Korvilansuo

Occurence type: deposit

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	2,09 t	NA	2,09 t	Small deposit

Easting EUREF: 712710,317
Northing EUREF: 6970038,964
Easting YKJ: 3712968
Northing YKJ: 6972959

Discovery year: 1986
Discovered by: Geological Survey of Finland
Province: Ilomantsi (Au)
District: Hattu (Au)
References: 25, 28, 30, 32

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Sub type 1: Au
Comments: Precipitation of gold by desulphidation of fluid and, possibly, by decomposition of Au-bisulphide, -thiosulphide and -telluride complexes of fluid due to cooling and/or changes in pH and fO2. Probably, gold precipitated just below 500°C with sulphides due to reaction between the mineralising fluid and wall-rock (chiefly by sulphidation). Formation of the present low-temperature Te and Bi minerals probably took place as subsolidus reactions with cooling temperature.
References: 20, 26, 29

Dimension

Expression: exposed
Form: discordant
Shape: NA
Length (m): NA
Width (m): NA
Thickness (m): NA
Depth (m): NA
Area (ha): NA
Dip azim: 115
Dip: 80
Plunge azim: NA
Plunge dip: NA
Orientation method: NA
Dimension comments: The occurrence comprises subvertical lodes open along strike and at depth within an area of about 2x2 km

Holder history

Current holder: Endomines Oy
Years: 2023-2026
Holding type: Exploration permit

Previous holders:

Company	Years	Holding type	Comments
Geological Survey of Finland	NA	NA	NA
Endomines Oy	2013-2018	Claim (old law)	NA
Endomines Oy	2011-2011	Claim reservation (old law)	NA
Polar Mining Oy	2003-2008	Claim (old law)	NA
Outokumpu Oy	1987-2001	Claim (old law)	NA

EXPLORATION ACTIVITY

Endomines Oy

Years	Activity type	Geologist	Exploration result	Ref
2023	core drilling	Jani Rautio	mineral occurrences	16, 17
	2023: 35 holes for a total of 5 076.8 m of drilling. The holes were targeted to a 1.5 km by 1 km area SE of the known Korvilansuo deposit. The area had multiple untested gold anomalies in historical base of till sampling completed by GTK in the 1990s. Also, some of the historical drill holes in the area with elevated gold intersections have not been followed up earlier. In tol, 31 of 2023 drill holes intercepted >1 m @ >0.4 ppm Au, significantly extending the mineralised domain at Korvilansuo.			
	Intersections			
	HoleID	KVS-100		
	From-To	99,2-103		
	Length	3,8m		
	gold	8,4ppm		
	HoleID	KVS-66		
	From-To	18,6-33,8		
	Length	15,2m		
	gold	3,4ppm		
	HoleID	KVS-69		
	From-To	80,5-81,3		
	Length	0,8m		
	gold	15,1ppm		

2015-2015	detailed geochemistry	NA	NA	10
	Sampling the base of till, campaign started in March 2015			

2011-2011	detailed geophysics	Jaakko Liikanen	geophysical anomaly	
	Airborne low-altitude [VTEM] geophysical surveys were completed over the entire permit area			

2006-2015	core drilling	NA	mineral occurrences	3, 4, 5, 6, 7, 8, 9, 10
	2011: 5 diamond-drill holes, total 8445 m *2012: total 3905 m of diamond drilling* *2014-2015: 24 diamond-drill holes*			
	Intersections			
	HoleID	KVS-2		
	From-To	100-128		
	Length	28m		
	gold	3,1ppm		
	HoleID	KVS-39		
	From-To	128-137,3		
	Length	9,3m		
	gold	5,3ppm		
	HoleID	KVS-58		
	From-To	23,8-24,8		
	Length	1m		
	gold	3,4ppm		
	HoleID	NA		
	From-To	NA		
	Length	16,9m		
	gold	5,3ppm		
	HoleID	NA		

	From-To	NA
	Length	49,6m
	gold	2,1ppm
	HoleID	NA
	From-To	NA
	Length	20,5m
	gold	4,6ppm

Polar Mining Oy

Years	Activity type	Geologist	Exploration result	Ref
2003-2006	detailed geophysics	NA	NA	26

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1989-1989	regional geophysics	NA	key geological features	
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

1987-1994	core drilling	Martti Damsten	mineral occurrences	1, 2, 19, 21, 22, 24, 26
	14 diamond-drill holes, total 2083 m in 50-100 m traverse intervals, total 2202 m.			
	Intersections			
	HoleID	NA		
	From-To	NA		
	Length	1m		
	gold	8,4ppm		
	HoleID	NA		
	From-To	NA		
	Length	0,5m		
	gold	15,2ppm		
	HoleID	NA		
	From-To	NA		
	Length	0,7m		
	gold	9,8ppm		

1987-1994	excavation	Martti Damsten	NA	1, 2, 19, 21, 22, 24, 26

1987-1994	detailed geology	Martti Damsten	mineral occurrences	1, 2, 19, 21, 22, 24, 26
	Special studies on Quaternary geology, ore mineralogy and geochemistry, and on petrogenesis.			

1987-1994	detailed geochemistry	Martti Damsten	NA	27, 31
	Till-bedrock interface geochemistry, samples collected across the Au anomaly along traverses 100 m apart with sampling distance 10-30 m.			

1987-1994	detailed geophysics	Martti Damsten	key geological features	1, 2
	No response on magnetic, slingram or IP methods. Magnetic and electric methods do show the structural features of the area, including those which control gold mineralisation .			

