



Gis-based Datasets Of Mineral Resources Maps - A Valuable Exploration Tool For Discovering Potential Ore Deposits In Greece

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Sustainable Development In The Minerals Industry

6th International Conference

Milos Island, Greece 30 June – 3 July, 2013



Structure

- ProMine project
 - Structure of the databases (Mineral Database & Anthropogenic Concentration Database)
 - Greek Mineral Database
 - Mineral Commodities & Critical Raw Materials
 - Metallogenetic districts based on PROMINE classification
 - “Hot” metallic commodities for Greece
 - Greek Anthropogenic Concentration Database
 - Mining waste deposits in Greece upon PROMINE classification



The ProMine project

Nano-particle products from new mineral resources in Europe

Total budget: 17 M €
Requested EU contribution 11 M €
28 partners*
11 EU countries
2009-2013

*Sound and objective driven INDUSTRIAL project with huge exploitation potential
THE FLAGSHIP project of the European mineral industry in the area of mineral supply for the high added value products*

***Greek partners involved: IGME, Hellas Gold, Grecian Magnesite**

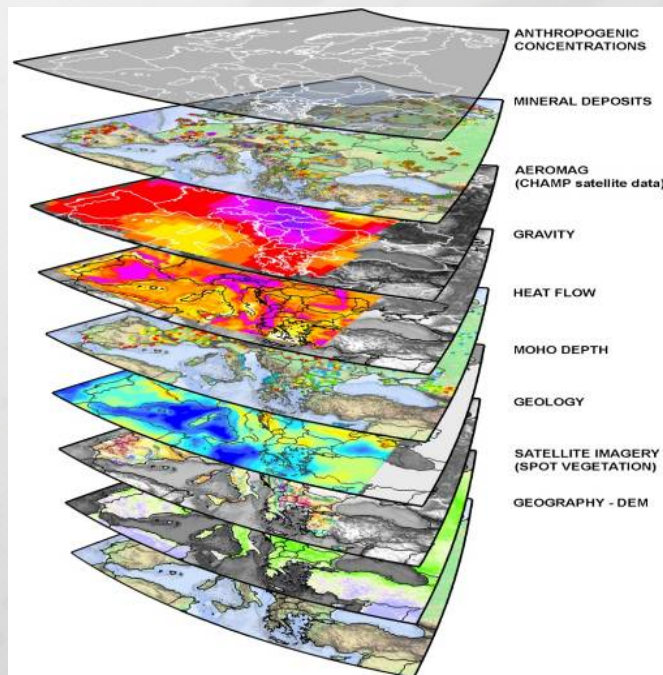


PROMINE project

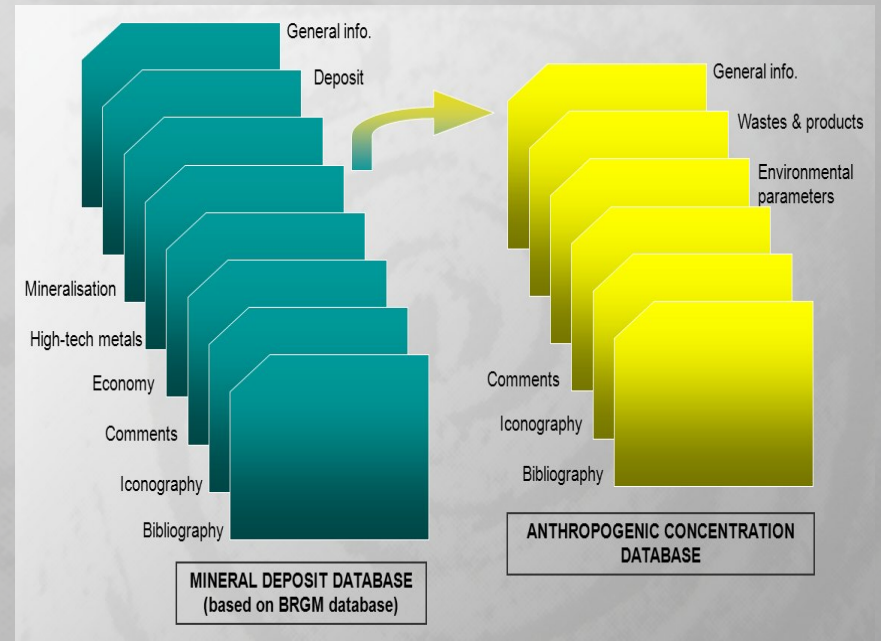
Objectives

- develop a Pan-EU GIS data management and visualization system for mineral resources
- develop the first ever 3D/ 4D mineral exploration geomodels in Fennoscandian shield (Sweden), Forsudetic belt (Poland-Germany), Iberian pyrite belt (Portugal and Spain), Hellenic belt (Greece)
- calculate the volumes of potentially strategic metals
- develop five new, high value, mineral-based (nano) products
- develop modern eco-efficient mineral processing and metal recovery methods

Using existing and new data of Greece territory, a multi-layer Geographical Information System was created. The system includes databases on mineral deposits, and anthropogenic / mining and metallurgical residues along with relevant geological, structural, geochemical, geophysical layers and other information from a diverse range of sources.



The GIS multi-layer information system.



Interconnecting evaluation of MD and AC databases.



Mineral Database

Id

GRC-00733

Name

Perama Hill

Commodity

Au

Identifier

Name

Identifier

GRC-00733

Mining company

0

District

Thrace-Evros

Status

B20 Deposit under development - project

Country(ies)

GREECE (Hellenic republic)

Author

IGME

Creation date

07/09/2010

Controller

Checking date

Longitude

25.63528

25

38

7

Latitude

40.90754

40

54

27

Controlled coordinates

☐

Ore-deposit names

Perama Hill

Comment

The Perama gold deposit, discovered in 1995 by the company "Thrace gold mines"

URL

Source

Database name

Identifier in the database

Back to the main menu

Preview for this deposit

Add a new deposit

Duplicate this deposit

Delete this deposit

General Information

Id

GRC-00733

Name

Perama Hill

Commodity

Au

Identifier

Name

DEPOSIT

Deposit type

D10 High-sulphidation (acid-sulphate) epithermal deposit

Main morphology

D Surfacial orebody of secondary origin

Azimet

0

Dip

0

Length (m)

0

Width (m)

0

Down dip (m)

0

Secondary morphologies

B40 Discordant lode or vein (thickness > 50 cm), in clusters or isolated

Deposit



Mineral Database

Id

GRC-00733

Name

Perama Hill

Commodity

Au

Identifier

Name

MINERALISATION

Age

Sup. (Ma)

Absolute age

0

Error

0

Unit

Inf. (Ma)

Method

USGS age

Ore mineralogy

Gangue mineralogy

Hydrothermal alteration

M436

Gold

M490

Pyrite

M848

Telluride

M585

Tetrahedrite

M210

Enargite

M099

Bornite

M558

Stannite

M247

Galena

M366

Luzonite

M499

Quartz

M332

Kaolinite

M316

Illite

M021

Alunite

M137

Chlorite

M213

Epidote

A10

Acide = Altération argileuse "avancée"

N10

Silicification

M

Oxydes de Fe, Mn

A40

Propylitisation

HOST ROCK

Age

Sup. (Ma)

Tert

Tertiary

1.806

Absolute age

0

Error

0

Unit

Inf. (Ma)

Method

USGS age

Host-rock formation names

Host-rock lithology

Petrota graben

EPI431

volcaniclastic sandstone

PYR12

Hyaloclastite

Mineralization / Rocks

Ore

C

Ore of indeterminate nature

Total

Production unit

t (1000 kg)

Grade unit

ppm

Former production

0

Avg. grade of prod.

0

Years

0

to

0

Reserve

11,000,000

Avg. grade of rese.

8.5

Year

0

Type of reserve

Ref. Reserve

Resource

0

Avg grade of resou.

0

Year

0

Type of resource

Ref. Resource

Classification code used

Former production

Reserves

Resources

Potential

#Ovoqa

Class

A

Calculation

Commodity

Au

Gold (metal)

GRC-00733

Ore

C

Ore of indeterminate nature

Total

Production unit

t (1000 kg)

Grade unit

ppm

Former production

0

Avg. grade of prod.

0

Years

0

to

0

Reserve

11,000,000

Avg. grade of rese.

