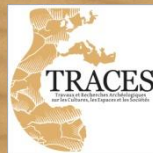


CUivre : PRoduction et Usages en Mauritanie à l'Holocène

CUPRUM

The first miners and metallurgists in Akjoujt region

Courcier Antoine



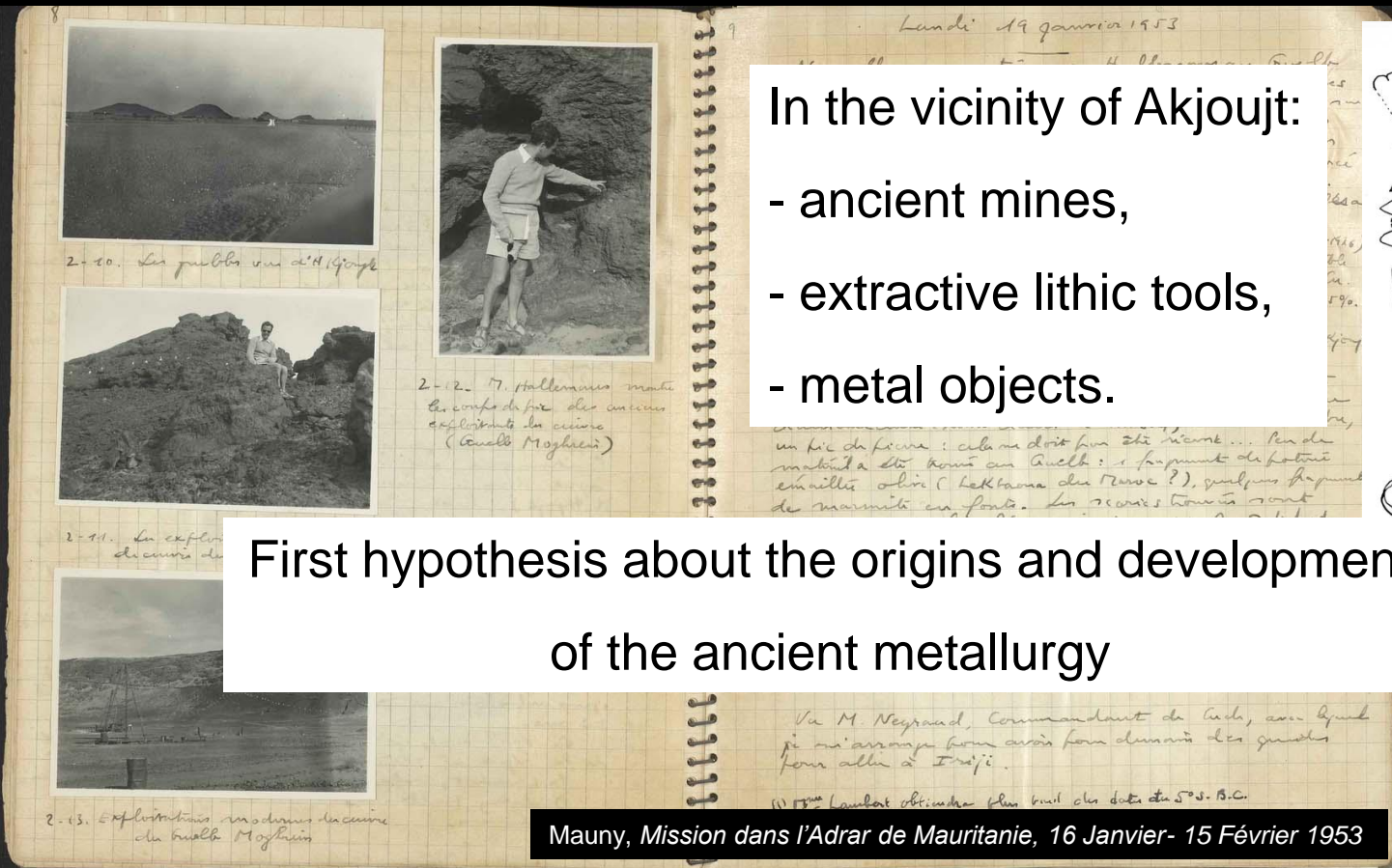
A black and white photograph of a desert landscape. The foreground is dominated by dark, jagged volcanic rocks and some sparse, scrubby vegetation. A sandy area is visible between the rocks. In the middle ground, a small settlement with several rectangular buildings is situated on a flat plain. The background features rolling hills and mountains under a clear sky. The overall scene is arid and desolate.

State of art

MICUMA, Guelb Moghrein, 1955. ANOM

Previous works: IFAN works (1945-1973)

Raymond Mauny & Jean-Jacques Hallemons (1947-1962)



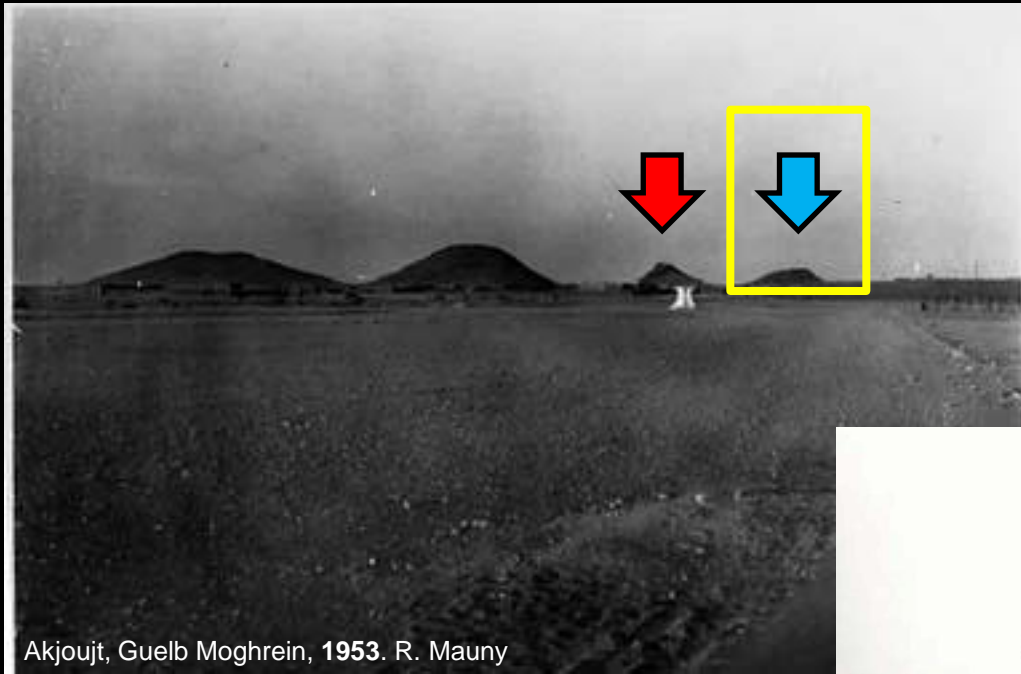
First hypothesis about the origins and development of the ancient metallurgy



R. Mauny, J.J. Hallemons, 1957

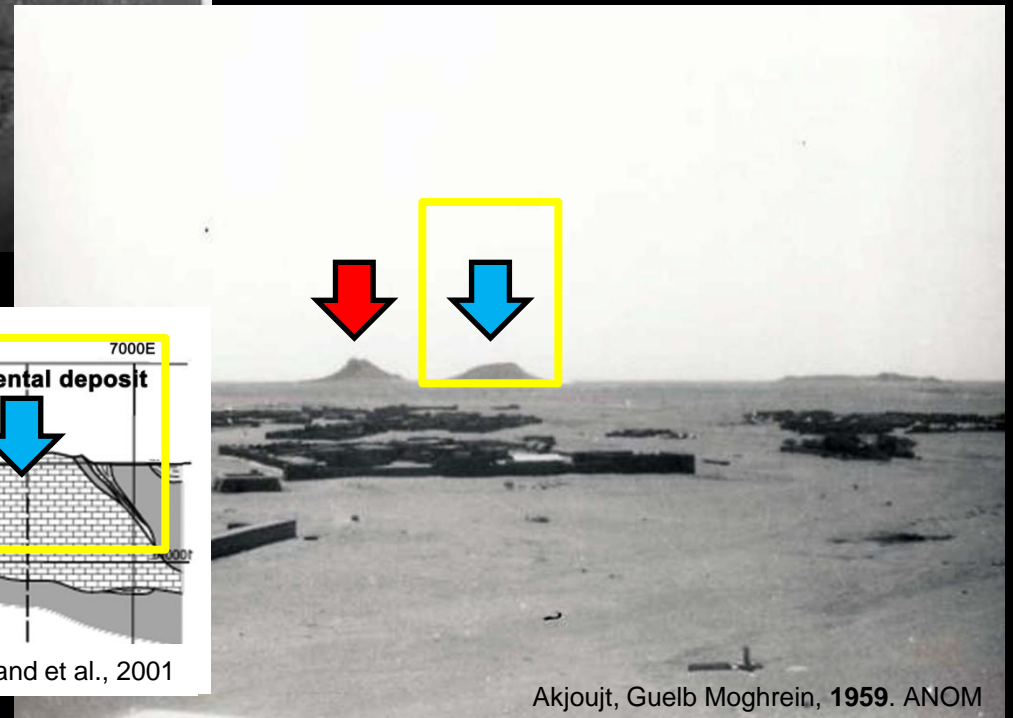
Mauny, Mission dans l'Adrar de Mauritanie, 16 Janvier- 15 Février 1953

Nicole Lambert's works (1965 -1983)

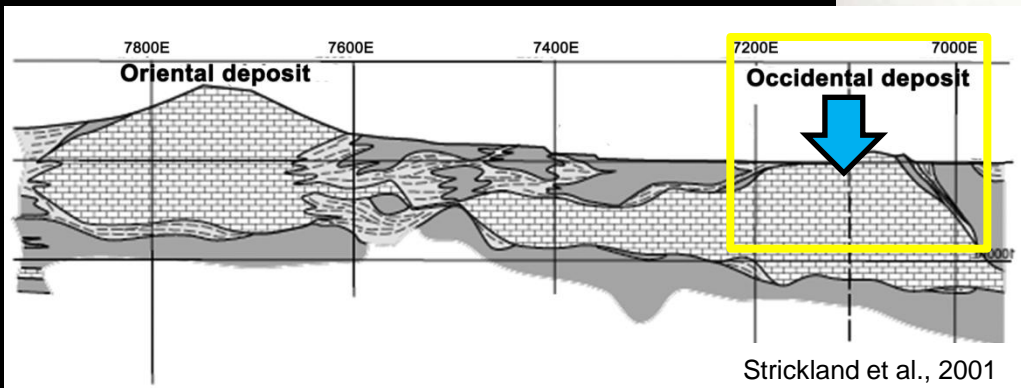


Akjoujt, Guelb Moghrein, 1953. R. Mauny

- eastern Guelb Moghrein
- western Guelb Moghrein



Akjoujt, Guelb Moghrein, 1959. ANOM



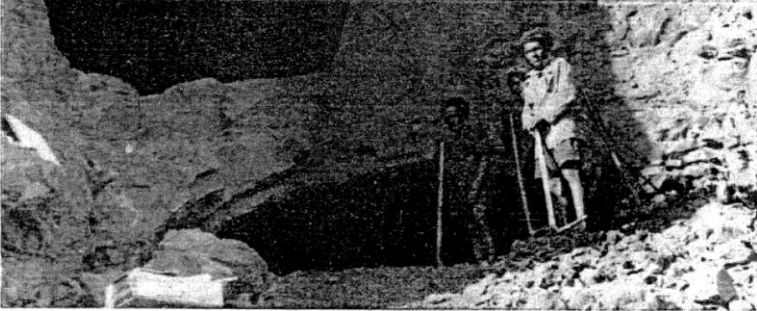
Strickland et al., 2001

Nicole Lambert's works (1965 -1983)

2 cavities connected

largest : 19m × 5m

400m³



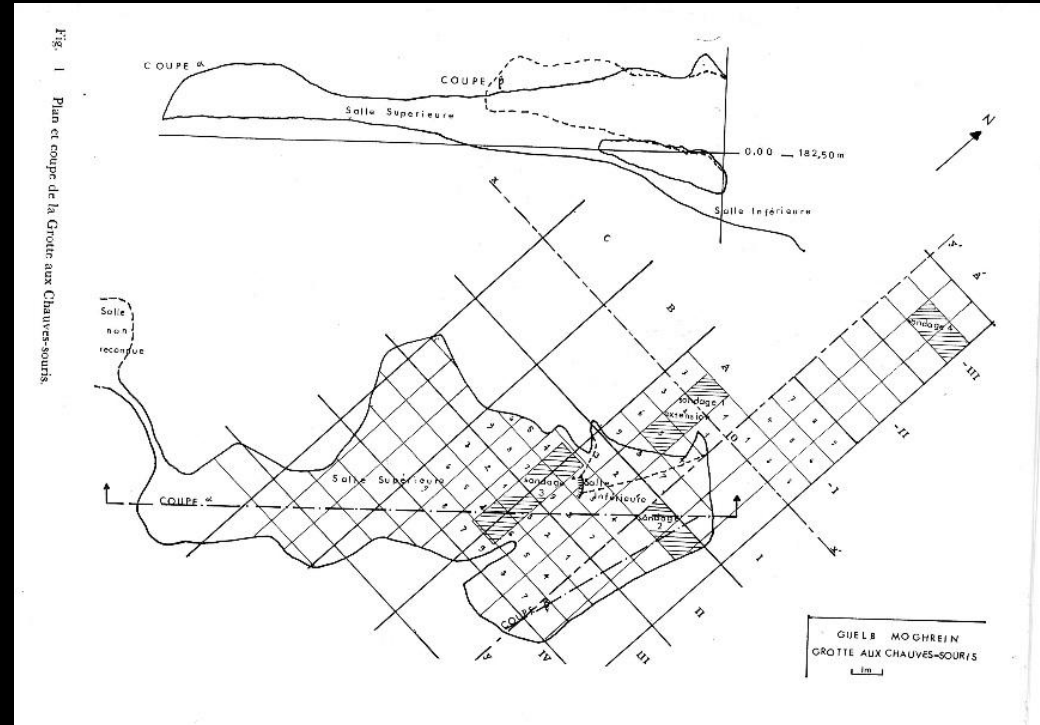
Lambert, 1965

2776 ± 126 BP - 2350 ± 110 BP

1305 - 197 cal. BC

“grotte aux chauves-souris” mine

(western Guelb Moghrein)



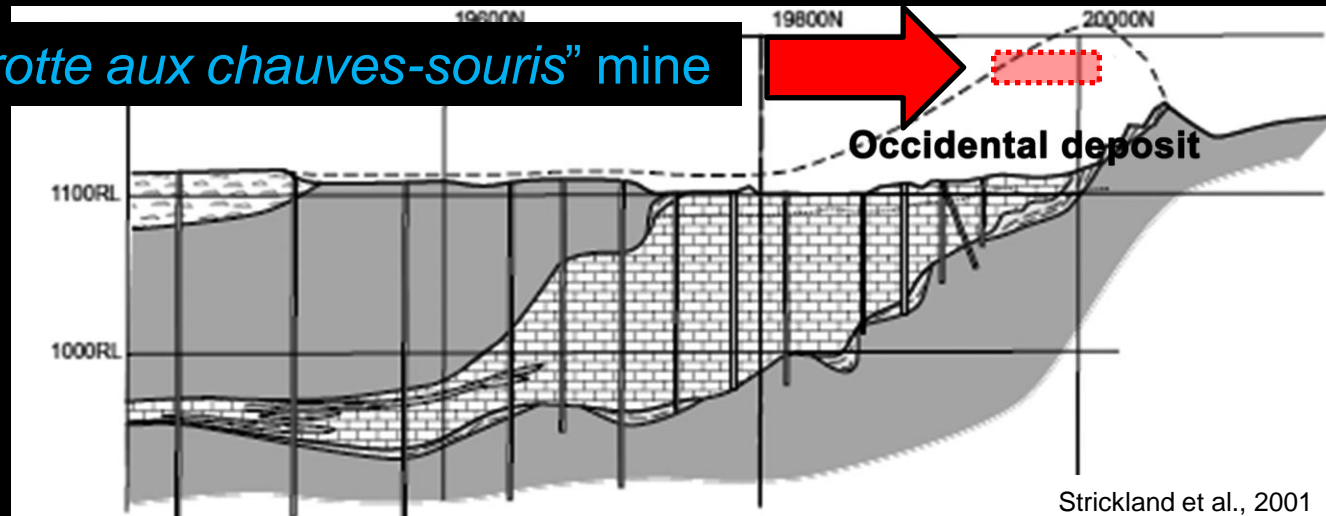
Lambert, 1975

Nicole Lambert's works (1965 -1983)



© MCM

“grotte aux chauves-souris” mine



Strickland et al., 2001

Many questions still remain...

CUivre : **PR**oduction et **U**sages en **M**auritanie à l'Holocène

CUPRUM

2016-2019

supported

financially and scientifically

Ministère de l'Europe et des
Affaires Etrangères

MEAE



human and logistic ways

private mining company
Mauritanian Copper Mine

MCM



Cultural & scientific network

Office National des Musées
de Mauritanie



Ville
d'Akjoujt

Projet franco-mauritanien

CUivre : PRoduction et
Usages à l'Holocène en
Mauritanie

CUPRUM



Ambassade de France
à Nouakchott



Ministère de la Culture et de
l'artisanat

Problematic

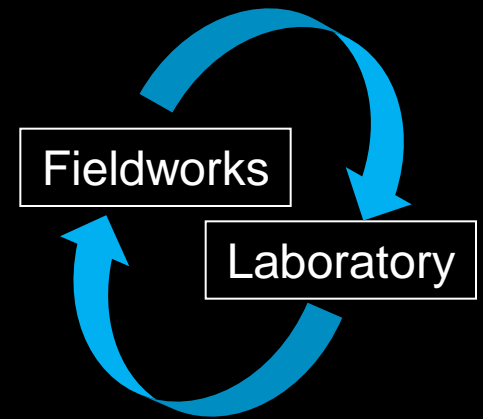
Origin and development of
the metallurgy
in Saharo-Sahelian zone

