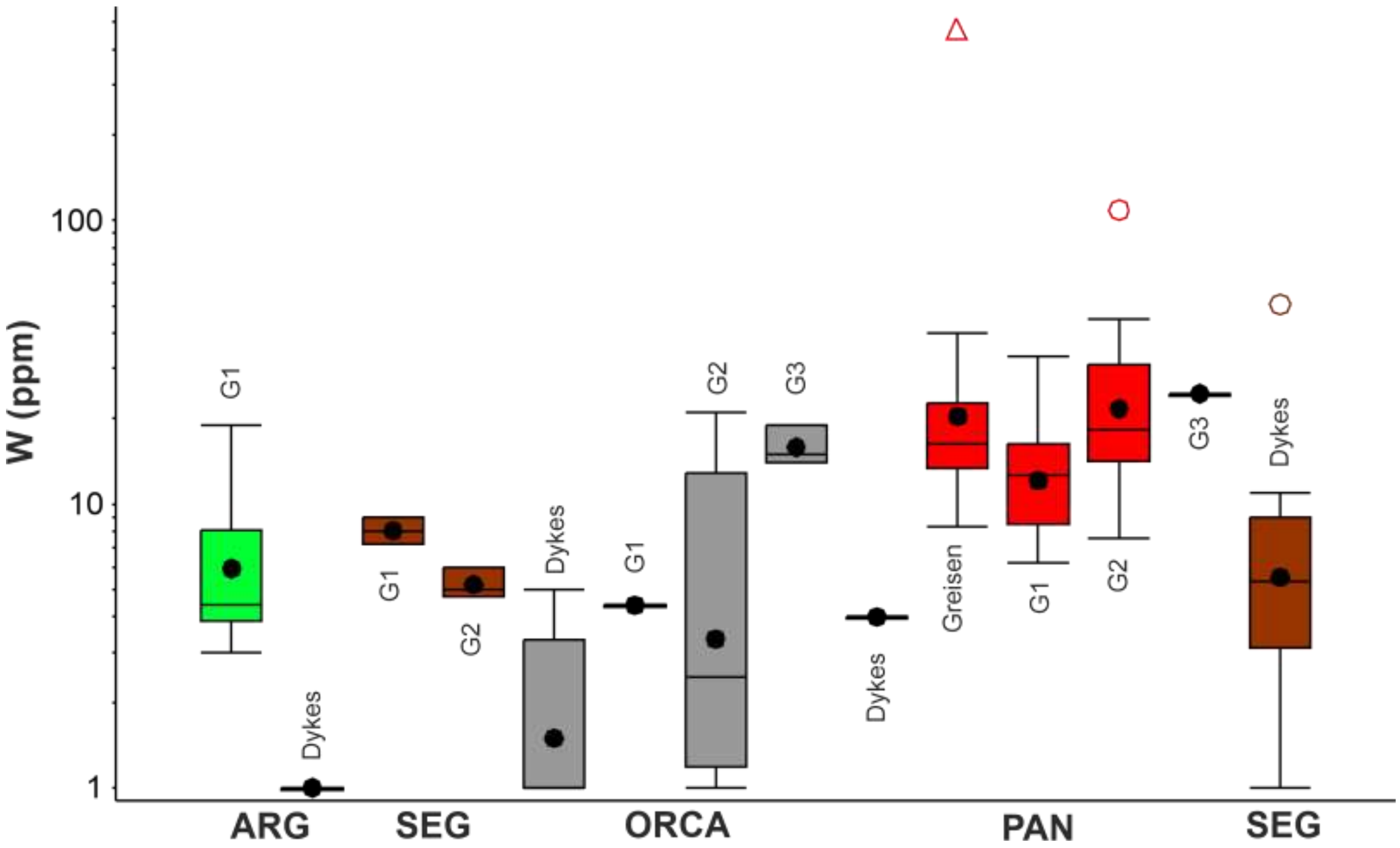

G1
G2
G3
G4
G5
G6
Dykes
Greisen
STEX
Atalaia
Castelo-Branco
Capinha
Segura
Orca
ZEB - Porphyry
Penamacor-Monsanto
Panasqueira
Argemela
Nb/Ta
UCC
Magmatic-hydrothermal processes
Th/U
Rb/Sr



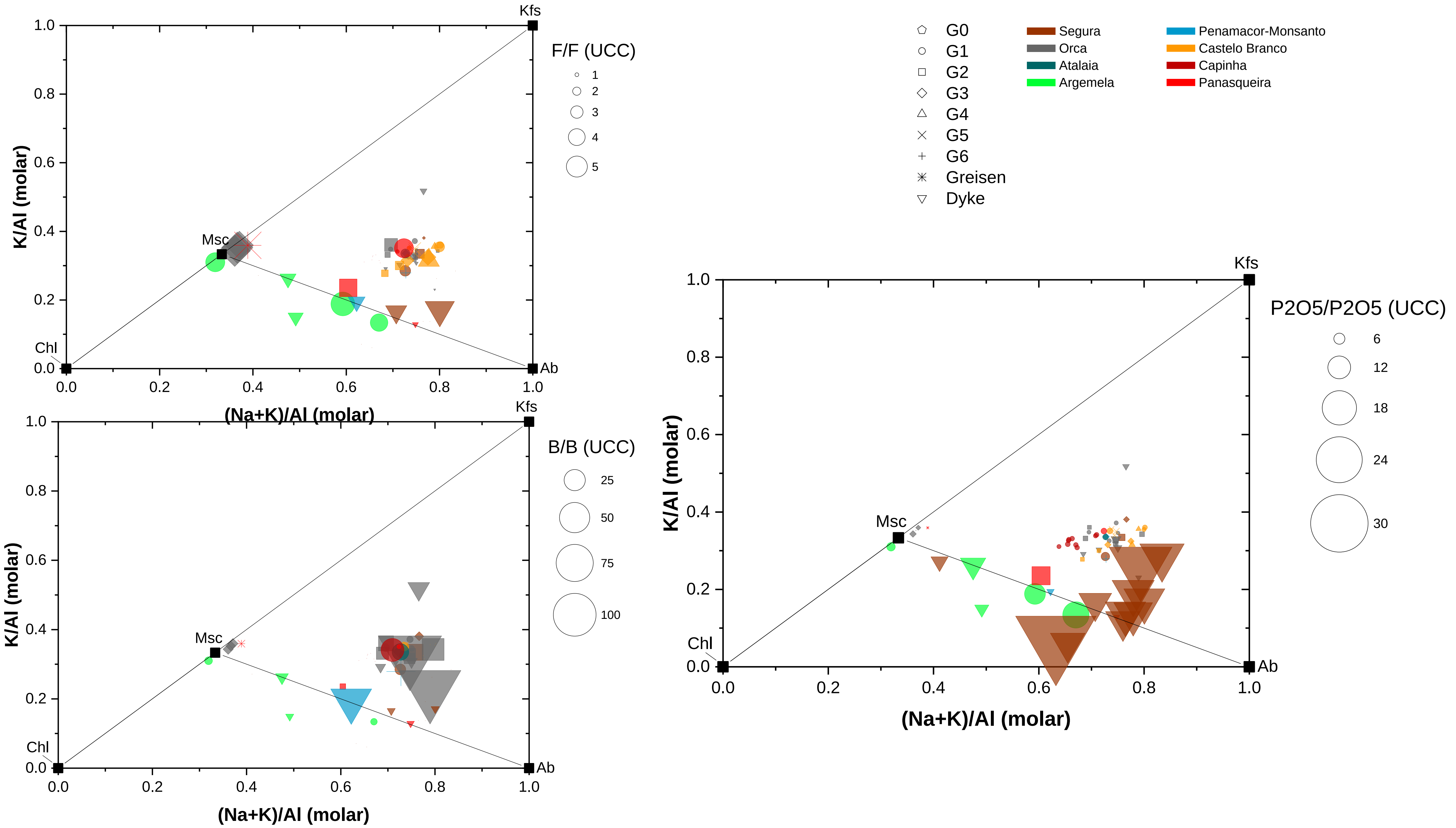
P2O5 (wt%)
0.0
0.5
1.0
1.5
2.0
2.5
3.0
3.5
4.0
4.5
G1
Dykes
G1
G2
G3
Dykes
G1
G2
G3
Dykes
Greisen
G1
G2
G3
Dykes
ARG
SEG
ORCA
PAN
SEG
Be (ppm)
0
10
20
30
40
50
60
70
80
90
100
110
120
130
140
G1
Dykes
G1
G2
G3
Dykes
G1
G2
G3
Dykes
Greisen
G1
G2
G3
Dykes
ARG
SEG
ORCA
PAN
SEG
F (ppm)
0
1,000
2,000
3,000
4,000
5,000
6,000
7,000
8,000
9,000
10,000
11,000
12,000
G1
Dykes
G1
G2
G3
Dykes
G1
G2
G3
Dykes
Greisen
G1
G2
Dykes
ARG
SEG
ORCA
PAN
SEG
B (ppm)
10
100
1000
G1
Dykes
G1
G2
G3
Dykes
G1
G2
G3
Dykes
Greisen
G1
G2
G3
Dykes
ARG
SEG
ORCA
PAN
SEG



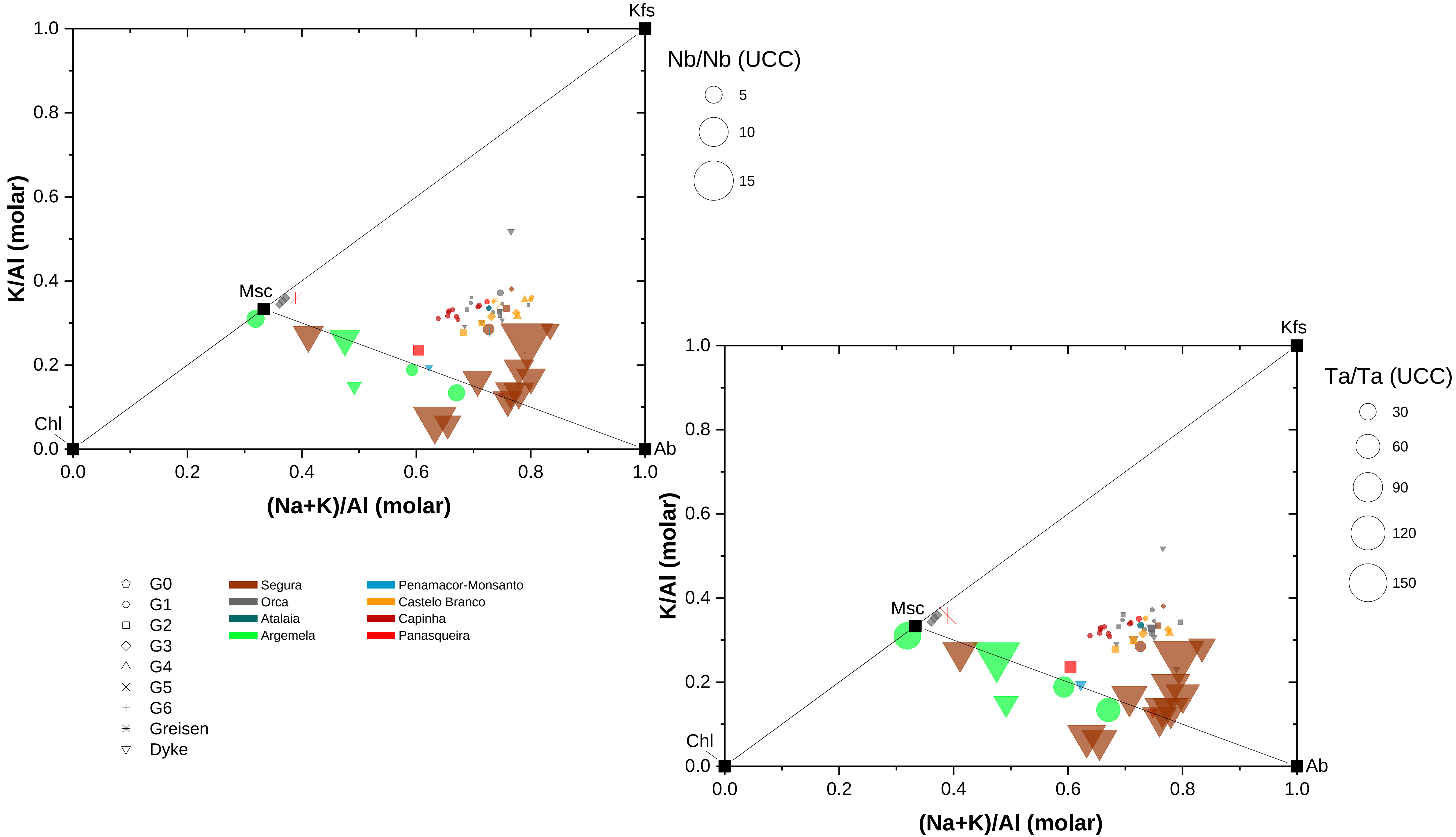
Li (ppm)
10000
1000
100
10
G1
Dykes
G2
G3
Greisen
ARG
SEG
ORCA
PAN
SEG
Nb (ppm)
100
10
1
Ta (ppm)
Sn (ppm)



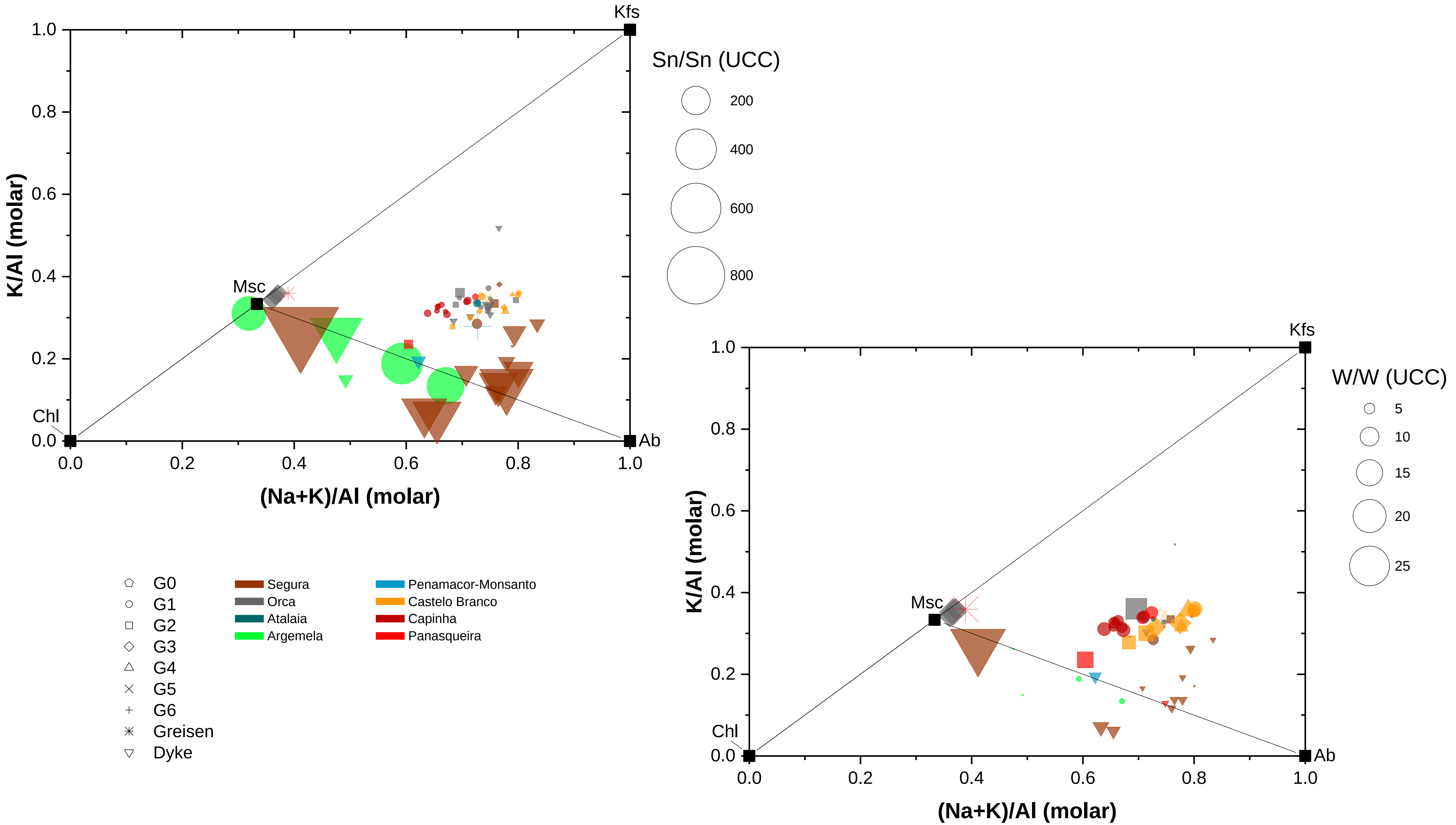
W (ppm)
100
10
1
G1
Dykes
G1
G2
Dykes
G1
G2
G3
Dykes
Greisen
G1
G2
G3
Dykes
ARG
SEG
ORCA
PAN
SEG