3.8

Year

0

Type of reserve

Ref. Reserve

Resource

0

Avg grade of resou.

0

Year

0

Type of resource

Ref. Resource

Classification code used

Economy



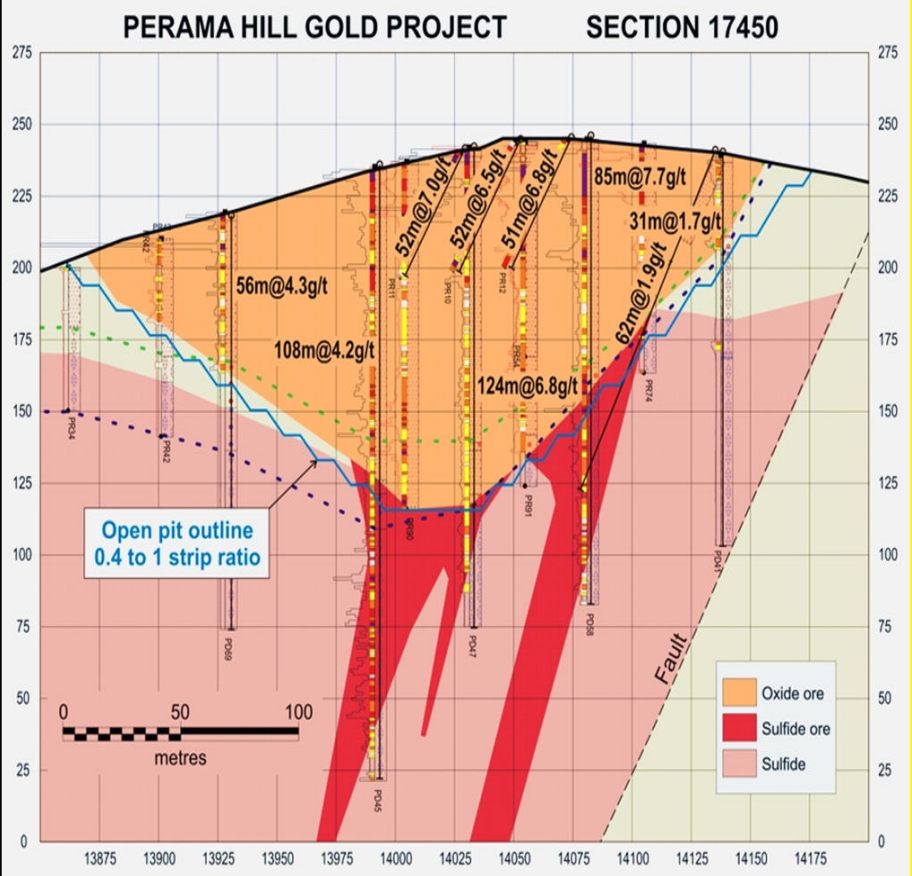
Mineral Database

Id GRC-00733 Name Perama Hill Commodity Au Identifier Name

Details about geology (free text)

Perama Hill is a high sulphidation deposit hosted by tertiary sandstones (Lescuyer J.L. et al. 2003) and is located on the east margin of Petrola graben. Perama gold mineralisation is related the late Eocene-Oligocene volcanism in the Rhodope massif. Gold mineralisation is associated with a series of wide (>1.5m) to narrow (few cm) milky quartz-barite veins and stockwork veining in the vuggy silica block. Gold in micro sized was also found disseminated in the surrounding altered (oxide mineralisation) epiclastic sandstones (Lescuyer J.L. et al. 2003).
After Michael C. 2004 Perama gold deposit occurs at the intersection of NS and NW trending epithermal zones. These structures represent the higher grade "feeder" system. After Lescuyer J.L. et al. 2003 the Perama Hill deposit is "mushroom shaped" oxide ore with 700m length (N-S) and up to 120m depth sandstone-filled depression Beneath the oxide ore the deposit contain sulphide mineralisation by pyritised andesite breccia.

Details about economy (free text)



Comments

Iconography

Mineral Database

Layout View

GIS Europe - Ore deposit database

Perama Hill

Perama Hill

General data

Deposit name(s):	Perama Hill			Identifier:	GRC-00733
Main commodity:	Ag	11,000,000 t (1000)	Class A	Main morphology:	Surface outcrops of secondary origin
	As	11,000,000 t (1000)	Class A	Status:	Deposit under development - project
Commodities:	Au	11,000,000 t (1000)	Class A		
	Be	11,000,000 t (1000)	Class A		
	Cu	11,000,000 t (1000)	Class A		
	Li	11,000,000 t (1000)	Class A		
	Mo	11,000,000 t (1000)	Class A		
	Nb	11,000,000 t (1000)	Class A		
	Ni	11,000,000 t (1000)	Class A		
	Pb	11,000,000 t (1000)	Class A		
	Sc	11,000,000 t (1000)	Class A		
	Se	11,000,000 t (1000)	Class A		
	V	11,000,000 t (1000)	Class A		
	W	11,000,000 t (1000)	Class A		
	Y	11,000,000 t (1000)	Class A		
	Zn	11,000,000 t (1000)	Class A		
	Zr	11,000,000 t (1000)	Class A		
	Cr	11,000,000 t (1000)	Class B		
	Mg	11,000,000 t (1000)	Class B		
	Mn	11,000,000 t (1000)	Class B		
	Ti	11,000,000 t (1000)	Class B		
	Fe	11,000,000 t (1000)	Class C		
Company:					
Longitude:	25.635	Latitude:	40.908	District:	Thrace-Evros

Geology

Ore deposit type (geology)

High-sulphidation (acid-sulphate) epithermal deposit

Ore deposit shape

Disseminated body or vein (thickness > 50 cm), in clusters or isolated

Mineralization

Age span:

Ore mineralogy

Gold

Pyrite

Telluride

Tetradraite

Enargite

Bornite

Stannite

Galena

Limonite

Host rocks

Age span:

Tertiary

Hostrock formation names

Petrified gneiss

Host rock lithology

volcaniclastic sandstone

Hydrothermal alteration

Quartz

Kaolinite

Silica

Alunite

Chlorite

Epidote

High sulfidation = Acid-sulfate / advanced argillite alteration

Silicification

Fe, Mn oxide alteration

Propylitization

Economy

Exploitation type

Unworked

BRGM Report

07 September 2019

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GIS Europe - Ore deposit database

Perama Hill

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.013	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.002	%		
-	t (1000)	Average grade:	-	%	

205)					
estimate nature	-	t (1000)	Average grade:	-	ppm
110000000 t (1000)	Average grade:	5	ppm		
-	t (1000)	Average grade:	-	ppm	

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.0008	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.071	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	ppm
110000000 t (1000)	Average grade:	9	ppm		
-	t				

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	39.4	ppm		
-	t (1000)	Average grade:	-	ppm	

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.09	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	%
110000000 t (1000)	Average grade:	0.003	%		
-	t (1000)	Average grade:	-	%	

Perama Hill

Perama Hill

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Perama Hill

Perama Hill

Layout V

GIS Europe - Ore deposit database

Perama Hill

estimate nature	-	t (1000)	Average grade:	-	%
100 t (1000)	Average grade:	0.002	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	ppm
100 t (1000)	Average grade:	2	ppm		
-	t (1000)	Average grade:	-	ppm	

estimate nature	-	t (1000)	Average grade:	-	%
100 t (1000)	Average grade:	0.008	%		
-	t (1000)	Average grade:	-	%	

estimate nature	-	t (1000)	Average grade:	-	ppm
100 t (1000)	Average grade:	7	ppm		
-	t (1000)	Average grade:	-	ppm	

Adrianos (Lescuyer J.L. et al. 2003) and is located on the east margin of the Eocene-Oligocene volcanism in the Rhodope massif. Gold occurs (few cm) in silty quartz-barite veins and stockworks, veining in the altered in the surrounding altered (oxide mineralisation) epithermal.

section of NE and NW trending epithermal zones. These structures are "room shaped" oxide ore with 700m length (N-S) and up to 120m depth contain sulphide mineralisation by pyritised and/or arsenic breccia.