Aims

➔ **Characterize copper metallurgy**

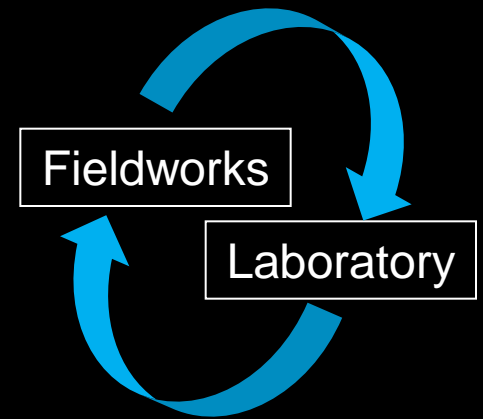
Aims

➔ **Circulation and inter-cultural relationships
linked to copper metallurgy**



Aims

➔ **Circulation and inter-cultural relationships
linked to copper metallurgy**



Aims

➔ **Universities collaboration: formation and teaching**

Mauritania

Nouakchott University
History departement



France

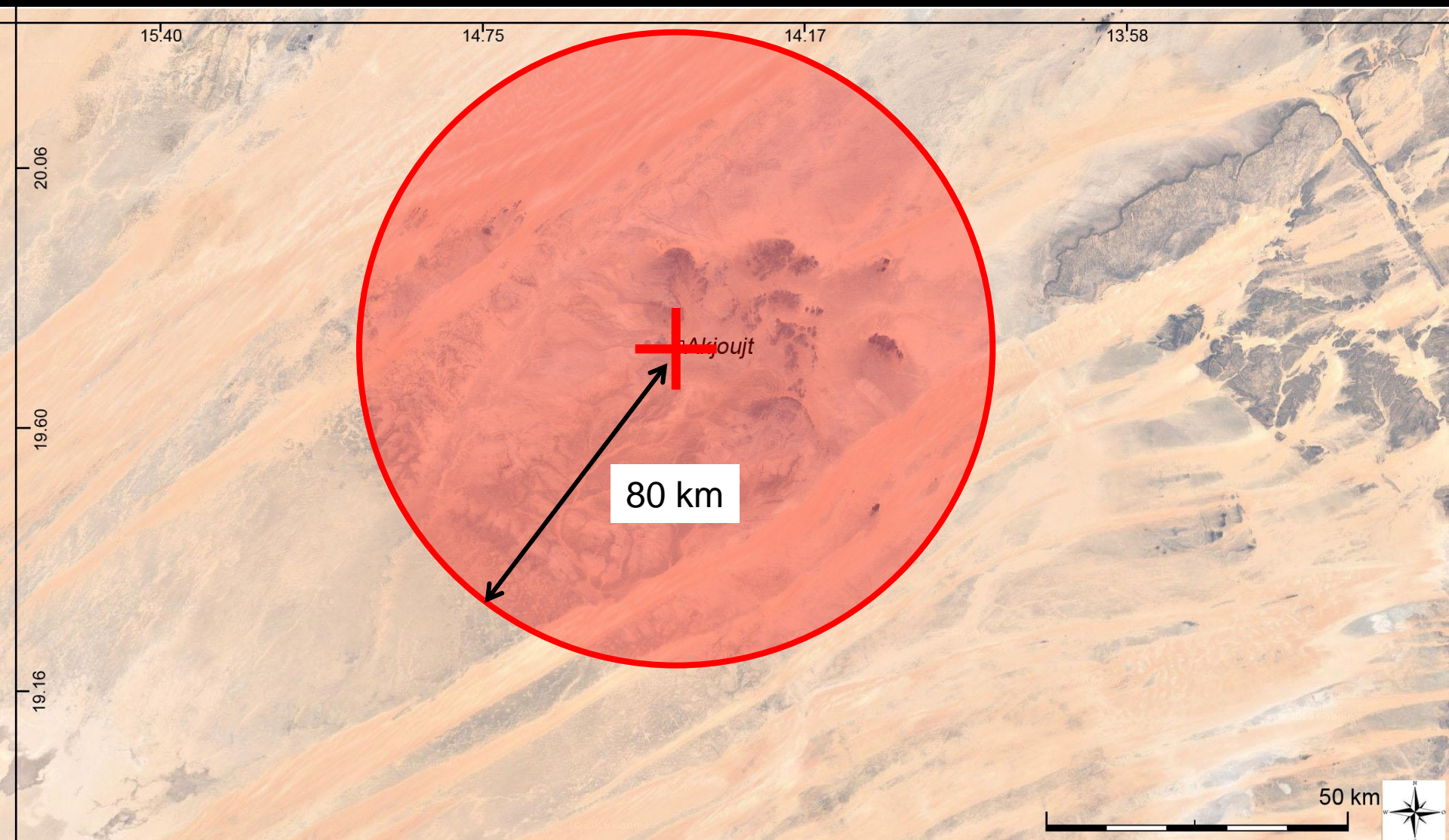
Toulouse 2
Jean-Jaures University
TRACES Laboratory

Aims

➔ Defend heritage & revive economy in Inchiri region



Research area



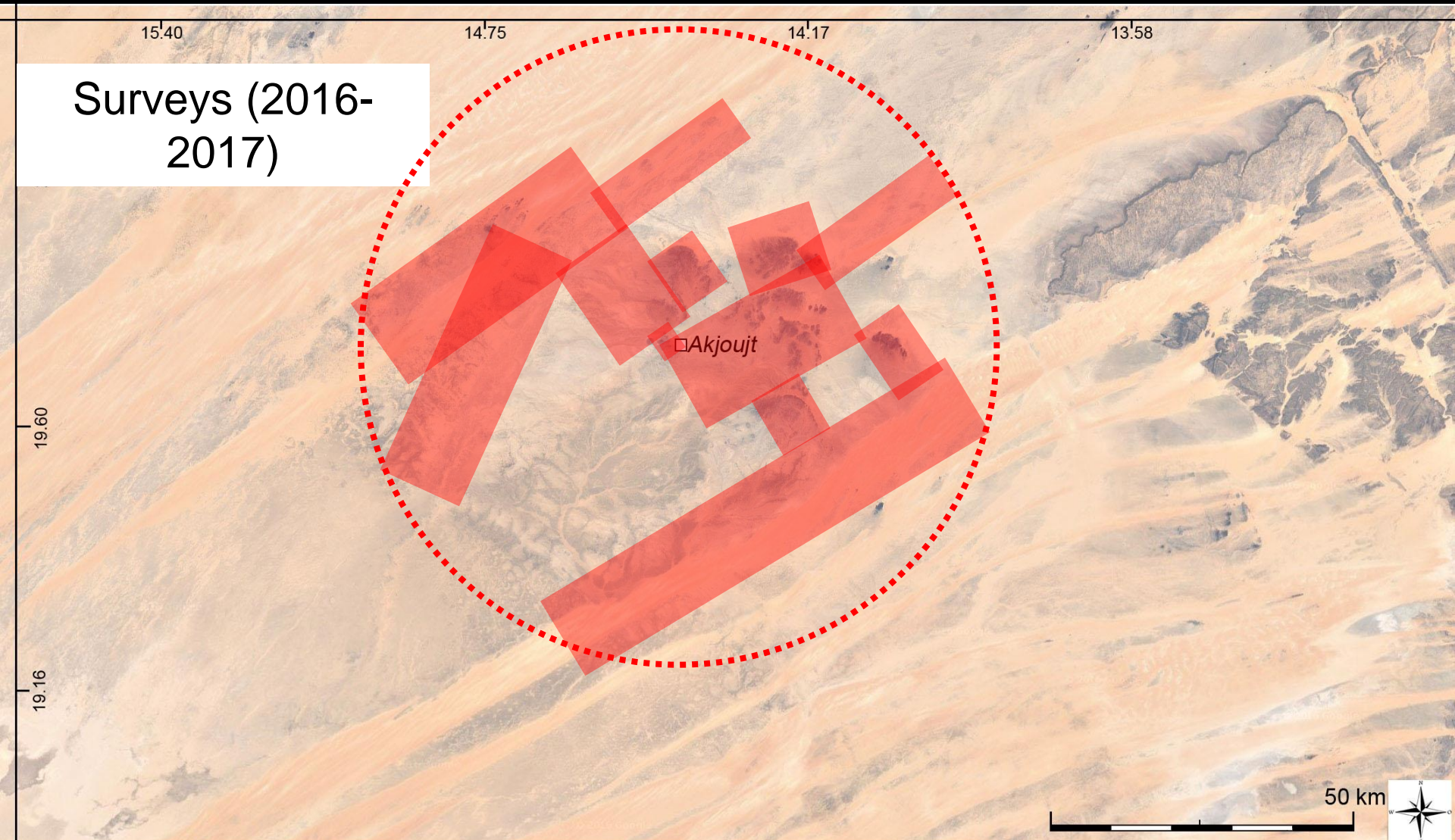


Research area

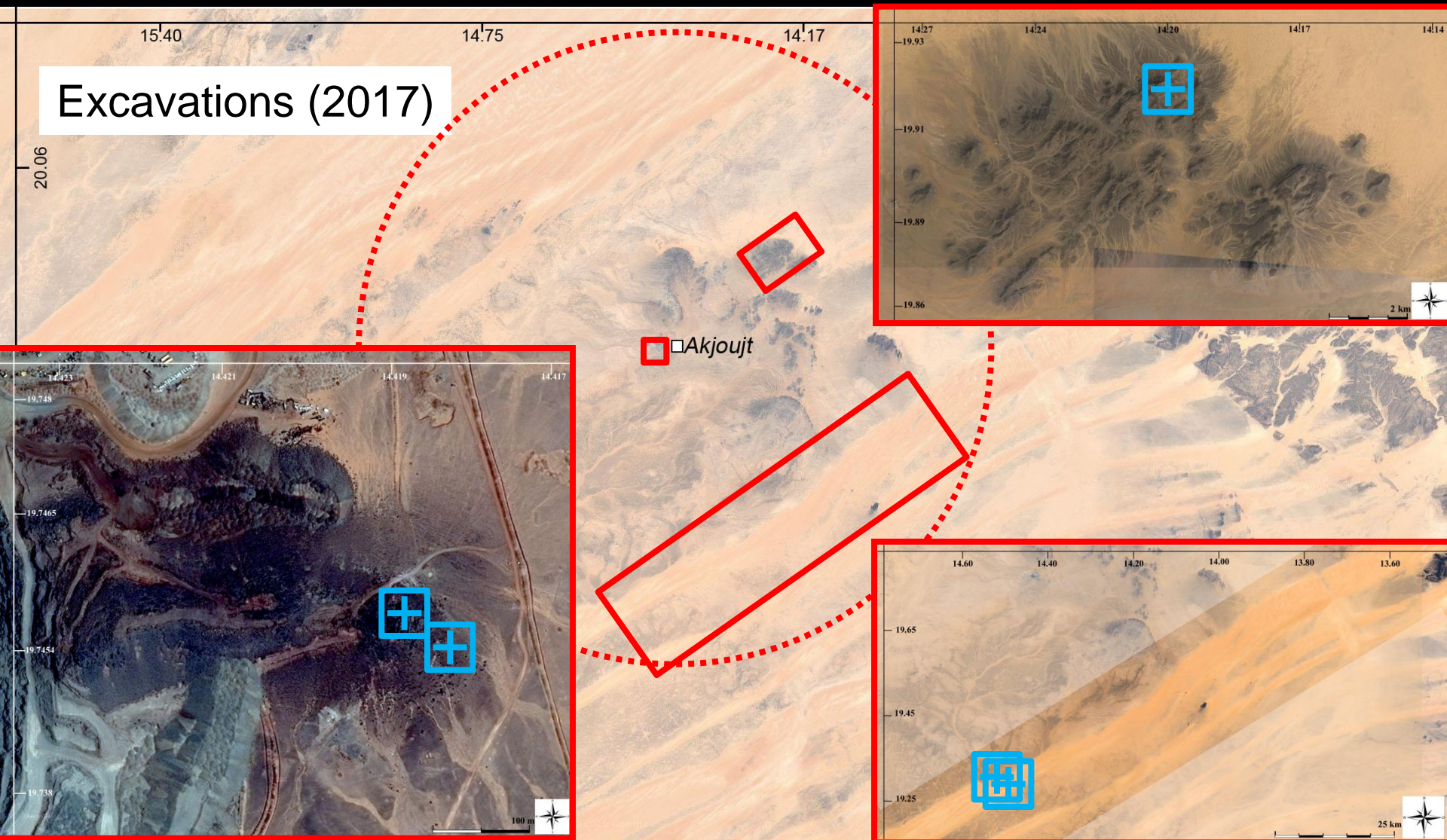
Surveys (2016-2017)

□ Akjoujt

50 km



Research area



Preliminary results

1st – 2nd campaigns

2016-2017

CUPRUM - CUivre : PRoduction et Usages à l'Holocène en Mauritanie -





ancient mines

15.40

14.75

14.17

13.58


ancient mine known

20.06

19.60

19.16

 Akjoujt

 mine known

50 km

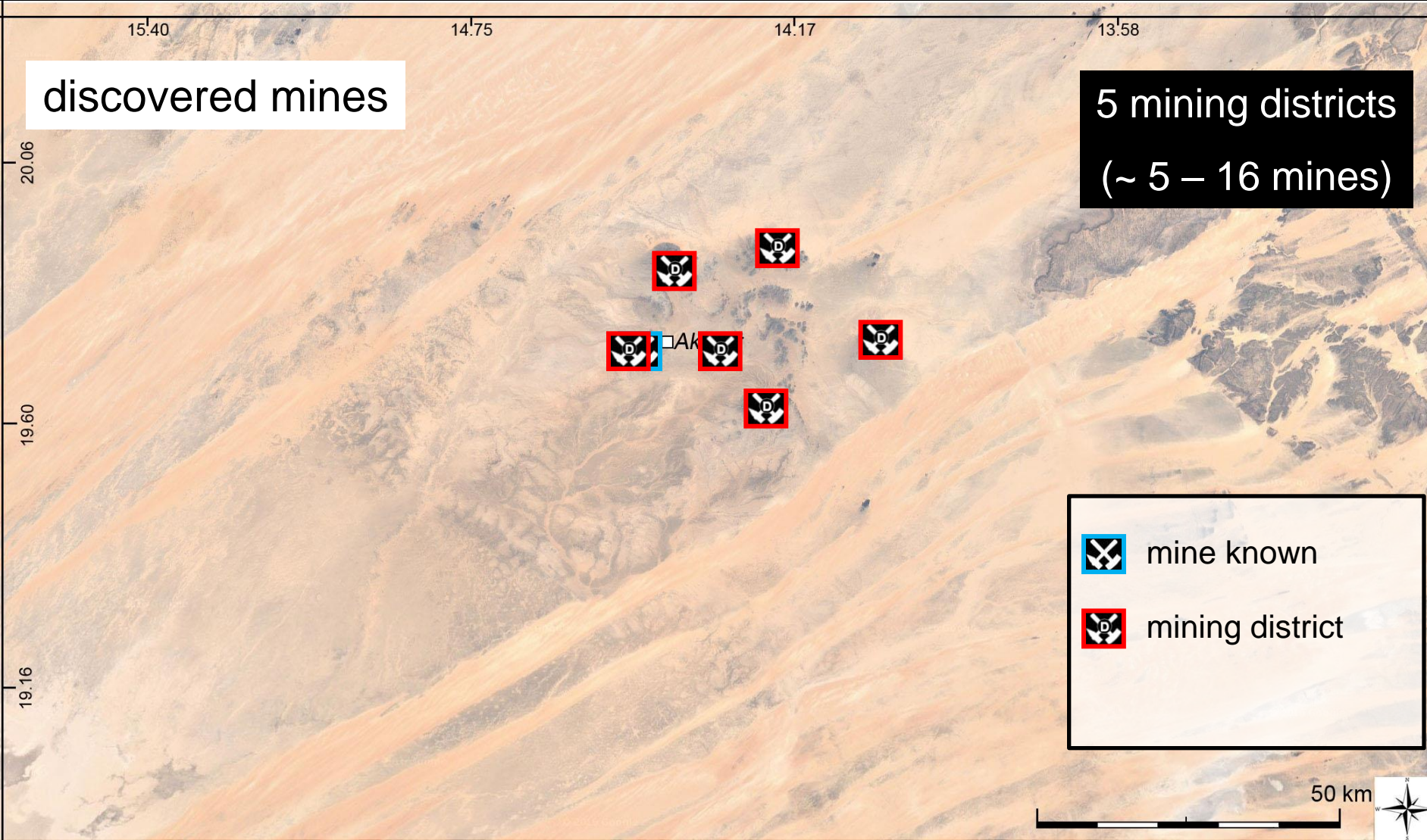


discovered mines

5 mining districts
(~ 5 – 16 mines)

 mine known

 mining district






discovered mines

5 mining districts
(~ 5 – 16 mines)

total :
45 mines found

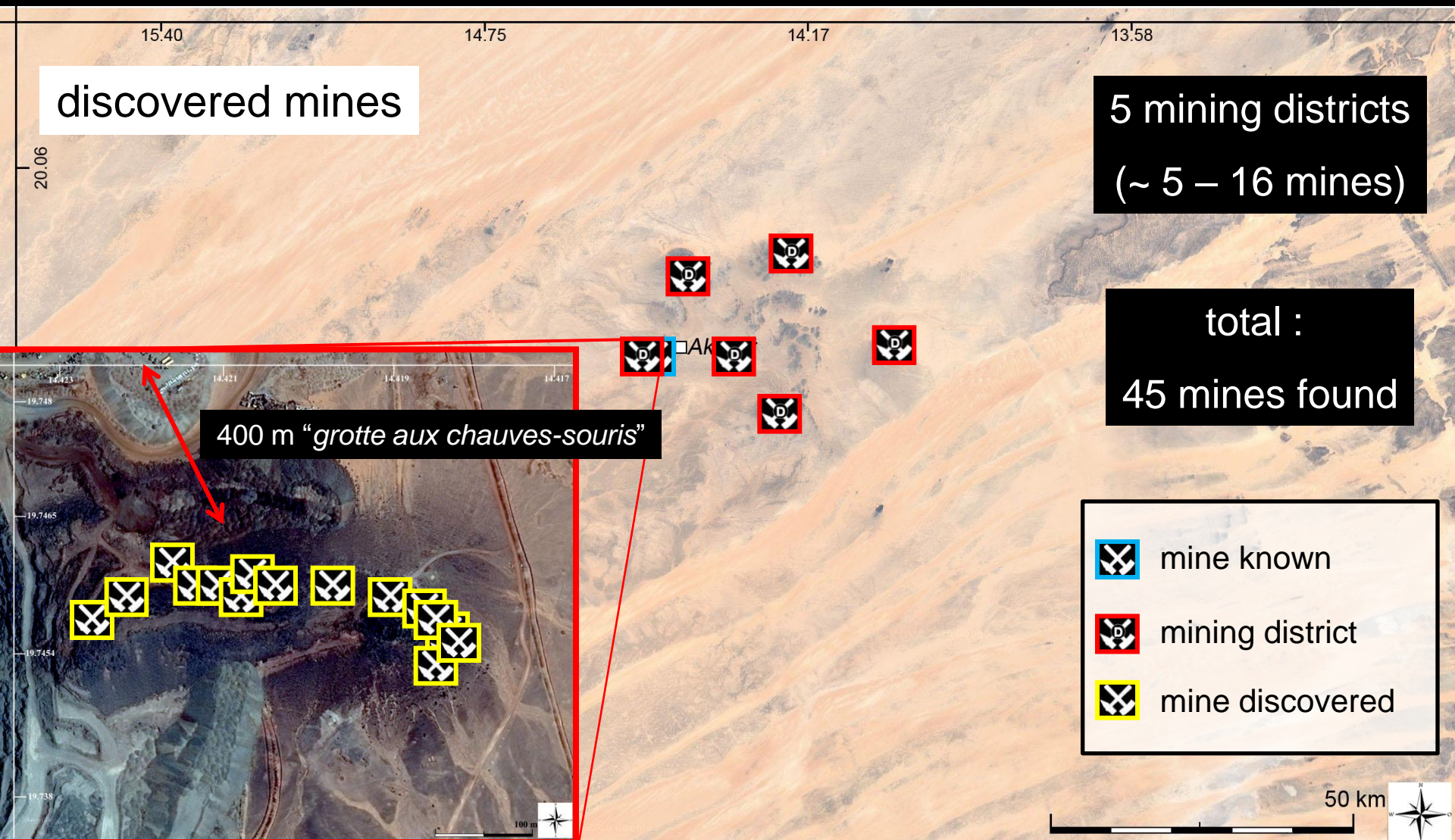
400 m "grotte aux chauves-souris"