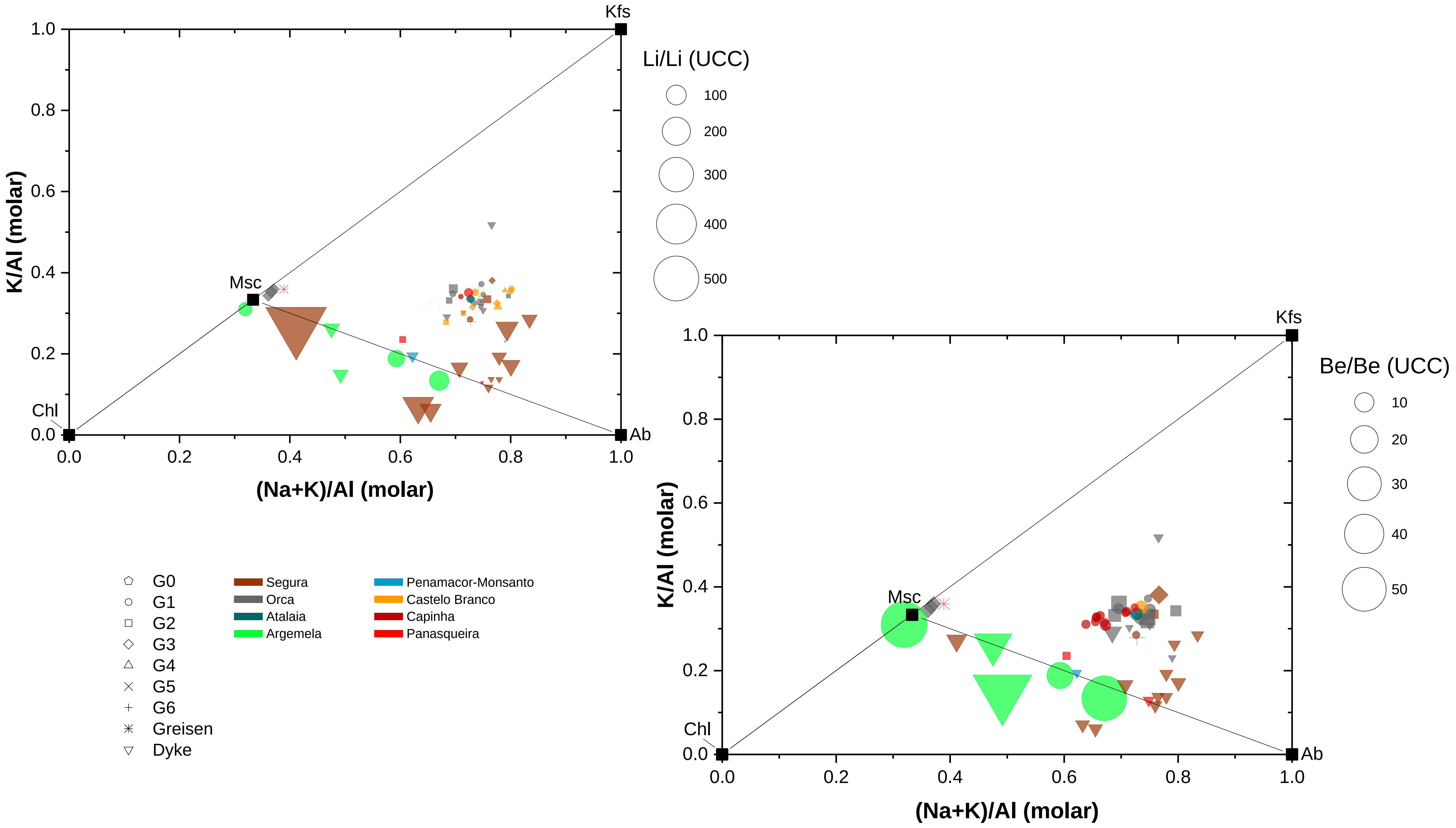


F/F (UCC)
1
2
3
4
5
B/B (UCC)
25
50
75
100
P2O5/P2O5 (UCC)
6
12
18
24
30
G0
G1
G2
G3
G4
G5
G6
Greisen
Dyke
Segura
Orca
Atalaia
Argemela
Penamacor-Monsanto
Castelo Branco
Capinha
Panasqueira
Kfs
Msc
Chl
Ab
K/Al (molar)
(Na+K)/Al (molar)

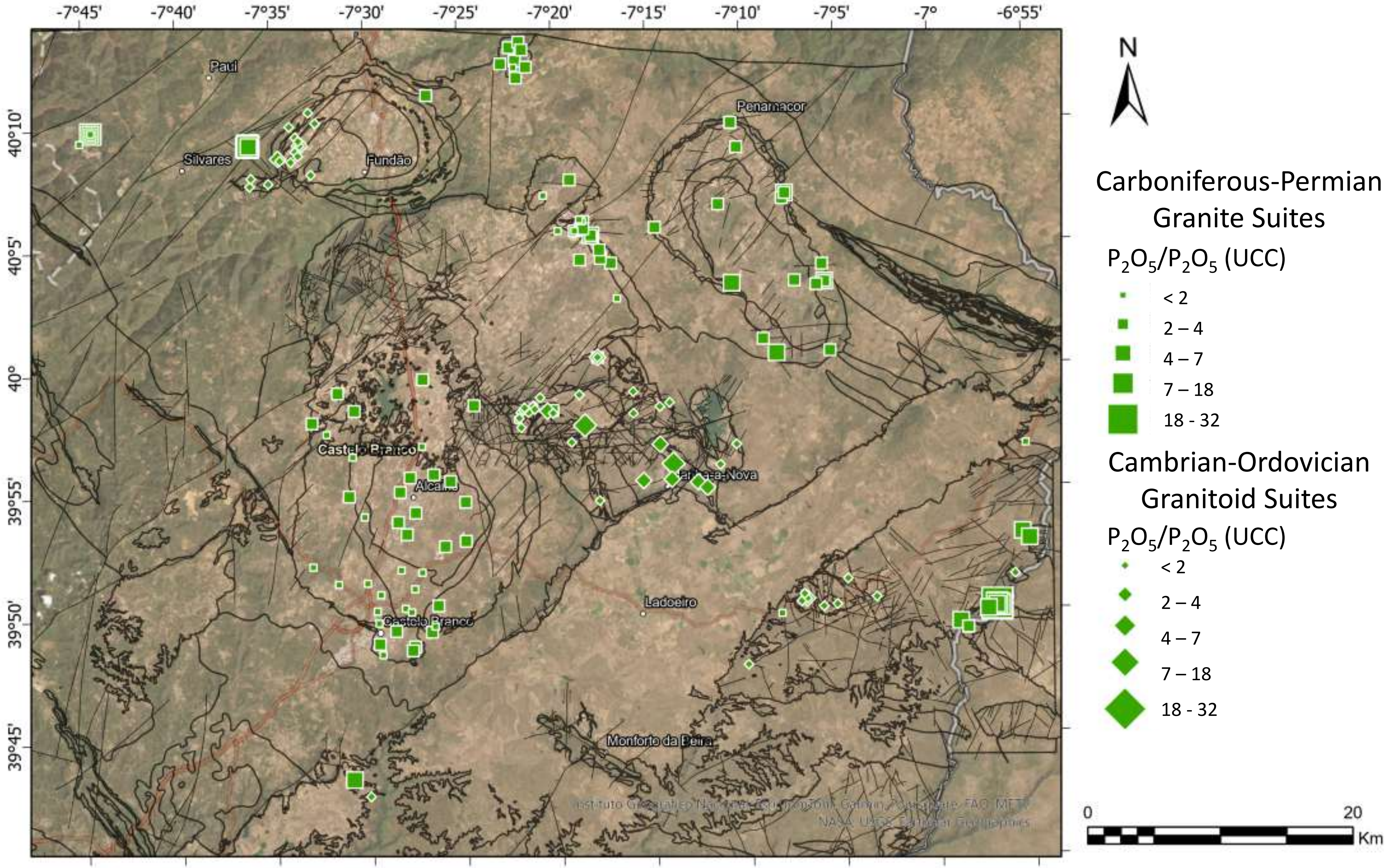


Kfs
Msc
Chl
Ab
K/Al (molar)
(Na+K)/Al (molar)
0.0
0.2
0.4
0.6
0.8
1.0
Nb/Nb (UCC)
5
10
15
Ta/Ta (UCC)
30
60
90
120
150
G0
G1
G2
G3
G4
G5
G6
Greisen
Dyke
Segura
Orca
Atalaia
Argemela
Penamacor-Monsanto
Castelo Branco
Capinha
Panasqueira


Kfs
Msc
Chl
Ab
K/Al (molar)
(Na+K)/Al (molar)
Sn/Sn (UCC)
200
400
600
800
W/W (UCC)
5
10
15
20
25
G0
G1
G2
G3
G4
G5
G6
Greisen
Dyke
Segura
Orca
Atalaia
Argemela
Penamacor-Monsanto
Castelo Branco
Capinha
Panasqueira



Kfs
Msc
Chl
Ab
K/Al (molar)
(Na+K)/Al (molar)
Li/Li (UCC)
100
200
300
400
500
Be/Be (UCC)
10
20
30
40
50
G0
G1
G2
G3
G4
G5
G6
Greisen
Dyke
Segura
Orca
Atalaia
Argemela
Penamacor-Monsanto
Castelo Branco
Capinha
Panasqueira



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-7°10'
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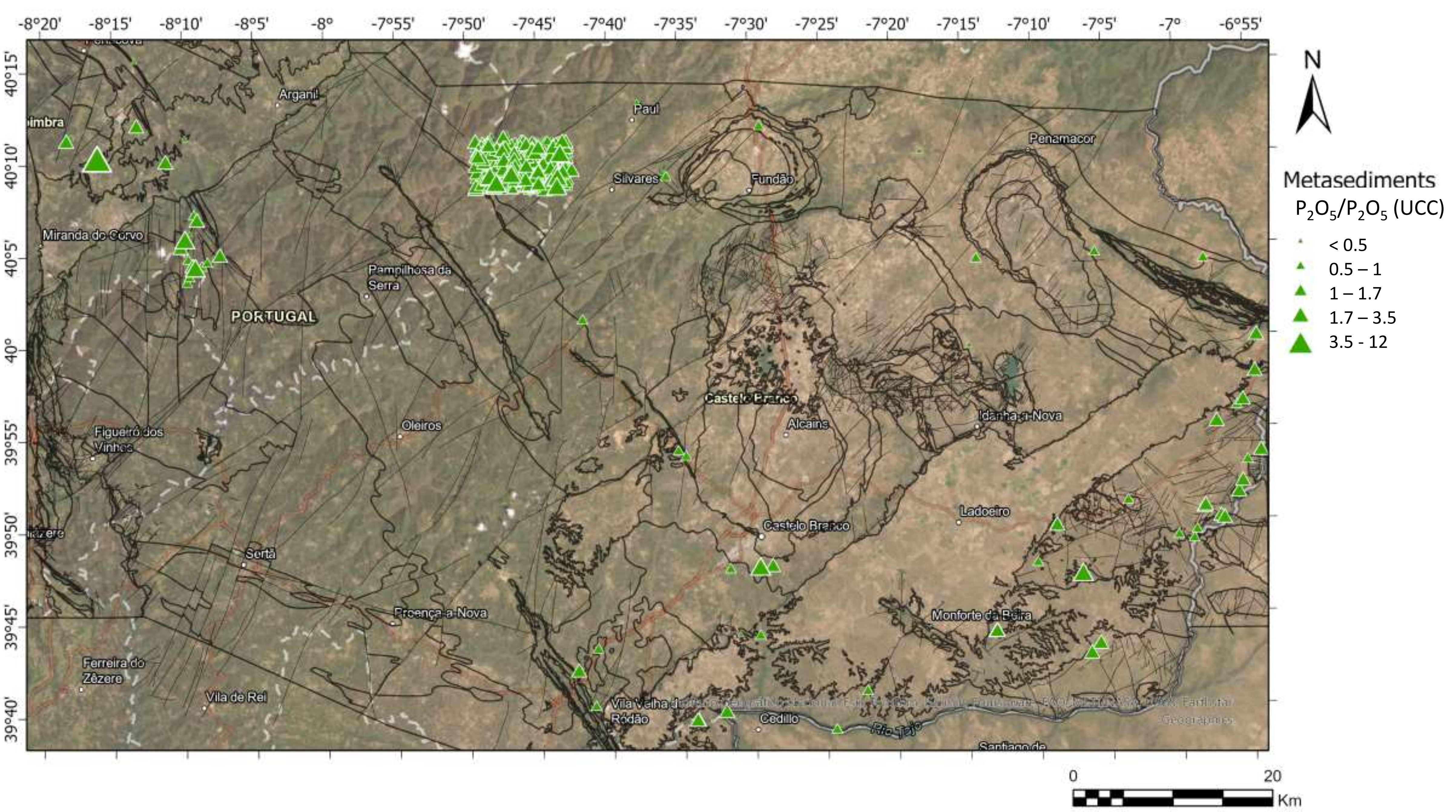
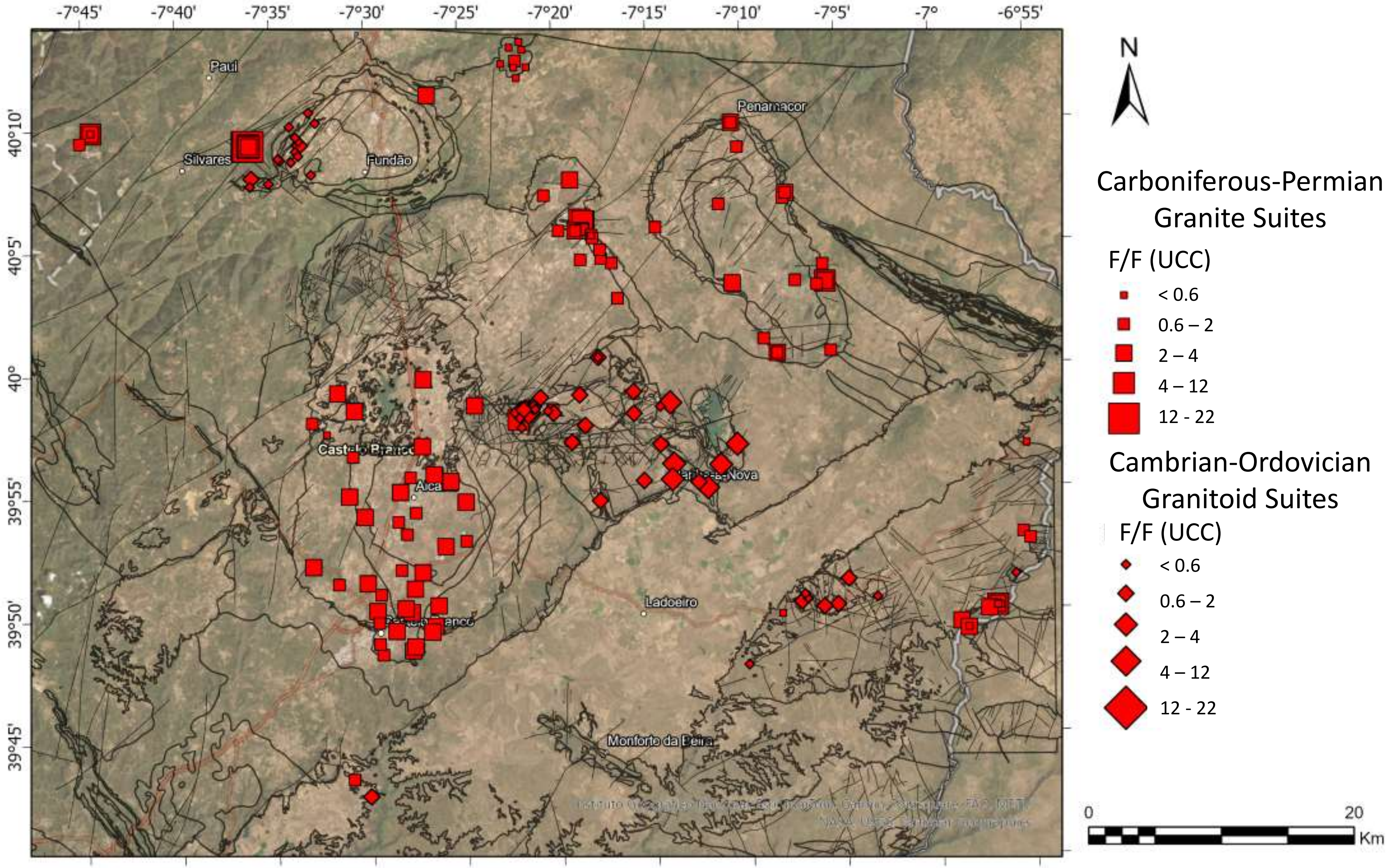
-7°
-6°55'
40°10'
40°5'
40°
39°55'
39°50'
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian
Granite Suites
P_2O_5/P_2O_5 (UCC)
< 2
2 – 4
4 – 7
7 – 18
18 - 32
Cambrian-Ordovician
Granitoid Suites
P_2O_5/P_2O_5 (UCC)
< 2
2 – 4
4 – 7
7 – 18
18 - 32
0
20
Km



N
Metasediments
P2O5/P2O5 (UCC)
< 0.5
0.5 – 1
1 – 1.7
1.7 – 3.5
3.5 - 12
0
20
Km
-8°20'
-8°15'
-8°10'
-8°5'
-8°
-7°55'
-7°50'
-7°45'
-7°40'
-7°35'
-7°30'
-7°25'
-7°20'
-7°15'
-7°10'
-7°5'
-7°
-6°55'
40°15'
40°10'
40°5'
40°
39°55'
39°50'
39°45'
39°40'
Arganil
Paul
Penamacor
Silvares
Fundão
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
Alcains
Idanha-a-Nova
Oleiros
Figueiró dos Vinhos
Ladoeiro
Sertã
Proença-a-Nova
Monforte da Beira
Ferreira do Zêzere
Vila de Rei
Vila Velha de Ródão
Cedillo
Rio Tejo