Thrace gold mines"

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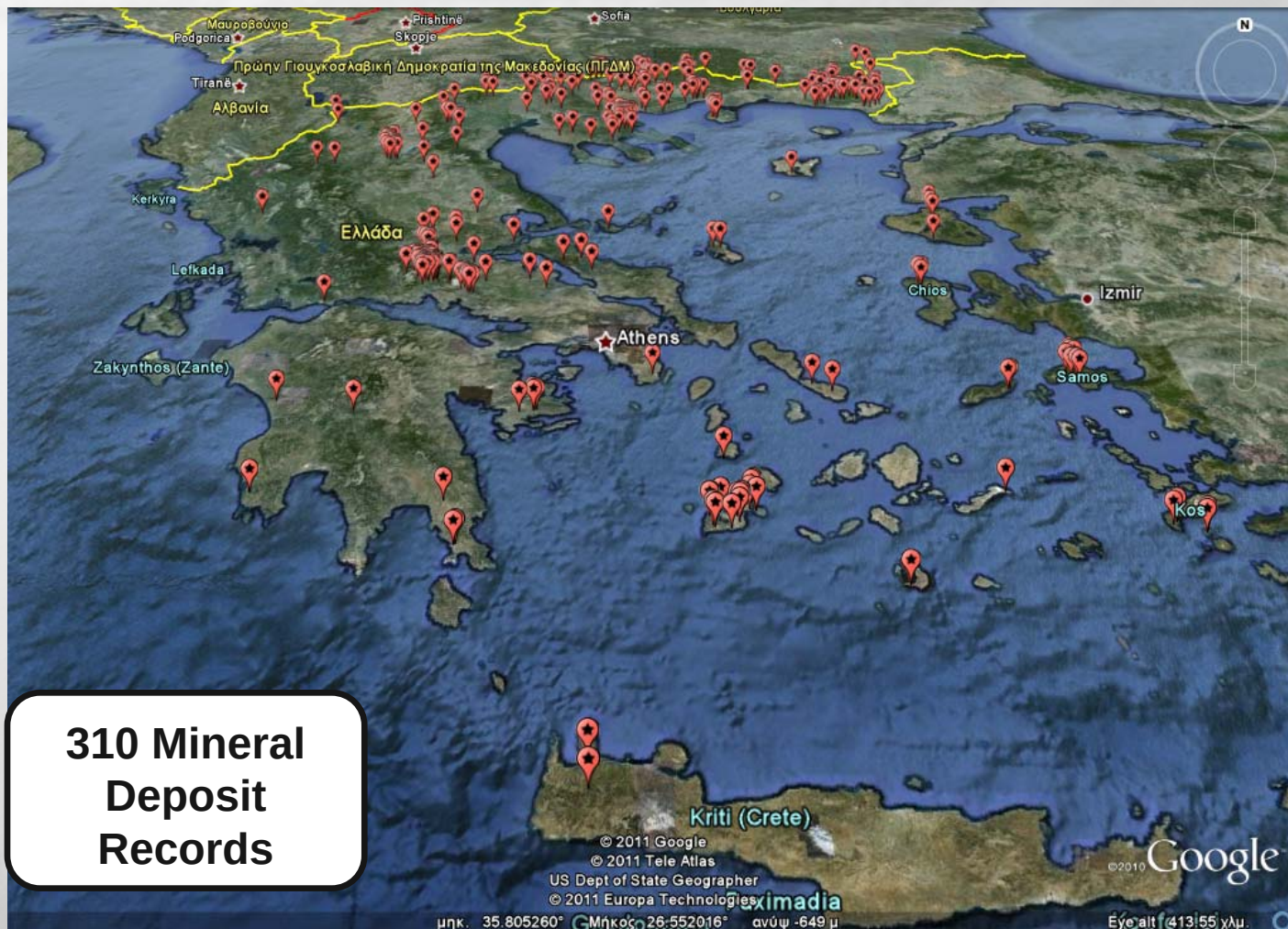
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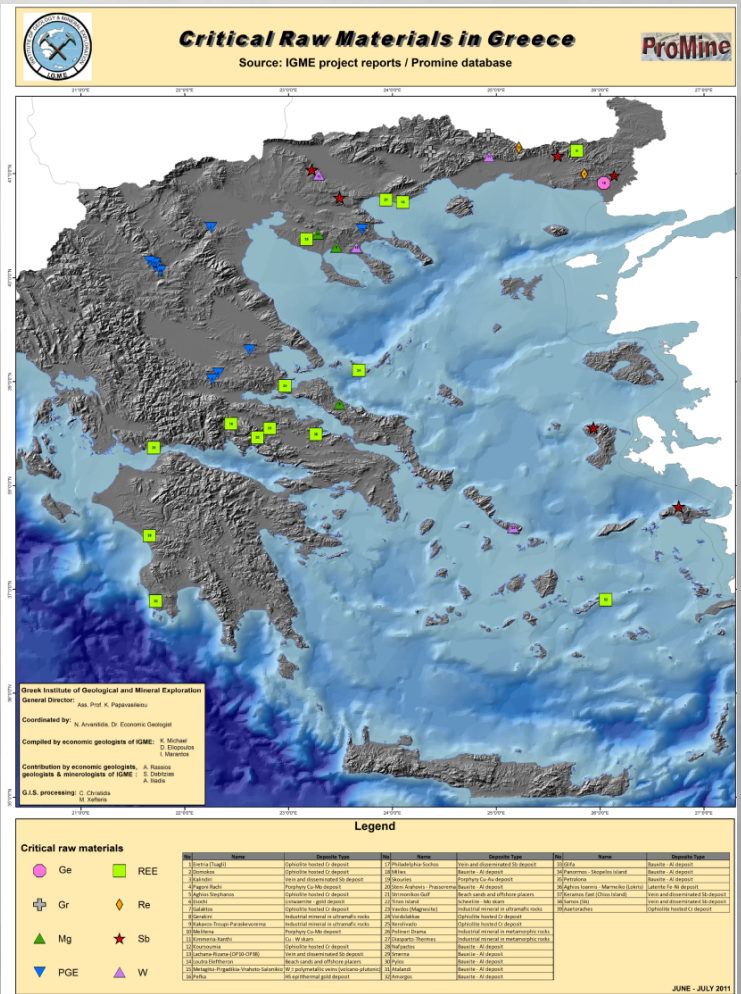
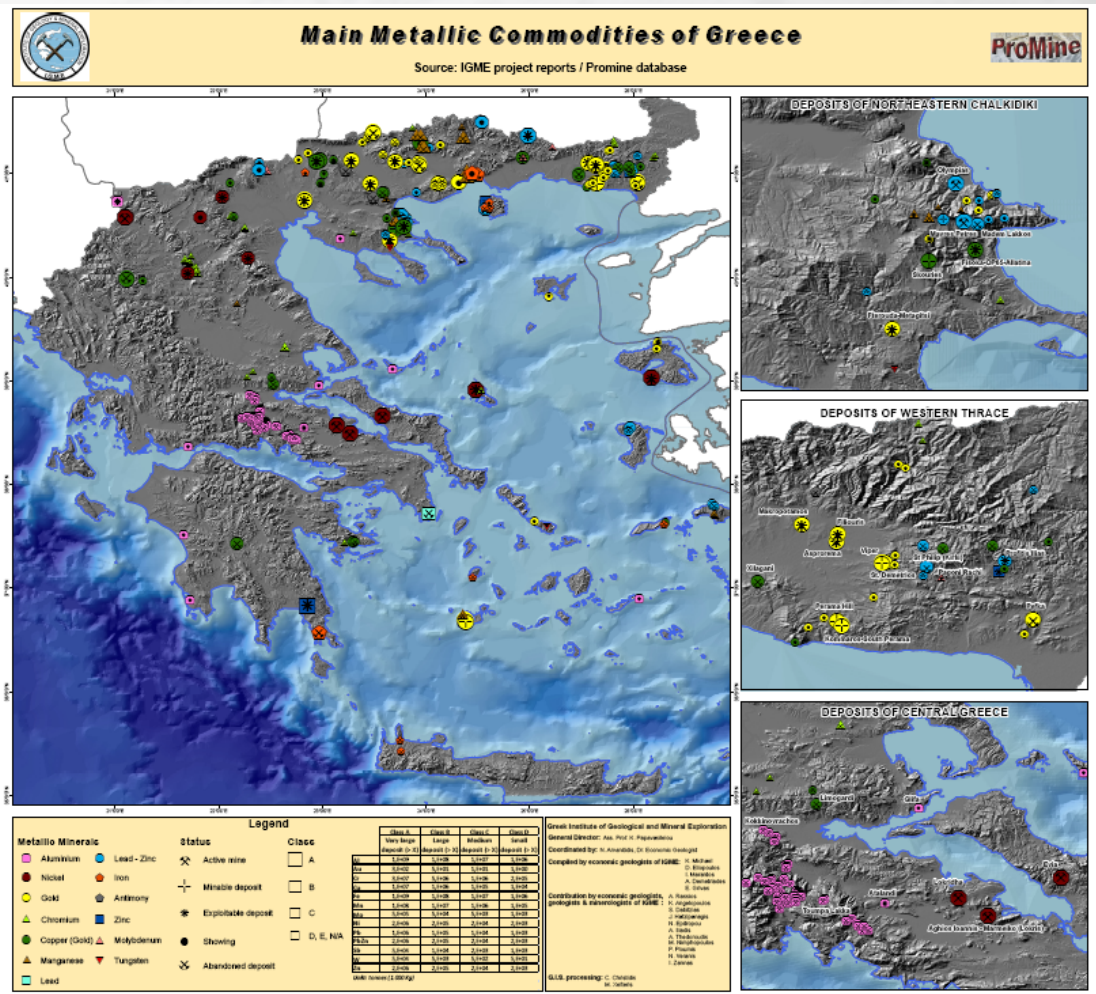
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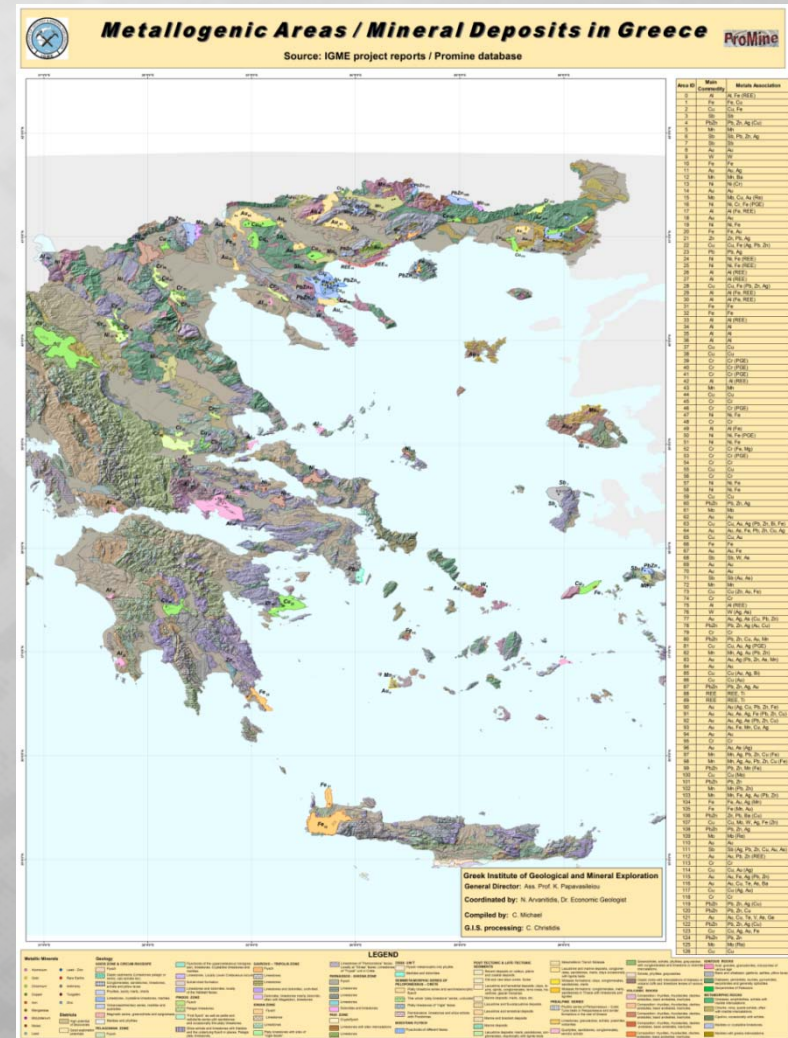
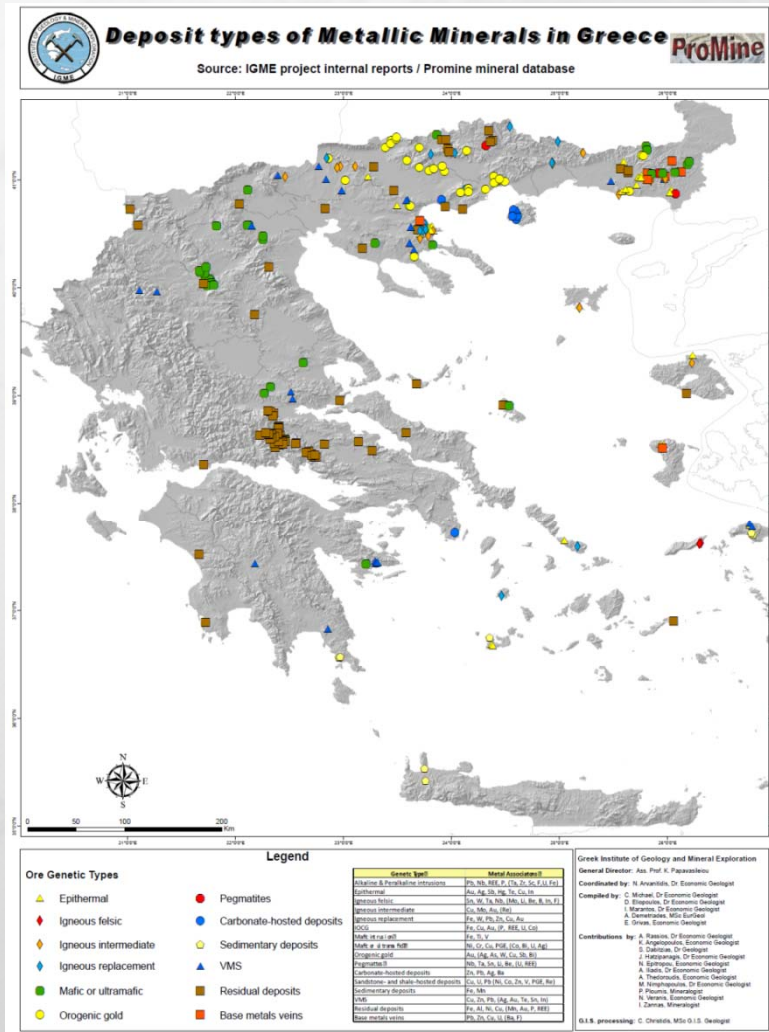