-  mine known
-  mining district
-  mine discovered

50 km



100 m



cutting face

extraction with
lithic hammer



5 cm



copper ores

malachite

chrysocolla

cutting face

copper ores

malachite

chrysocolla

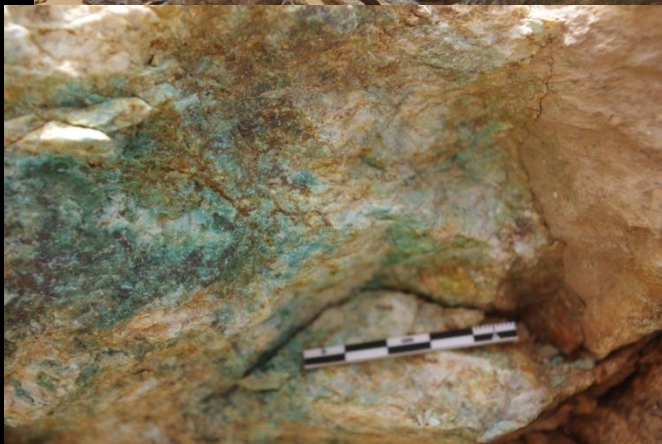


cutting face

copper ores

malachite

chrysocolla



extraction with
lithic hammer



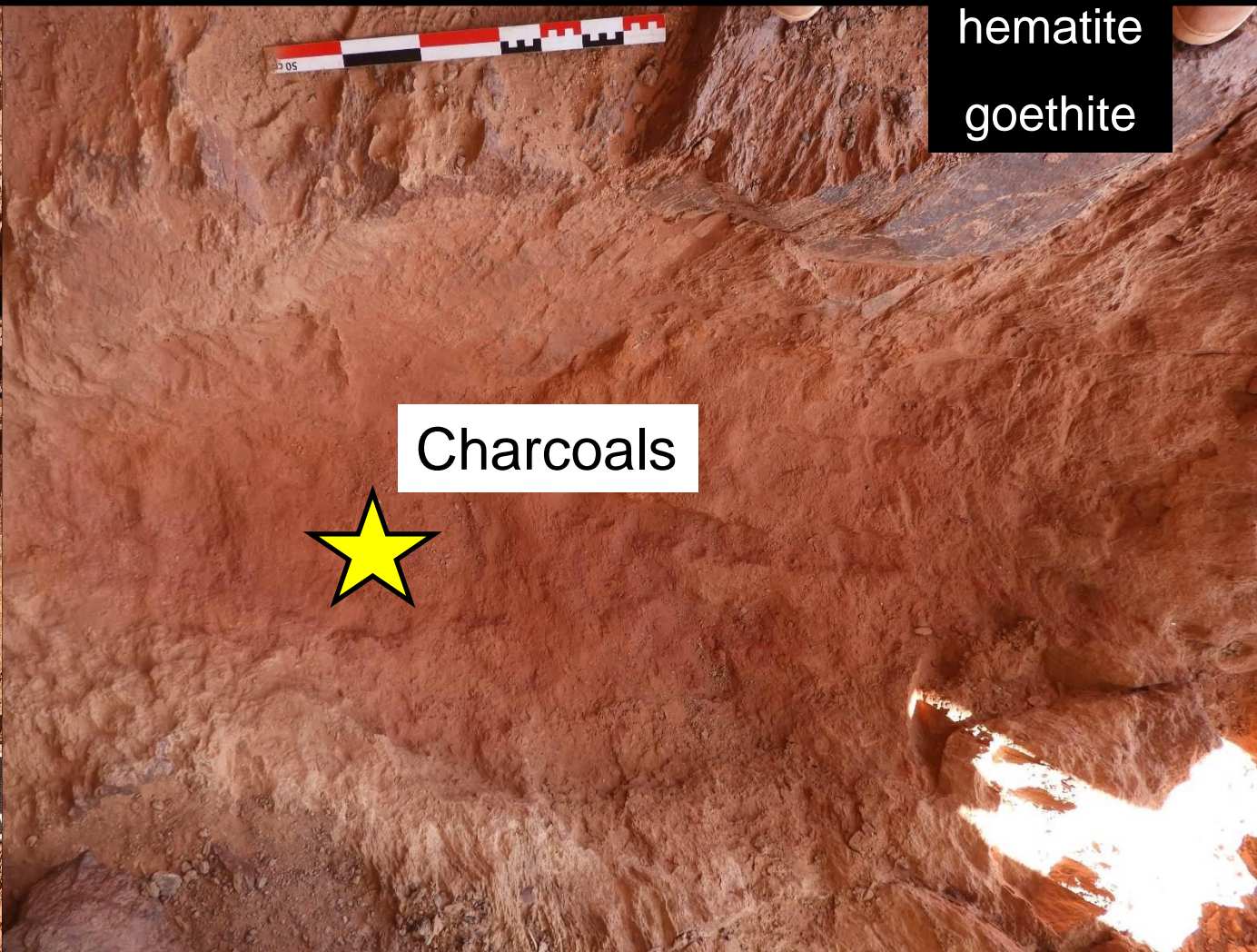
cutting face

iron ores

hematite

goethite

Charcoals



cutting face

iron ores
hematite
goethite



cutting face

iron ores

hematite

goethite



a)

extraction :

- iron ores ?
- pigments ?
- flux for copper smelting ?



c)