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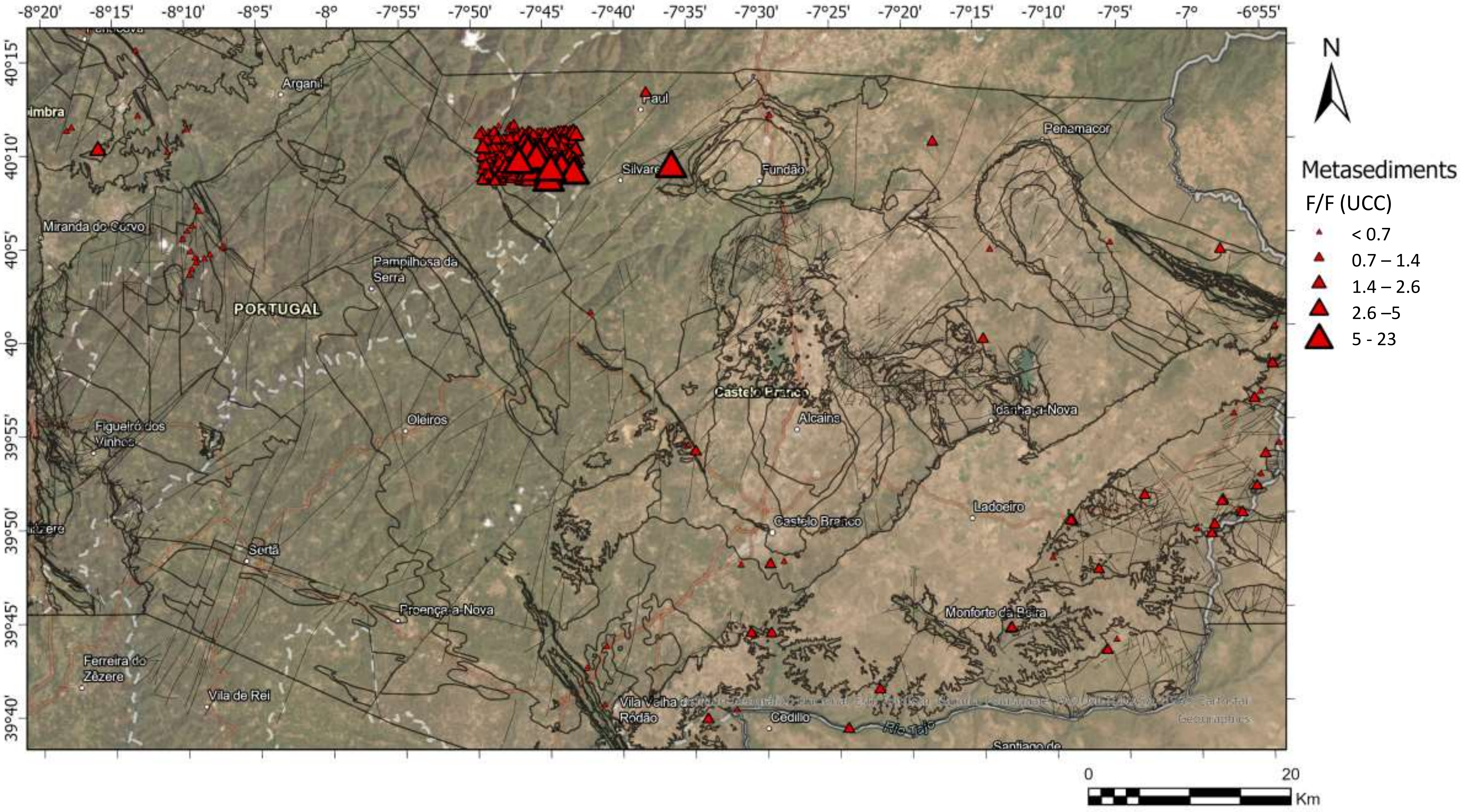
-7°25'
-7°20'
-7°15'
-7°10'
-7°5'
-7°
-6°55'
40°10'
40°5'
40°
39°55'
39°50'
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian
Granite Suites
F/F (UCC)
< 0.6
0.6 – 2
2 – 4
4 – 12
12 - 22
Cambrian-Ordovician
Granitoid Suites
F/F (UCC)
< 0.6
0.6 – 2
2 – 4
4 – 12
12 - 22
0
20
Km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-8°
-7°55'
-7°50'
-7°45'
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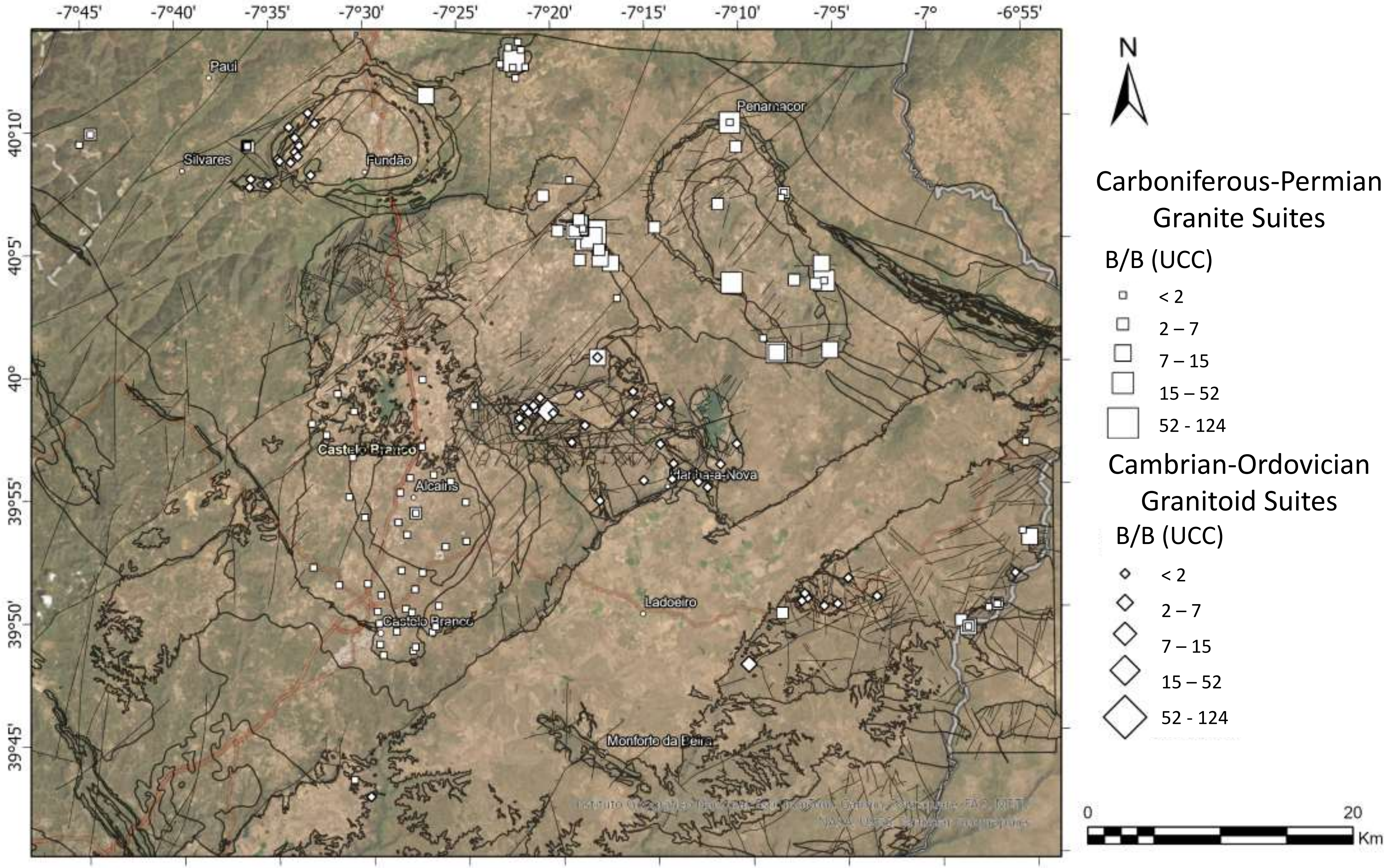
-7°30'
-7°25'
-7°20'
-7°15'
-7°10'
-7°5'
-7°
-6°55'
40°15'
40°10'
40°5'
40°
39°55'
39°50'
39°45'
39°40'
Arganil
Paul
Silvares
Fundão
Penamacor
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
Alcains
Idanha-a-Nova
Oleiros
Figueiró dos Vinhos
Ladoeiro
Castelo Branco
Sertã
Proença-a-Nova
Monforte da Beira
Ferreira do Zêzere
Vila de Rei
Vila Velha de Ródão
Cedillo
Rio Tejo
N
Metasediments
F/F (UCC)
< 0.7
0.7 – 1.4
1.4 – 2.6
2.6 –5
5 - 23
0
20
Km



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-7º35'
-7º30'
-7º25'
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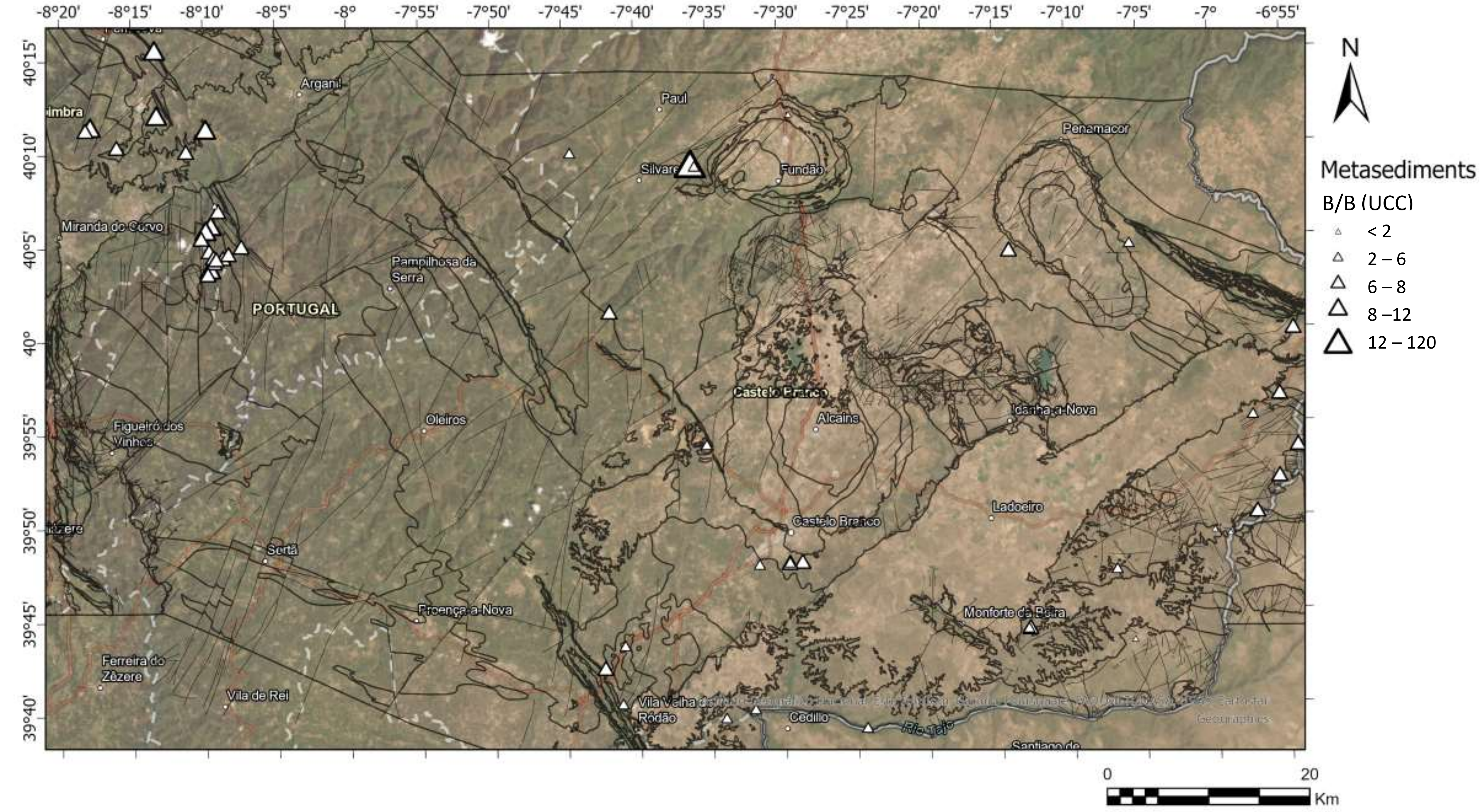
-7º15'
-7º10'
-7º5'
-7º
-6º55'
40º10'
40º5'
40º
39º55'
39º50'
39º45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian
Granite Suites
B/B (UCC)
< 2
2 – 7
7 – 15
15 – 52
52 - 124
Cambrian-Ordovician
Granitoid Suites
B/B (UCC)
< 2
2 – 7
7 – 15
15 – 52
52 - 124
0
20
Km


Metasediments
B/B (UCC)
< 2
2 – 6
6 – 8
8 –12
12 – 120
N
0
20
Km
PORTUGAL
Arganil
Paul
Silvares
Fundão
Penamacor
Miranda do Corvo
Pampilhosa da Serra
Castelo Branco
Alcains
Idanha-a-Nova
Oleiros
Figueiró dos Vinhos
Ladoeiro
Sertã
Proença-a-Nova
Monforte da Beira
Ferreira do Zêzere
Vila de Rei
Vila Velha de Ródão
Cedillo
Rio Tejo
-8°20'
-8°15'
-8°10'
-8°5'
-8°
-7°55'
-7°50'
-7°45'
-7°40'
-7°35'
-7°30'
-7°25'
-7°20'
-7°15'
-7°10'
-7°5'
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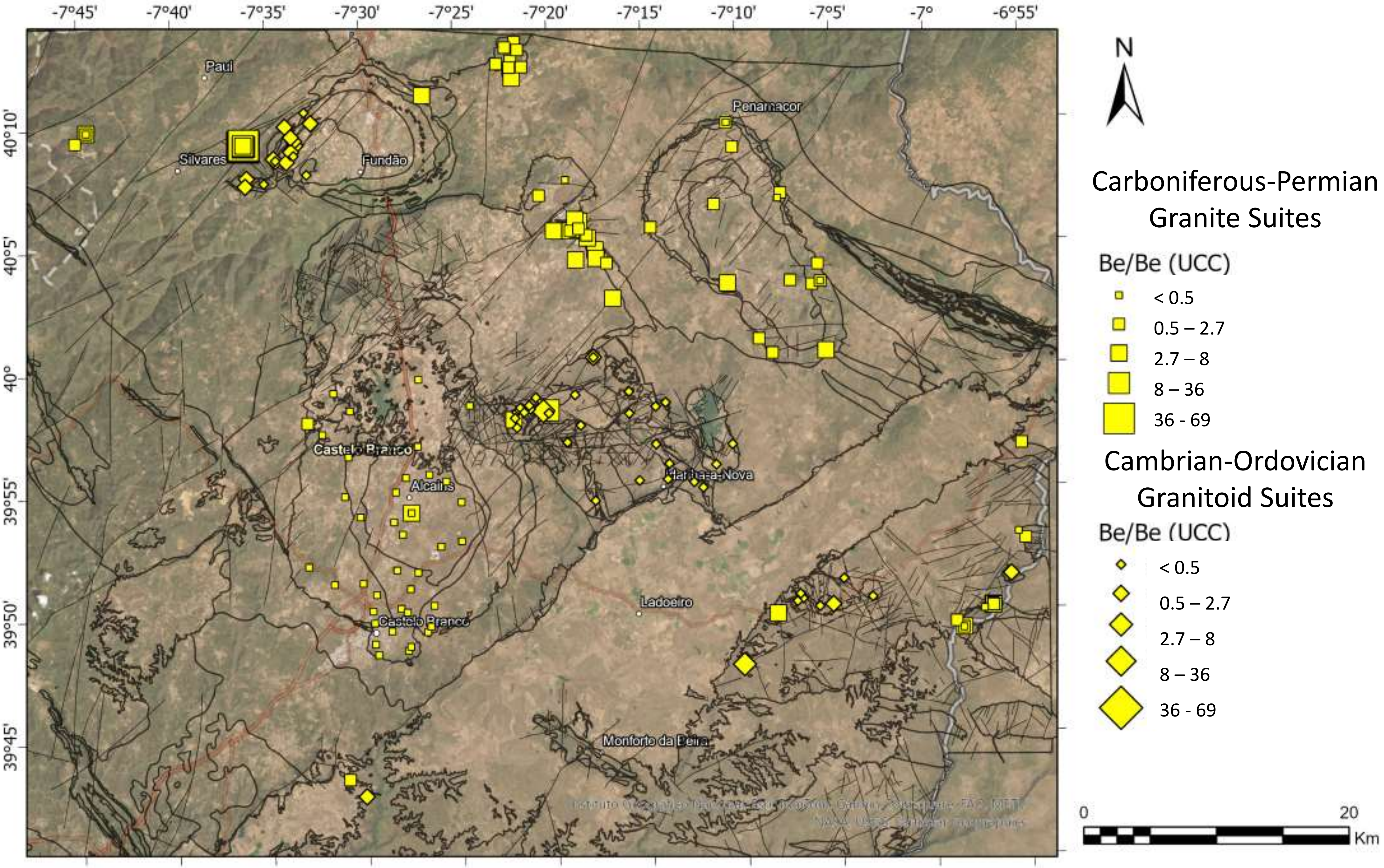
40°5'
40°
39°55'
39°50'
39°45'
39°40'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-7º35'
-7º30'
-7º25'
-7º20'
-7º15'
-7º10'
-7º5'
-7º
-6º55'
40º10'
40º5'
40º
39º55'
39º50'
39º45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian Granite Suites
Be/Be (UCC)
< 0.5
0.5 – 2.7
2.7 – 8
8 – 36
36 - 69
Cambrian-Ordovician Granitoid Suites
Be/Be (UCC)
< 0.5
0.5 – 2.7
2.7 – 8
8 – 36
36 - 69
0
20
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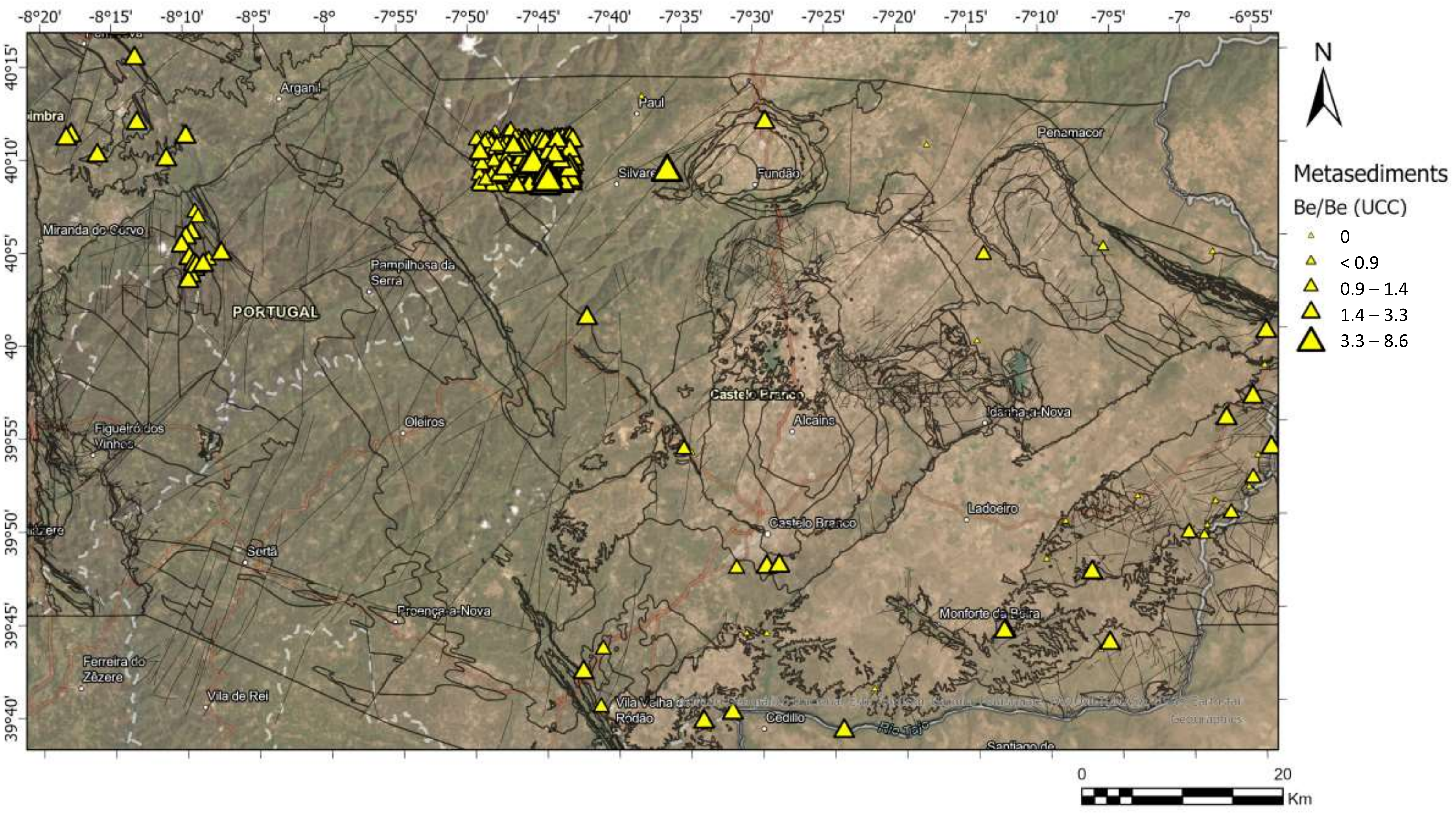