310 Mineral
Deposit
Records



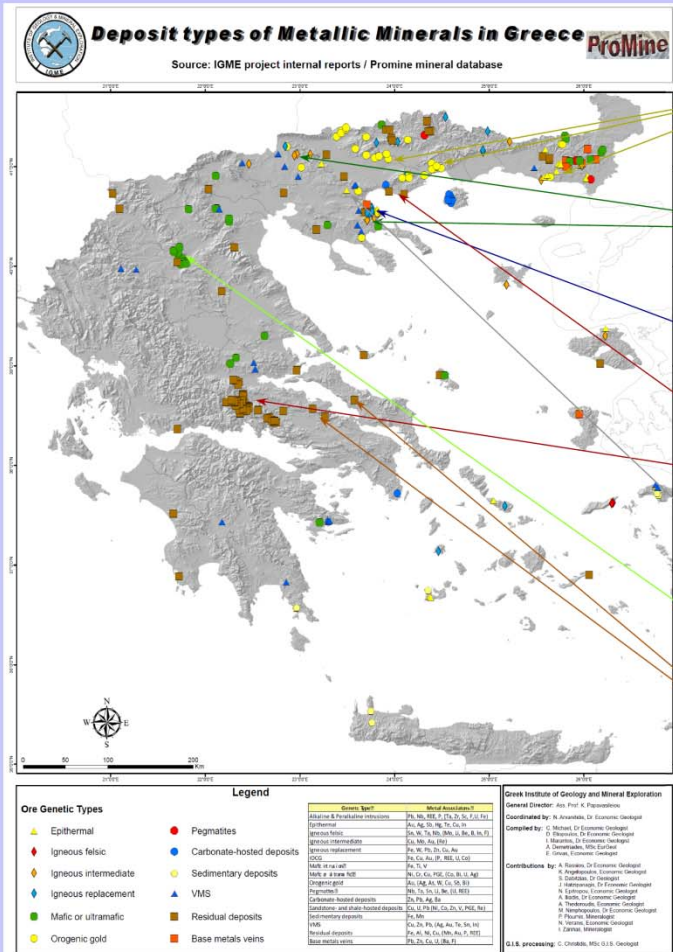
Mineral Commodities & Critical Raw Materials