small cavities

copper ores

&

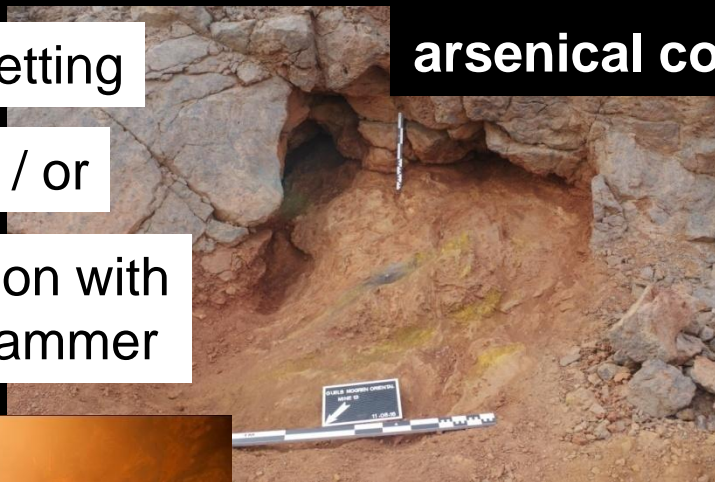
arsenical copper ores



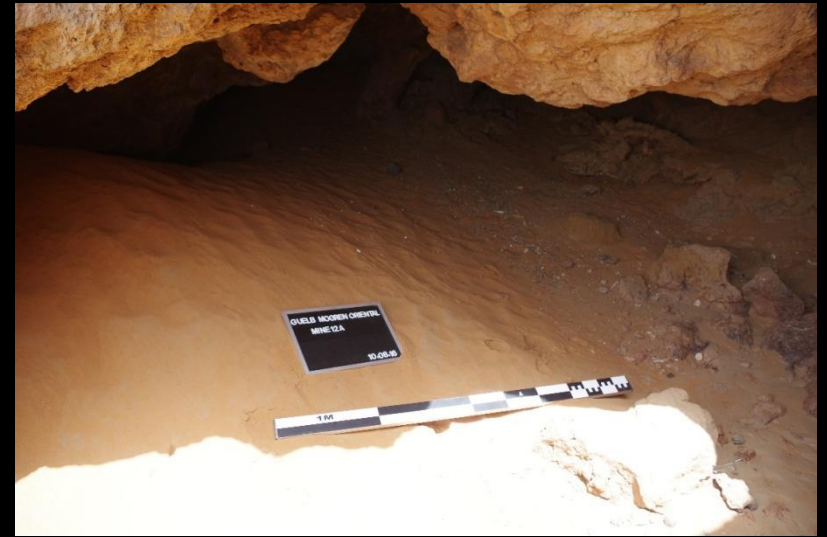
fire-setting

and / or

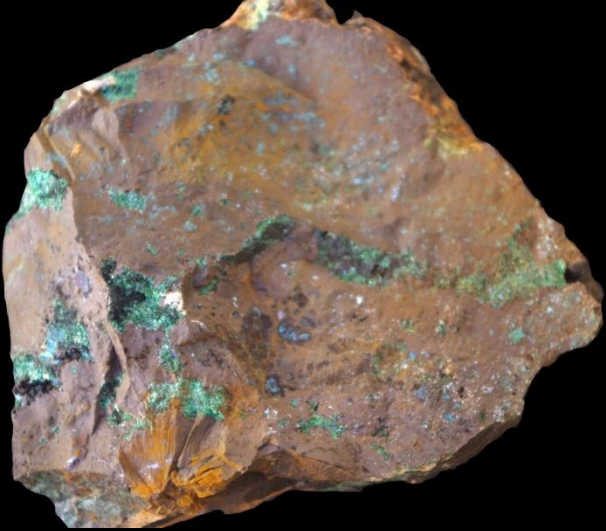
extraction with
lithic hammer



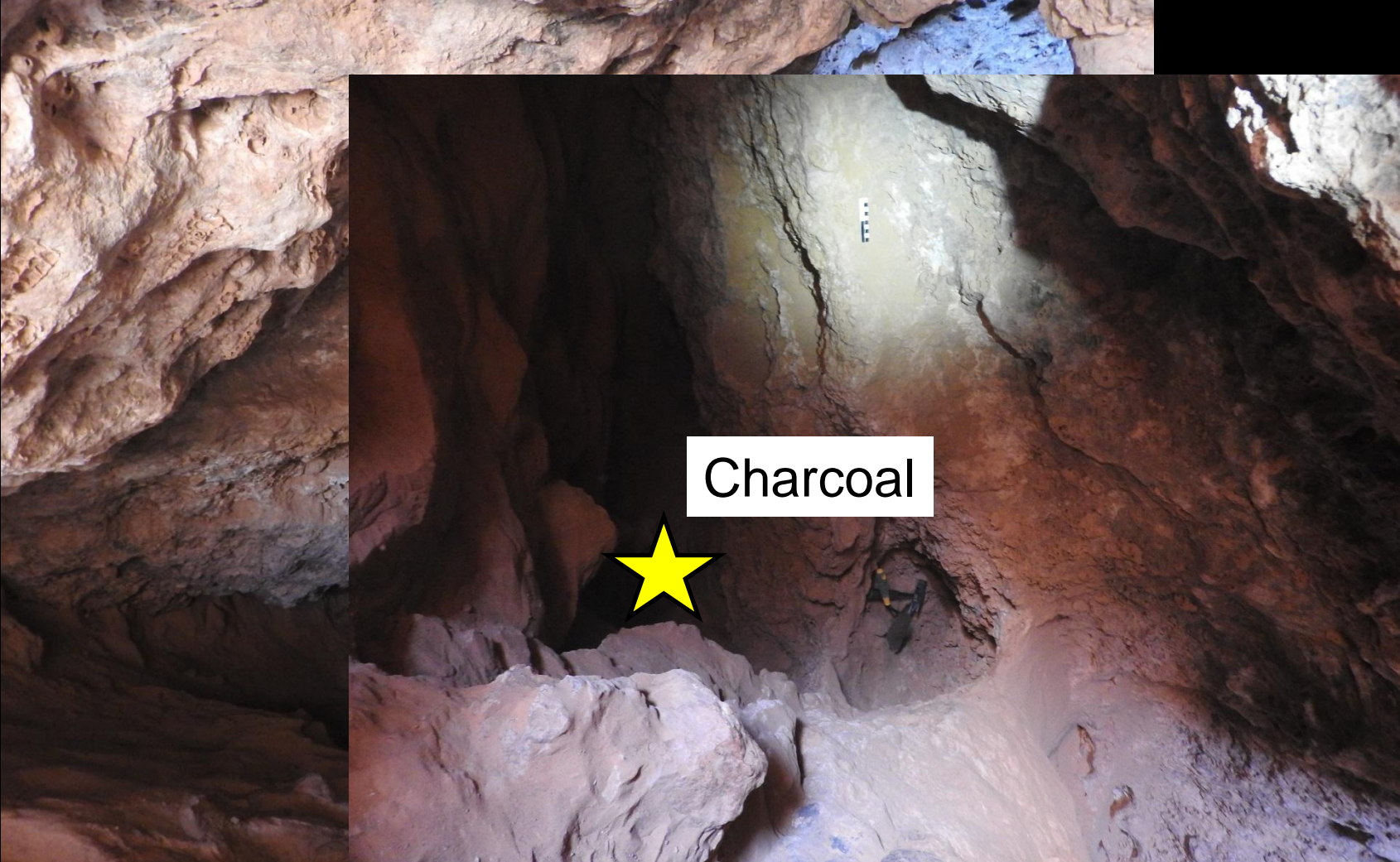
large cavities



large cavities



large cavities



large cavities

Z1 M12a

fire-setting

2 (3?) entrances

2 (3?) levels

- 5.80m × 1m

- 6m × 4m

connected by pit access

lateral small galleries

excavations still in progress

IN

5 m

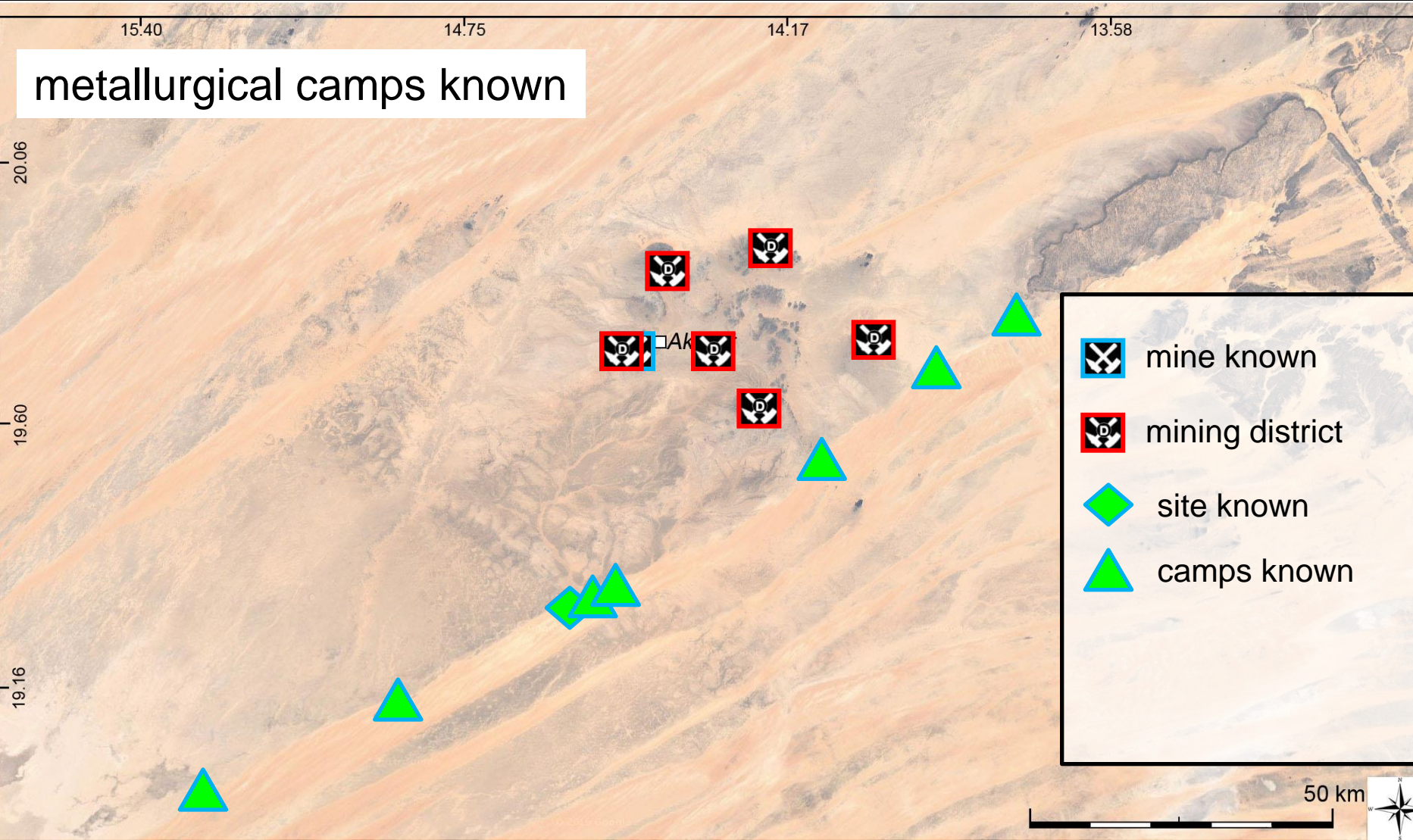
Maass, 2017



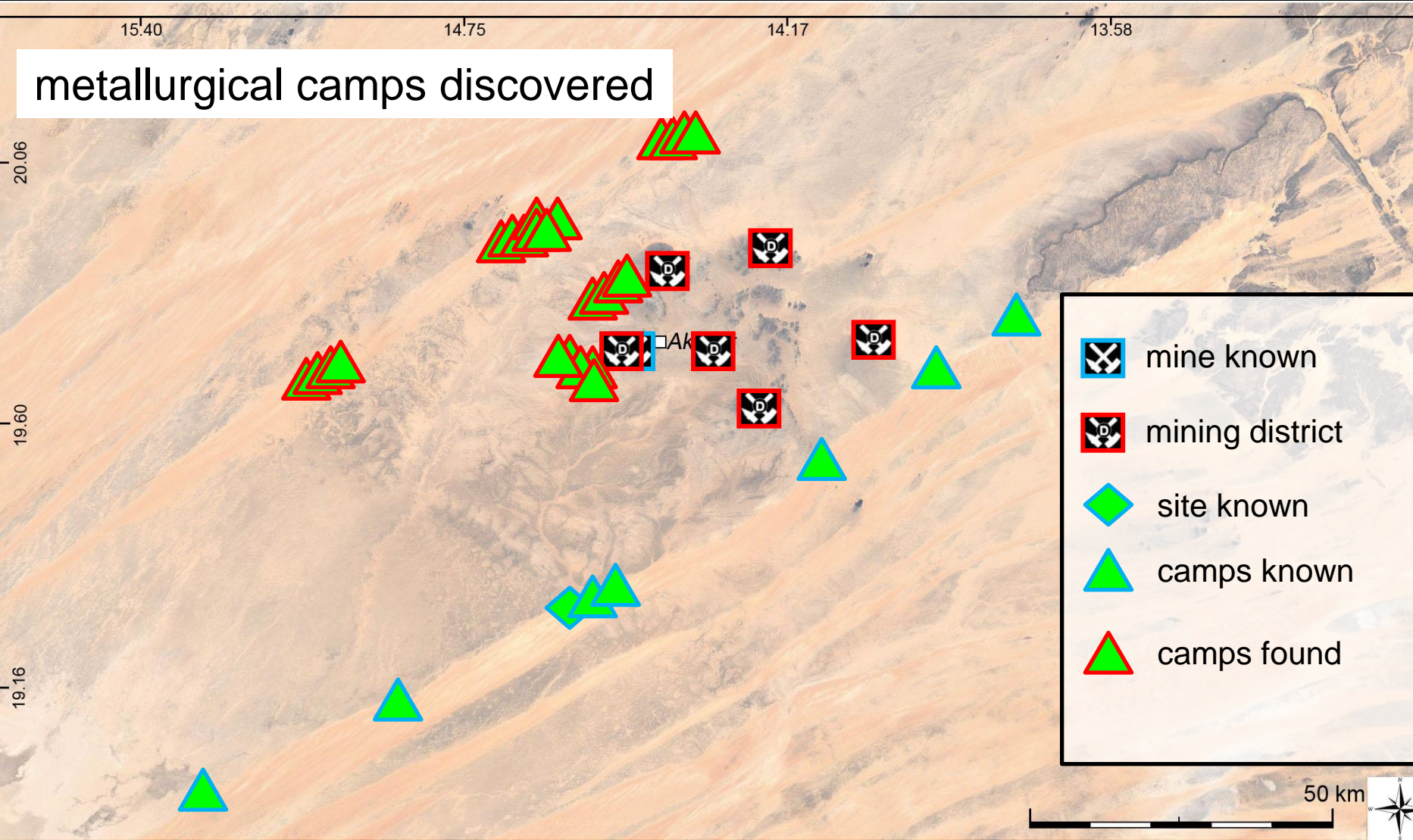


metallurgical camps

metallurgical camps known



metallurgical camps discovered



15.40

14.75

14.17

13.58

20.06

19.60

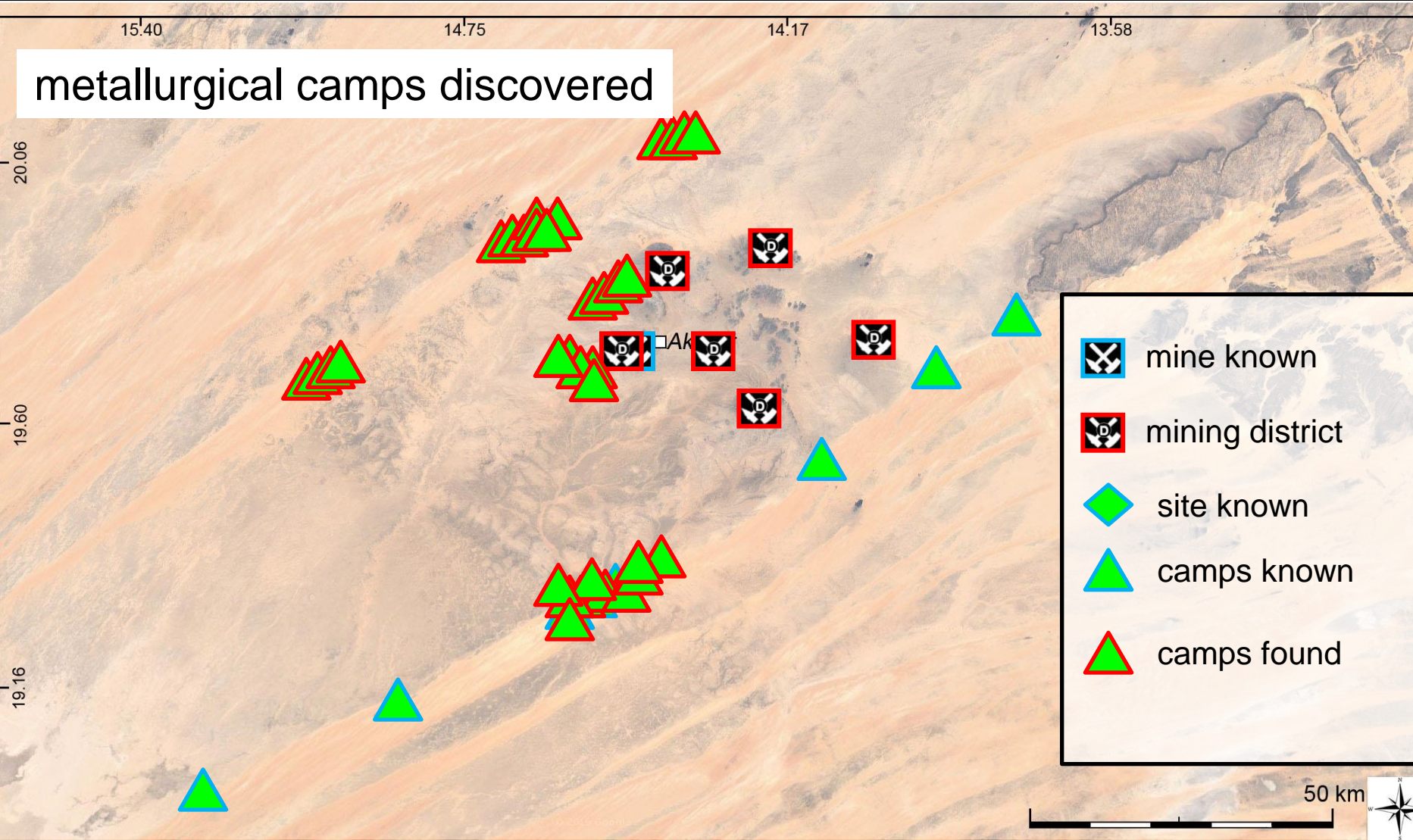
19.16

-  mine known
-  mining district
-  site known
-  camps known
-  camps found

50 km



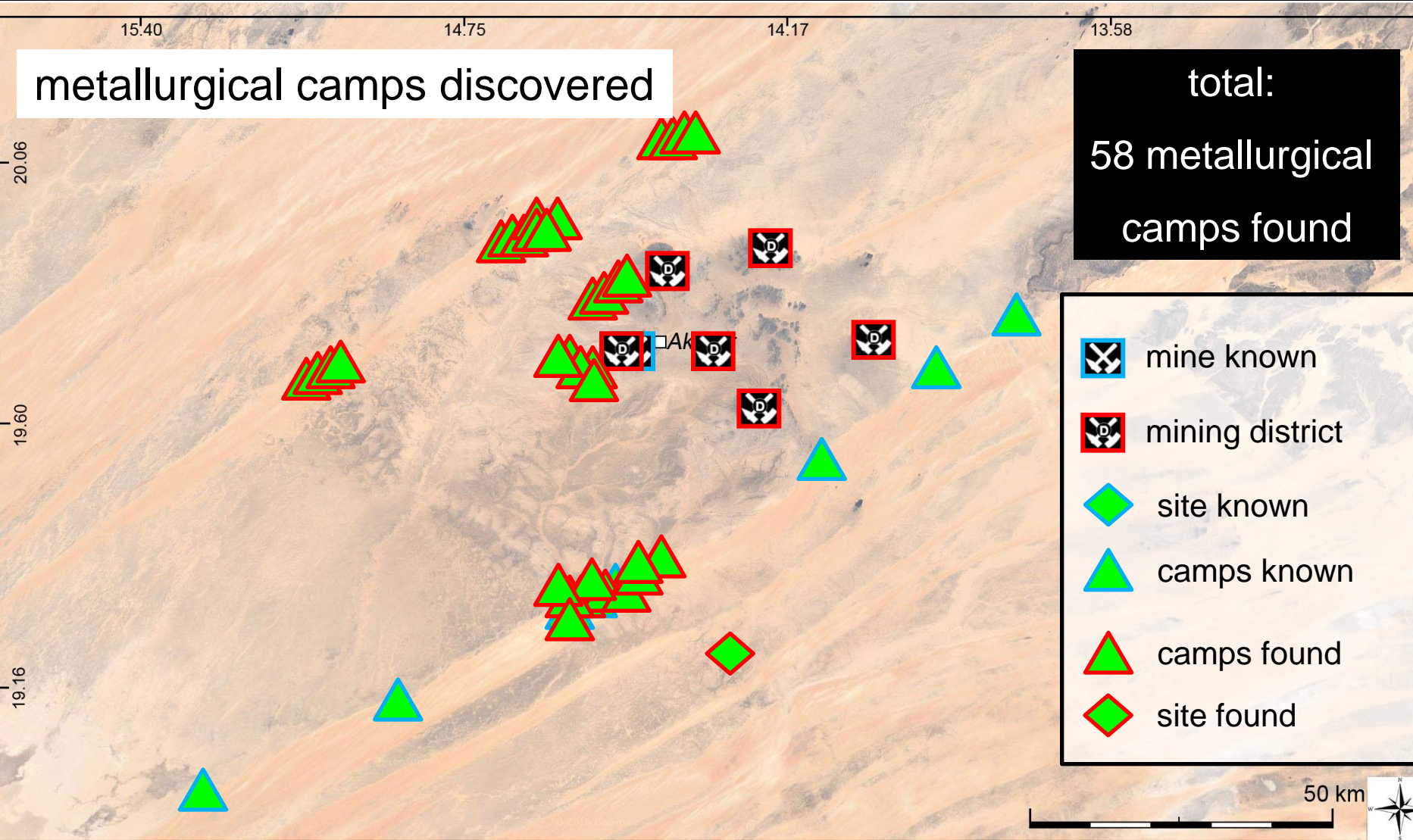
metallurgical camps discovered



metallurgical camps discovered

total:
58 metallurgical
camps found

-  mine known
-  mining district
-  site known
-  camps known
-  camps found
-  site found

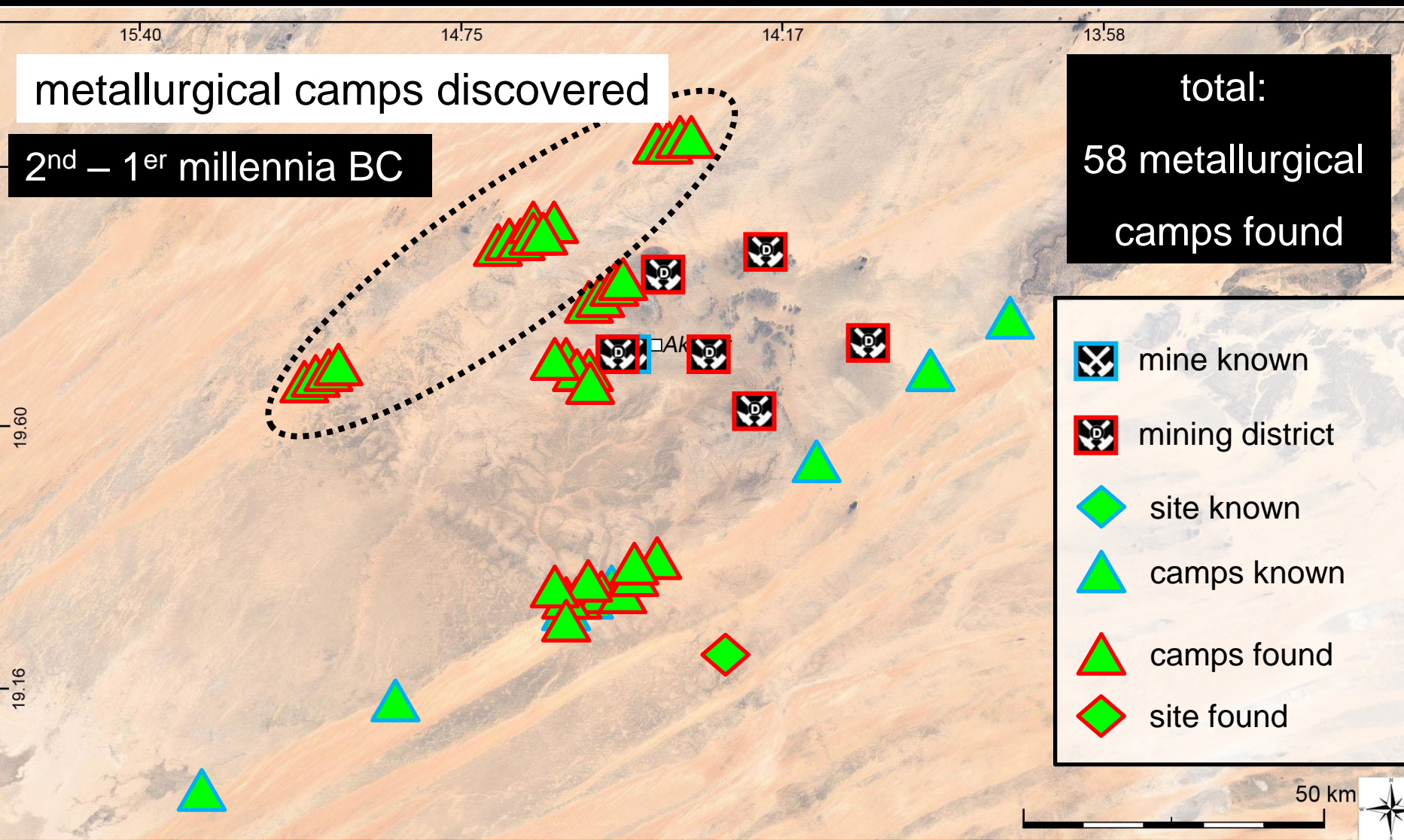


metallurgical camps discovered

2nd – 1^{er} millennia BC

total:

58 metallurgical
camps found



-  mine known
-  mining district
-  site known
-  camps known
-  camps found
-  site found

15.40

14.75

14.17

13.58

metallurgical camps discovered

2nd – 1^{er} millennia BC

1^{er} mill. BC

5^e – 7^e centuries AD.

total:

58 metallurgical
camps found

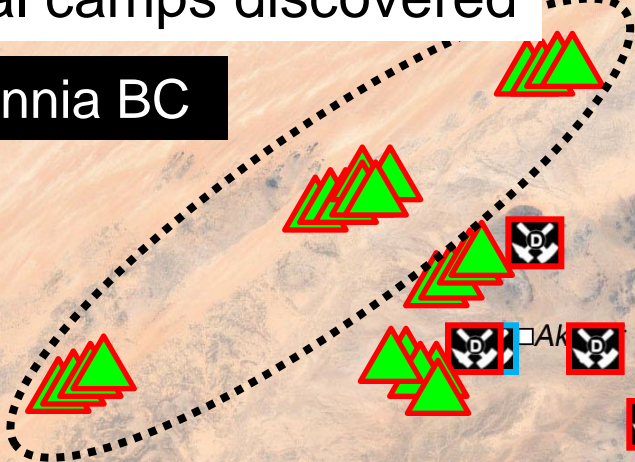
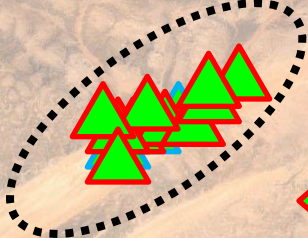
-  mine known
-  mining district
-  site known
-  camps known
-  camps found
-  site found

50 km



19.60

19.16



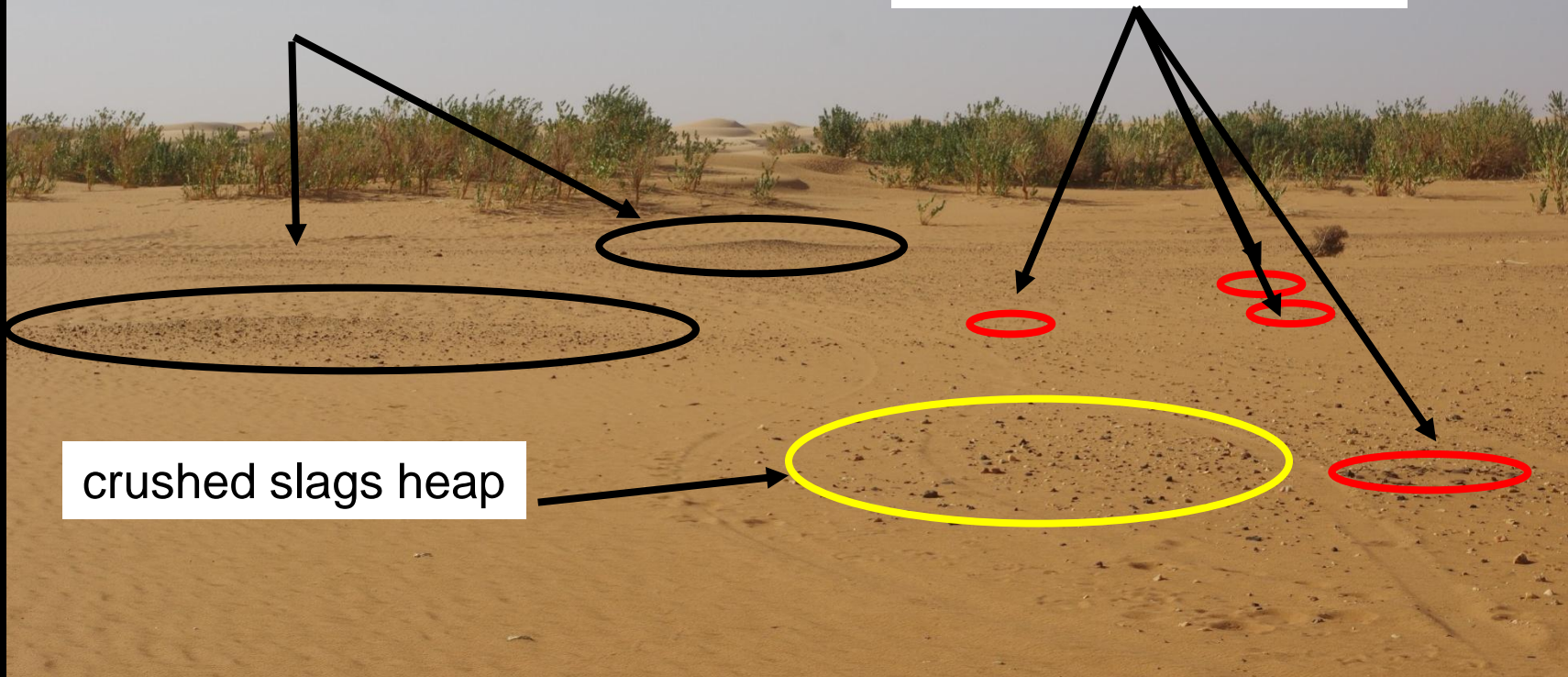
metallurgical camps / metallurgical sites