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40°10'
40°5'
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39°50'
39°45'
39°40'
N
Metasediments
Be/Be (UCC)
0
< 0.9
0.9 – 1.4
1.4 – 3.3
3.3 – 8.6
Arganil
Paul
Silvares
Fundão
Penamacor
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
Alcains
Idanha-a-Nova
Oleiros
Figueiró dos Vinhos
Ladoeiro
Castelo Branco
Sertã
Proença-a-Nova
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Cedillo
Rio Tejo
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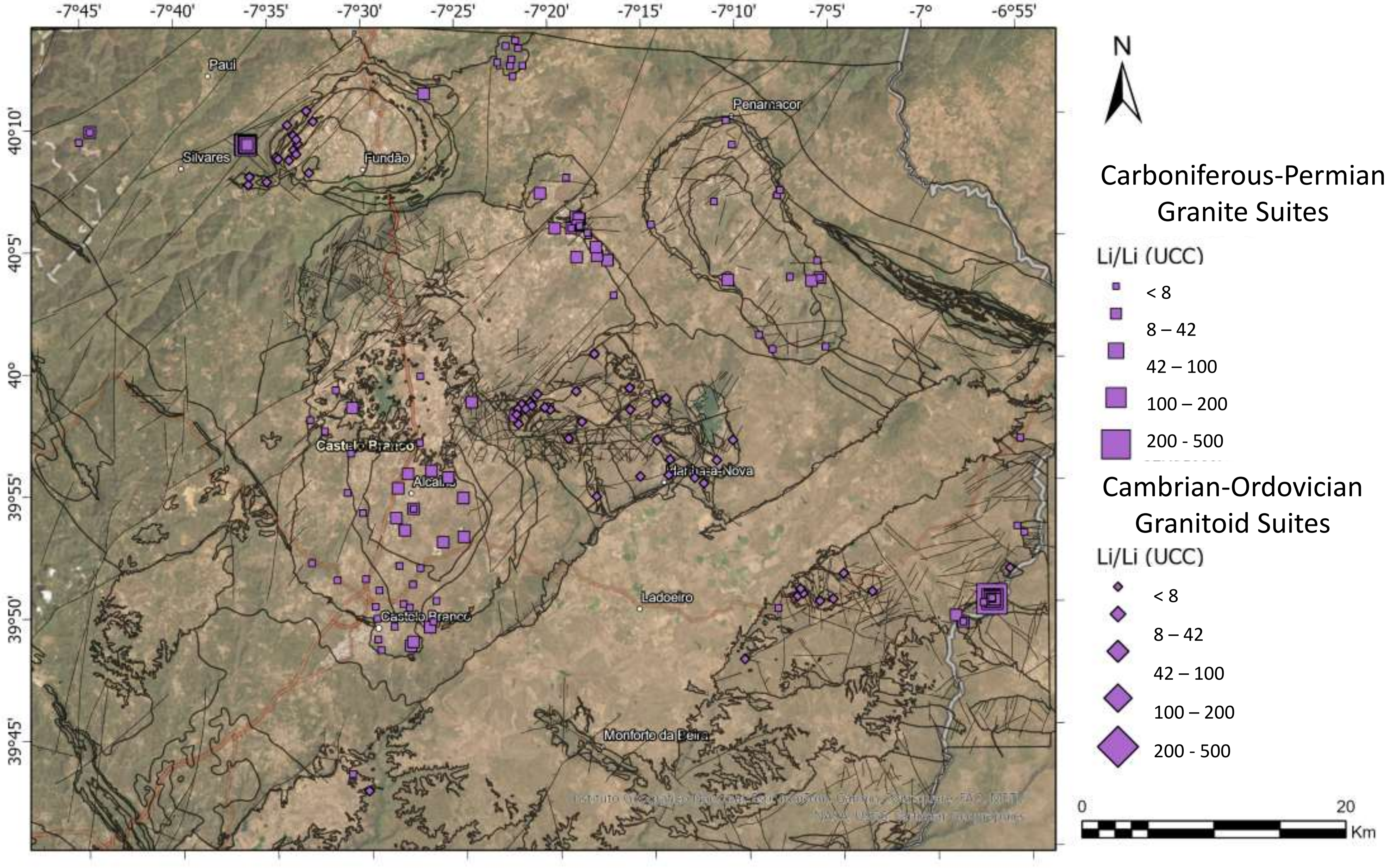

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39°50'
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Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Idanha-a-Nova
Ladoeiro
Castelo Branco
Monforte da Beira
N
Carboniferous-Permian Granite Suites
Li/Li (UCC)
< 8
8 – 42
42 – 100
100 – 200
200 - 500
Cambrian-Ordovician Granitoid Suites
Li/Li (UCC)
< 8
8 – 42
42 – 100
100 – 200
200 - 500
0
20
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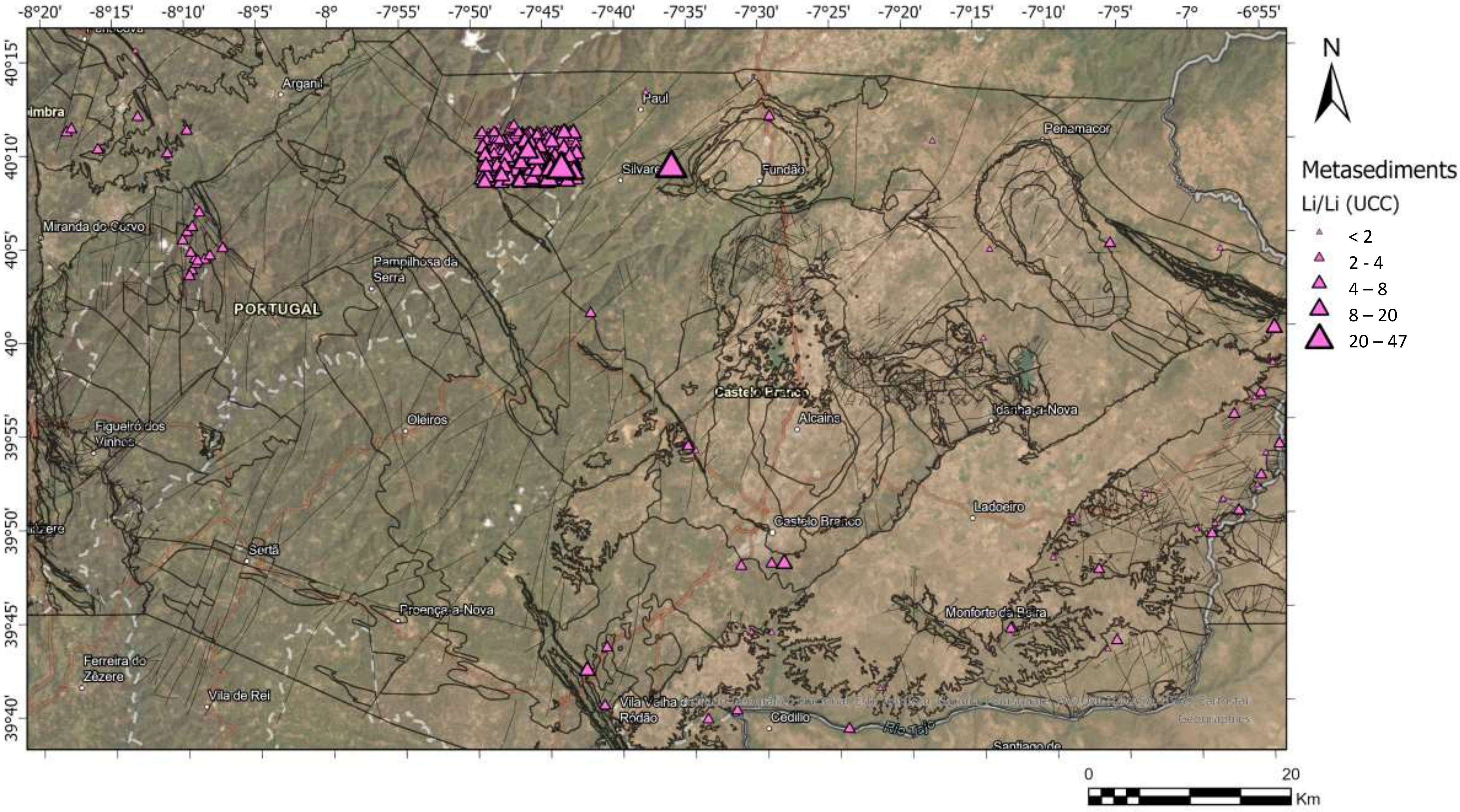
N
Metasediments
Li/Li (UCC)
< 2
2 - 4
4 – 8
8 – 20
20 – 47
0
20
Km
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Paul
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Silvares
Fundão
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
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Oleiros
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Ladoeiro
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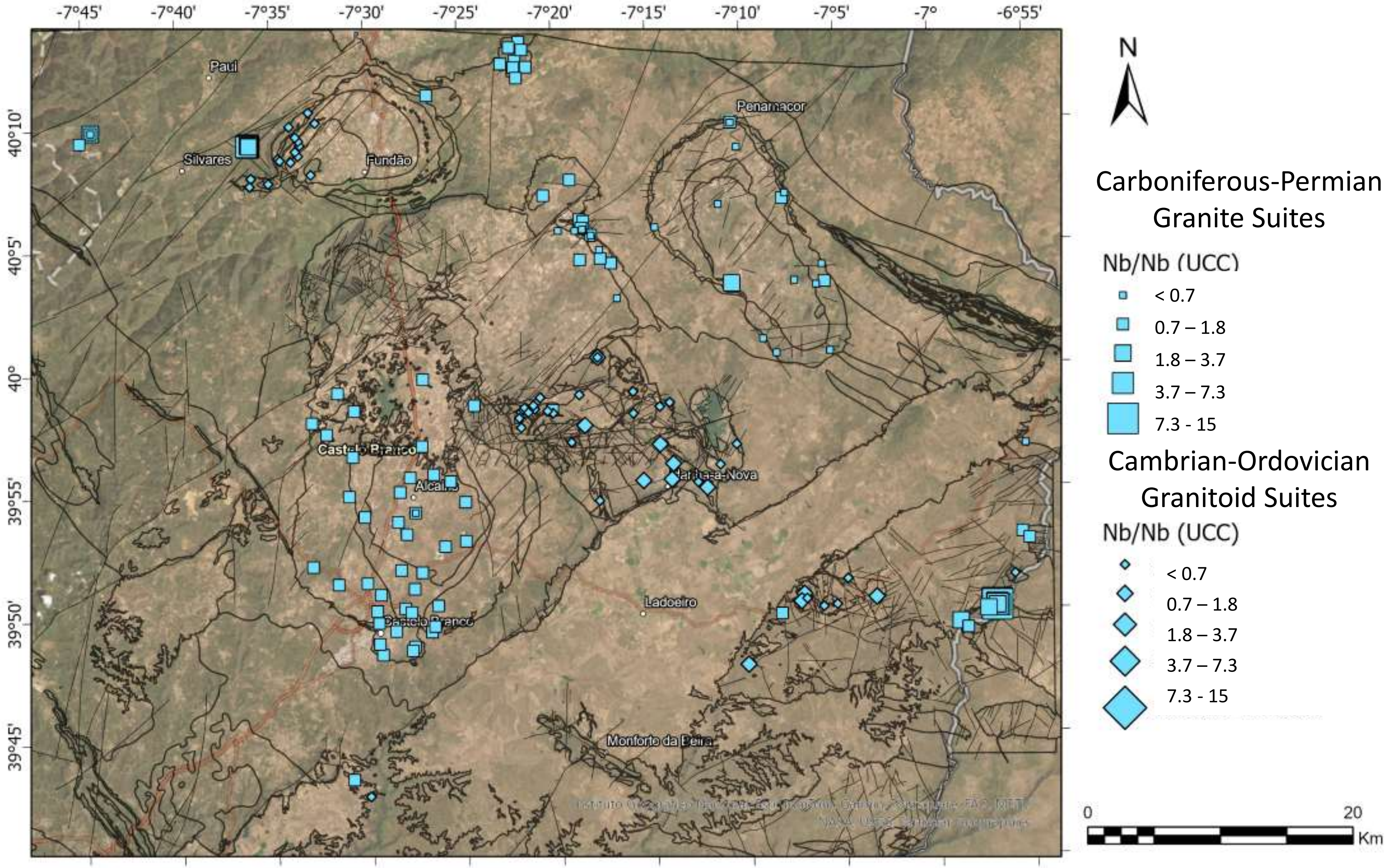
Rio Tejo



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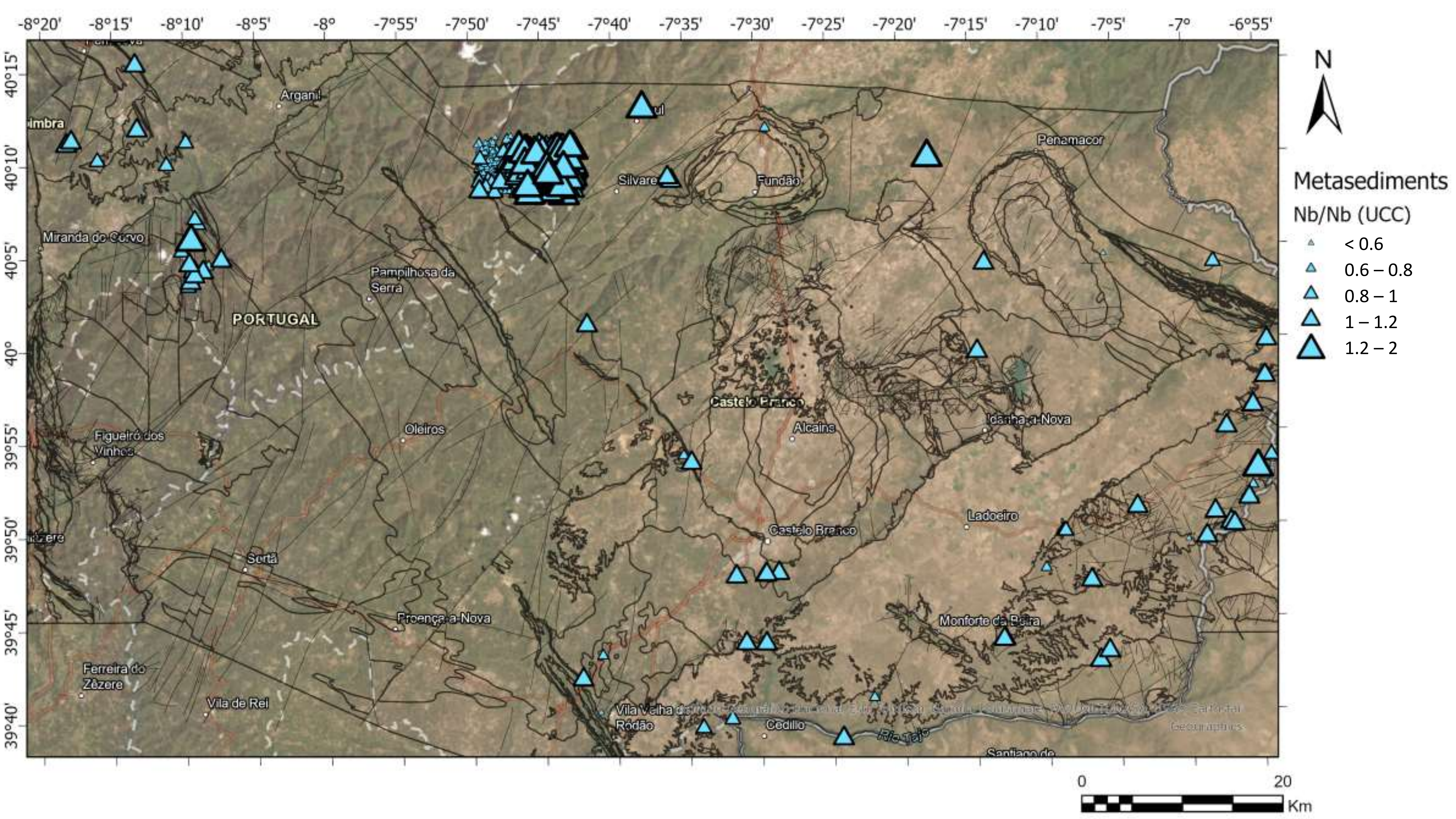
40°5'
40°
39°55'
39°50'
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian
Granite Suites
Nb/Nb (UCC)
< 0.7
0.7 – 1.8
1.8 – 3.7
3.7 – 7.3
7.3 - 15
Cambrian-Ordovician
Granitoid Suites
Nb/Nb (UCC)
< 0.7
0.7 – 1.8
1.8 – 3.7
3.7 – 7.3
7.3 - 15
0
20
Km