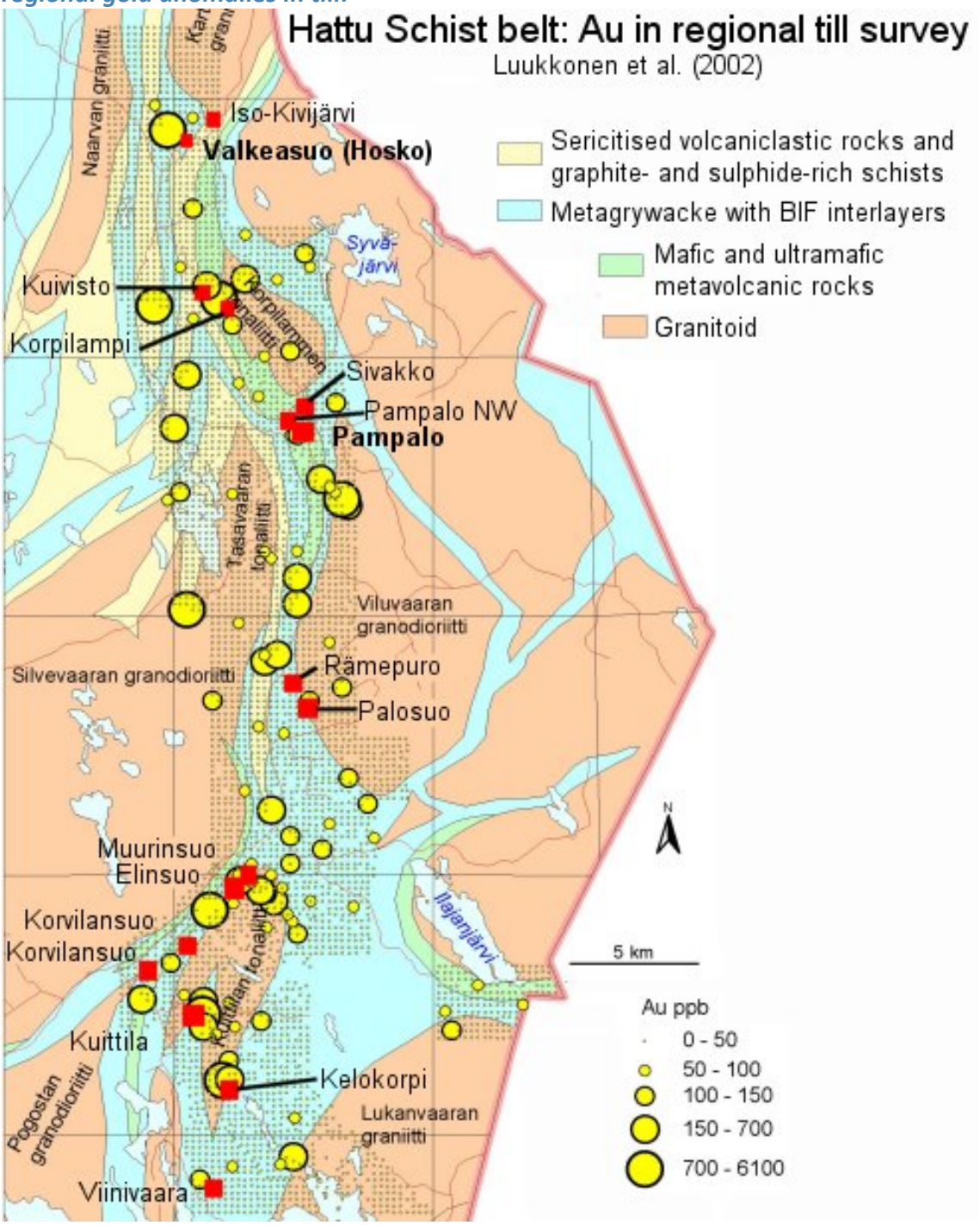
1983-1989	regional geochemistry	Aimo Hartikainen	geochemical anomaly	

	Sampling grid 250x250 m over the greenstone belt, covering 400 km2. Regional Au, As and B till anomaly, local Au, Te and Bi anomaly. Au content within the till anomaly is from tens of ppb to >1 ppm. Best combination for defining exploration targets: Au + Te + Bi - better than Au alone. A 0.5-1 km wide Au anomaly in till along the western-southwestern contact of the Kuittila tonalite.

1982-1982	regional geochemistry	Aimo Hartikainen	geochemical anomaly	
	Country-wide till-geochemical survey			

Figures

regional gold anomalies in till:



RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Endomines Oy	2023	18.12.2023	JORC code	14
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,509 Mt**			
	gold	2,16 ppm			
	Cutoff:	**gold 0,5 ppm**			
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,838 Mt**			
	gold	2,494 ppm			
	Cutoff:	**NA**			
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,329 Mt**			
	gold	3,01 ppm			
	Cutoff:	**gold 1,4 ppm**			

Previous calculations

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Outotec	2014	31.12.2022	JORC code	11, 12, 13, 15, 18
	Comments: Mineral resources remain unchanged 31.12.2022				
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,256 Mt**			
	gold	2 ppm			
	Cutoff:	**gold 0,5 ppm**			

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Endomines Oy	2013	NA	JORC code	
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,256 Mt**			
	gold	2 ppm			
	Cutoff:	**NA**			

GEOLOGY

Host rock: Mica schist, Mafic tuff, Quartz vein, Dolerite, Quartz feldspar porphyry, Tonalite

Mica schist (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 4, 21, 22, 23, 25, 26, 29, 30, 32
Comments: The mica schists of sedimentary and/or volcano-sedimentary origin are intruded by felsic porphyry, gabbroidic dikes and tonalite. The mineralisation is characterised by quartz-tourmaline vein and breccias. Lodes are formed by dissemination in the host rock and auriferous tourmaline-quartz veins. Proximal alteration: productino of chlorite-sericite-biotite assemblage; destruction of andalusite + tourmalinisation.