“Hot” metallic commodities for Greece



High potential areas for Au discoveries

High potential areas for Cu discoveries

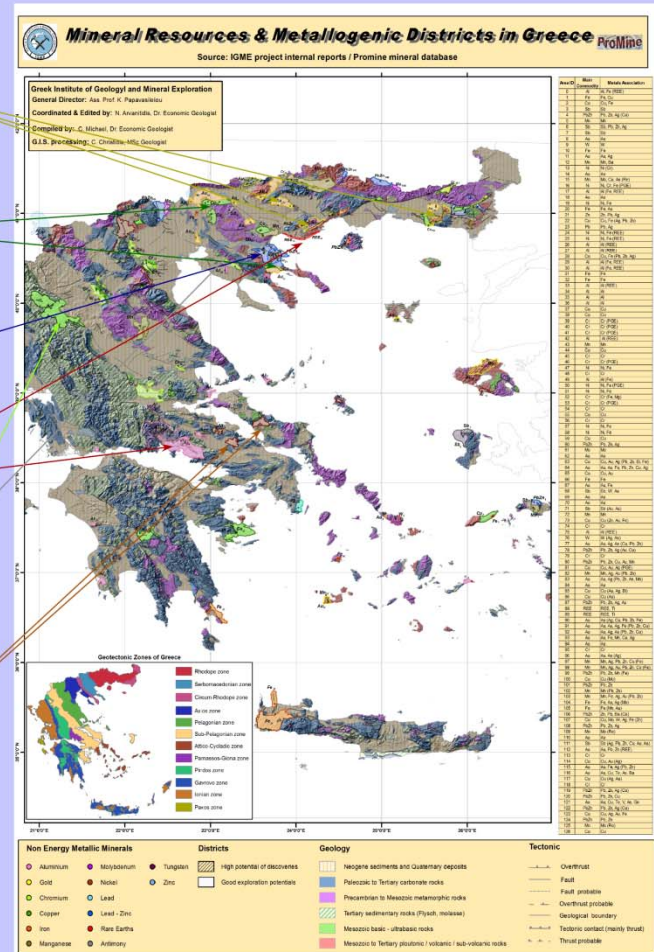
High potential areas for Pb, Zn, Ag discoveries

High potential areas for REE discoveries

High potential areas for Sb discoveries

High potential areas for Cr discoveries

High potential areas for Ni discoveries





Anthropogenic Database

Anthropogenic concentration database

Αρχείο Επεξεργασία Εισαγωγή Εγγραφές Παράθυρο Βοήθεια Adobe PDF Πληκτρολογήστε ερώτηση

Description of the site

Id GRC-A00015 Name St Phillip (Kirki)

General information Wastes and products Comments Iconography Bibliography

Identifier GRC-A00015

Owner(s)

District/province Evros-Thrace

Status Inactive Plant

Country GREECE (Hellenic republic)

Longitude 25,81944 25 49 10

Latitude 41,01766 41 1 4

Controlled coordinates

Author IGME

Creation date 18/11/2010

Controller

Checking date

Come from deposit St Phillip (Kirki) Full ore processing & selling concentrates

Implemented processing(s) Comminution (crushing-grinding-pulverising) Flotation

Site names St Phillip (Kirki)

URL

Source

Database name

Identifier in the database

Εγγραφή: 13 από 15

Εγγραφή: 1 από 2

General report

Back to the main menu

Preview for this site

Add a new site

Duplicate this site

Delete this site



Anthropogenic Database

Anthropogenic concentration database

Αρχείο Επεξεργασία Εισαγωγή Εγγραφές Παράθυρο Βοήθεια Adobe PDF Πληκτρολογήστε ερώτηση

Id **GRC-A00015** Name **St Phillip (Kirki)** Id Name

General information **Wastes and products** **Comments** **Iconography** **Bibliography**

SITE

Type of storage	Volume (m3)	Surface (m²)	Tonnage (t)	Density
A Surface storage	90.000,00 m3	0,00 m²	0,00 t	

Type of waste	Classe
B Mine products and waste	

Waste mineralogy	Commodity	Min.	Max.	Ave.	Unit	Date	Accuracy	Potential
M490 Pyrite	Pb Lead (metal)	505,000	31.100,000	4.672,890	ppm	19/11/2010	100,00%	0,0 t
M133 Chalcopirite	As Arsenic (metal)	105,000	550,000	243,600	ppm	19/11/2010	100,00%	0,0 t
M554 Sphalerite	Cd Cadmium (metal)	5,000	165,000	34,600	ppm	19/11/2010	100,00%	0,0 t
M640 Wurtzite	Mn Manganese (metal)	675,000	18.650,000	4.242,100	ppm	19/11/2010	100,00%	0,0 t
M247 Galena	Zn Zinc (metal)	785,000	21.150,000	4.168,700	ppm	19/11/2010	100,00%	0,0 t
M061 Arsenopyrite	Cu Copper (metal)	75,000	17.100,000	1.215,300	ppm	19/11/2010	100,00%	0,0 t
M1014 Iron Oxides(unspecified)	Ni Nickel (metal)	25,000	100,000	55,800	ppm	19/11/2010	100,00%	0,0 t
M265 Goethite								
M292 Hematite								
M531 Scorodite								
M809 Jacobsite								
M4145 Vernadite								

Εγγραφή: 1 από 11

Impacts

Impact	Surface (km²)	Volume of water affected(m3)
B10 Erosion	0,00	0
A21 AMD (Acid Mine Drainage)	0,00	0

Εγγραφή: 1 από 2

Comment

Εγγραφή: 1 από 1

WARNING: An estimated accuracy has to be entered [0-100%] for each input data

Εγγραφή: 13 από 15

Refresh



Anthropogenic Database

Anthropogenic concentration database

Δρχείο Επεξεργασία Εισαγωγή Εγγραφές Παράθυρο Βοήθεια Adobe PDF

Πληκτρολογήστε ερώτηση

Tahoma 8 B I U

Impacts

Pathway	Treatment
A Surface water	
B Groundwater	
C Soil	
*	

Εγγραφή: 1

Receptor	Restoration
A10 Soil	
A70 Flora	
B32 Agriculture, forestry and fishery	
*	

Εγγραφή: 1

St Phillip (Kirki)
GRC-A00015

Impacts

Erosion

Waste

Type of storage: Surface storage

Type of waste: Mine products and waste

Volume (m3)	Surface (m²)	Tonnage
90.000,00 m3	0,00 m²	0,0

Affected

Surface	Water
0,0 km²	0 m3

Volume of water affected(m3)