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-6°55'
40°15'
40°10'
40°5'
40°
39°55'
39°50'
39°45'
39°40'
N
Metasediments
Nb/Nb (UCC)
< 0.6
0.6 – 0.8
0.8 – 1
1 – 1.2
1.2 – 2
0
20
Km
Arganil
Penamacor
Fundão
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
Alcains
Idanha-a-Nova
Oleiros
Figueiró dos Vinhos
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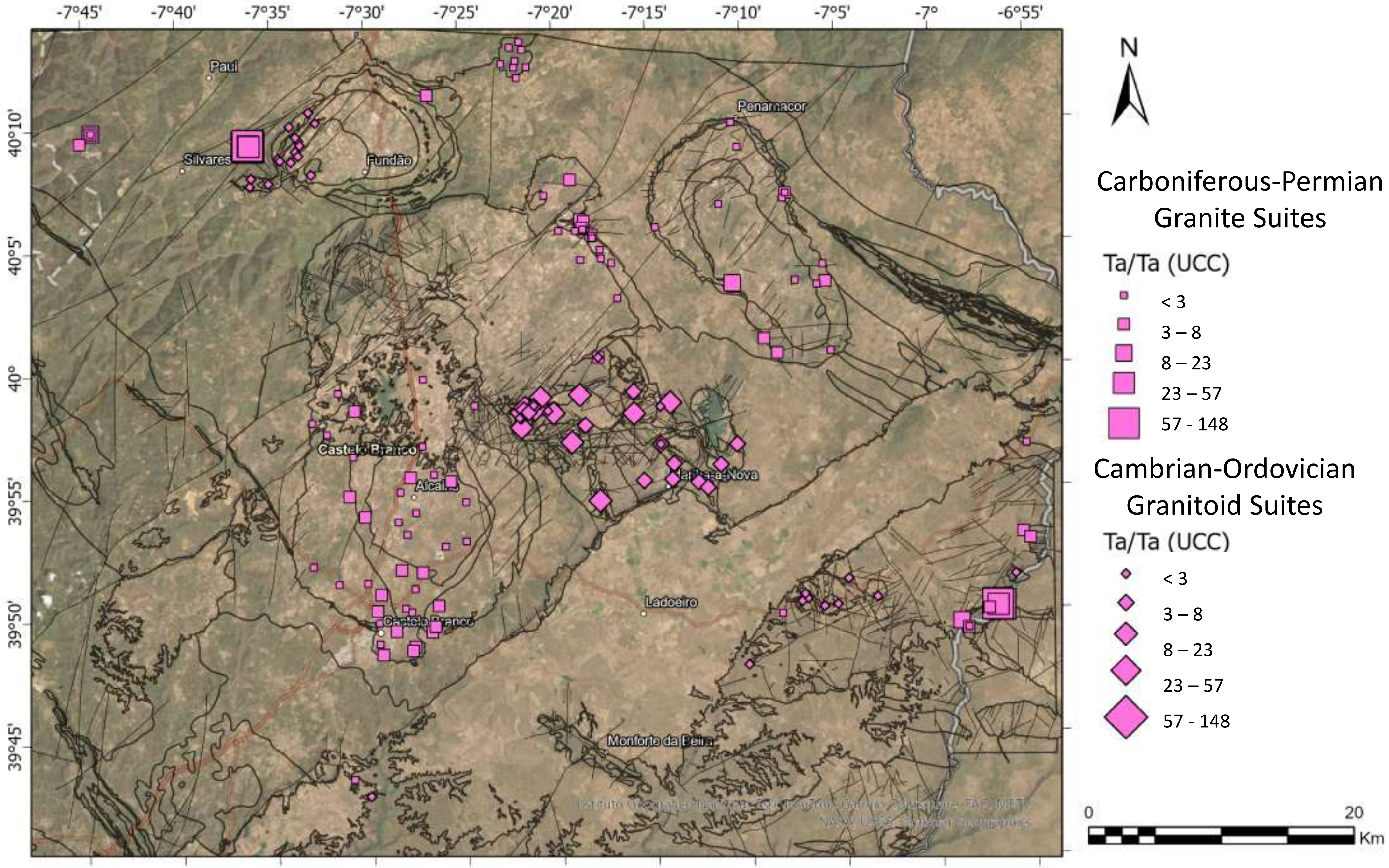
Cedillo



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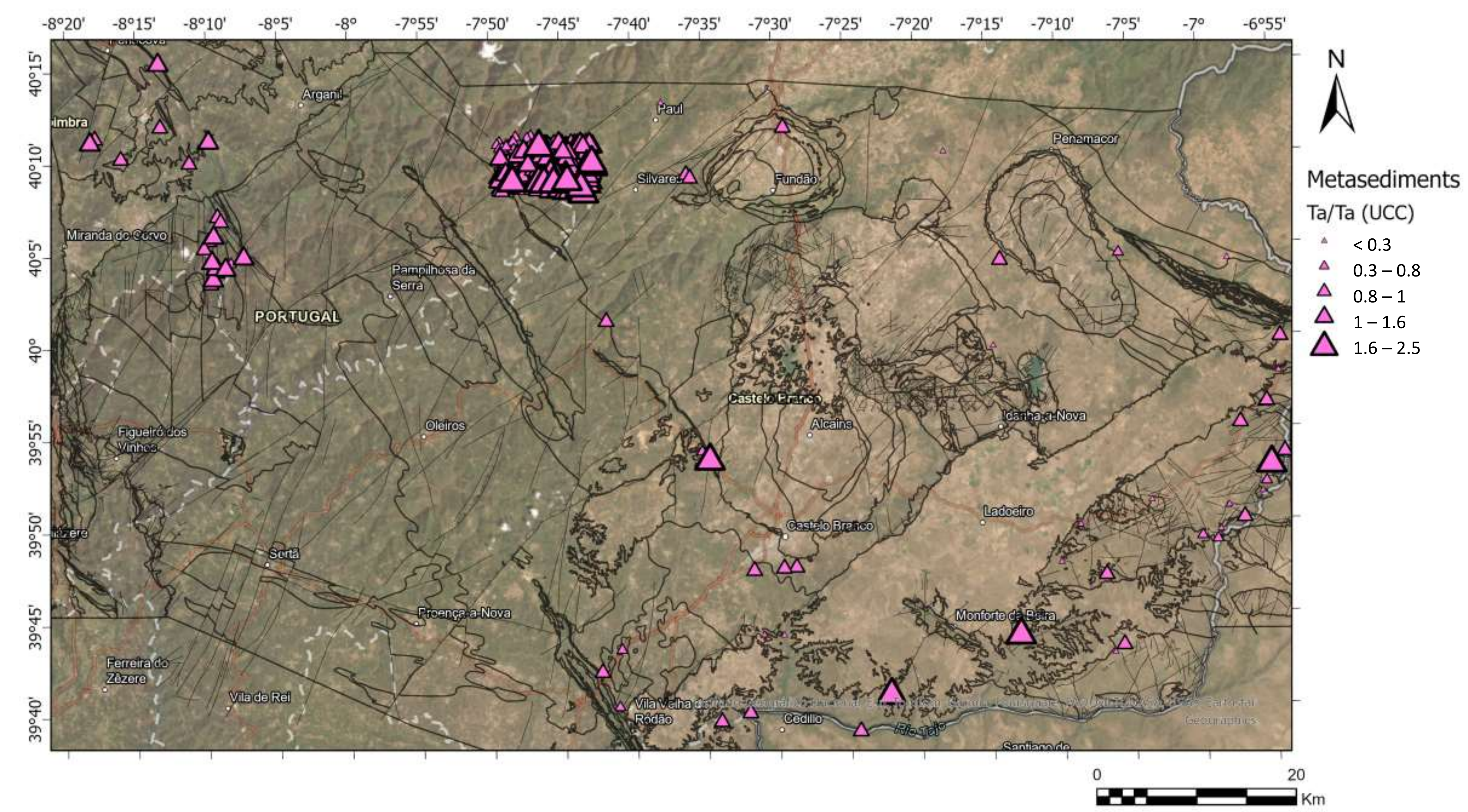
39°50'
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Castelo Branco
Monforte da Beira
N
Carboniferous-Permian Granite Suites
Ta/Ta (UCC)
< 3
3 – 8
8 – 23
23 – 57
57 - 148
Cambrian-Ordovician Granitoid Suites
Ta/Ta (UCC)
< 3
3 – 8
8 – 23
23 – 57
57 - 148
0
20
Km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40°
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39°40'
N
Metasediments
Ta/Ta (UCC)
< 0.3
0.3 – 0.8
0.8 – 1
1 – 1.6
1.6 – 2.5
Arganil
Paul
Penamacor
Silvares
Fundão
Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
Alcains
Idanha-a-Nova
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Proença-a-Nova
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0
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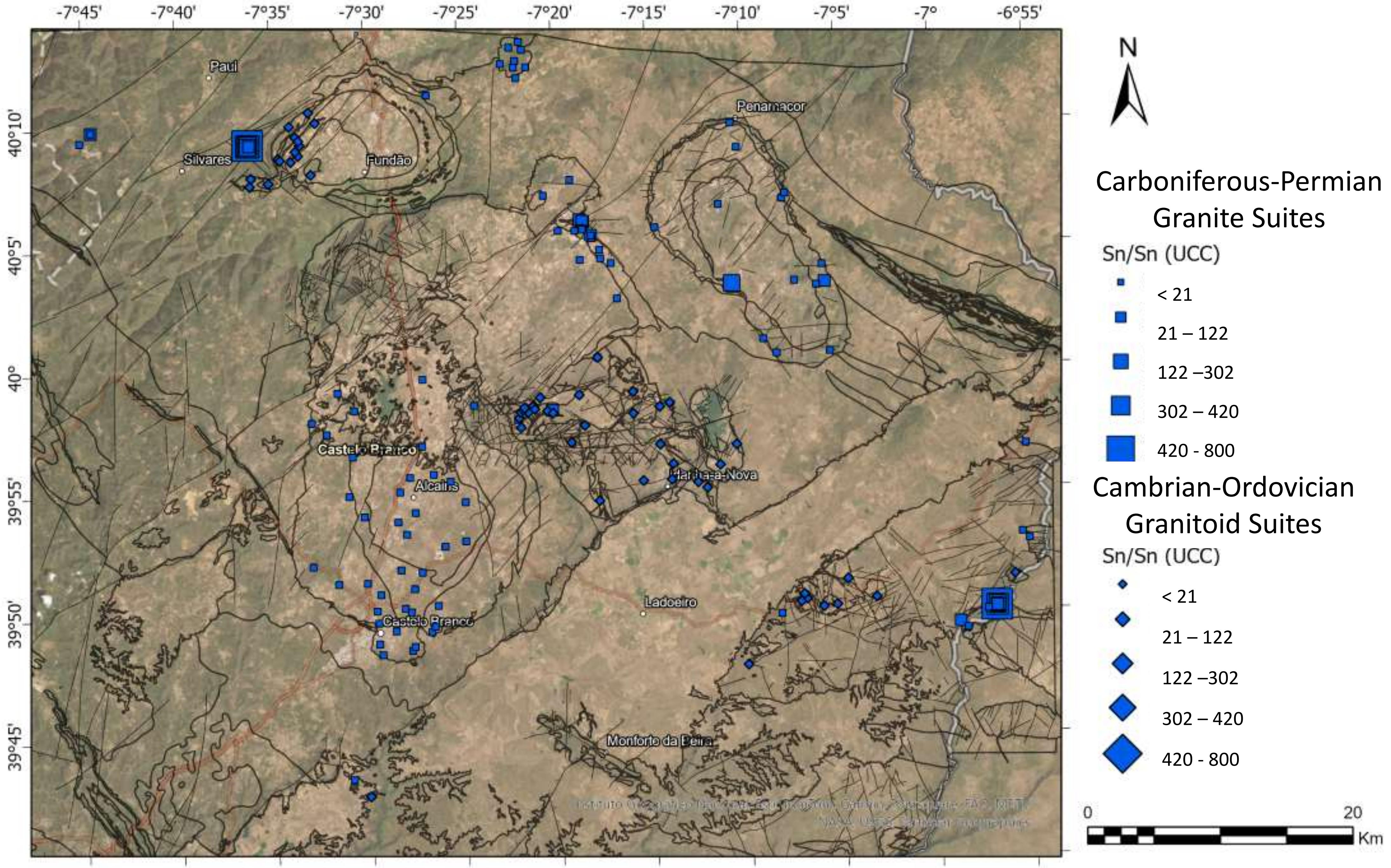
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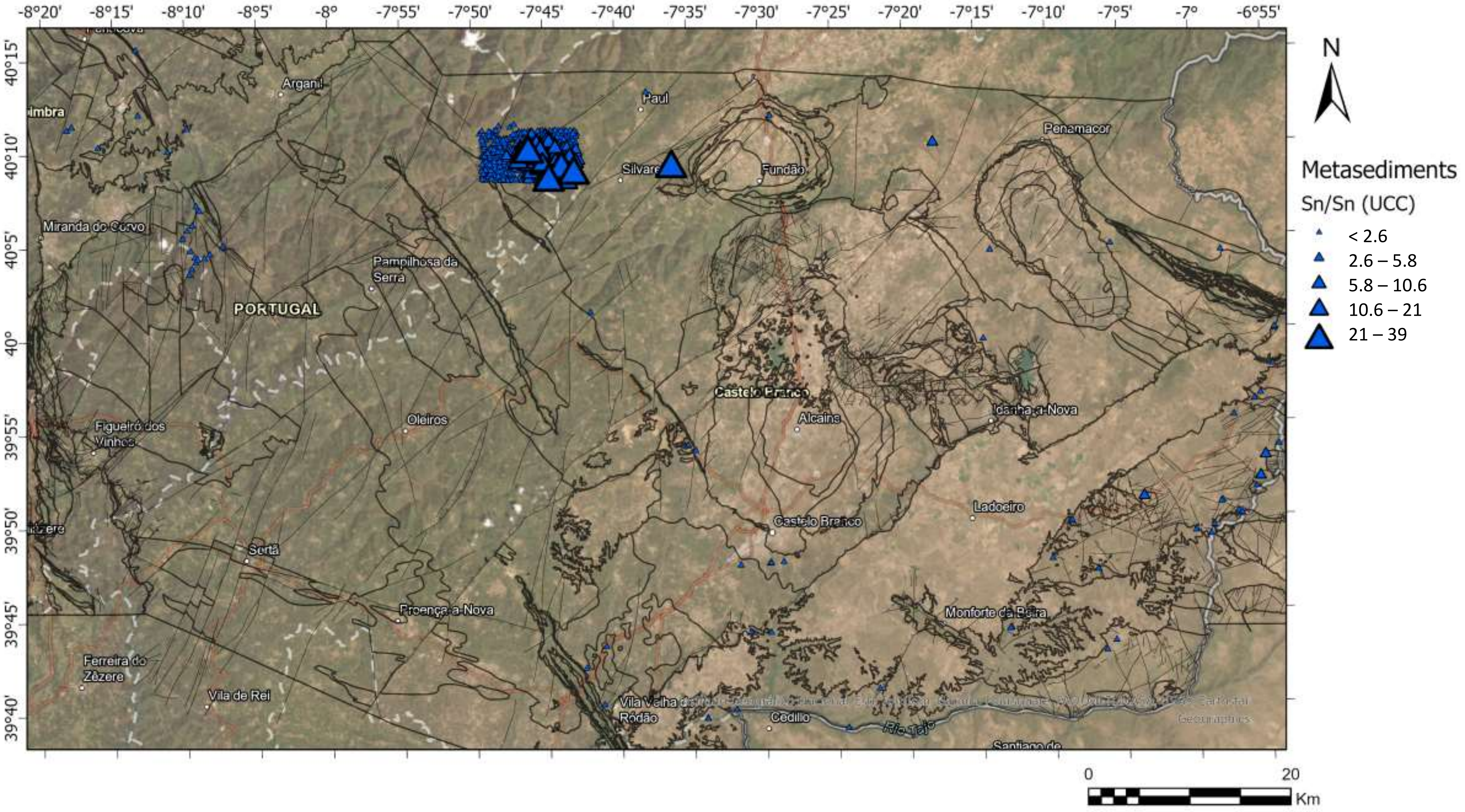
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Idanha-a-Nova
Ladoeiro
Castelo Branco
Monforte da Beira
N
Carboniferous-Permian Granite Suites
Sn/Sn (UCC)
< 21
21 – 122
122 –302
302 – 420
420 - 800
Cambrian-Ordovician Granitoid Suites
Sn/Sn (UCC)
< 21
21 – 122
122 –302
302 – 420
420 - 800
0
20
Km