Ore minerals:

Mineral	Proportion	Mineral texture
Altaite	minor	
Arsenopyrite	minor	
Bismuth	minor	
Chalcopyrite	minor	
Cubanite	minor	
Frohbergite	minor	
Galena	minor	
Gold	minor	
	Dissemination in mica schist and in tourmaline-quartz veins and breccia. Gold is as inclusions in biotite, pyrrhotite, pyrite and arsenopyrite, free between silicate grains, intergrown with bismuth, tellurides and rutile and in petzite.Fineness 78-96% Au, 4-17% Ag.	
Hessite	minor	
Ilmenite	minor	
Mackinawite	minor	
Melonite	minor	
Molybdenite	minor	
Pentlandite	minor	
Petzite	minor	
Pyrite	major	
Pyrrhotite	major	
Rucklidgeite	minor	
Rutile	minor	
Sphalerite	minor	
Tellurobismuthite	minor	
Volynskite	minor	

Other minerals:

Mineral	Proportion	Mineral texture
Albite	present	
Biotite	present	
Calcite	present	
Chlorite	present	
Garnet	present	
K-Feldspar	present	

Muscovite	present
Quartz	present
Scheelite	present
Titanite	present
Tourmaline	present

Structures
Breccia
Comments: Sorjonen-Ward et al. (2015): The mineralised zone coincides with an area where foliation and lithic layering dips are less steep than in most of the Hattu belt, at 55-70°, and fold axes plunge moderately northward throughout the zone.
Veined

Textures
Granoblastic

Alteration:	Distribution:	Degree:	Relation to mineralization:
sericitic alteration	Disseminated	Moderate	Syn
biotite alteration	Disseminated	Moderate	Syn

Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	Post		-595
Comments: Progressive regional metamorphism on ca. 2750-2700 Ma (probably at 2.70 Ga), apparently peaked soon after gold mineralisation, at a temperature of about 539-595±50°C (garnet-biotite thermometer). Thermal peak was synchronous or outlasted deformation. Andalusite-chlorite-biotite-quartz-plagioclase-garnet-K feldspar(-staurolite).					

Geological age:

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

Mafic tuff (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 20, 21, 22, 23, 26, 29, 30
Comments: The mineralisation is characterised by quartz-tourmaline vein and breccias. S and B isotopes suggest the metasedimentary rocks being the main source for gold. Cu-isotopes suggest local sources => not much of Cu mobility in the Hattu belt Au systems? Kalliomäki et al. (2019): Hydrothermal calcite REE patters give a strong support to metamorphic source for the

mineralisation.

Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	Post		-595
Comments: Progressive regional metamorphism on ca. 2750-2700 Ma, apparently peaked soon after gold mineralisation, at a temperature of about 539-595±50°C (garnet-biotite thermometer). Thermal peak was synchronous or outlasted deformation.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2726-2754		N

Quartz vein (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 22, 26
Comments: Auriferous tourmaline-quartz veins up to a few tens of centimetres wide, tourmaline-quartz breccia

Ore minerals:

Mineral	Proportion	Mineral texture
Arsenopyrite	present	
Bismuth	trace	
Sphalerite	trace	
Telluride	trace	
Galaxite	present	

Other minerals:

Mineral	Proportion	Mineral texture
Quartz	most abundant	
Tourmaline	trace	
Gabrielite	trace	

Dolerite (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 21, 22, 23, 26, 29, 30
Comments: The mica schists of sedimentary and/or volcano-sedimentary origin are intruded by felsic porphyry, gabbroidic dikes (dolerite) and tonalite.

Metamorphic description:

Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	Post		-595
Comments: Progressive regional metamorphism on ca. 2750-2700 Ma, apparently peaked soon after gold mineralisation, at a temperature of about 539-595±50°C (garnet-biotite thermometer). Thermal peak was synchronous or outlasted deformation.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2726-2754		N

Quartz feldspar porphyry (Host rock)

Rock type: Host rock
References: 4
Comments: Not clear if these are mineralised or not

Tonalite (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 2, 21, 22, 23, 26, 29, 30
Comments: The mica schists of sedimentary and/or volcano-sedimentary origin are intruded by felsic porphyry, gabbroidic dikes and tonalite.