Εγγραφή: 1 από 2

Εγγραφή: 1 από 1

Estimated accuracy has to be entered [0-100%] for each input data

Refresh



Anthropogenic Database

Anthropogenic concentrations database

Layout View



Anthropogenic concentrations database

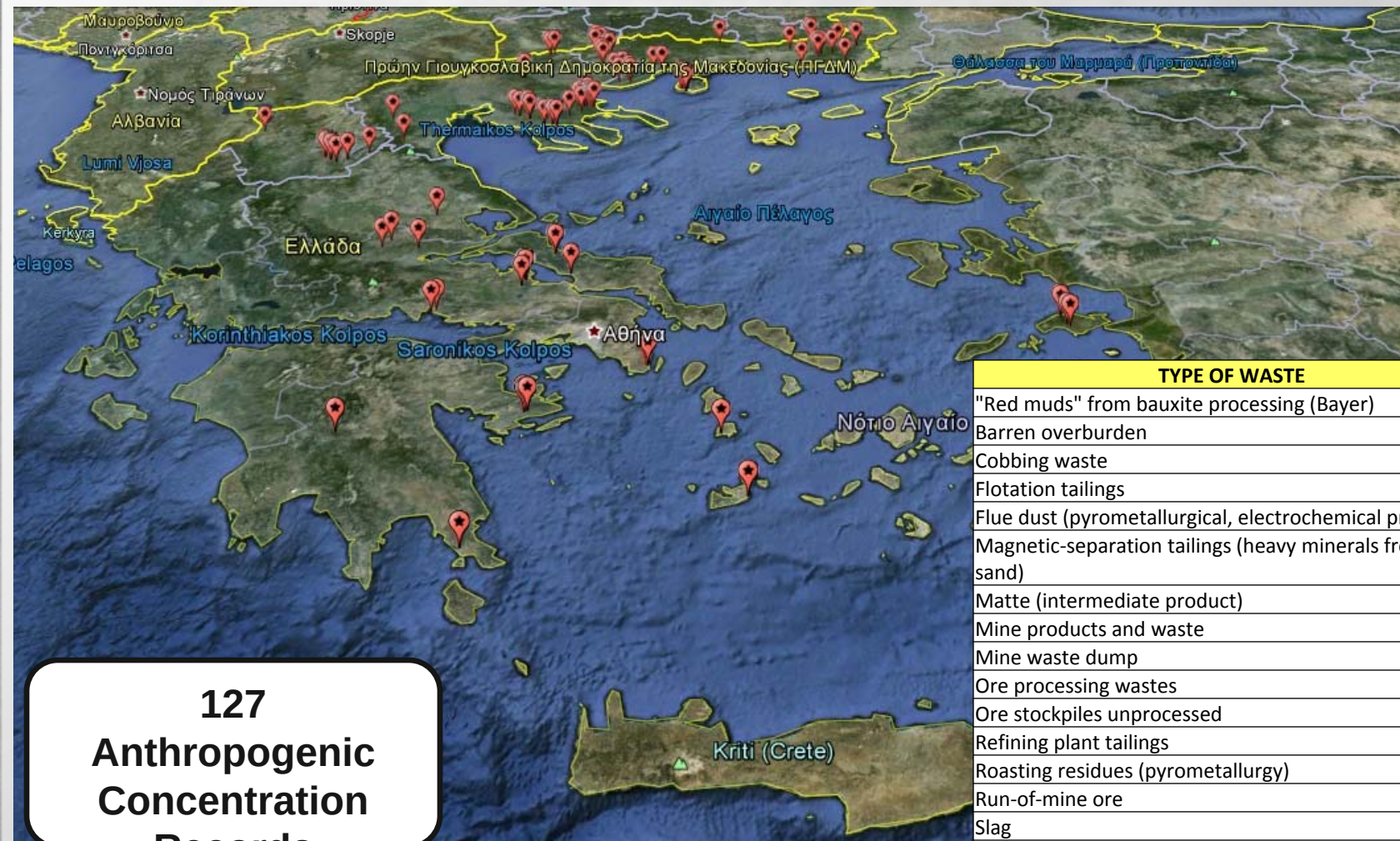
St Philip (Kirk) - GRC-A00015						
District/province						
Evros-Thrace						
Status						
Inactive Plant						
Other names						
St Philip (Kirk)						
g concentrates						
(King-pulverising)						
ts						
surface storage						
fine products and waste						
Tonnage 0						
Density						
Class						
min.	max.	ave.	unit	date	accuracy	potential
0,000	11.100,000	4.672,690	ppm	19/11/2010	100,00%	0
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0,000	165,000	34,600	ppm	19/11/2010	100,00%	0
0,000	8.950,000	4.242,100	ppm	19/11/2010	100,00%	0
0,000	11.150,000	4.168,700	ppm	19/11/2010	100,00%	0
0,000	7.100,000	1.215,300	ppm	19/11/2010	100,00%	0
0,000	100,000	55,600	ppm	19/11/2010	100,00%	0
0,000	18,000	8,300	ppm	19/11/2010	100,00%	0
0,000	150,000	136,700	ppm	19/11/2010	100,00%	0
0,000	19,000	7,500	ppm	19/11/2010	100,00%	0
0,120	1,420	0,800	%	19/11/2010	100,00%	0
Chalcopyrite						
Galena						
Goethite						
Jacobinite						
Sphaerite						
Arsenopyrite						
Hematite						
Vermadite						

Anthropogenic concentrations database

Hollandite	Jarosite	
Wulfenite	Anglesite	
Bismutotellurite	Quartz	
Mica	Kaolinite	
Montmorillonite	Pyrophyllite	
Anhydrite	Alunite	
affected	Surface	Volume
	0,00 km²	0 m3
Receptor		
Soil		
Flora		
Agriculture, forestry and fishery		
inage)	0,00 km²	0 m3
Receptor		
Surface water		
Groundwater		
Soil		
Flora		
Agriculture, forestry and fishery		
WEB sources		
Controller		
Checking date		



Total AC database inputs



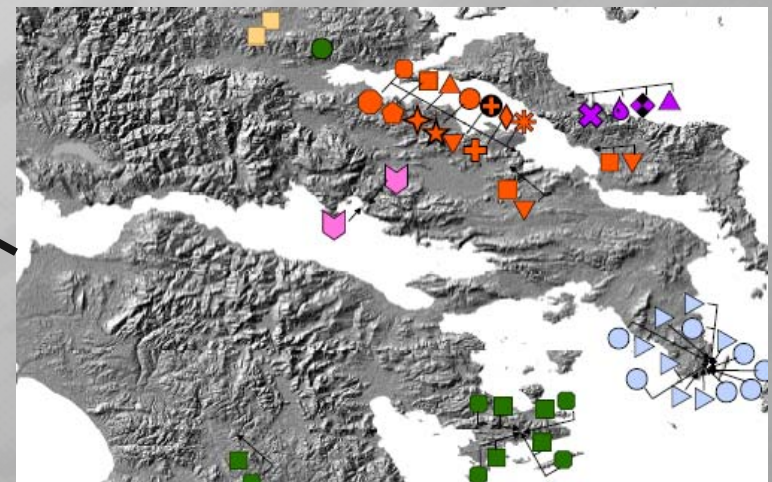
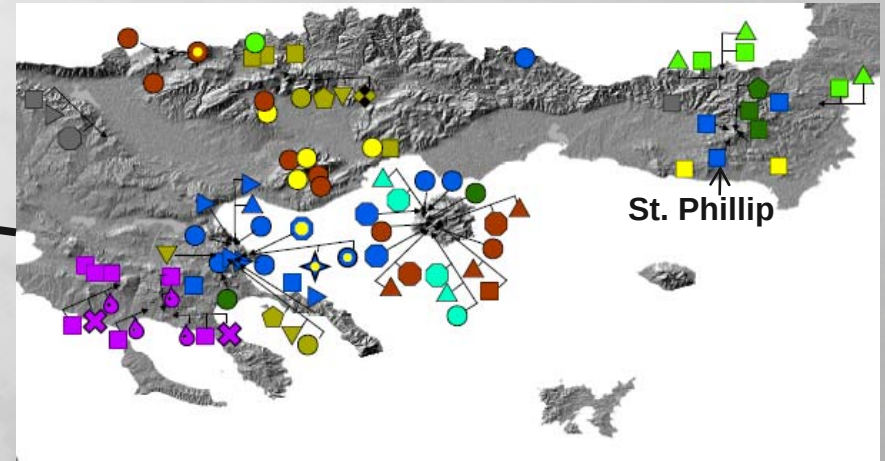
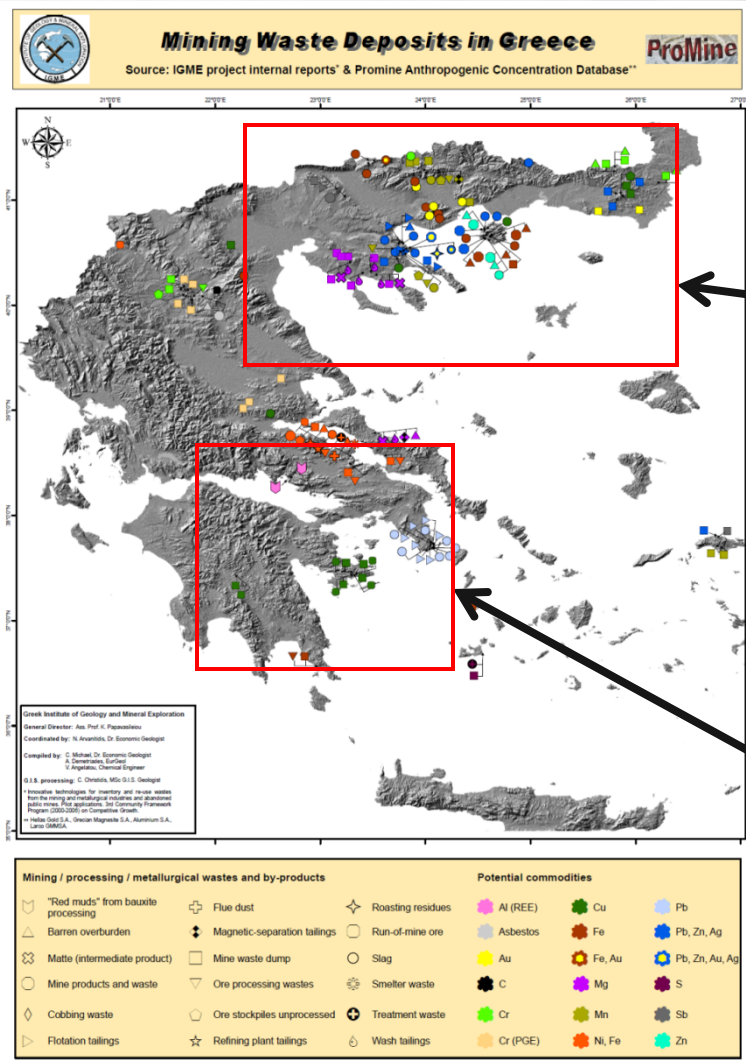
127