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Miranda do Corvo
Pampilhosa da Serra
PORTUGAL
Castelo Branco
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Sertã
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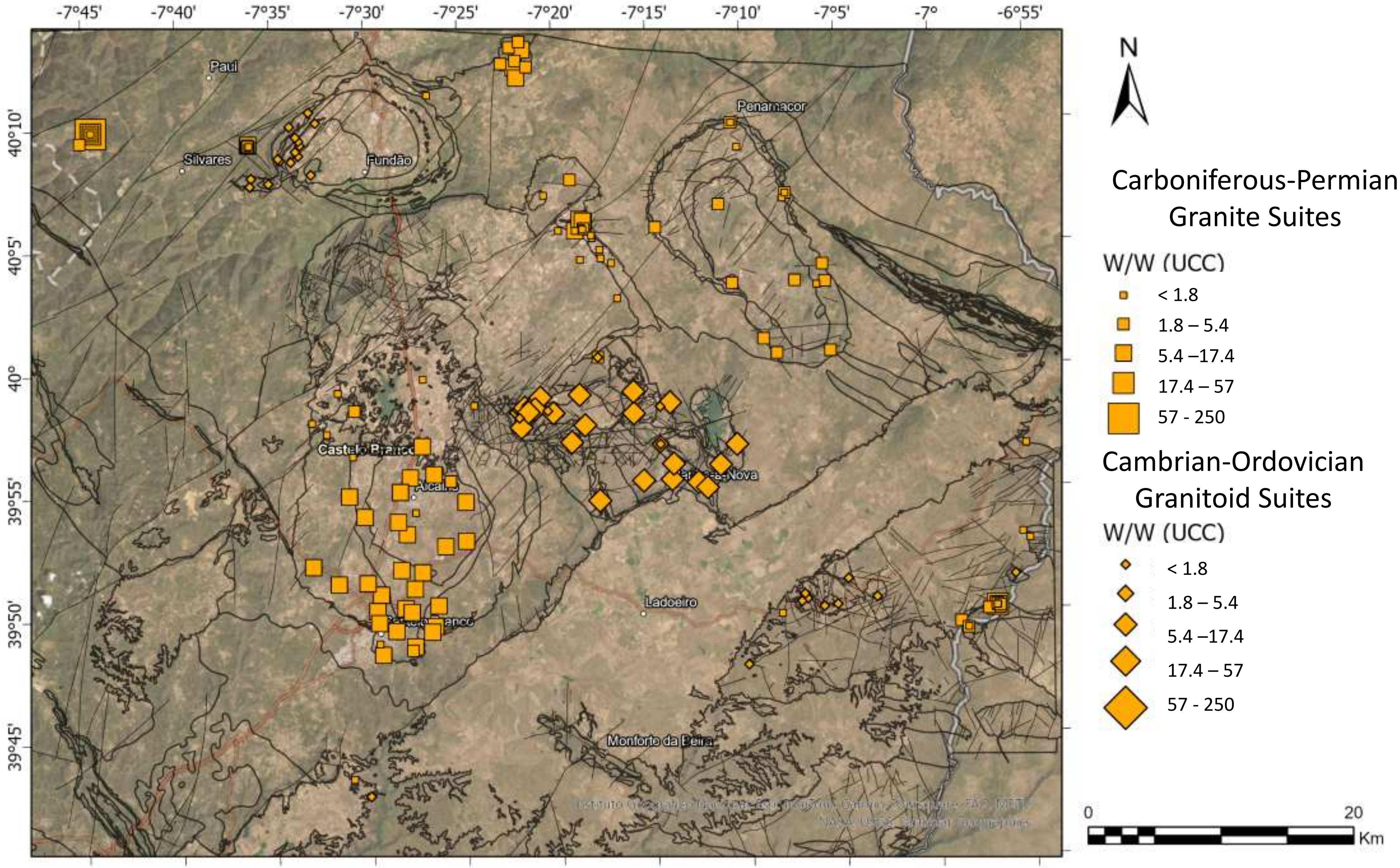
Monforte da Beira
Ferreira do Zêzere
Vila de Rei
Vila Velha de Ródão
Cedillo
Rio Tejo
N
Metasediments
Sn/Sn (UCC)
< 2.6
2.6 – 5.8
5.8 – 10.6
10.6 – 21
21 – 39
0
20
Km



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39°55'
39°50'
39°45'
Paul
Silvares
Fundão
Penamacor
Castelo Branco
Alcains
Ladoeiro
Monforte da Beira
N
Carboniferous-Permian
Granite Suites
W/W (UCC)
< 1.8
1.8 – 5.4
5.4 –17.4
17.4 – 57
57 - 250
Cambrian-Ordovician
Granitoid Suites
W/W (UCC)
< 1.8
1.8 – 5.4
5.4 –17.4
17.4 – 57
57 - 250
0
20
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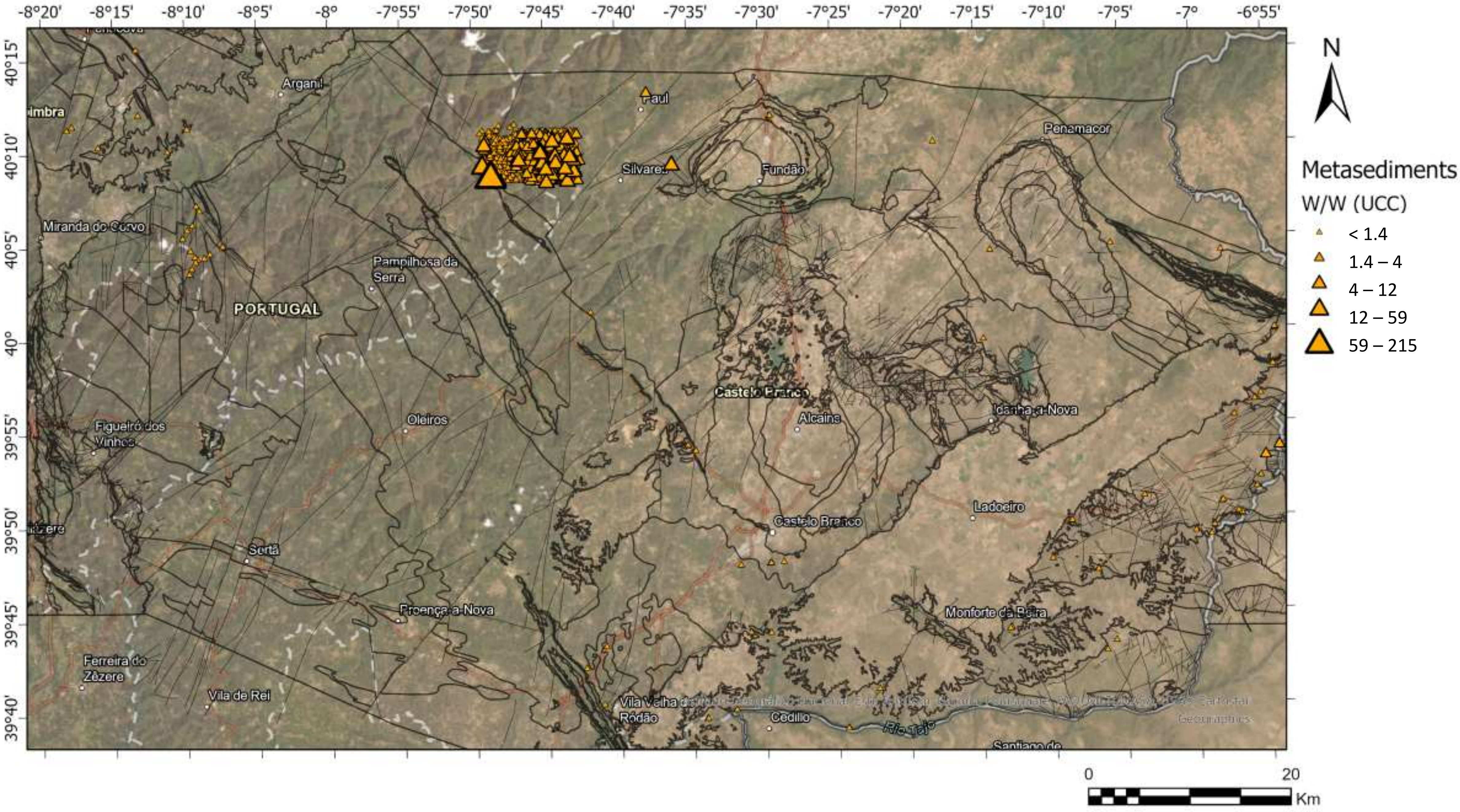

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Alcains
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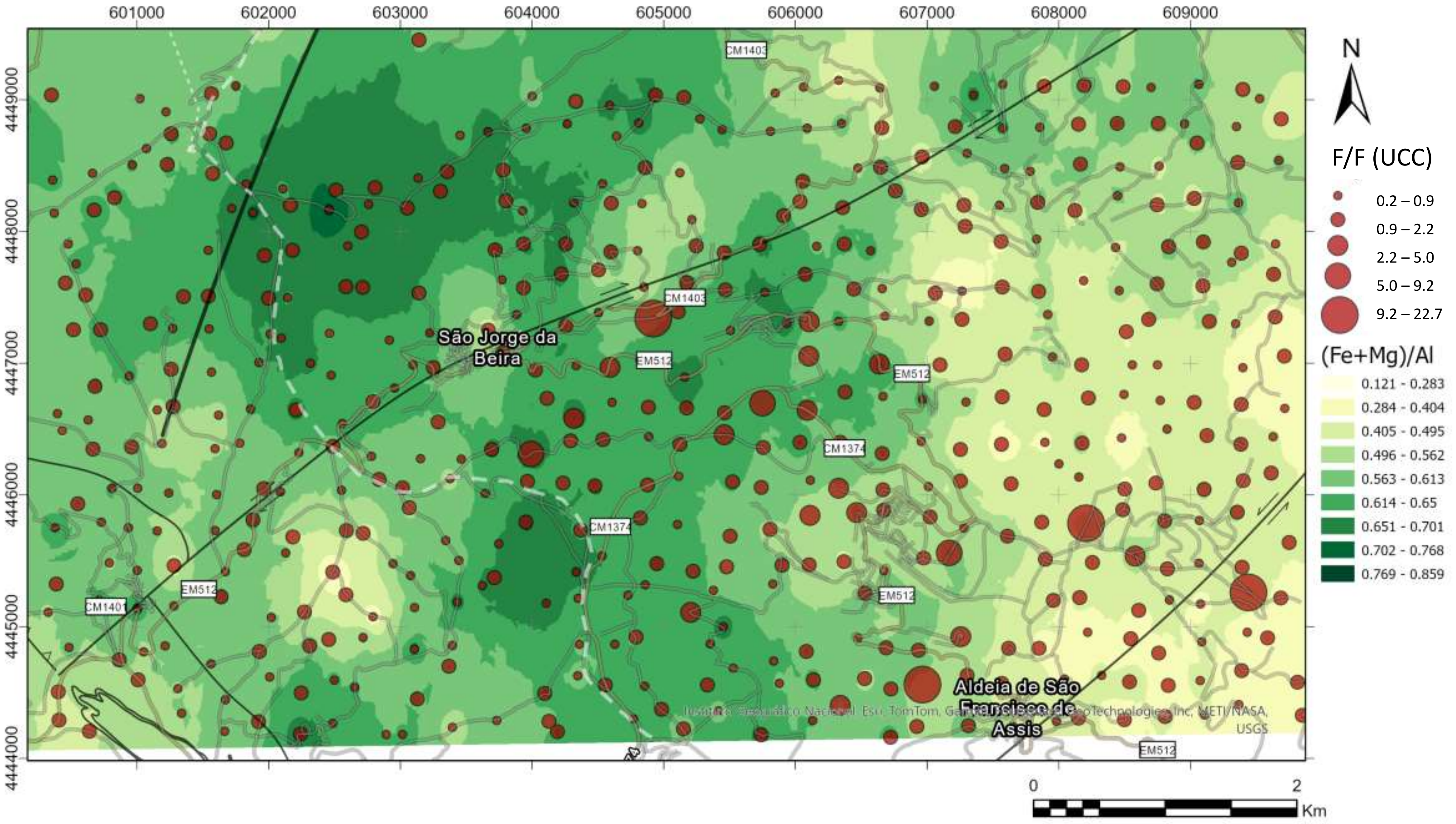
Proença-a-Nova
Monforte da Beira
Ferreira do Zêzere
Vila de Rei
Vila Velha de Ródão
Cedillo
Rio Tejo
N
Metasediments
W/W (UCC)
< 1.4
1.4 – 4
4 – 12
12 – 59
59 – 215
0
20
Km



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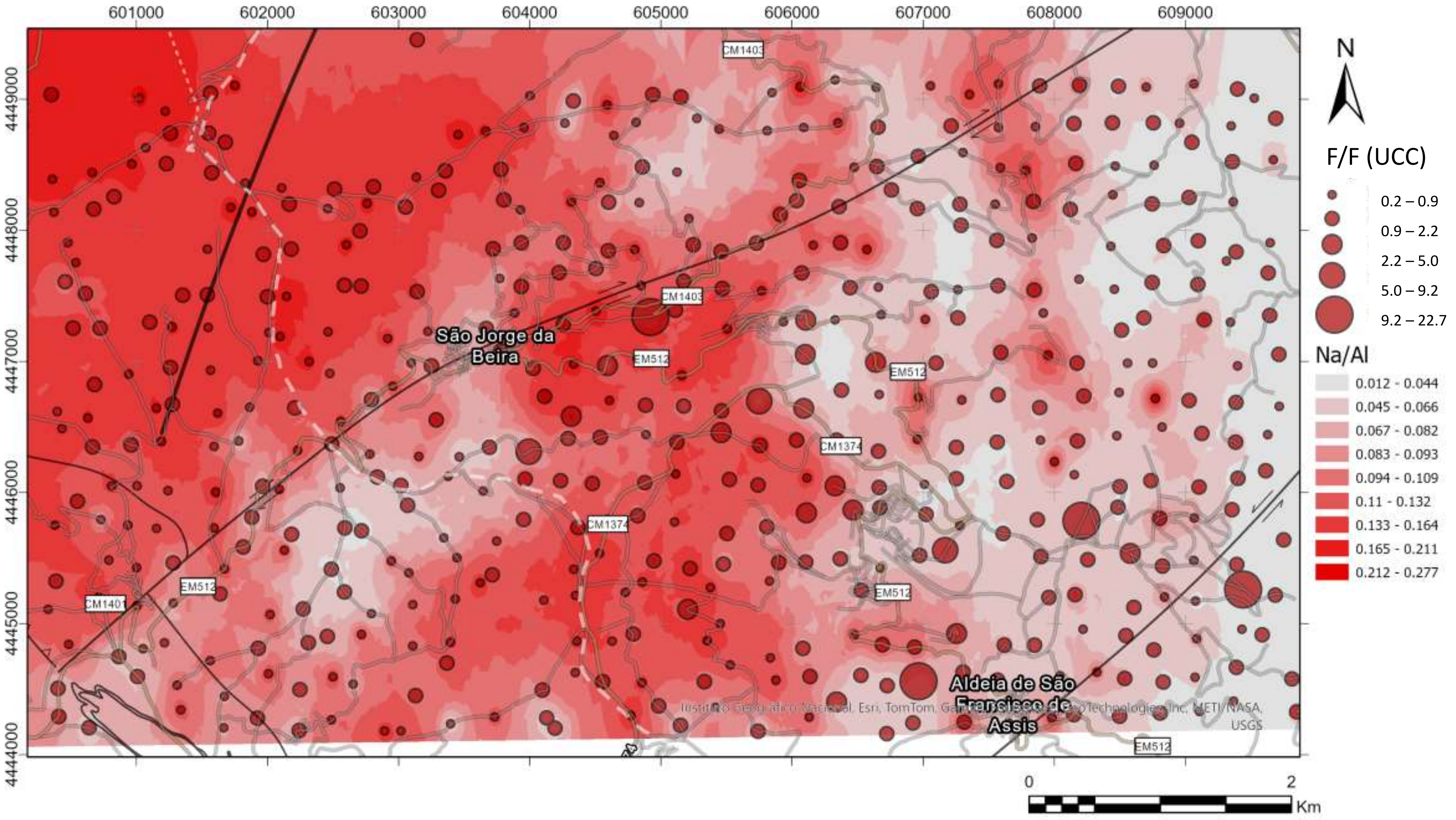
São Jorge da Beira
Aldeia de São Francisco de Assis
CM1403
EM512
CM1374
CM1401
N
F/F (UCC)
0.2 – 0.9
0.9 – 2.2
2.2 – 5.0
5.0 – 9.2
9.2 – 22.7
(Fe+Mg)/Al
0.121 - 0.283
0.284 - 0.404
0.405 - 0.495
0.496 - 0.562
0.563 - 0.613
0.614 - 0.65
0.651 - 0.701
0.702 - 0.768
0.769 - 0.859
0
2
Km
USGS



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N
F/F (UCC)
0.2 – 0.9
0.9 – 2.2
2.2 – 5.0
5.0 – 9.2
9.2 – 22.7
Na/Al
0.012 - 0.044
0.045 - 0.066
0.067 - 0.082
0.083 - 0.093
0.094 - 0.109
0.11 - 0.132
0.133 - 0.164
0.165 - 0.211
0.212 - 0.277
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Aldeia de São Francisco de Assis
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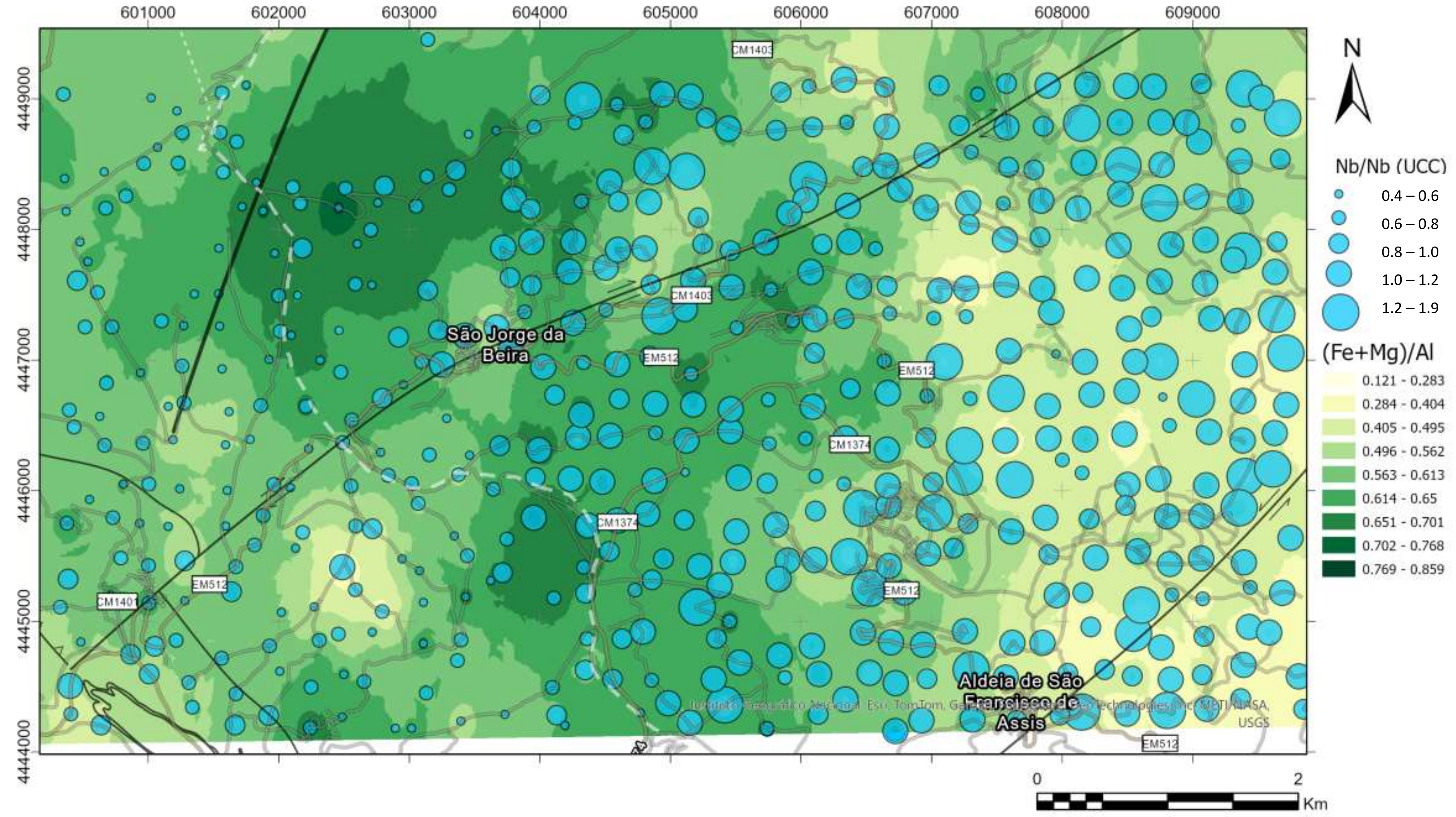

