

# Härmänkylä

**Alternative Names:** Hautalehto, Mataralampi

**Occurrence type:** occurrence

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	NA	NA	NA	NA
silver	2	NA	NA	NA	NA
copper	3	NA	NA	NA	NA
bismuth	3	NA	NA	NA	NA

Easting EUREF: 597690

Northing EUREF: 7148010

Easting YKJ: 3597902

Northing YKJ: 7151003

**Discovery year:** 2003

**Discovered by:** Outokumpu Oy

**Province:** Kuhmo (Ni, Ag, Au)

**District:** Kuhmo (Au)

**Comments:** Discovered in outcrop. The first indications were anomalous gold in till and micronuggets of gold detected in regional nickel exploration by Outokumpu in 1990s.

**References:** 2, 3, 4, 5, 6, 7, 8, 9, 10

## Mineral deposit type

**Group:** Metallogenic deposit

**Main type:** Orogenic (metamorphic hydrothermal)

## Dimension

**Expression:** exposed

**Area (ha):** NA

**Form:** discordant

**Dip azim:** NA

**Shape:** lensoidal

**Dip:** NA

**Length (m):** 100

**Plunge azim:** NA

**Width (m):** NA

**Plunge dip:** NA

**Thickness (m):** 10

**Orientation method:** NA

**Depth (m):** 50

**Dimension comments:** Shape either lensoidal or tabular. Open along strike at both ends and at depth. Thickness varies from 1 to 10 metres. This is within a 4–5 km long, 100–300 m wide, NW to NNW-trending domain of potential gold mineralisation.

## Holder history

**Current holder:** Magnus Minerals Oy

**Years:** 2023

**Holding type:** Application for exploration permit

**Previous holders:**

Company	Years	Holding type	Comments
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Magnus Minerals Oy	2021	Application for reservation	NA
Dragon Mining Oy	2003	Claim (old law)	NA
Outokumpu Oy	2000-2003	Claim (old law)	NA

## EXPLORATION ACTIVITY

### Polar Mining Oy

Years	Activity type	Geologist	Exploration result	Ref
2003-2003	detailed geochemistry	Jukka Jokela	geochemical anomaly	6, 10
<i>Detailed till geochemical survey.</i>				
2002-2003	detailed geochemistry	Pasi Eilu	geochemical anomaly	3, 4, 6, 9, 10
<i>Lithogeochemical anomaly surrounding the occurrence defined by GTK as consulting to Outokumpu Oy. Mass balance evaluation shows that during mineralisation, Al, Cr, Ni, P, Ti, and Zr were immobile, Ba, Bi, CO<sub>2</sub>, Cu, K, Rb, S, Sb, Te, and W enriched and Li, Na and Sr depleted throughout the alteration halo. In addition, Ag, Au, Cd, Pb, and Zn were enriched in the proximal alteration zone, whereas Fe, Ga, La, Mg, and V were only enriched within the proximal zone.</i>				
2001-2003	core drilling	Jukka Jokela	mineral occurrences	2, 3, 4, 6, 8
<i>10 diamond-drill holes, in total 1254.7 m.</i>				
<b>Intersections</b>				
HoleID				
From-To				
Length				
gold				
silver				
copper				
bismuth				
HoleID				
From-To				
Length				
gold				
silver				
copper				
2000-2003	detailed geology	Jukka Jokela	key geological features	1, 2, 3, 4, 8, 9, 10
<i>Detailed bedrock mapping by Outokumpu. Detailed alteration halo (Pasi Eilu) and bedrock structures (Juhani Ojala) related to mineralised zone defined by GTK as consulting to Outokumpu Oy.</i>				
2000-2003	detailed geophysics	Jukka Jokela	geophysical anomaly	10
<i>Low-altitude airborne magnetic and electromagnetic survey in 2002.</i>				

### Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1990-2001	regional geochemistry	Markku Tenhola	geochemical anomaly	
<i>Greenstone belt-wide till-geochemical survey with 16 samples per one square kilometre</i>				
1988-1988	regional geochemistry	Markku Tenhola	geochemical anomaly	7
<i>Country-wide till-geochemical survey</i>				

1987-1994	regional geophysics	NA	geophysical anomaly	7
<i>Low-altitude airborne magnetic, electromagnetic and radiometric survey.</i>				