Metamorphic description:

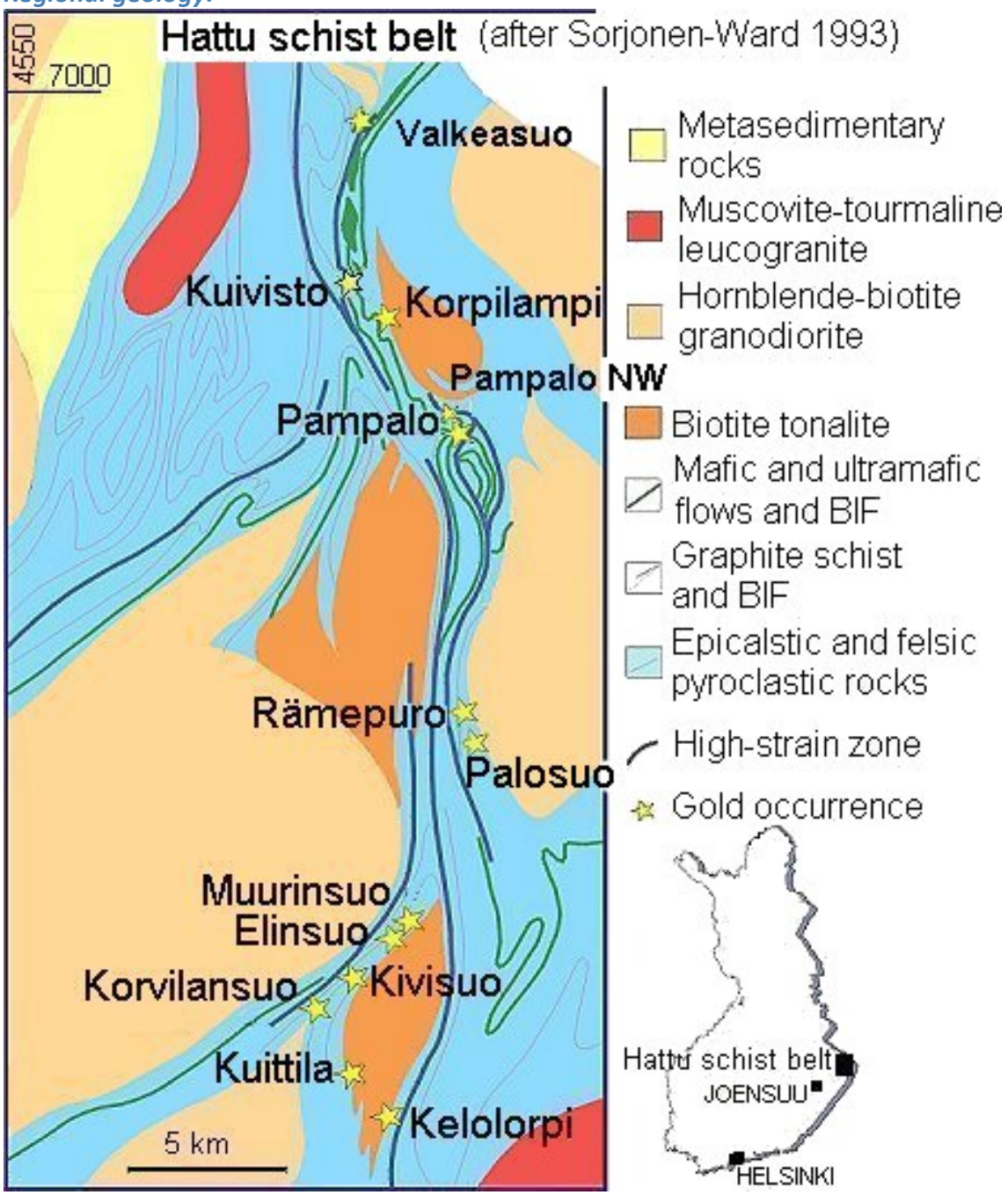
Type:	Facies:	Degree:	Relation to mineralization:	Min P- Max P (kbar)	MIn T- Max T (°C)
Regional	amphibolite metamorphic facies	medium metamorphic grade	Post		-595
Comments: Progressive regional metamorphism on ca. 2750-2700 Ma, apparently peaked soon after gold mineralisation, at a temperature of about 539-595±50°C (garnet-biotite thermometer). Thermal peak was synchronous or outlasted deformation.					

Geological age:

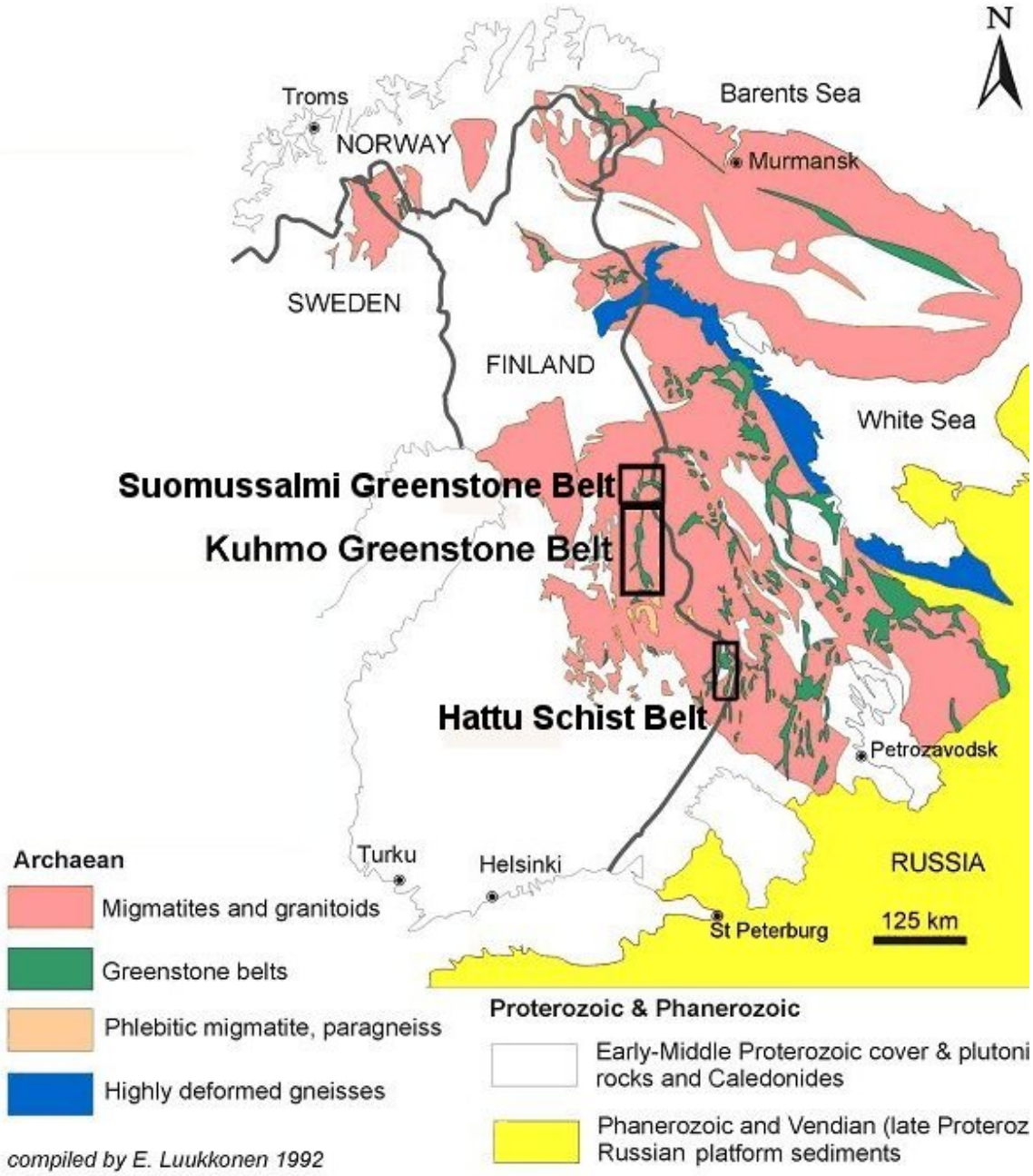
Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Neoarchean (2800-2500 Ma)	2726-2754		N

Figures

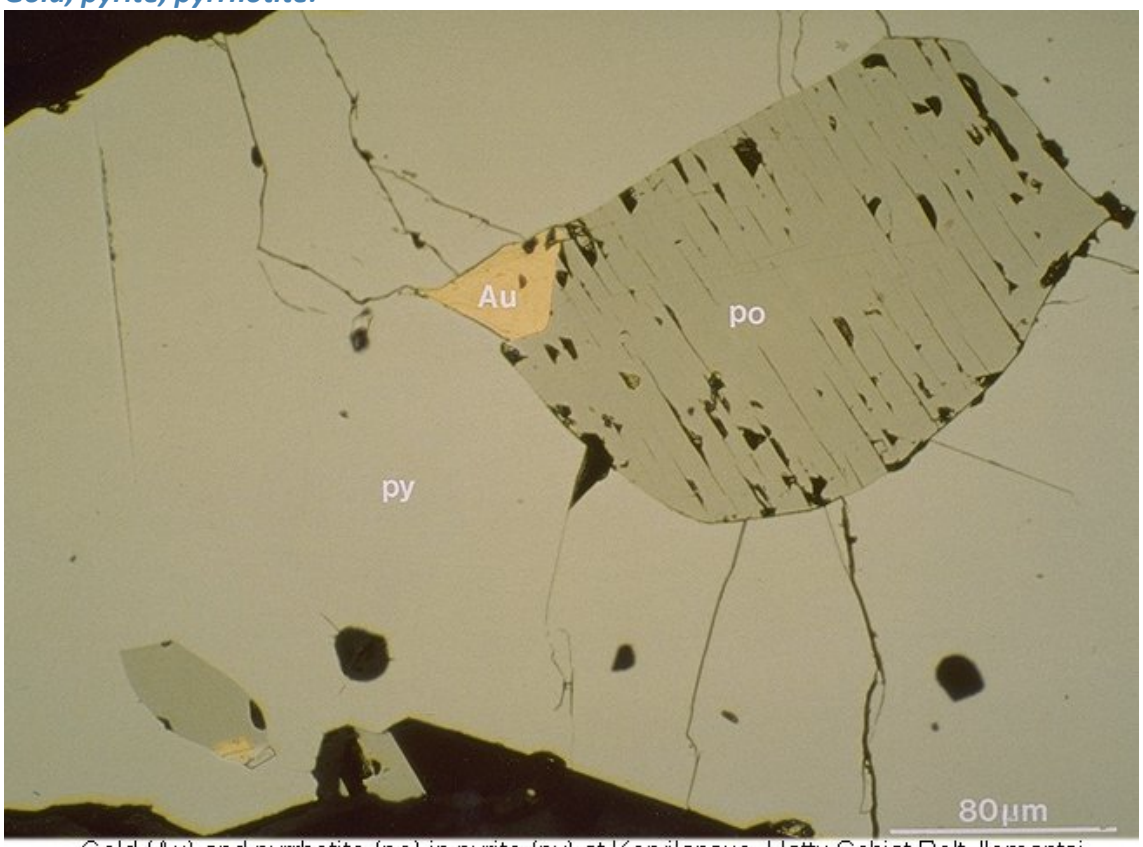
Regional geology:



Location in the Carelian craton:

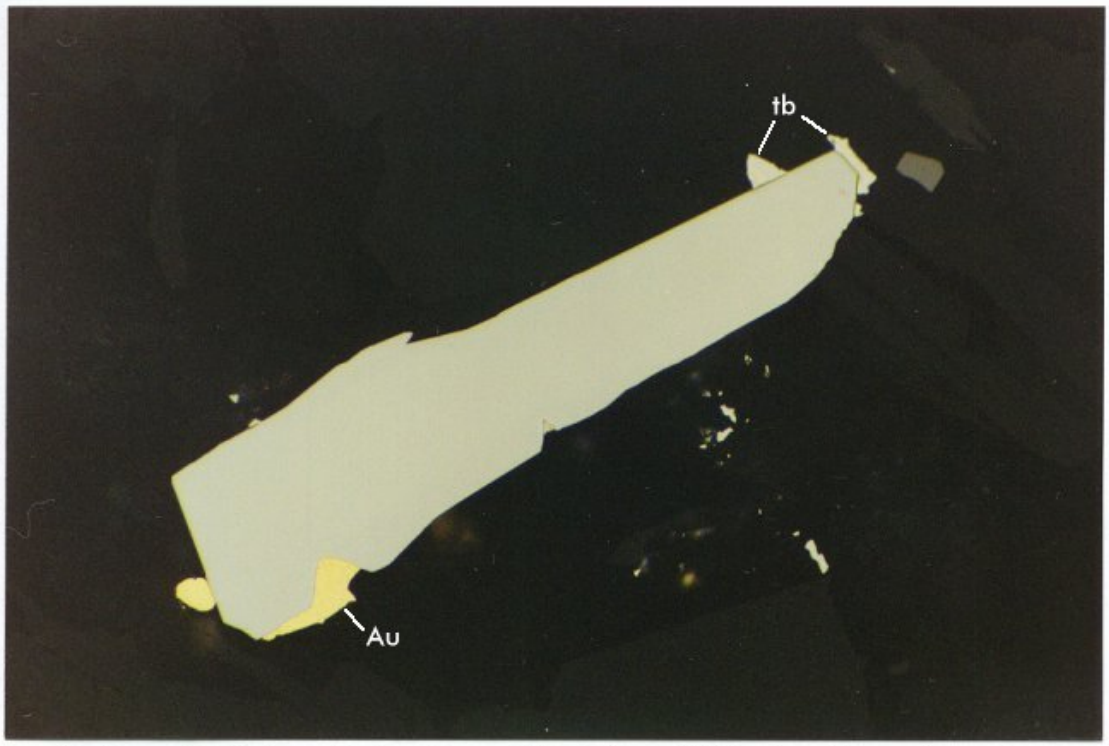


Gold, pyrite, pyrrhotite:



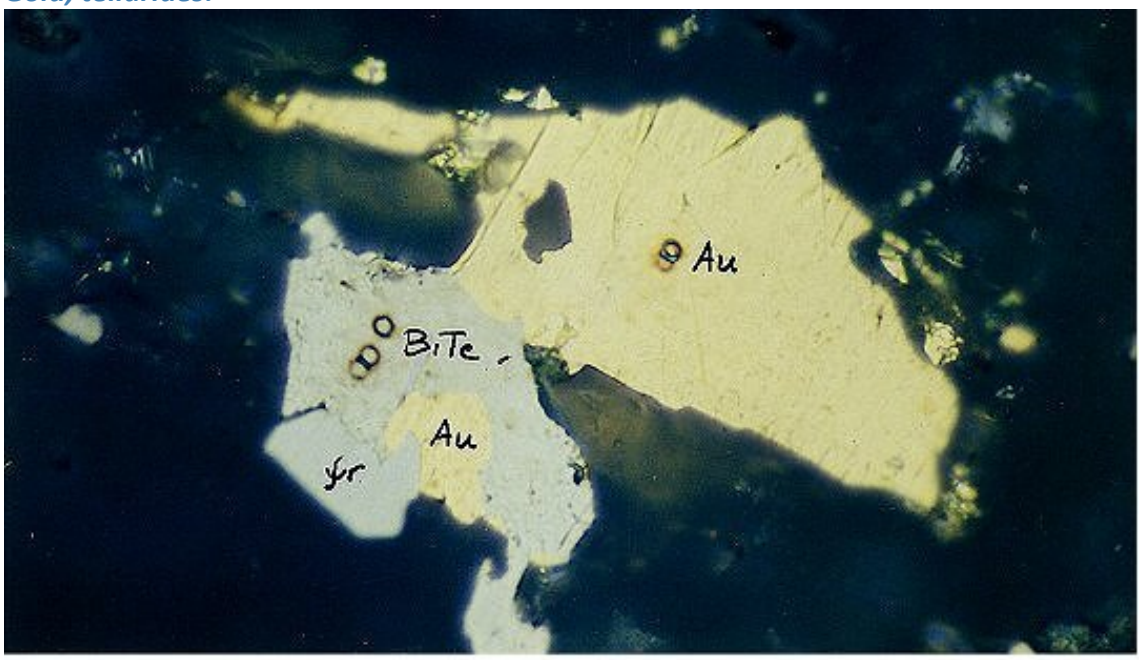
Gold (Au) and pyrrhotite (po) in pyrite (py) at Korvilansuo, Hattu Schist Belt, Ilomantsi. Sample ddh 327, 28.40 m. From Kojonen et al. (1991).

gold, tellurides, arsenopyrite:



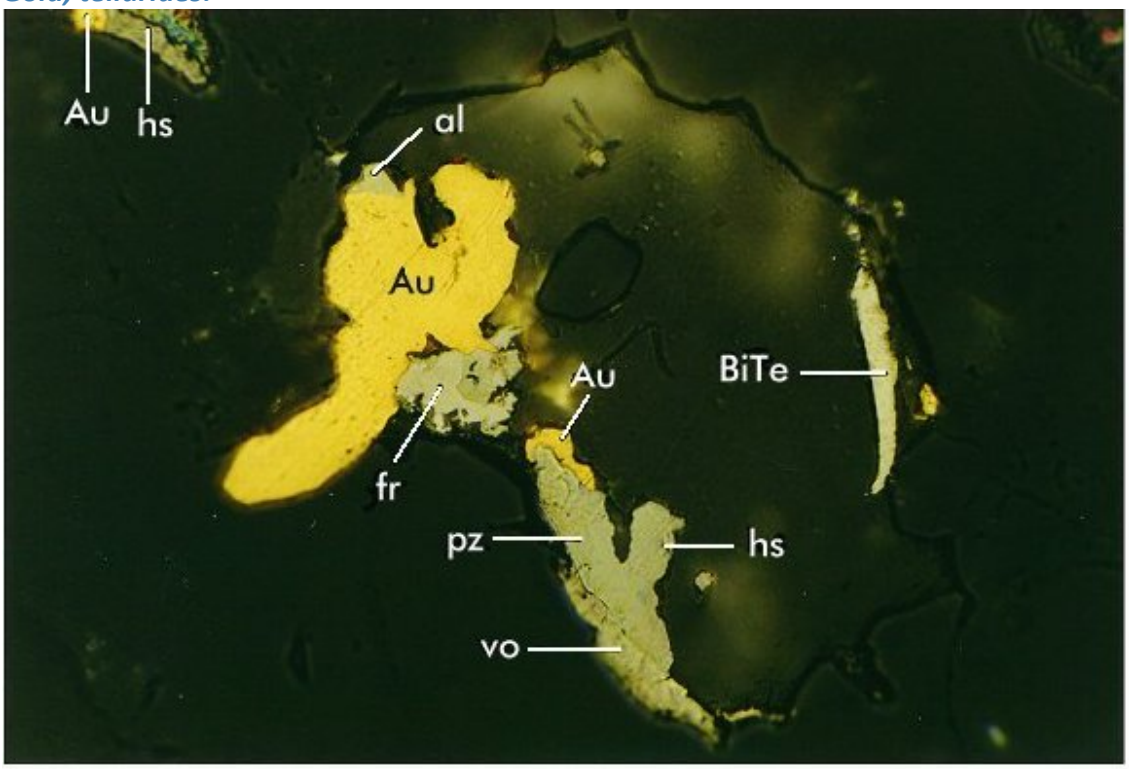
Native gold (Au) and tellurobismuthite (tb) crystallized on the surface of an arsenopyrite grain, host rock tourmaline-quartz vein, Korvilansuo, Ilomantsi. Ddh 325, depth 135.85 m. Field of view 0.244 mm.
(from Kojonen et al. 1993)

Gold, tellurides:



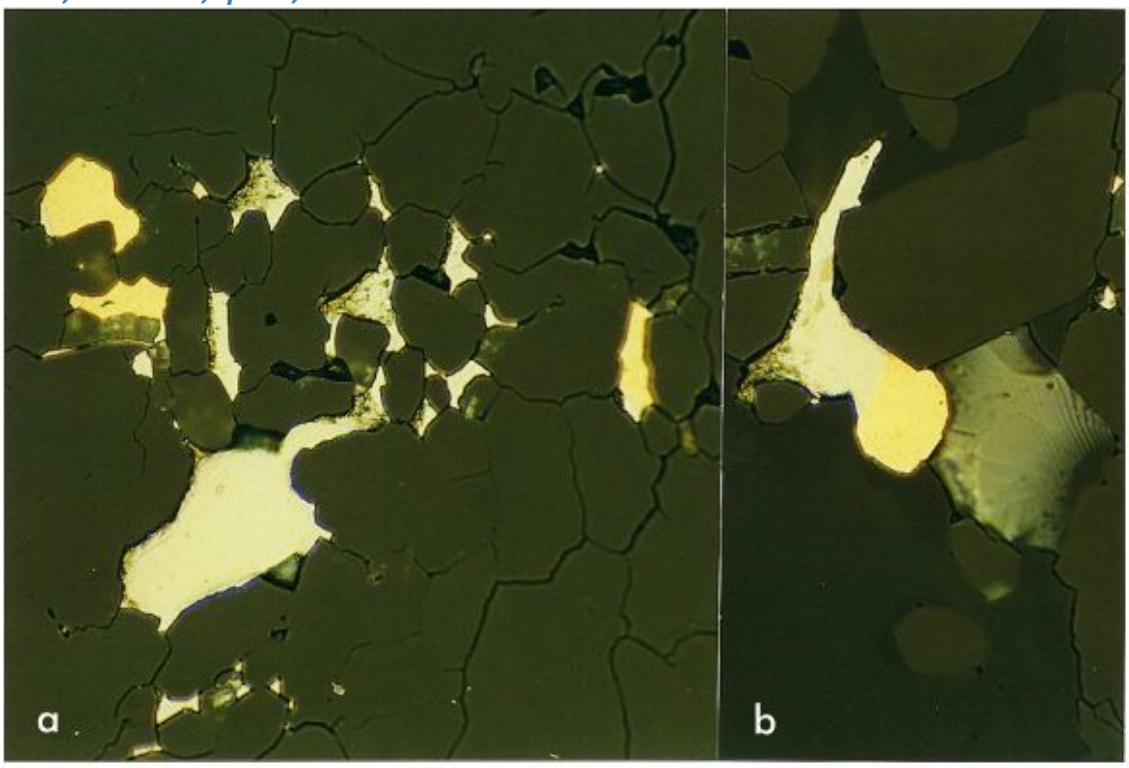
Gold intergrown with tellurobismuthite (BiTe) and frohbergite (fr), Korvilansuo, Ilomantsi. Field of view 0.244 mm. From Kojonen et al. (1991).