**Anthropogenic
Concentration
Records**

TYPE OF WASTE	NUMBER
"Red muds" from bauxite processing (Bayer)	2
Barren overburden	12
Cobbing waste	1
Flotation tailings	15
Flue dust (pyrometallurgical, electrochemical processes)	1
Magnetic-separation tailings (heavy minerals from glass sand)	2
Matte (intermediate product)	3
Mine products and waste	10
Mine waste dump	57
Ore processing wastes	8
Ore stockpiles unprocessed	5
Refining plant tailings	1
Roasting residues (pyrometallurgy)	2
Run-of-mine ore	8
Slag	38
Smelter waste	1
Treatment waste (metallurgical residues & slags, etc.)	2
Wash tailings	5
Total	173

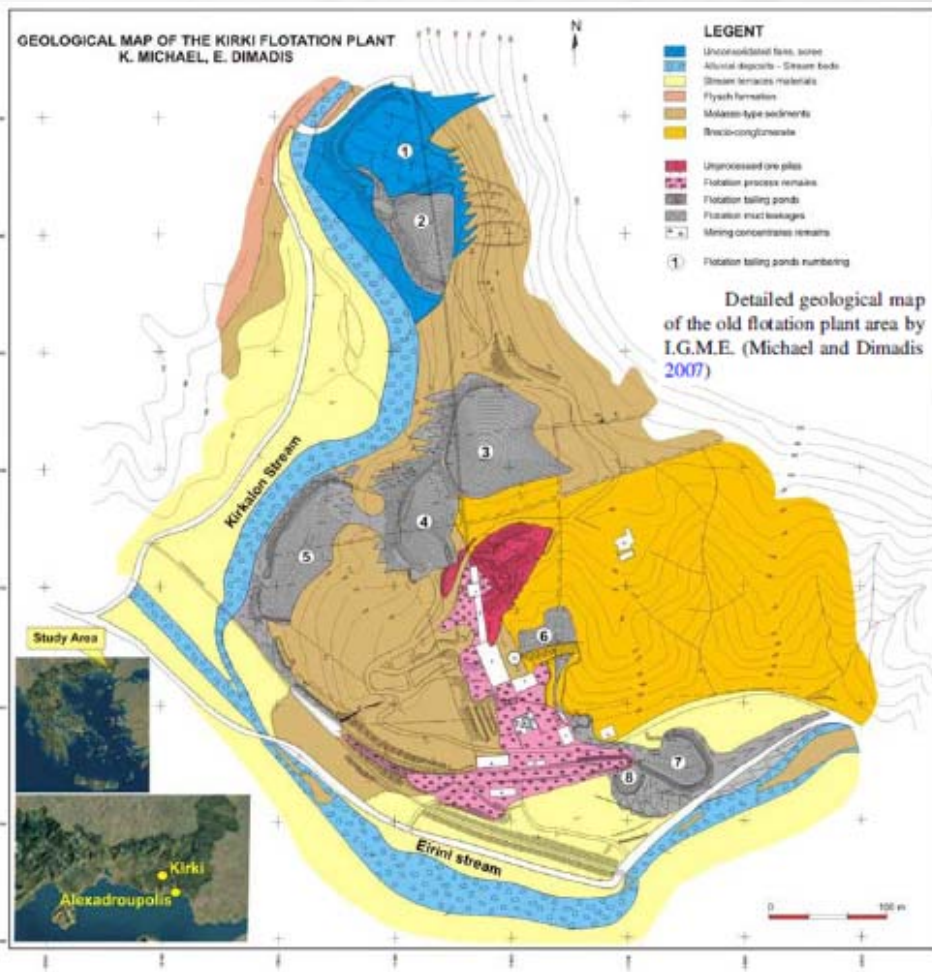


Mining waste deposits in Greece upon PROMINE classification



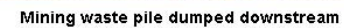
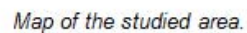


AD – St. Phillip



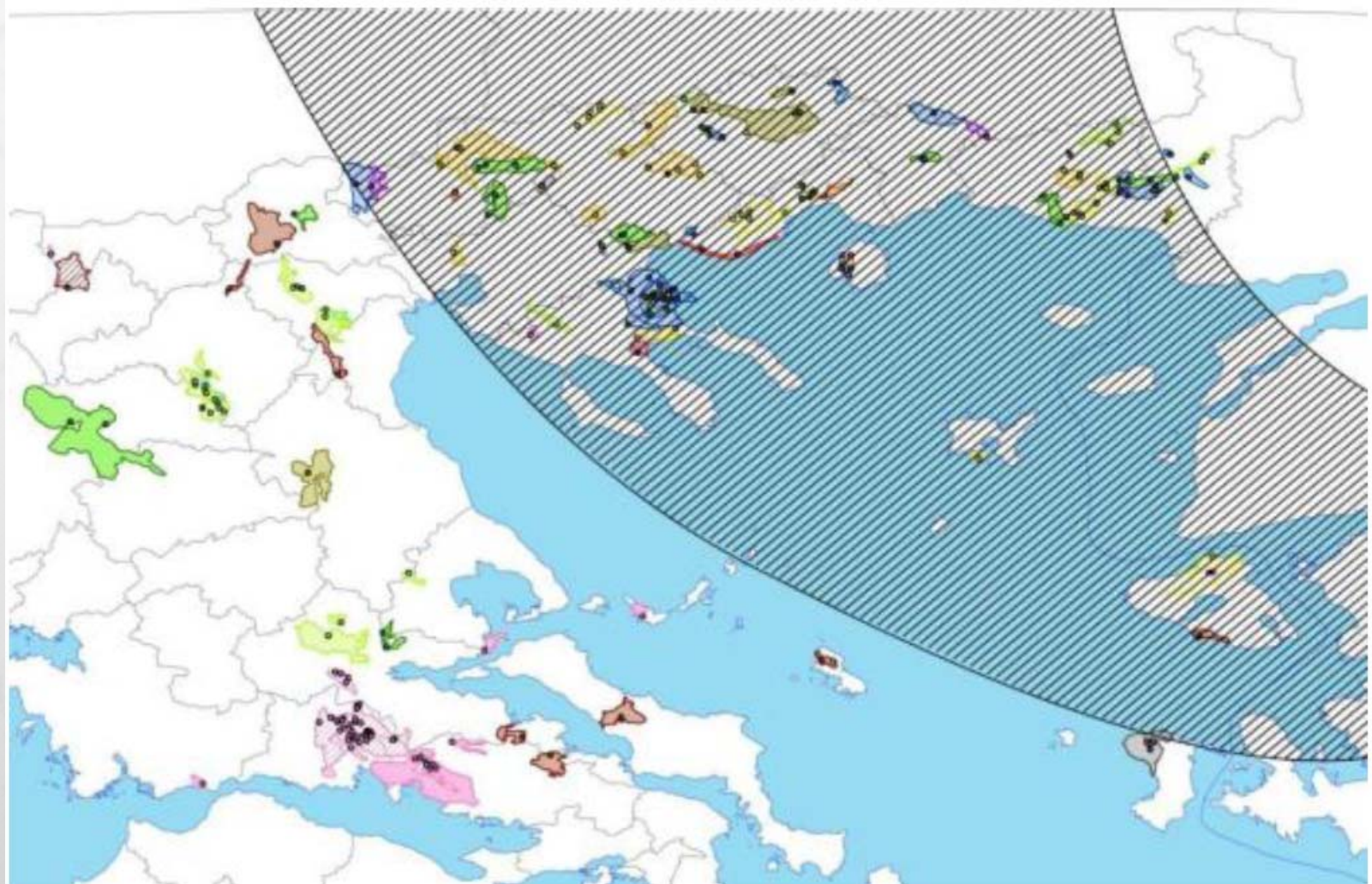
Mud overflowing from tailings pond extending to pond