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Aldeia de São Francisco de Assis
CM1403
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EM512
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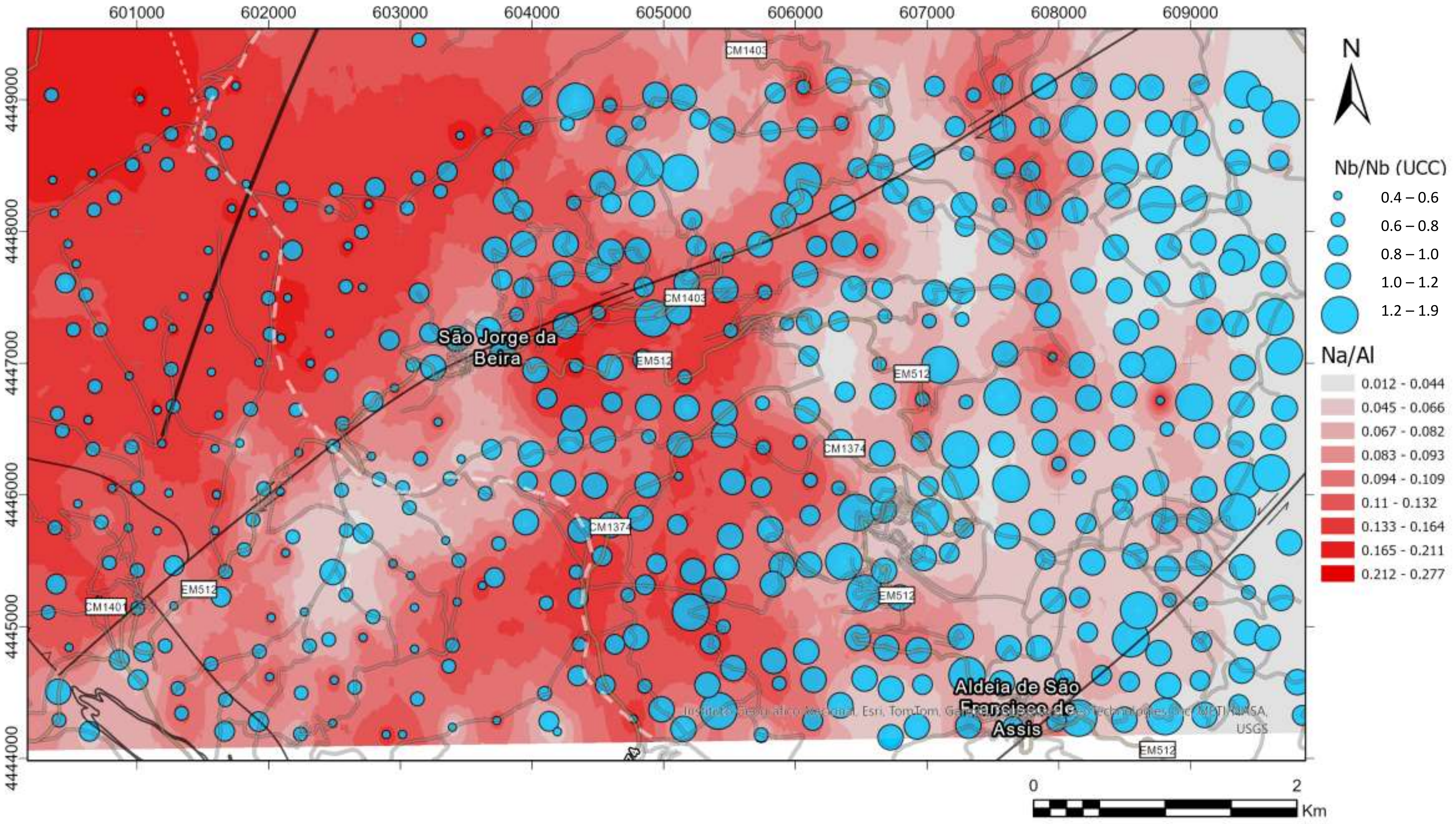
EM512
CM1374
CM1374
CM1401
N
Nb/Nb (UCC)
0.4 – 0.6
0.6 – 0.8
0.8 – 1.0
1.0 – 1.2
1.2 – 1.9
(Fe+Mg)/Al
0.121 - 0.283
0.284 - 0.404
0.405 - 0.495
0.496 - 0.562
0.563 - 0.613
0.614 - 0.65
0.651 - 0.701
0.702 - 0.768
0.769 - 0.859
0
2
Km
USGS



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N
Nb/Nb (UCC)
0.4 – 0.6
0.6 – 0.8
0.8 – 1.0
1.0 – 1.2
1.2 – 1.9
Na/Al
0.012 - 0.044
0.045 - 0.066
0.067 - 0.082
0.083 - 0.093
0.094 - 0.109
0.11 - 0.132
0.133 - 0.164
0.165 - 0.211
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Aldeia de São Francisco de Assis
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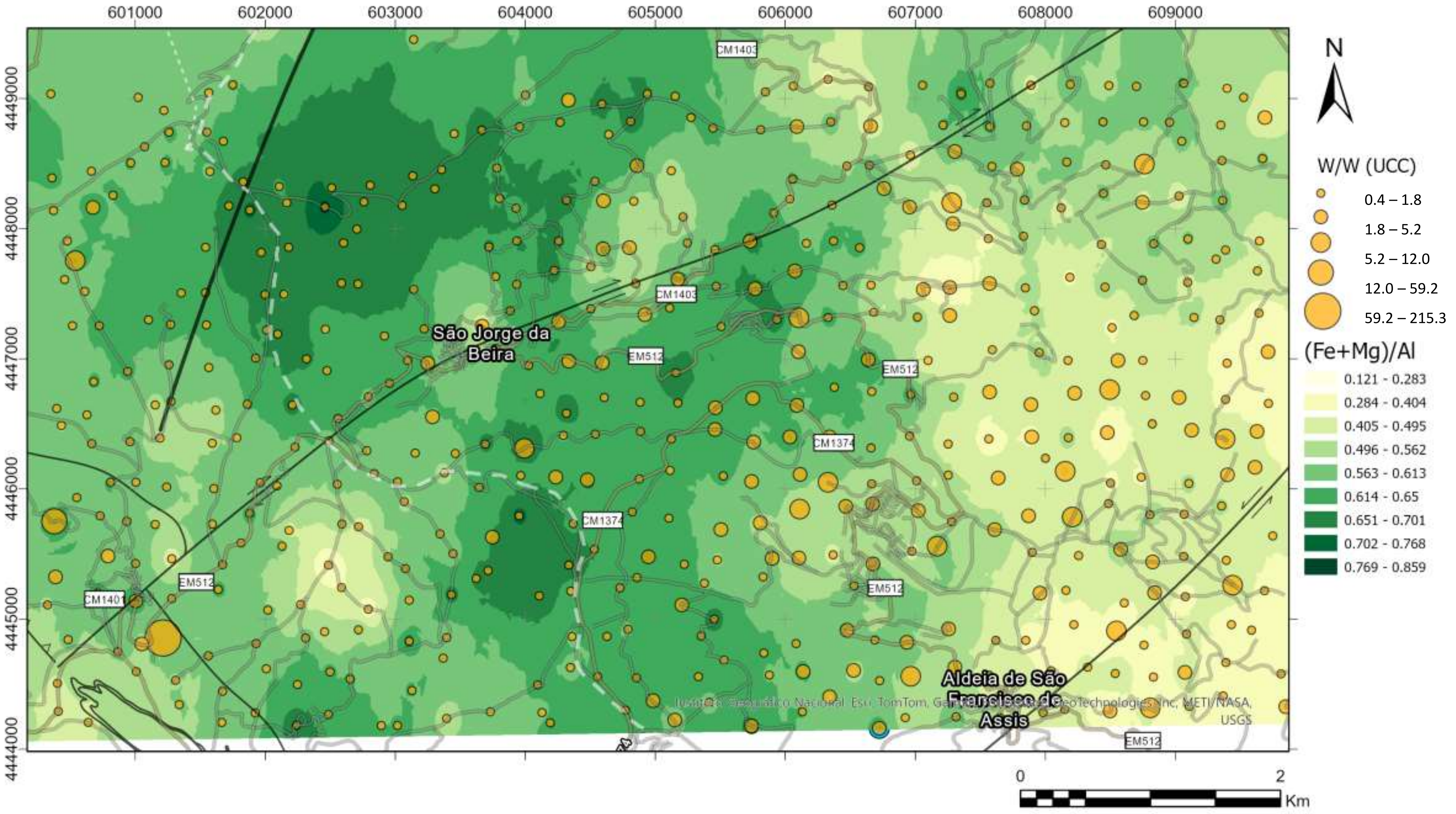

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4444000
N
W/W (UCC)
0.4 – 1.8
1.8 – 5.2
5.2 – 12.0
12.0 – 59.2
59.2 – 215.3
(Fe+Mg)/Al
0.121 - 0.283
0.284 - 0.404
0.405 - 0.495
0.496 - 0.562
0.563 - 0.613
0.614 - 0.65
0.651 - 0.701
0.702 - 0.768
0.769 - 0.859
São Jorge da Beira
Aldeia de São Francisco de Assis
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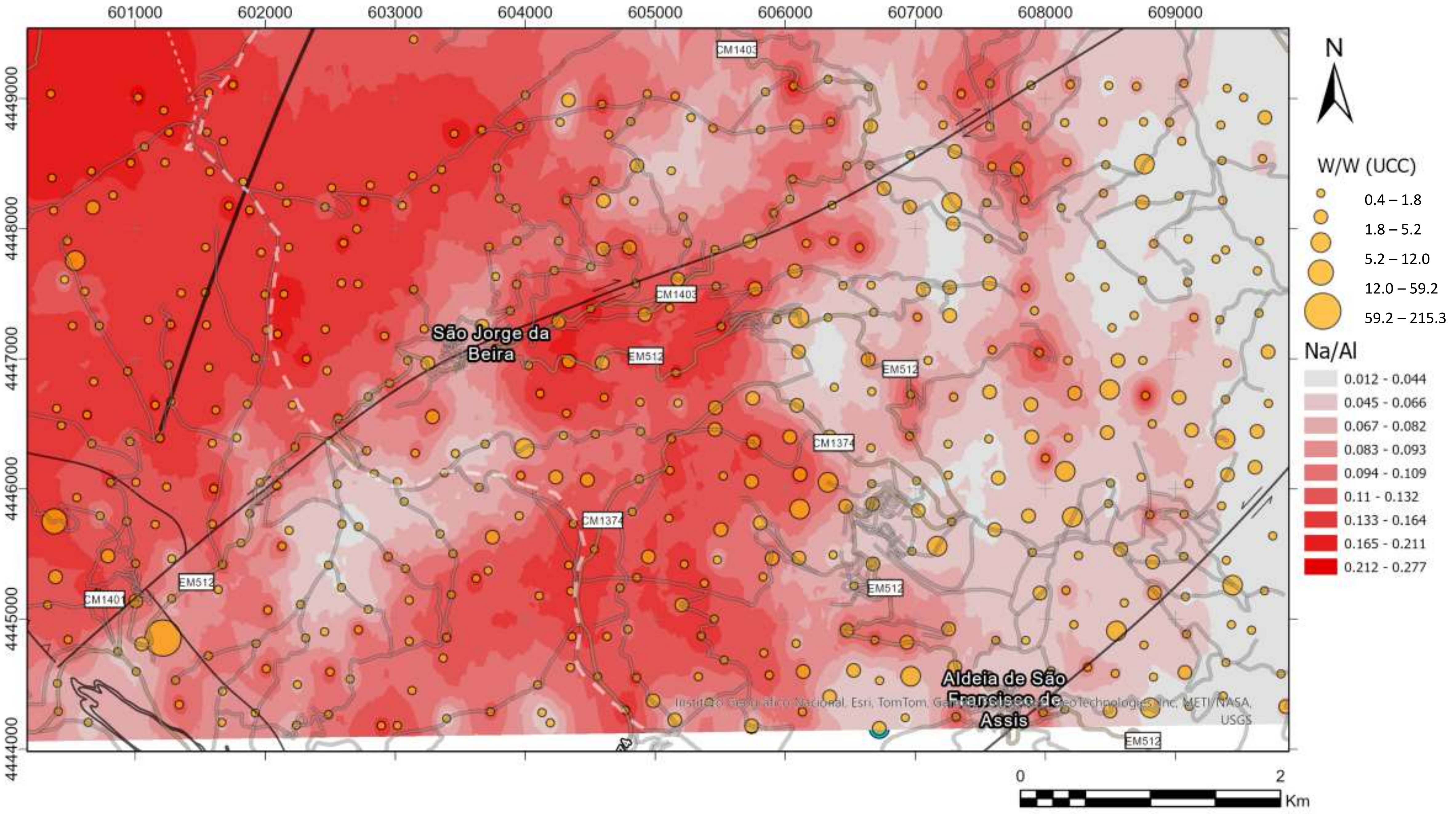
CM1374
CM1401
0
2
Km
USGS



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São Jorge da Beira
Aldeia de São Francisco de Assis
CM1403
CM1401
CM1374
EM512
N
W/W (UCC)
0.4 – 1.8
1.8 – 5.2
5.2 – 12.0
12.0 – 59.2
59.2 – 215.3
Na/Al
0.012 - 0.044
0.045 - 0.066
0.067 - 0.082
0.083 - 0.093
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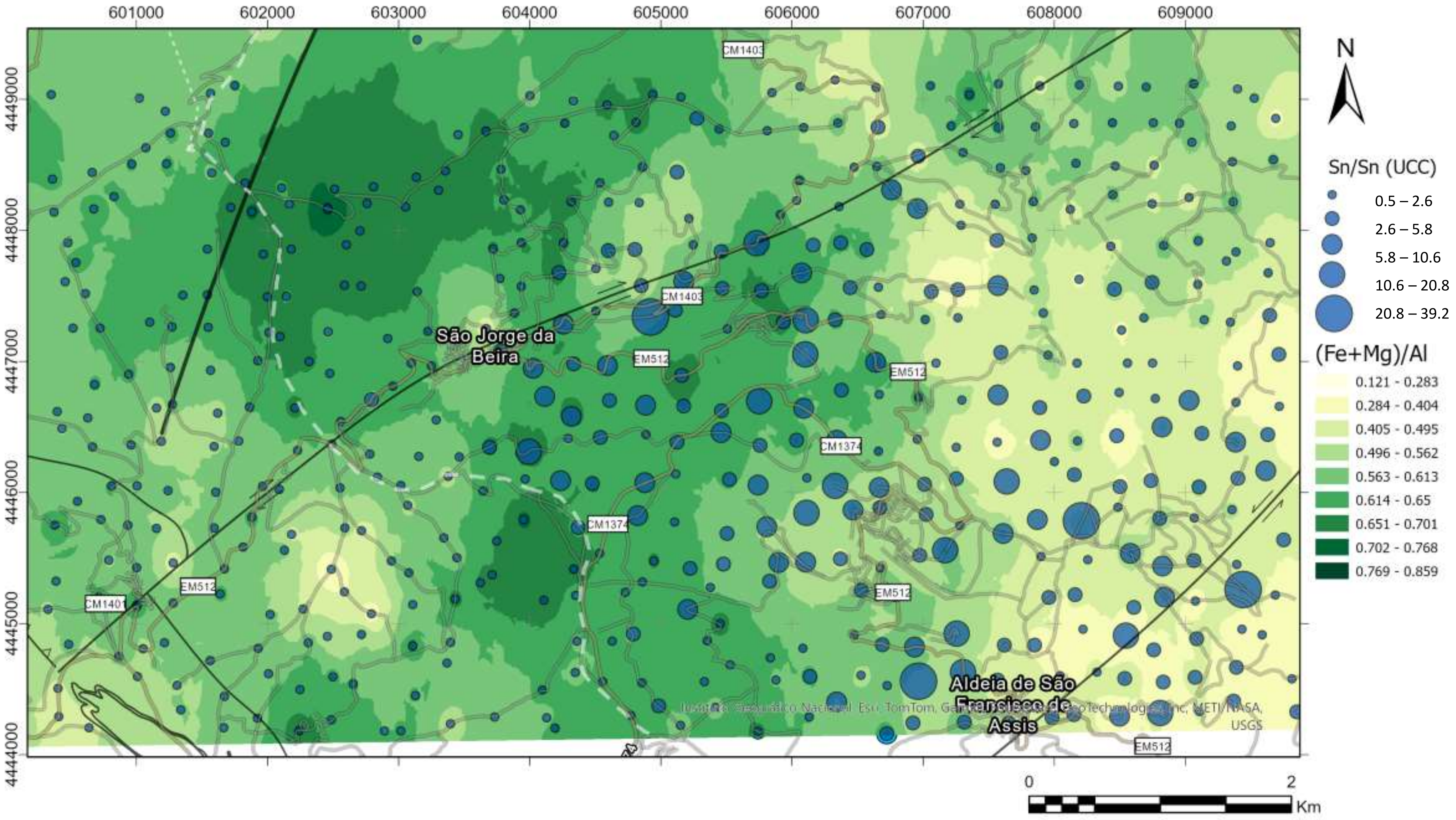
0.11 - 0.132
0.133 - 0.164
0.165 - 0.211
0.212 - 0.277
0
2
Km