Z-8-H-W-7

slags heap

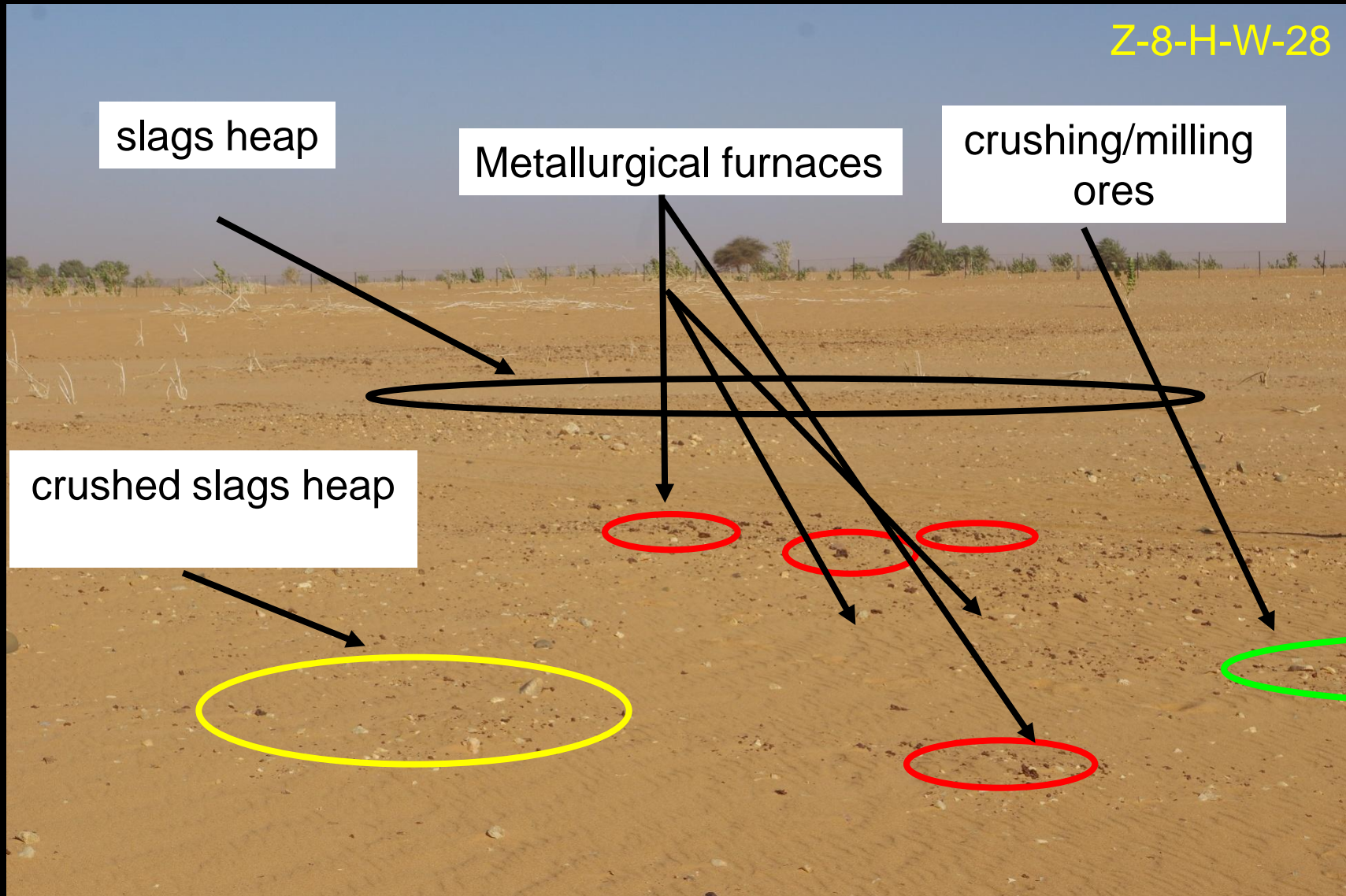
metallurgical furnaces

crushed slags heap

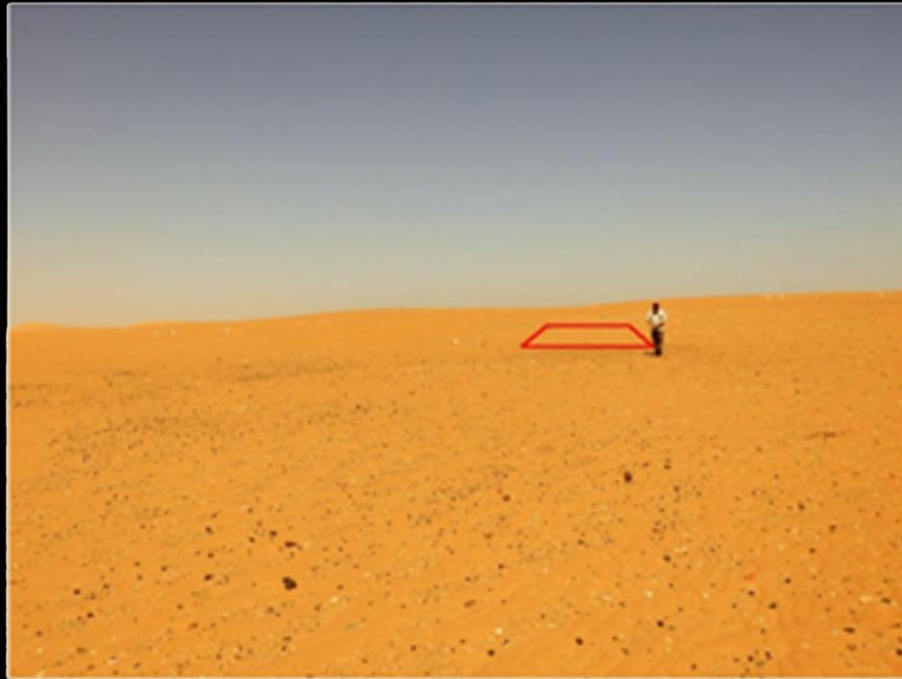


metallurgical camps / metallurgical sites

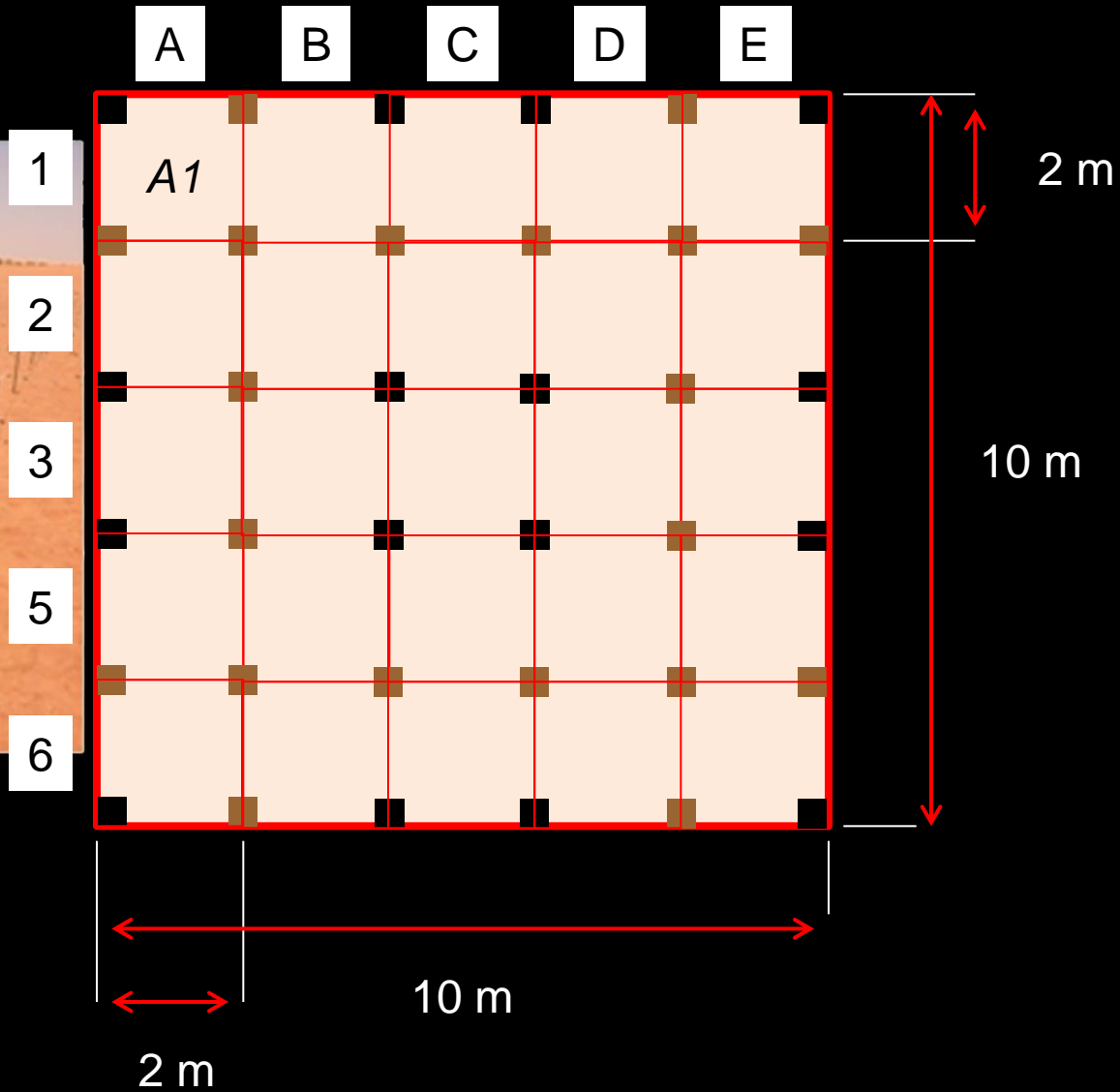
Z-8-H-W-28



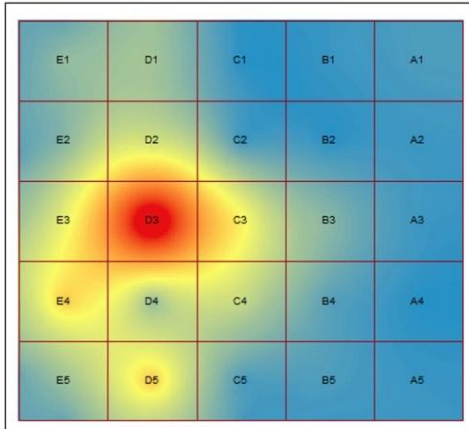
metallurgical camps / metallurgical sites



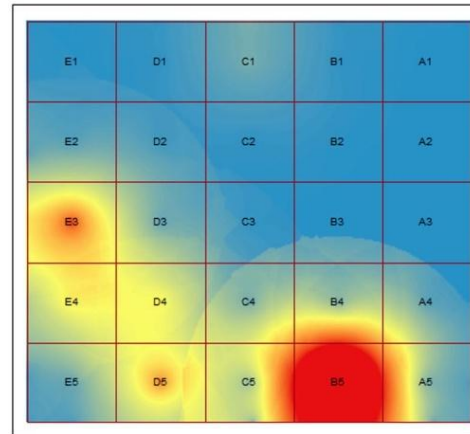
metallurgical camps / metallurgical sites



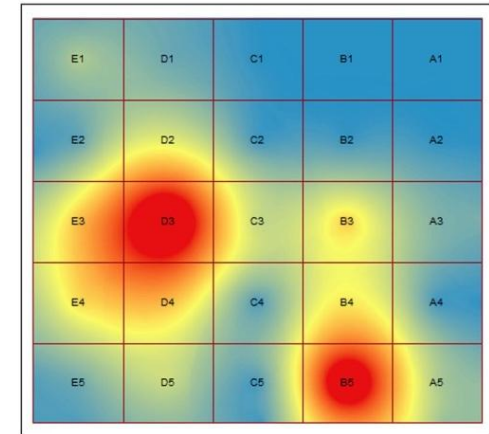
metallurgical camps / metallurgical sites



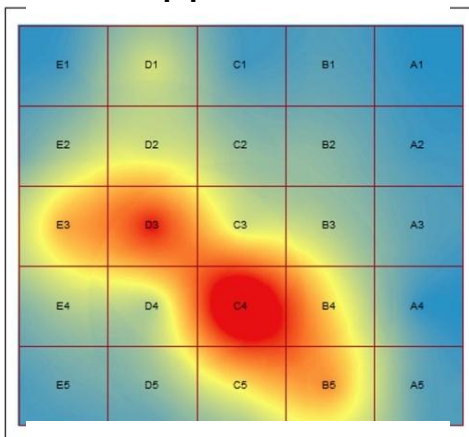
copper ores



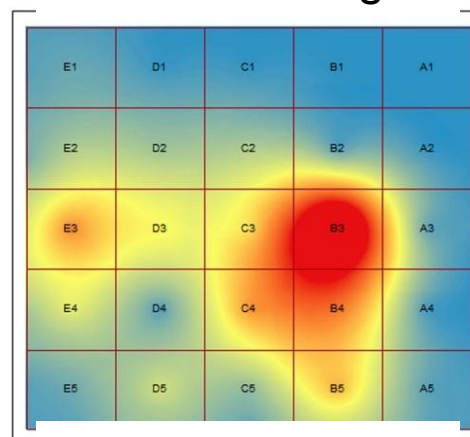
crucibles frag.



furnace wall frag.



slag



metal prills

TOTAUX	
tessons	609
scories	509
minerais	179
éléments de four	154
objets métal	0
éclats de taille	0
macrolithiques	15
os (esquilles)	117
charbons	11
frags. œuf d'autruche	2
billes de métal	140
fragments de creuset	35
objets semi-finis	2

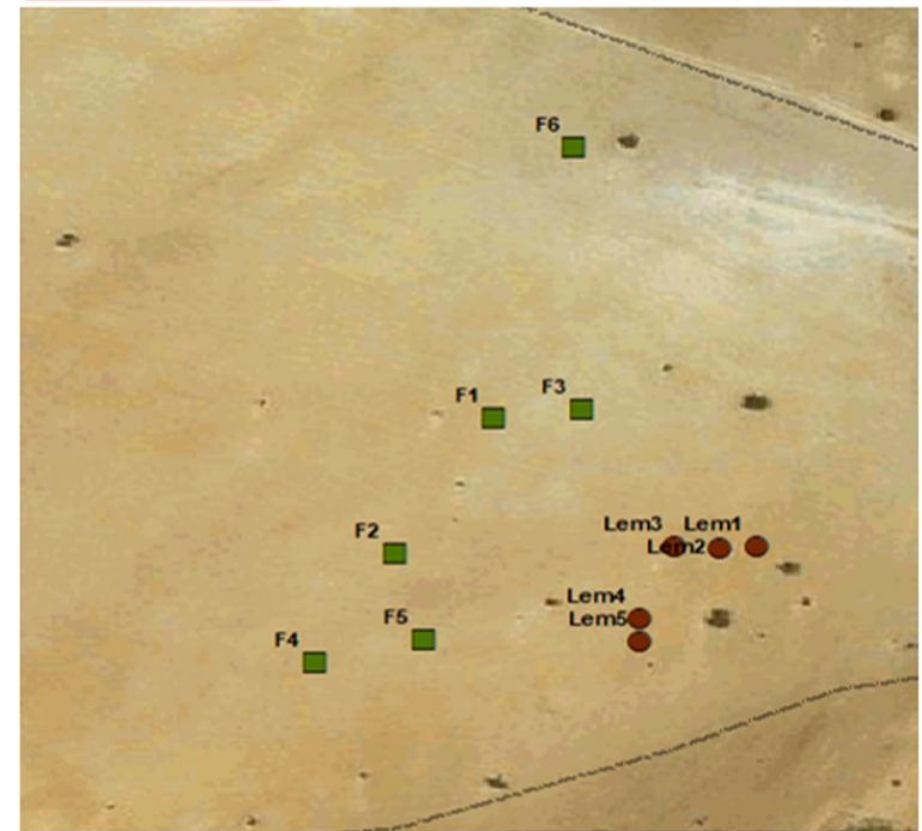
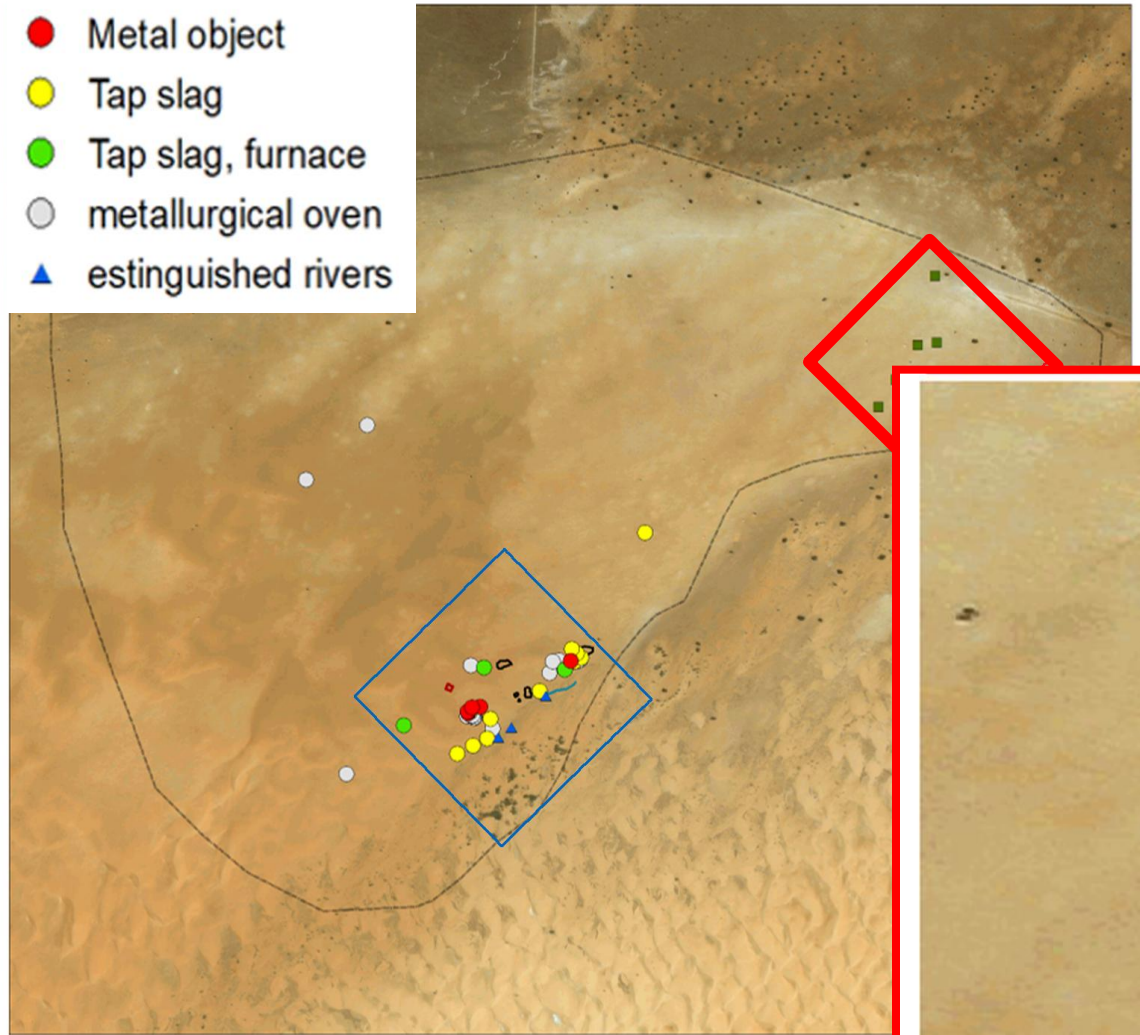
0 1.5 3 6 Meters



Coordinate System: GCS WGS 1984
Datum: WGS 1984
Units: Degree

metallurgical camps / metallurgical sites

- Metal object
- Tap slag
- Tap slag, furnace
- metallurgical oven
- ▲ estinguished rivers

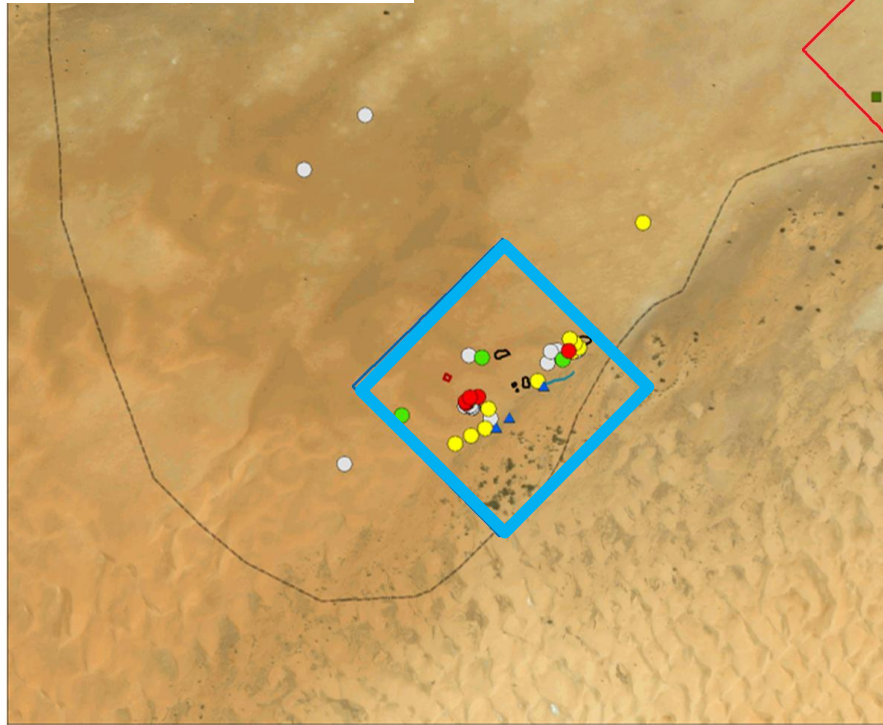
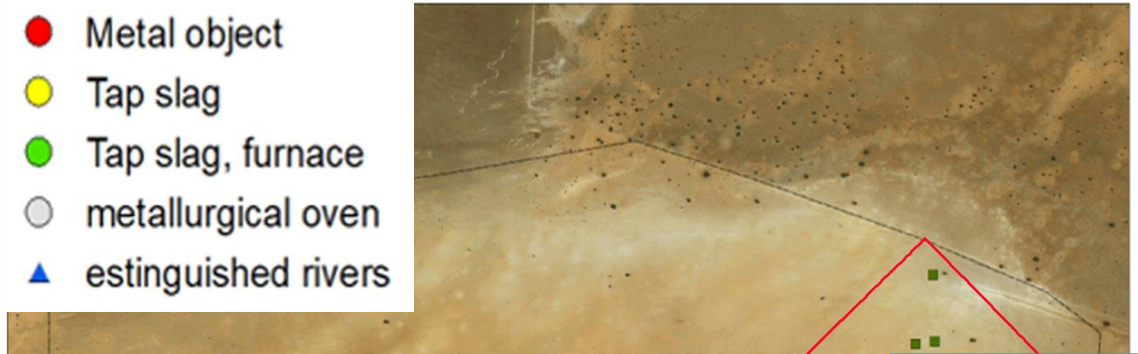