## GEOLOGY

**Host rock:** Quartz porphyry, Quartz feldspar porphyry

**Wall rock:** Dolerite, Granodiorite, Mafic hypabyssal rock, Basaltic rock

### Quartz porphyry (Host rock)

**Rock type:** Host rock

**Proportion:** major

**Color:** Grey

**References:** 1, 2, 3, 4, 8

**Comments:** The mass balance evaluation indicates that during mineralisation:

- net mass and volume changes were minimal;
- Al, Cr, Ni, P, Ti, and Zr were consistently immobile;
- Fe, Ga, La, Mg and V were only mobilised in the areas of most intense alteration (in 'ore'), elsewhere these were immobile;
- the relative mass transfer for silica was minor; however, because the Si concentrations are significantly higher than those for any other element, even a relatively large absolute Si transfer is difficult t

#### Ore minerals:

Mineral	Proportion	Mineral texture
Galena	trace	<i>Only present in the highest-grade ore</i>
Pyrite	minor	
Silver	trace	<i>Only present in the highest-grade ore</i>
Sphalerite	trace	<i>Only present in the highest-grade ore</i>
Tetrahedrite	trace	<i>Only present in the highest-grade ore</i>

#### Other minerals:

Mineral	Proportion	Mineral texture
Apatite	present	
Biotite	minor	
Calcite	minor	<i>Product of alteration related to mineralisation</i>
Microcline	major	
Muscovite	minor	<i>Mainly product of alteration-related to mineralisation</i>
Plagioclase	major	
Quartz	major	
Rutile	present	<i>More common in altered parts</i>
Rutile	minor	<i>Product of alteration related to mineralisation</i>
Titanite	present	

#### Textures

Porphyritic

*Comments: Pale-blue quartz phenocrysts which are 0.5-1 cm in diameter and form 20-35 vol.% of the rock. There also are distinct, reddish, K feldspar phenocrysts 1-3 cm in diameter, forming <5 vol.% of the rock*

Alteration:	Distribution:	Degree:	Relation to mineralization:
sericitic alteration	Disseminated	Moderate	Syn
<i>Comments: Alteration intensity changes from weak distal to intense when approaching the mineralisation-related quartz veins.</i>			
sulphidation	Disseminated	Weak	Syn
<i>Comments: Sulphidation (mainly pyrite) occurs within the mineralised zone and in the entire alteration halo.</i>			
carbonate alteration	Disseminated	Moderate	Syn
<i>Comments: Alteration intensity changes from weak distal to intense when approaching the mineralisation-related quartz veins.</i>			

### Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	Min T- Max T (°C)
Regional	epidote amphibolite metamorphic facies	medium metamorphic grade			
<i>Comments: Upper-greenschist facies PT conditions, probably</i>					

### Geological age:

Geological era:	Max age - Min age (Ma):	Inferred age (Ma):	Age of mineralization:		
Neoarchean (2800-2500 Ma)	2734-2734				
Radiometric age:	Method:	Age:	Error (Ma):	Mineral:	Reference:
	U-Pb	2734	2	Zircon	

## Quartz feldspar porphyry (Host rock)

**Rock type:** Host rock

**Proportion:** minor

**Color:** Grey

**References:** 1, 2, 3, 4, 8

### Other minerals:

Mineral	Proportion	Mineral texture
Apatite	present	
Biotite	major	
Calcite	present	
	<i>Abundant in most altered parts</i>	
Chlorite	minor	
Epidote	minor	
Microcline	major	
Plagioclase	major	
Quartz	major	
Titanite	minor	
Zircon	rare	

**Textures**

Porphyritic

*Comments: K-feldspar and plagioclase phenocrysts in variable degree. Quartz phenocrysts are rare to non-existent.*

**Metamorphic description:**

Type:	Facies:	Degree:	Relation to mineralization:	Min P- (kbar)	Max P (kbar)	Min T- (°C)	Max T (°C)
Regional	epidote amphibolite metamorphic facies	medium metamorphic grade					

*Comments: Upper-greenschist facies PT conditions, probably*

**Geological age:**

Geological era:	Max age - Min age (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2800-2700		

**Dolerite (Wall rock)****Rock type:** Wall rock**Proportion:** minor**Color:** Black**References:** 1, 2, 3, 4

**Comments:** Late, unmineralised, possibly Proterozoic, NW-trending, Fe-tholeiitic, dolerites cutting across other rock units.