PREDICTIVE MODELLING





PROMINE Portal

<http://ptrarc.gtk.fi/ProMine/default.aspx>



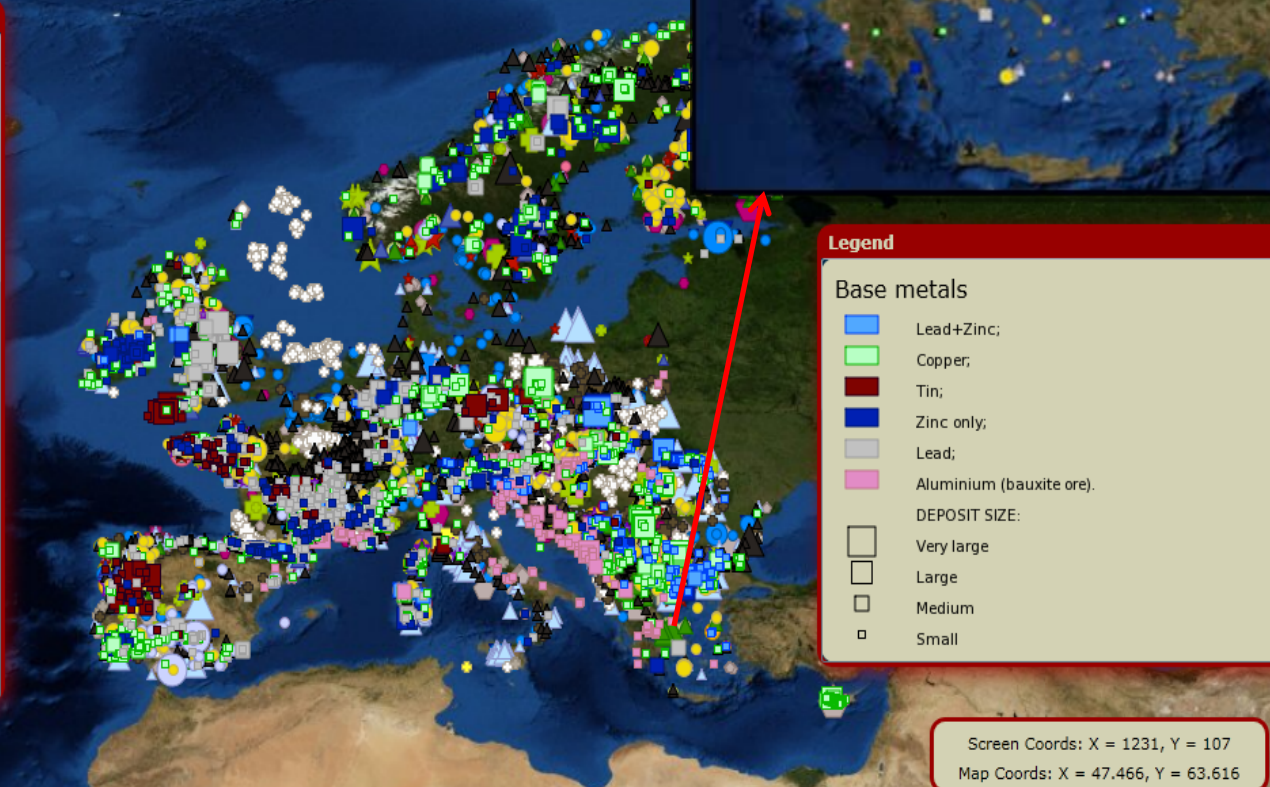
ProMine Portal

Table of Contents

ProMine - Mineral deposit layers

- ☒ Base metals
- ☒ Precious metals
- ☒ Iron and ferro-alloy metals
- ☒ Speciality and rare metals
- ☒ Energy commodities
- ☒ Precious and semi-precious stones
- ☒ Minerals for chemical use
- ☒ Ceramic and refractory minerals
- ☒ Fertilizer minerals
- ☒ Building raw materials
- ☒ Specialty and other industrial rocks and minerals
- ☒ Critical mineral raw materials

- ProMine - WP2 (Demo)
- ProMine - Geological layers
- ProMine - Geographic layers
- ProMine - Geophysical layers



Screen Coords: X = 1231, Y = 107
Map Coords: X = 47.466, Y = 63.616



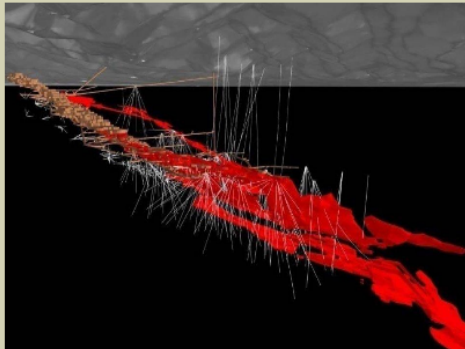
PROMINE Portal



ProMine Portal

GetFeatureInfo results

Southeastern Europe – The Balkans



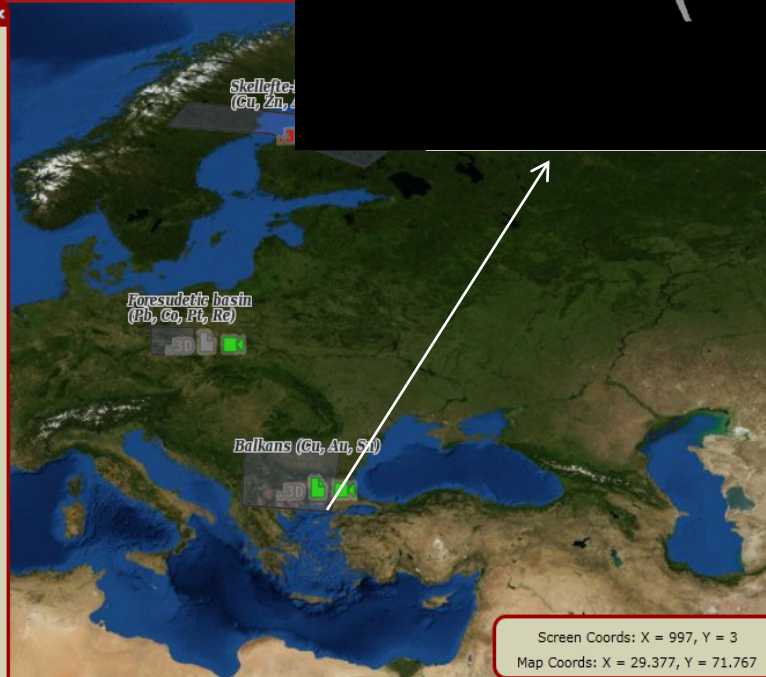
Place a text here to briefly present the belt/district, it's general geological description, mining activity and history.

A short description of the work done within the framework of ProMine, should be presented, with list of available 3D/4D models and some basic information on each of them.

Data download

[Link to public access data](#)

[Link to restricted access data \(login and password required\)](#)





Thank you for your attention

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*In memory of
Gabor Gaal*