0 0,5 1 Kilometers

Coordinate System
Datum: WGS 1984
Units: Degree

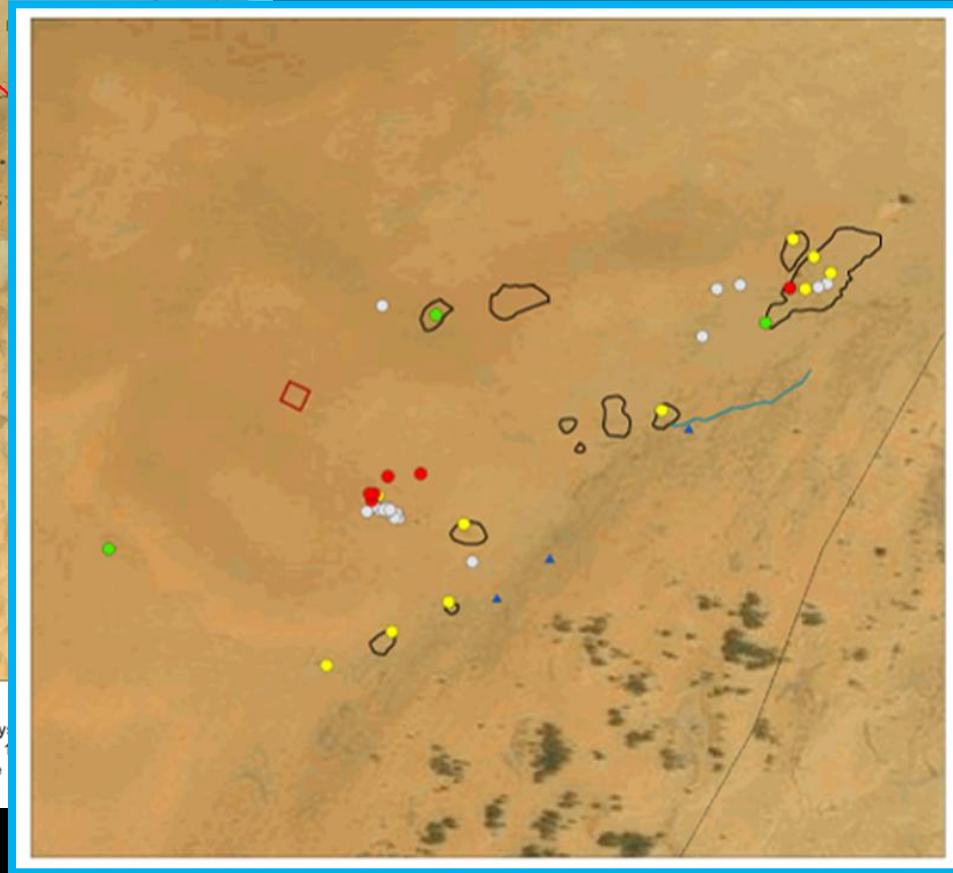
metallurgical camps / metallurgical sites

- Metal object
- Tap slag
- Tap slag, furnace
- metallurgical oven
- ▲ estinguished rivers



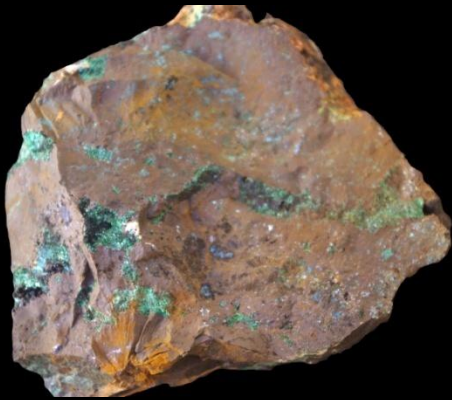
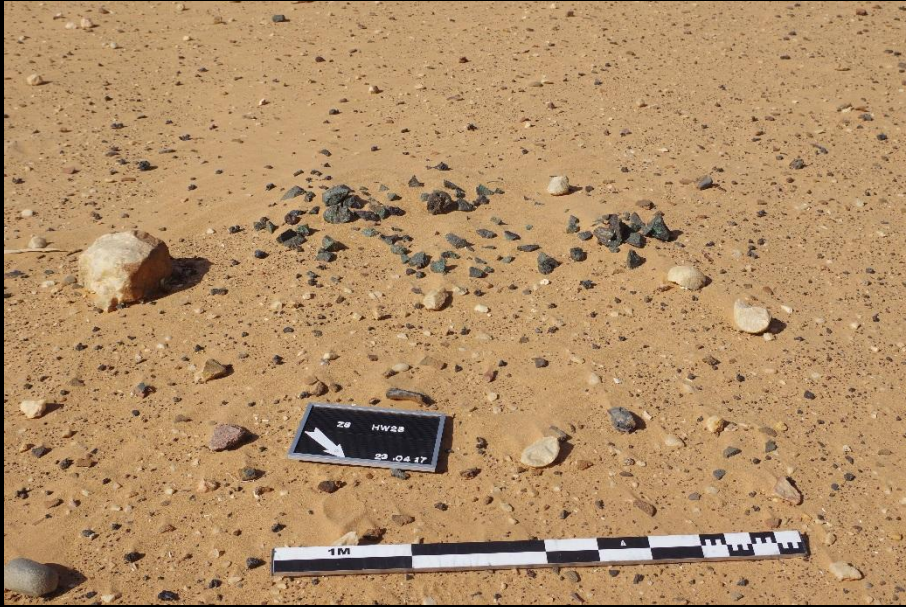
0 0,5 1 Kilometers

Coordinate System:
Datum: WGS 1984
Units: Degree

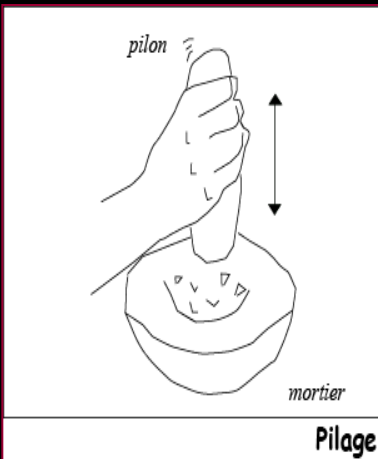


characteristics:

- crushing/grinding ores workshops



Crushing / grinding



Crushing / grinding



Beneficiation



smelting process ?

Raw Material
ores powder



STERILE
hostrock

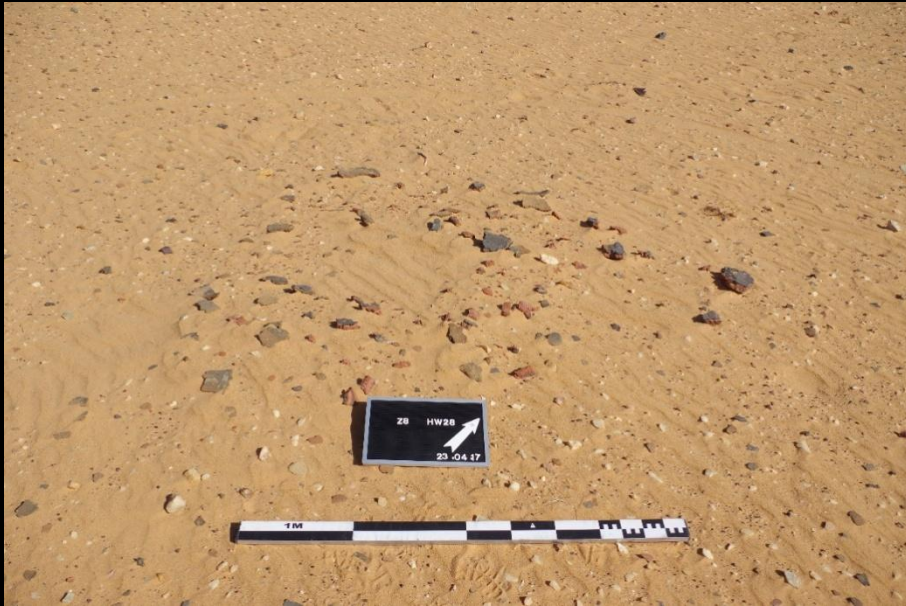


CONCENTRATE
concentrated ores



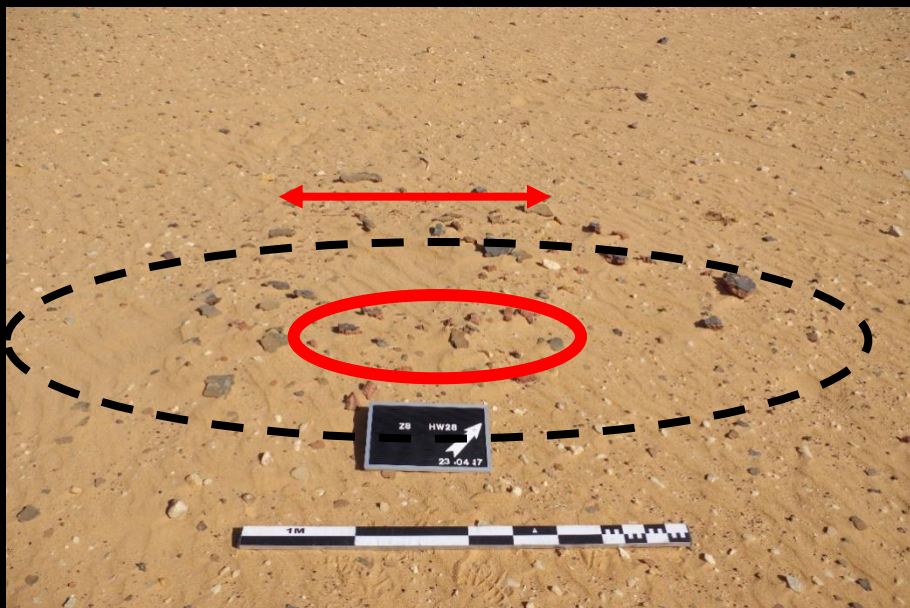
characteristics:

- crushing/grinding ores workshops
- furnaces

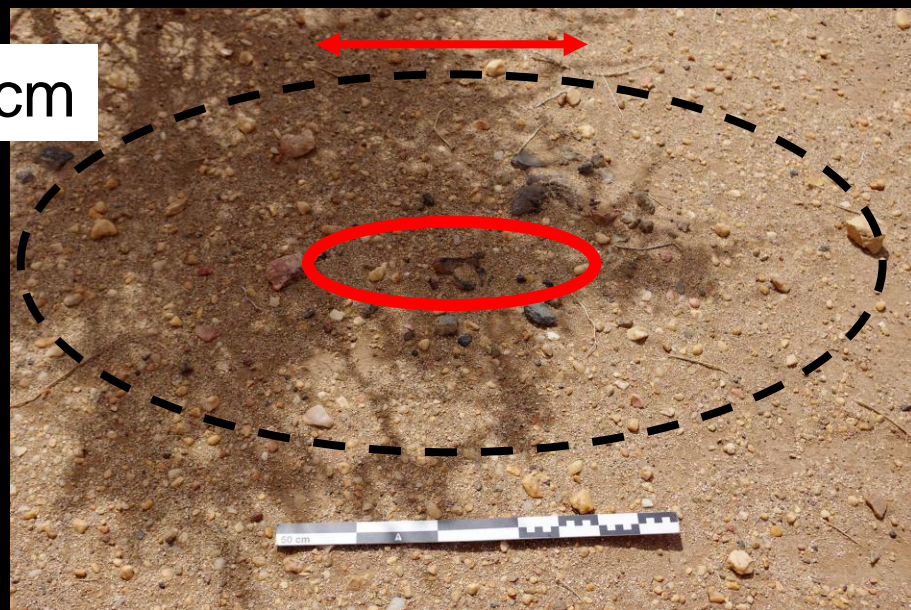


characteristics:

- crushing/grinding ores workshops
- furnaces



31 - 42 cm



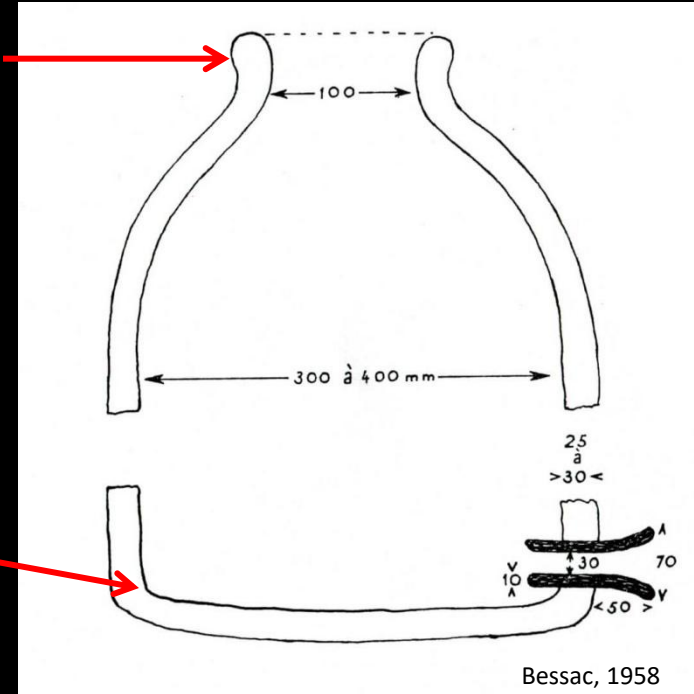
characteristics:

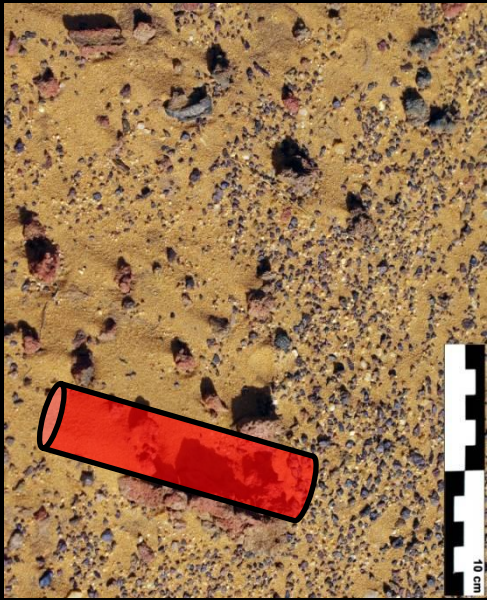
- crushing/grinding ores workshops
- furnaces (walls,



characteristics:

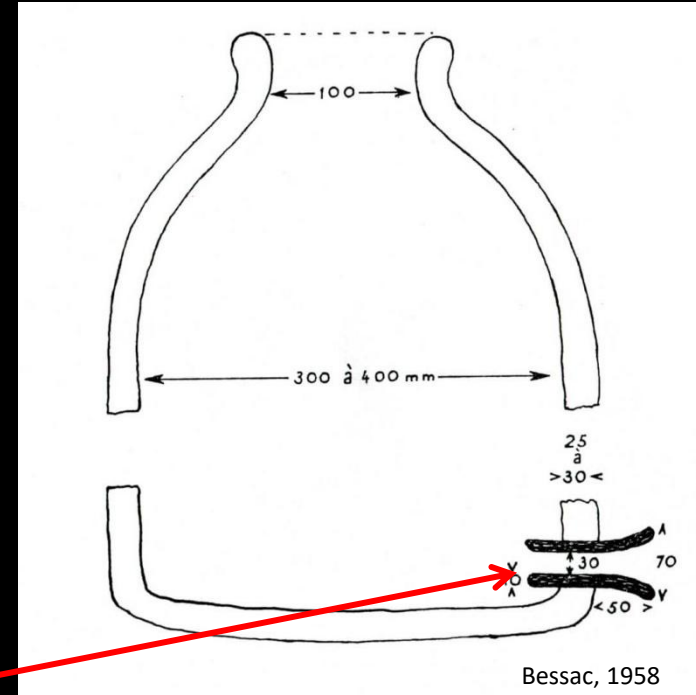
- crushing/grinding ores workshops
- furnaces (walls,





characteristics:

- crushing/grinding ores workshops
- furnaces (walls, tuyère)



Bessac, 1958

smelting process ?

malachite

concentrated
ores

chrysocolla

flux (?)

hematite
goethite (?)





characteristics:

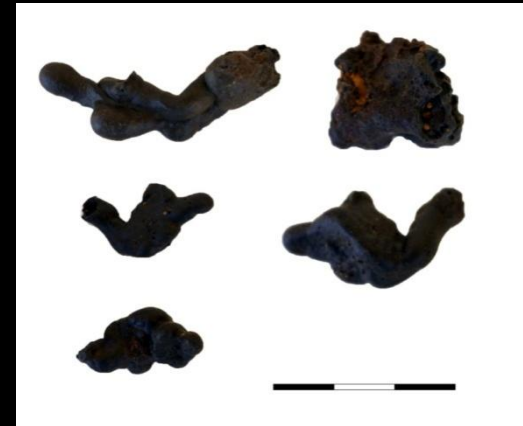
- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles





characteristics:

- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap





characteristics:

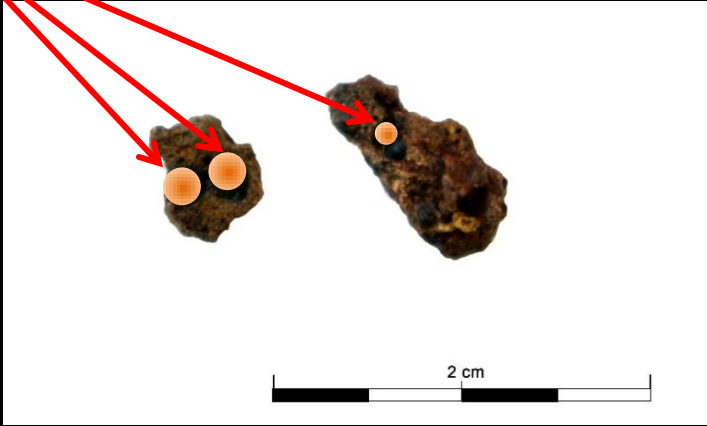
- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap
- crushed slags heap





characteristics:

- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap
- crushed slags heap
- metal prills



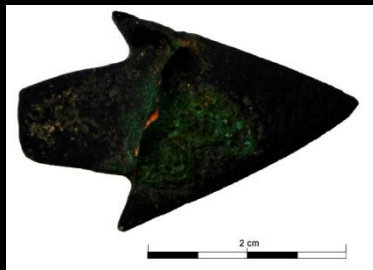
73 g
sand casting



93,5% Cu
3% Fe, 3% Mn, 0,4% Ni

characteristics:

- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap
- crushed slags heap
- metal prills
- semi-manufactured metal object



characteristics:

- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap
- crushed slags heap
- metal prills
- semi-manufactured metal object
- metal objects (copper,

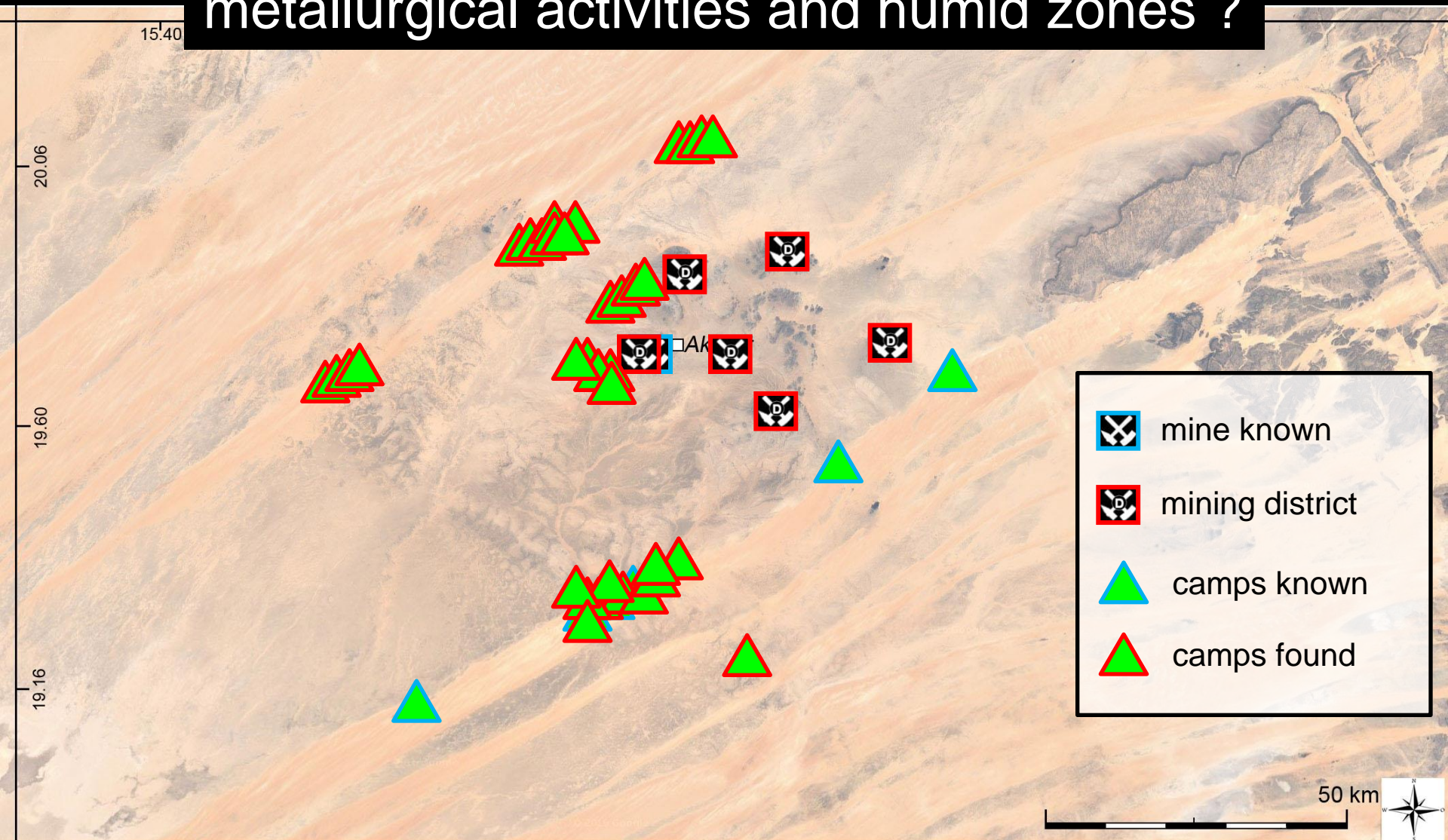


characteristics:

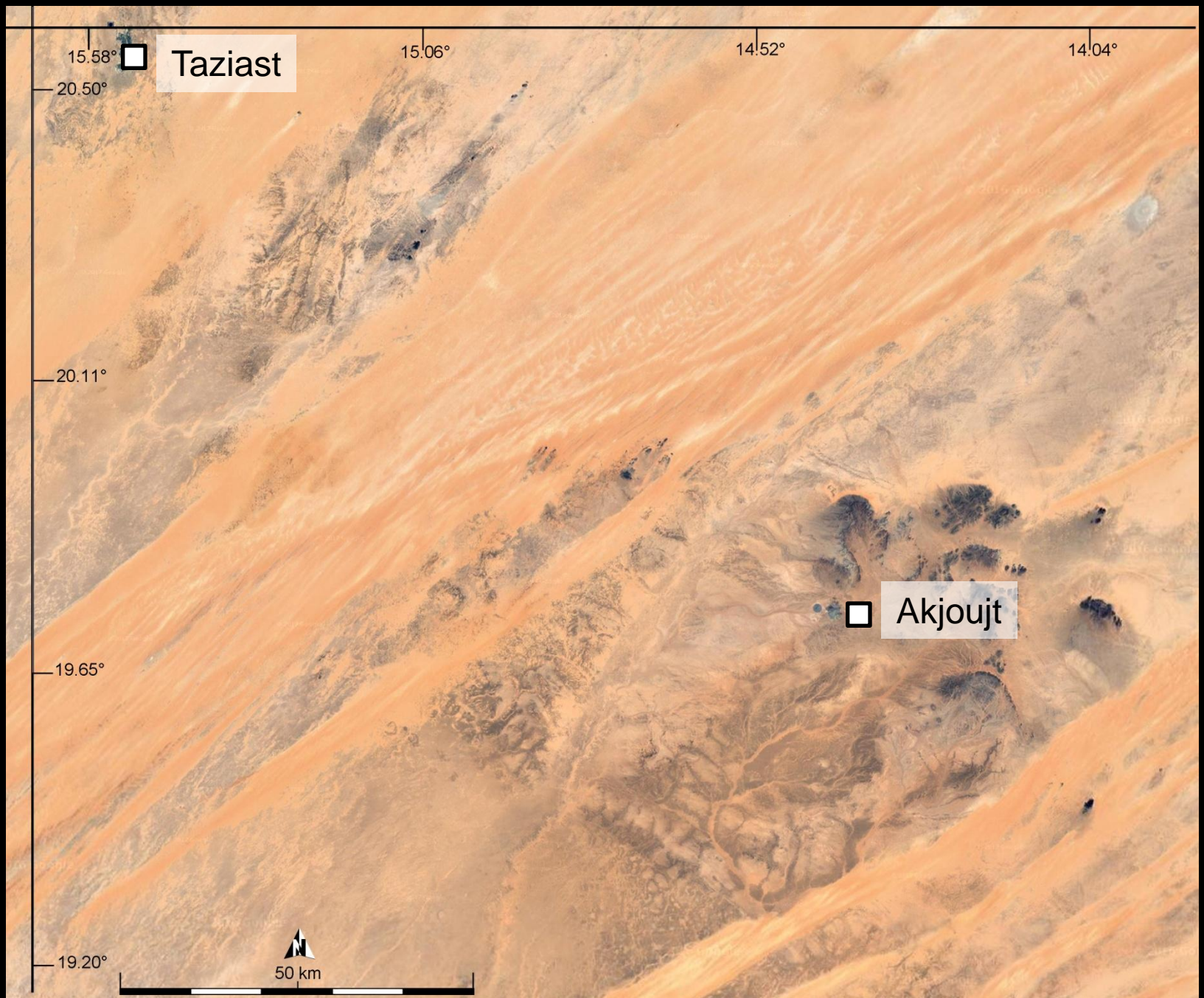
- crushing/grinding ores workshops
- furnaces (walls, tuyère)
- crucibles
- slags heap
- crushed slags heap
- metal prills
- semi-manufactured metal object
- metal objects (copper, iron)



relation between location of metallurgical activities and humid zones ?