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São Jorge da Beira
EM512
EM512
EM512
EM512
EM512
CM1374
CM1374
CM1401
Aldeia de São Francisco de Assis
USGS
N
Sn/Sn (UCC)
0.5 – 2.6
2.6 – 5.8
5.8 – 10.6
10.6 – 20.8
20.8 – 39.2
(Fe+Mg)/Al
0.121 - 0.283
0.284 - 0.404
0.405 - 0.495
0.496 - 0.562
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0.614 - 0.65
0.651 - 0.701
0.702 - 0.768
0.769 - 0.859
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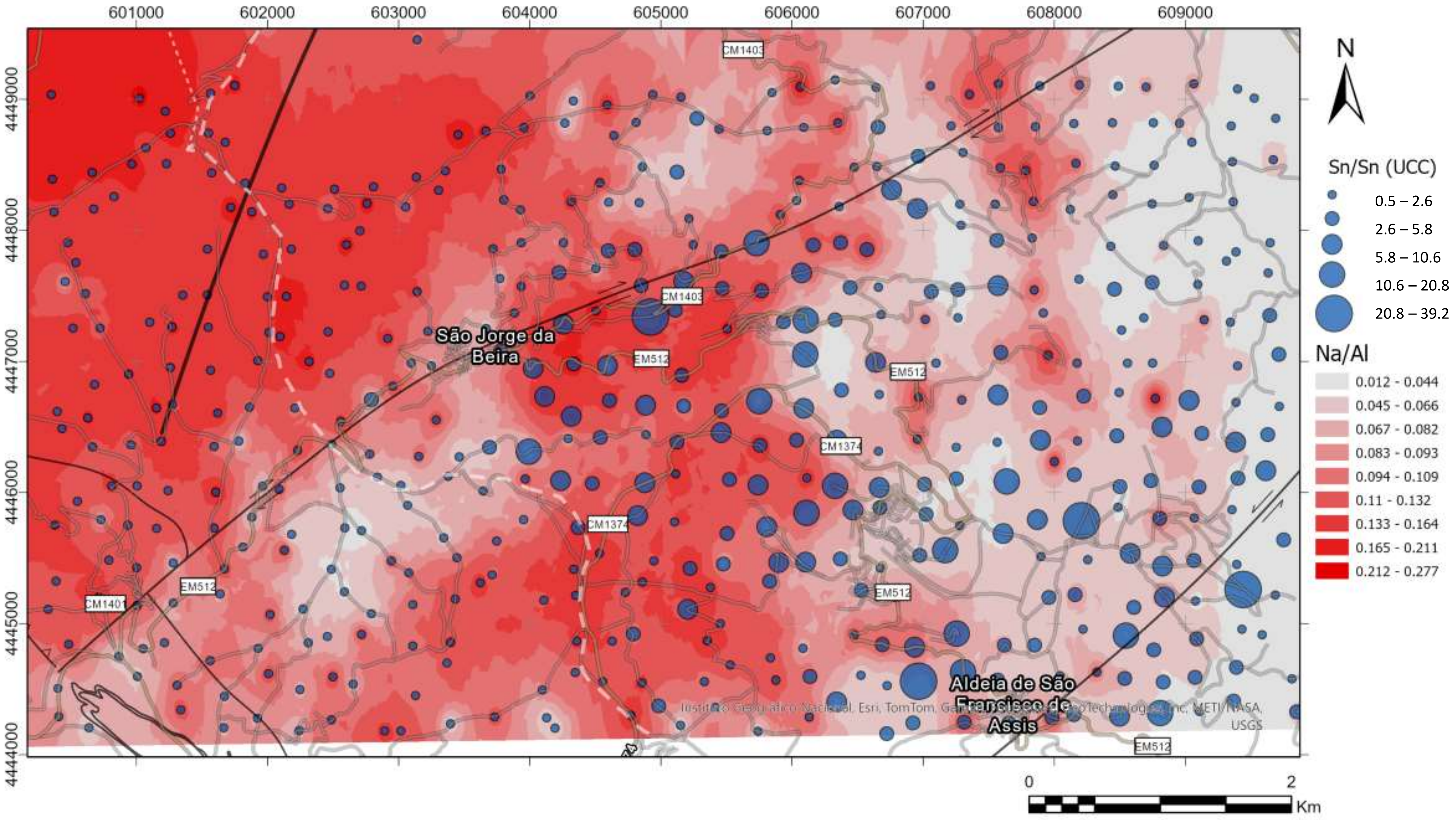
2
Km



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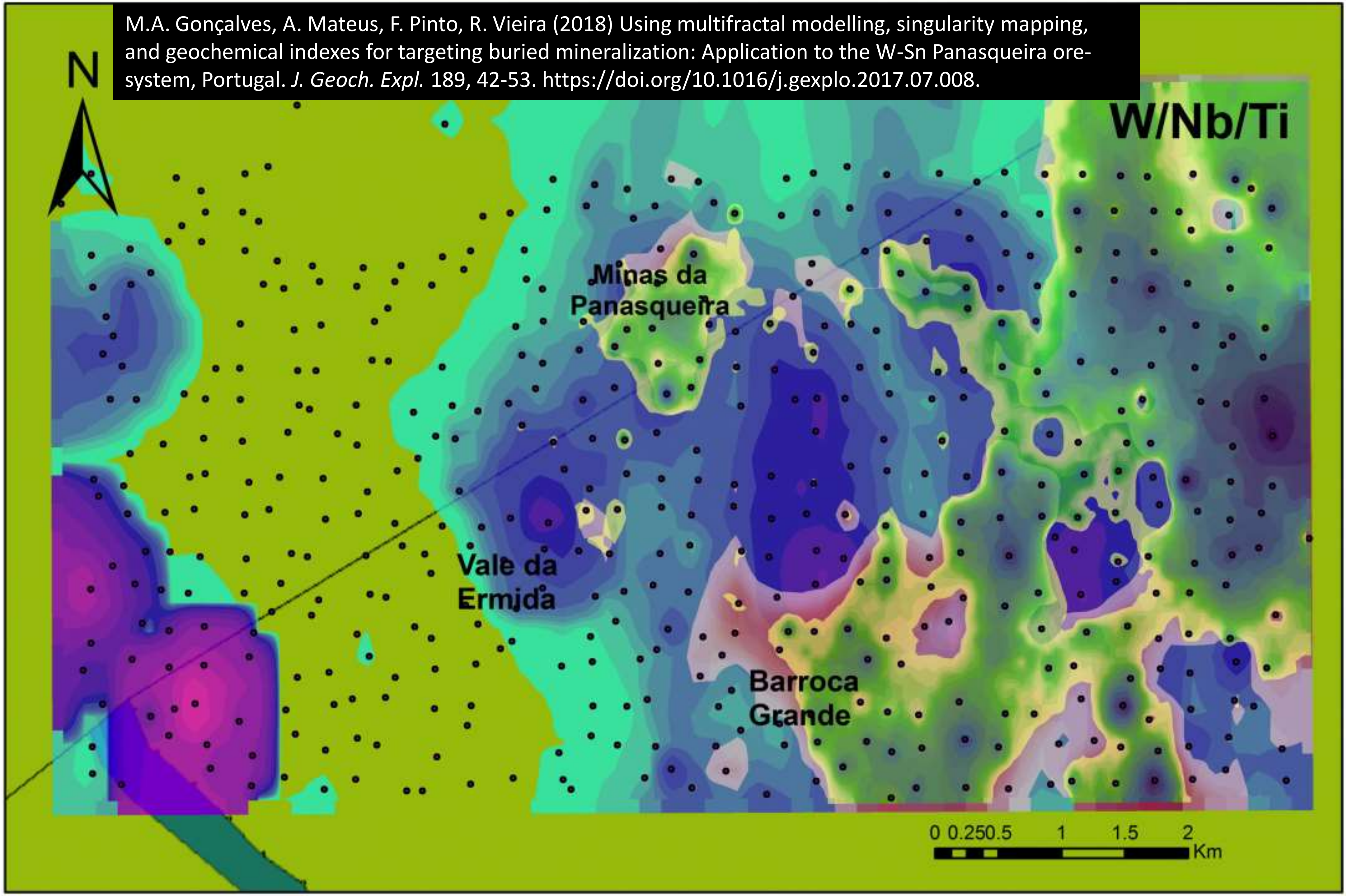
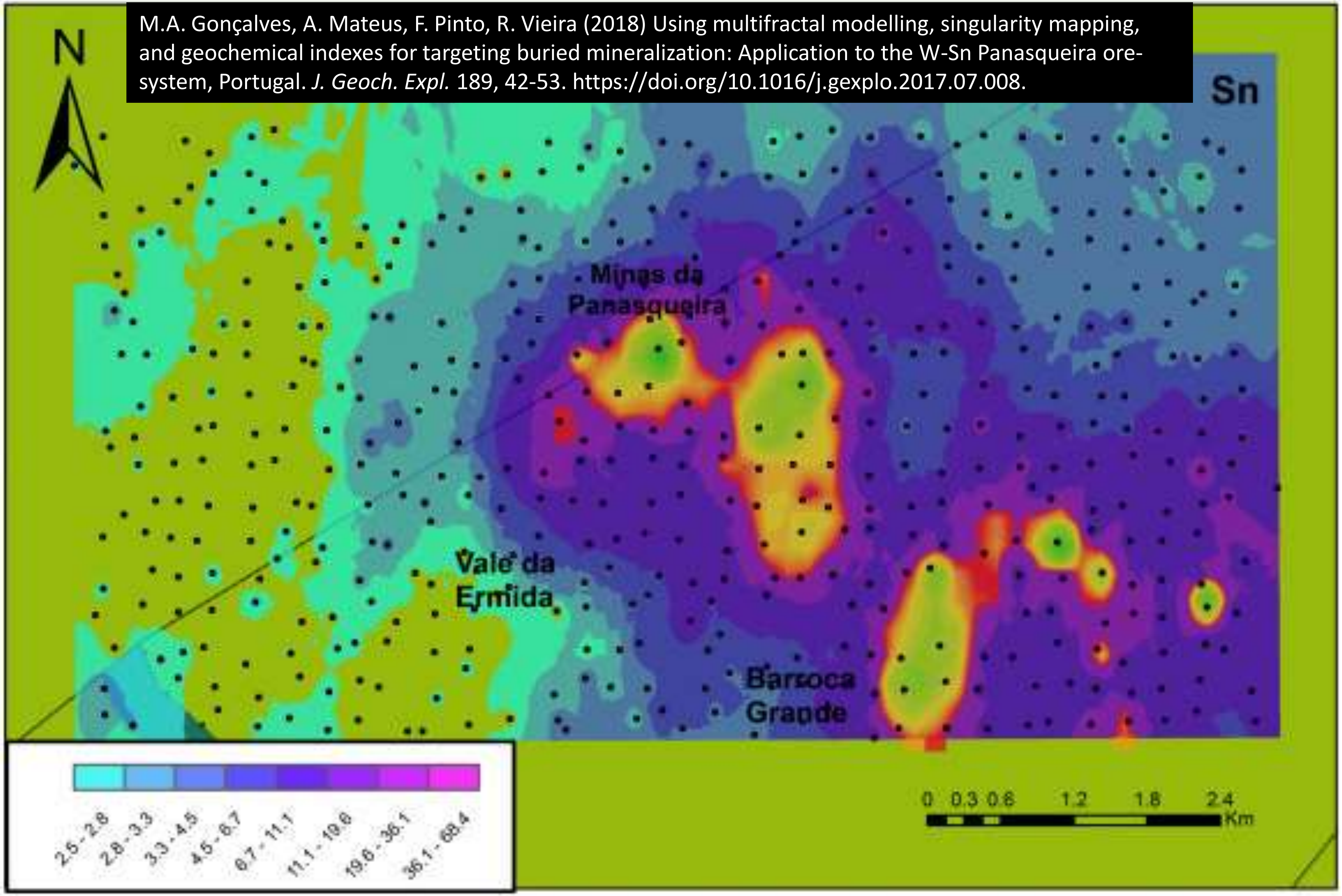
São Jorge da Beira
Aldeia de São Francisco de Assis
CM1403
CM1401
CM1374
EM512
N
Sn/Sn (UCC)
0.5 – 2.6
2.6 – 5.8
5.8 – 10.6
10.6 – 20.8
20.8 – 39.2
Na/Al
0.012 - 0.044
0.045 - 0.066
0.067 - 0.082
0.083 - 0.093
0.094 - 0.109
0.11 - 0.132
0.133 - 0.164
0.165 - 0.211
0.212 - 0.277
0
2
Km
USGS

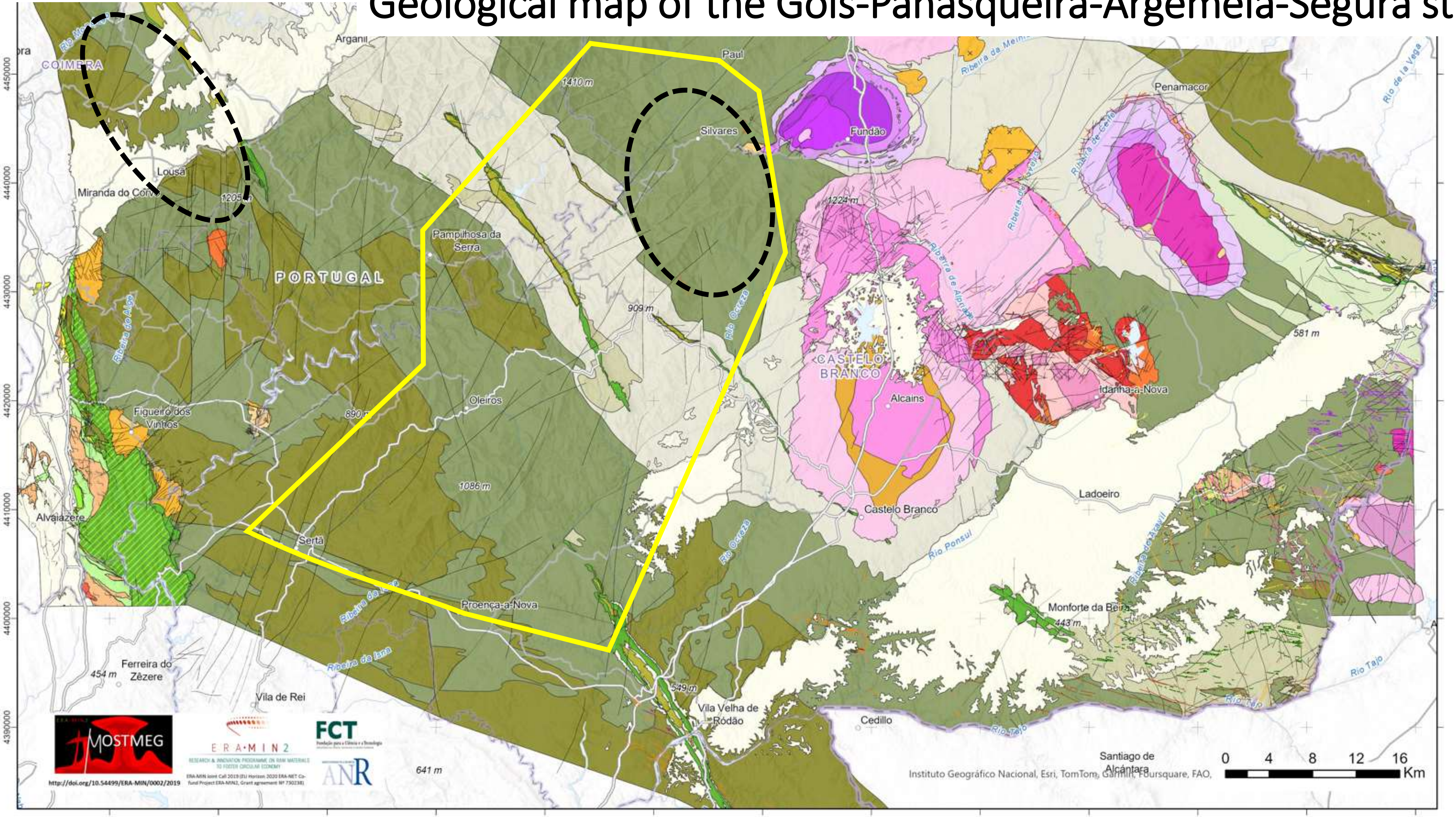
M.A. Gonçalves, A. Mateus, F. Pinto, R. Vieira (2018) Using multifractal modelling, singularity mapping, and geochemical indexes for targeting buried mineralization: Application to the W-Sn Panasqueira ore-system, Portugal. *J. Geoch. Expl.* 189, 42-53. https://doi.org/10.1016/j.gexplo.2017.07.008.



M.A. Gonçalves, A. Mateus, F. Pinto, R. Vieira (2018) Using multifractal modelling, singularity mapping, and geochemical indexes for targeting buried mineralization: Application to the W-Sn Panasqueira ore-system, Portugal. *J. Geoch. Expl.* 189, 42-53. https://doi.org/10.1016/j.gexplo.2017.07.008.



Geological map of the Góis-Panasqueira-Argemela-Segura strip



https://mostmeg.rd.ciencias.ulisboa.pt/

Thank you for your attention!

Modified metasediment adjoining the “greisen-like” facies (Mata da Rainha)