**Ore minerals:**

Mineral	Proportion	Mineral texture
Plagioclase	major	

**Other minerals:**

Mineral	Proportion	Mineral texture
Biotite	minor	
	<i>Alteration product</i>	
Chalcopyrite	rare	
Epidote	minor	
Hornblende	major	
Pyrite	present	
Quartz	minor	
Titanite	present	

**Textures**

Granoblastic

Alteration:	Distribution:	Degree:	Relation to mineralization:
carbonate alteration	Disseminated	Weak	Post
biotite alteration	Disseminated	Moderate	Post

*Comments: Biotitisation (and carbonation) in dolerite is related to cooling of the dykes or to retrograde stages of a Palaeoproterozoic metamorphic overprint*

### Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	Min T- Max T (°C)
Orogenic	greenschist metamorphic facies	low metamorphic grade			

### Geological age:

Geological era:	Max age - Min age (Ma):	Inferred age (Ma):	Age of mineralization:
Paleoproterozoic (2500-1600 Ma)	2500-1600	2500-1600	
<i>Comments: Indirect indications for the age only</i>			

## Granodiorite (Wall rock)

**Rock type:** Wall rock

**Proportion:** major

**Color:** Grey

**References:** 1, 2, 3, 4, 8

**Comments:** Deformed granodiorite at the greenstone belt margin

### Other minerals:

Mineral	Proportion	Mineral texture
Biotite	major	
Microcline	major	
Muscovite	minor	
Plagioclase	major	
Quartz	major	

### Structures

Gneiss

### Textures

Porphyritic

*Comments: Locally, K-feldspar and/or plagioclase phenocrysts*

Granoblastic

### Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	Min T- Max T (°C)
Regional	epidote amphibolite metamorphic facies	medium metamorphic grade			
<i>Comments: Upper-greenschist facies PT conditions, probably</i>					

### Geological age:

Geological era:	Max age - Min age (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2800-2700		

## Mafic hypabyssal rock (Wall rock)

**Rock type:** Wall rock

**Proportion:** present

**Grain size:** Medium grained 2 - 5 mm

**Color:** Dark coloured

**References:** 1, 2, 3, 4, 8, 9

**Comments:** Late, unmineralised, unmetamorphosed, possibly Palaeozoic, N-trending dyke cutting across other rock units. Sharp, brittle contacts to country rocks. Classified to basanite of continental rift environment according to bulk chemical composition. Originally mapped as a lamprophyre, which it is not. Basanite classification changed to mafic hypabyssal rock.

### Other minerals:

Mineral	Proportion	Mineral texture
Amphibole	major	
Calcite	minor	
		<i>Replacing amphibole</i>
Chlorite	minor	
		<i>replacing amphibole</i>
Epidote	present	
Microcline	minor	
Plagioclase	major	
Rutile	minor	
		<i>Replaced all ilmenite</i>
Talc	minor	
		<i>Replacing amphibole</i>

### Textures

Equigranular

## Basaltic rock (Wall rock)

**Rock type:** Wall rock

**Proportion:** minor

**References:** 1, 2, 3, 4, 8

**Comments:** Massive to pillow mafic lava forms most of the investigated unit, but there also are minor, banded, interlayers of mafic tuff. Whole-rock composition is transitional between Fe and Mg tholeiite.

### Other minerals:

Mineral	Proportion	Mineral texture
Biotite	minor	
		<i>Product of biotitisation of primary mafic silicates</i>
Calcite	present	
		<i>Alteration product</i>
Epidote	minor	
Hornblende	major	
Ilmenite	minor	
Plagioclase	major	
Pyrite	present	
Quartz	minor	
		<i>Product of biotitisation of hornblende</i>

Titanite	present
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**Structures**

Pillow lava

**Textures**

Granoblastic

Alteration:	Distribution:	Degree:	Relation to mineralization:
biotite alteration	Disseminated	Moderate	NA
spilitisation	Fractures	Weak	Pre

*Comments: Locally abundant, paragenetically early, epidote-rich veins with epidote- and hornblende-rich selvages, and epidote- and hornblende-rich pillow selvages and inter-pillow matrices suggest that the rocks have been subject to synvolcanic spilitic alteration. In that stage, the mafic rocks may also have gained some iron sulphides and chalcopyrite, because pyrite, pyrrhotite and chalcopyrite are more abundant in the epidotised than in the unaltered parts of these rocks.*

**Metamorphic description:**

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	Min T- Max T (°C)
Orogenic	amphibolite metamorphic facies	medium metamorphic grade			

*Comments: Upper-greenschist facies PT conditions, probably*

**Geological age:**

Geological era:	Max age - Min age (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2700-2800		

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