3rd campaign:
aims & process



15.58°
20.50°

15.06°

14.52°

14.04°

10 juillet - 02 Août 2018

Z-7-H-W-45

Z-7-H-W-44

Z-7-H-W-27

Guelb Moghrein oriental
Z-1-M-12-A

 Fouilles

19.65°

19.20°



15.58°

15.06°

14.52°

14.04°

20.50°

10 juillet - 02 Août 2018

Z-7-H-W-45

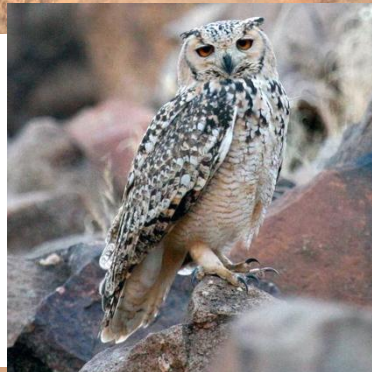
Z-7-H-W-44

Z-7-H-W-27

19.65°



Fouilles



Mine El'Bawma

بومة

Grand-duc ascalaphe
Pharaoh Eagle-Owl

19.20°



50 km

© André Wiertz

03 - 04 Août 2018


Z-7-H-W-45


Z-7-H-W-44

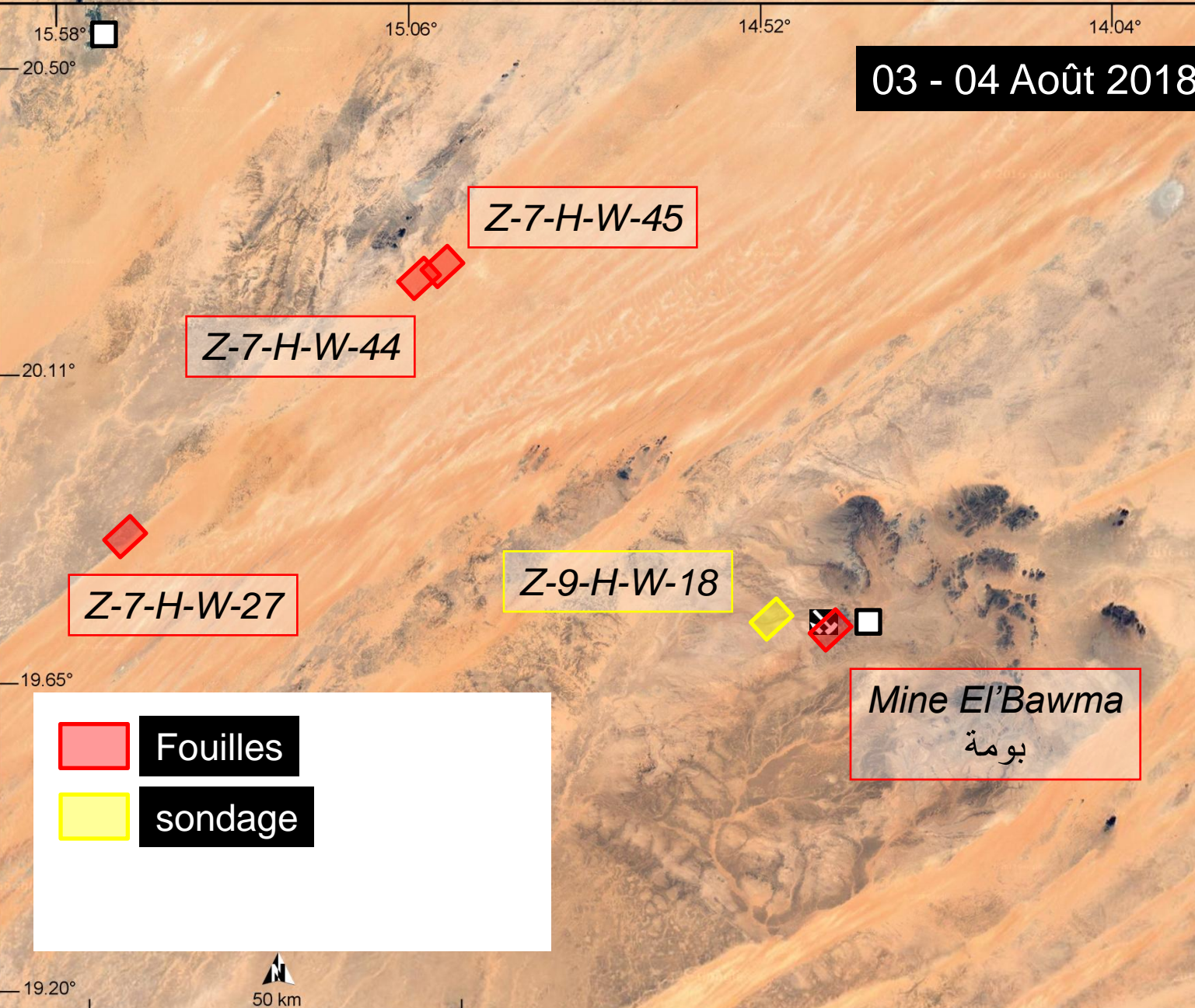
Z-7-H-W-27

Z-9-H-W-18

Mine El'Bawma
بومة

 Fouilles

 sondage



05 - 15 Août 2018




Z-7-H-W-45

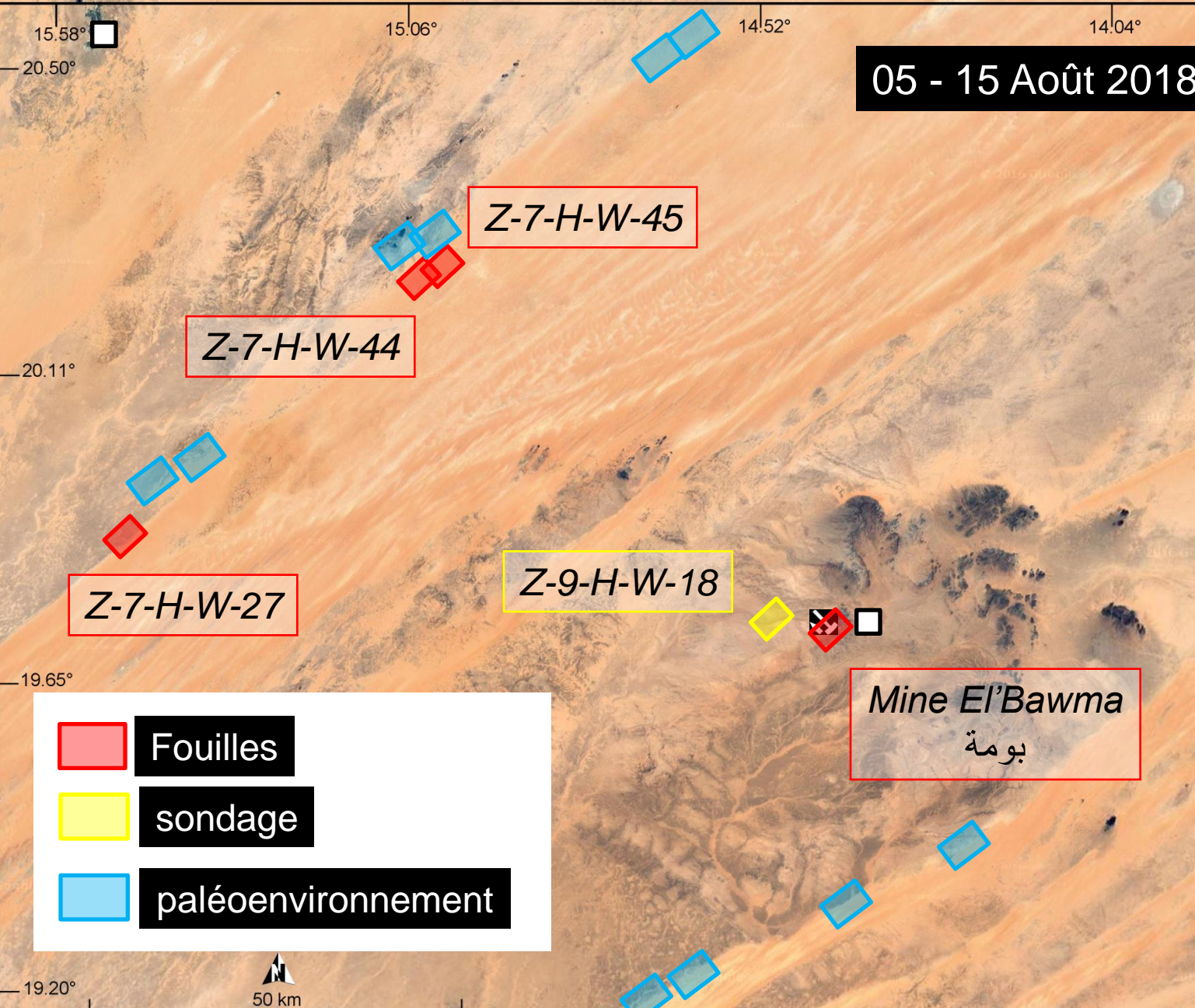
Z-7-H-W-44

Z-7-H-W-27

Z-9-H-W-18

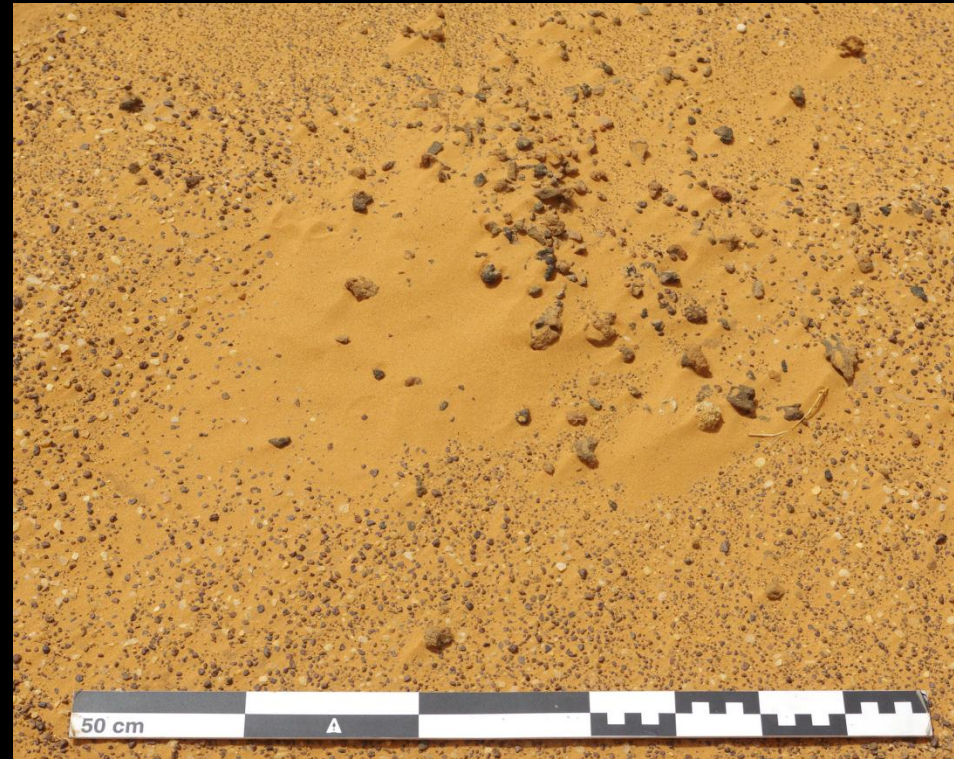
Mine El'Bawma
بومة

	Fouilles
	sondage
	paléoenvironnement



3rd campaign:
preliminary results

Metallurgical site Z-7-H-W-97



Metallurgical site Z-7-H-W-97

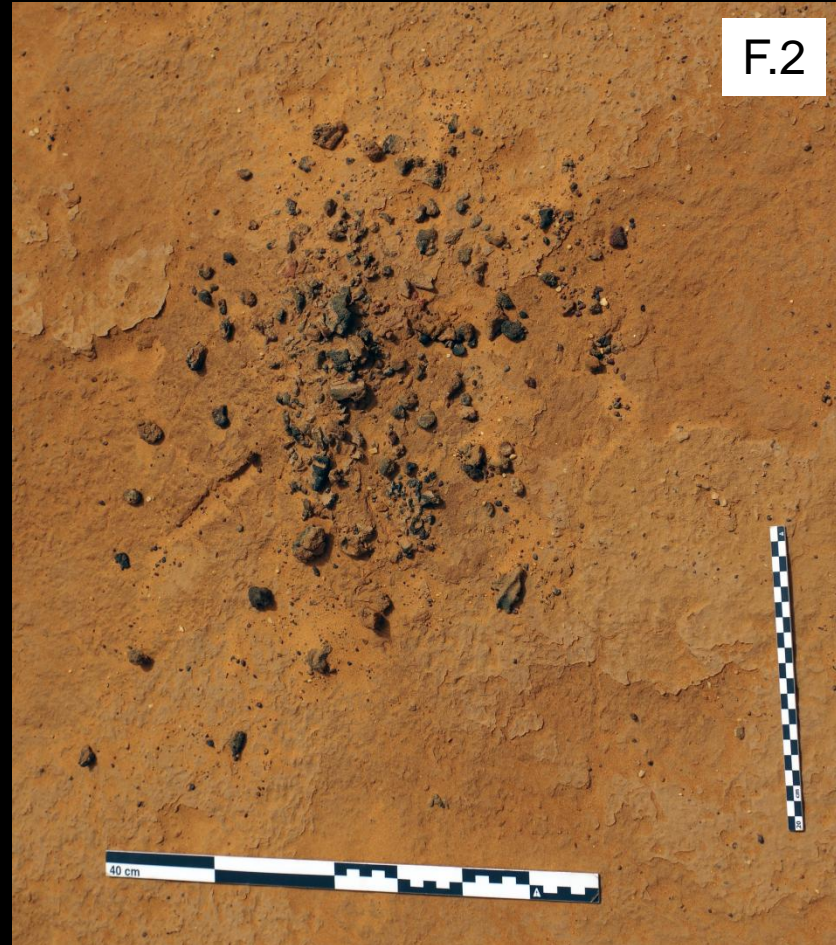


Metallurgical site Z-7-H-W-97

F.1

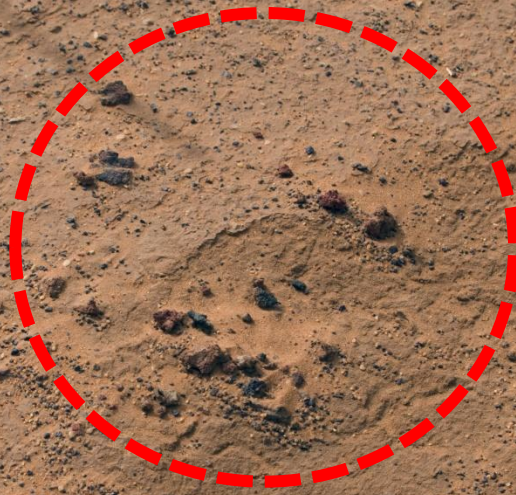


F.2

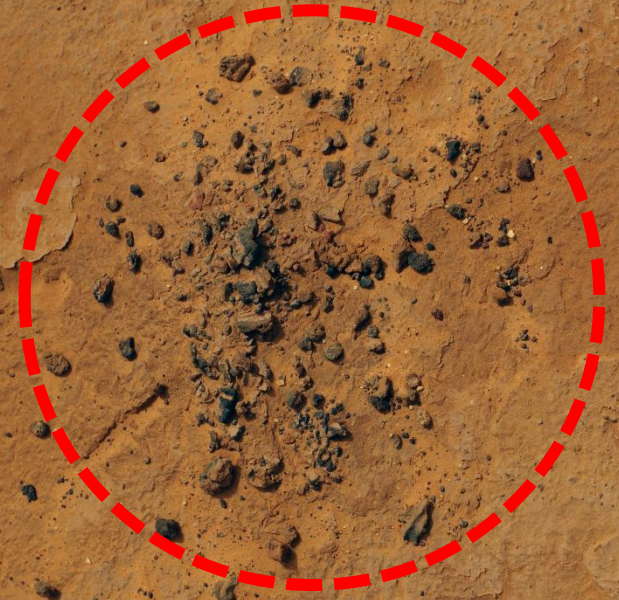


Metallurgical site Z-7-H-W-97

F.1



F.2

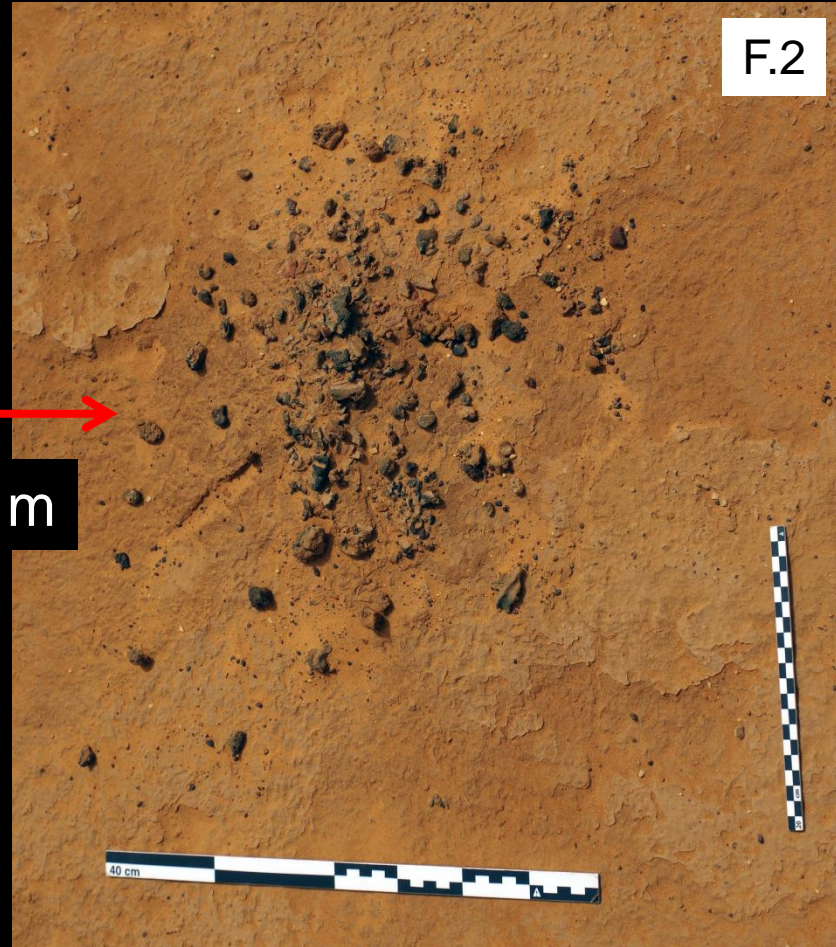


Metallurgical site Z-7-H-W-97

F.1

F.2

2.75 m



Metallurgical site Z-7-H-W-97

F.1

- walls furnace
- charcoal
- **metal prills**



F.2

- walls furnace
- charcoal
- **crucible frag.**



Metallurgical site Z-7-H-W-97

F.1

- walls furnace
- charcoal
- metal prills

smelting furnace

30 cm

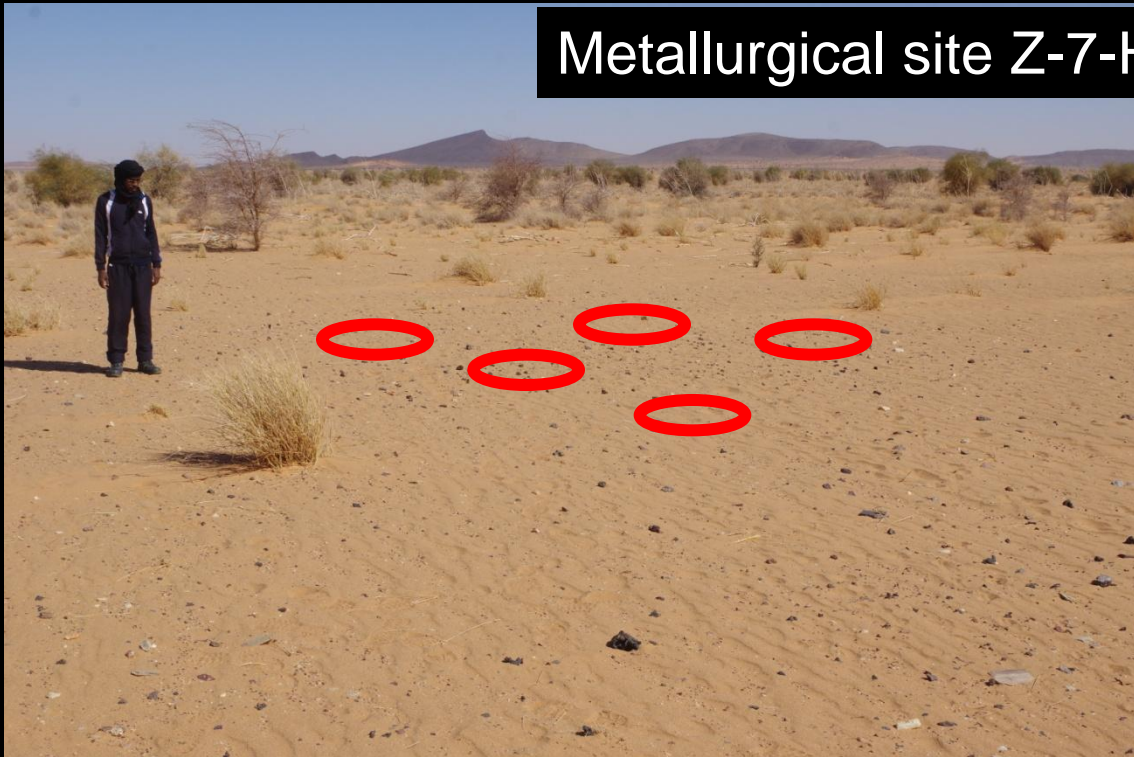
F.2

- walls furnace
- charcoal
- crucible frag.

melting furnace

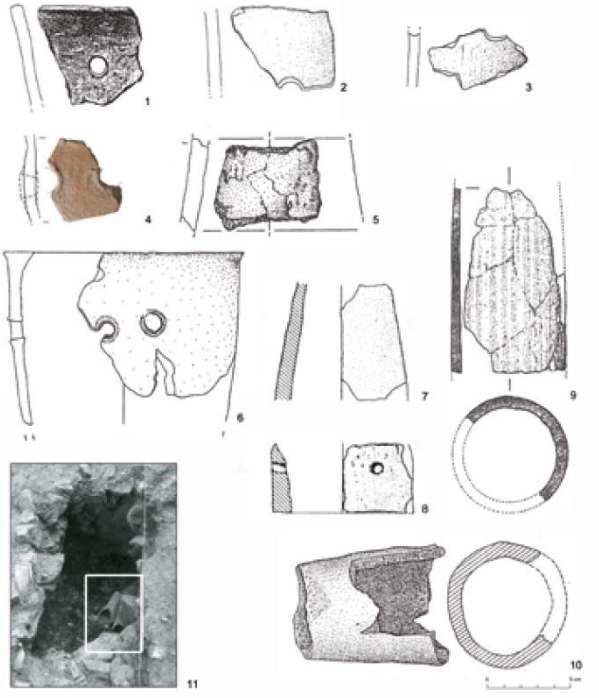
40 cm

Metallurgical site Z-7-H-W-45



Metallurgical site Z-7-H-W-45

Pot-bellows



Metallurgical site Z-7-H-W-45

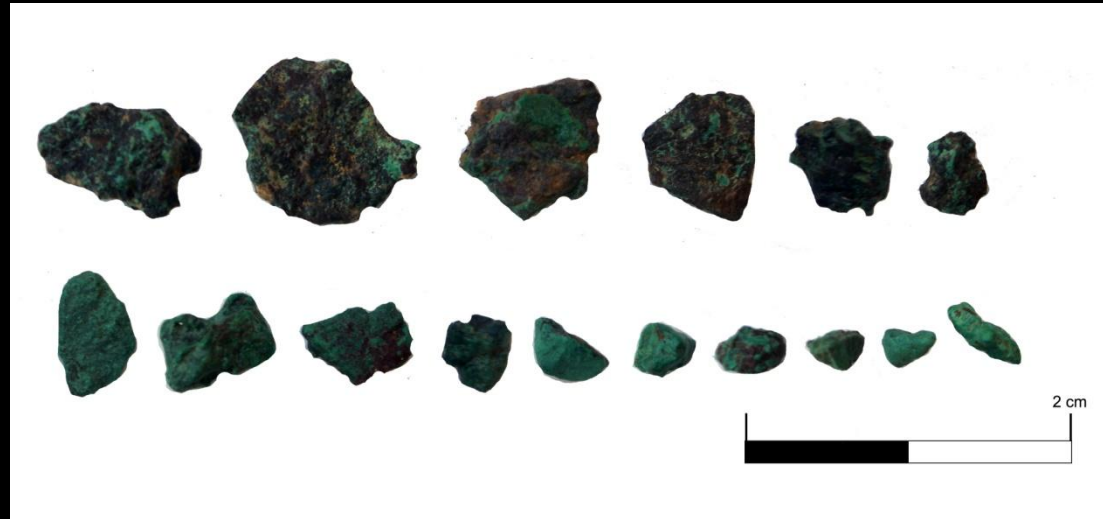


Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

- ores: **123**



- primary ores
- secondary ores (alluvial placer ?)

Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

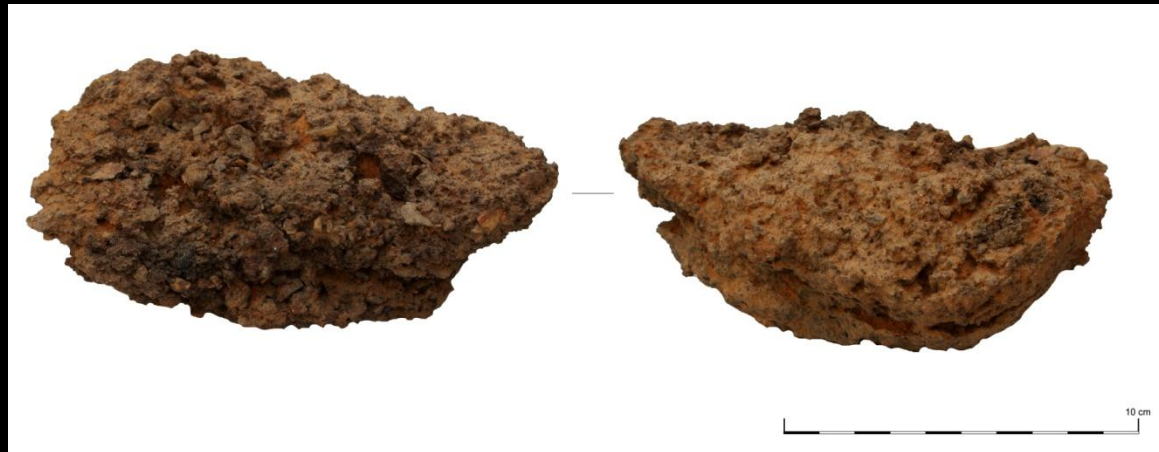
- ores: **123**
- slags: **437**
- furnace walls: **44**

Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

- ores: **123**
- slags: **437**
- furnace walls: **44**
- sinter base of furnace: **2**

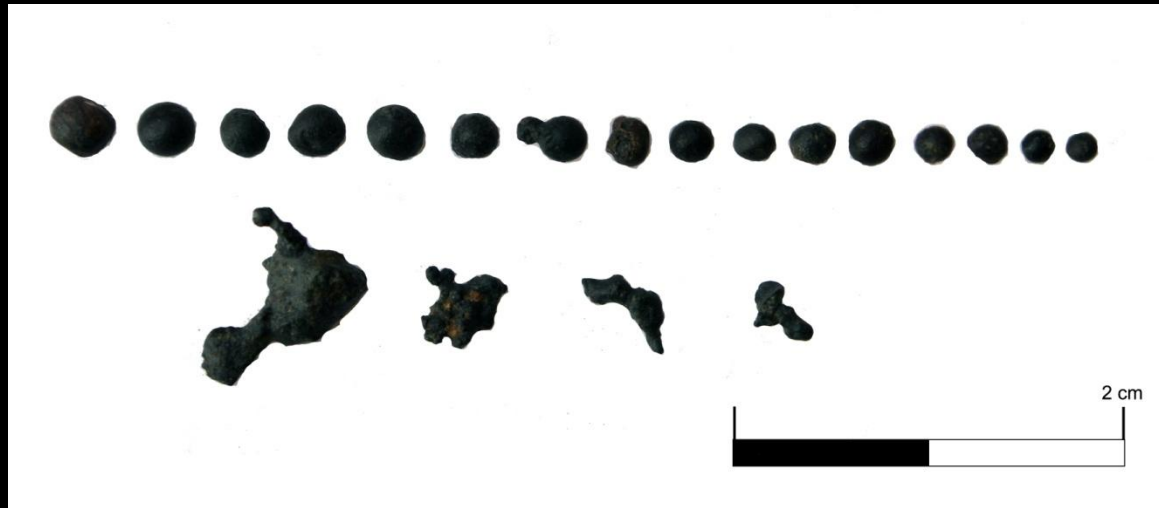


Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

- ores: **123**
- slags: **437**
- furnace walls: **44**
- sinter base of furnace: **2**
- metal prills: **132**



Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

- ores: **123**
- slags: **437**
- furnace walls: **44**
- sinter base of furnace: **2**
- metal prills: **132**
- crucible fragments: **5**

Metallurgical site Z-7-H-W-45

Results

(excavation in progress, 40% done)

- ores: **123**
- slags: **437**
- furnace walls: **44**
- sinter base of furnace: **2**
- metal prills: **132**
- crucible fragments: **5**
- metal objets: **3**



➤ hammered metal prill

Metallurgical site Z-9-H-W-18



Furnace discovered in 2017
7.1 km to the West of the mine:

- furnace walls with slaggy encrusting,
 - slags,
 - copper bearing rocks,
 - metal prills.

smelting furnace ?

Metallurgical site Z-9-H-W-18

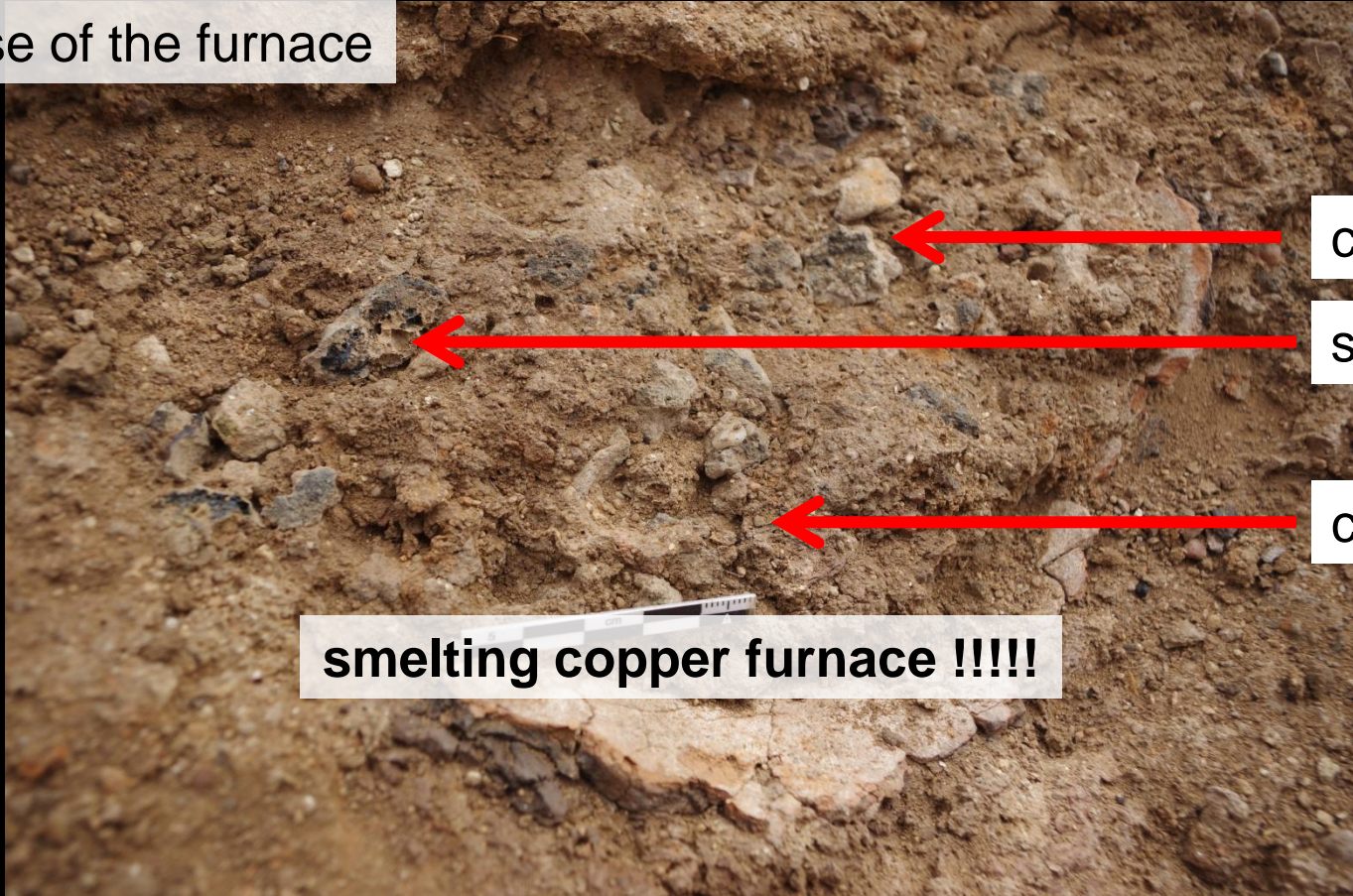


Metallurgical site Z-9-H-W-18



Metallurgical site Z-9-H-W-18

sinter base of the furnace



charcoal

slag

copper matte

smelting copper furnace !!!!!

Welcome to participate with us to
the archaeological fieldworks !



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CUPRUM - CUivre : PRoduction et Usages à l'Holocène en Mauritanie -





Thank you !