Gold, tellurides:



Gold (Au) intergrown with altaite (al) and frohbergite (fr). Also tellurobismuthite (BiTe), hessite (hs), petzite (pz) and volynskite (vo) are present. Korvilansuo, Ilomantsi. Ddh 327, depth 29.40 m, field of view 0.122 mm.
(from Kojonen et al. 1991)

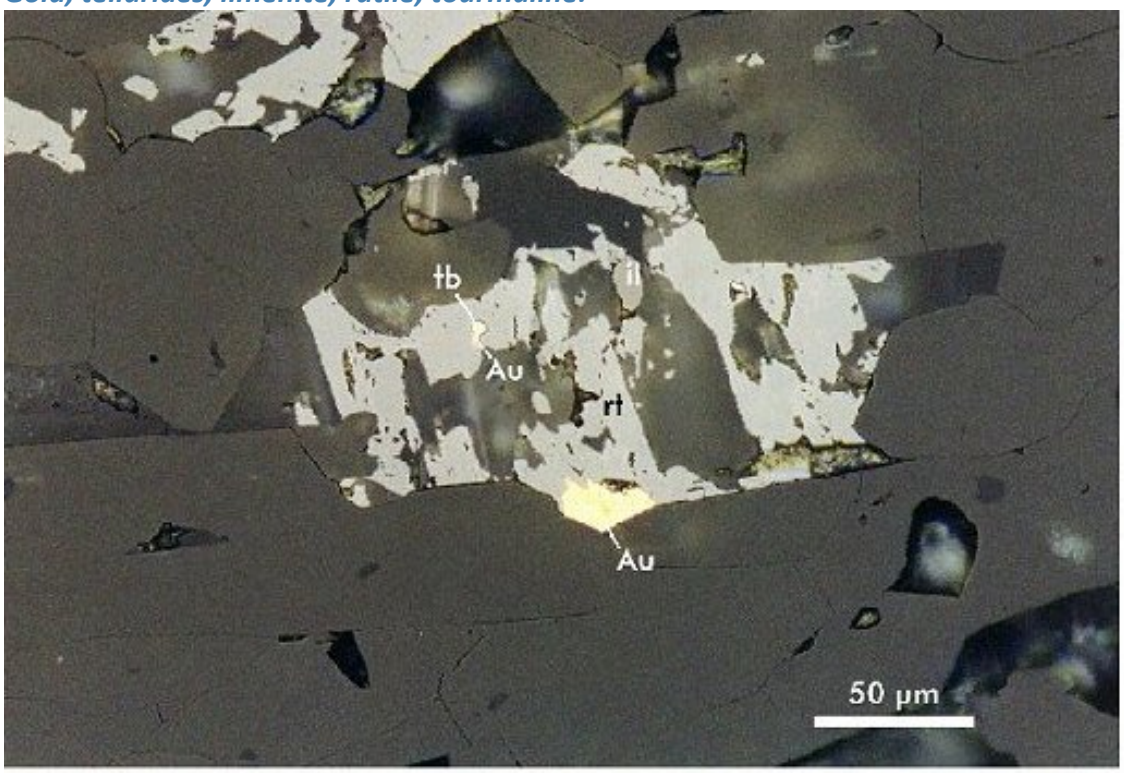
Gold, tellurides, quarz, tourmaline:



Native gold (yellow) and tellurides (grey) in tourmaline-quartz rock, Korvilansuo, Ilomantsi. Ddh 355, depth 94.70 m (a), 97.30 m (b), field of view 0.244 mm.

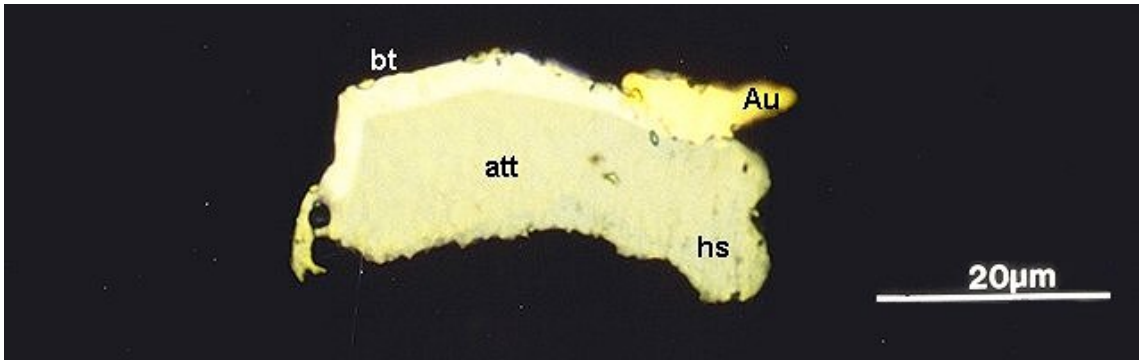
(from Kojonen et al. 1991)

Gold, tellurides, ilmenite, rutile, tourmaline:



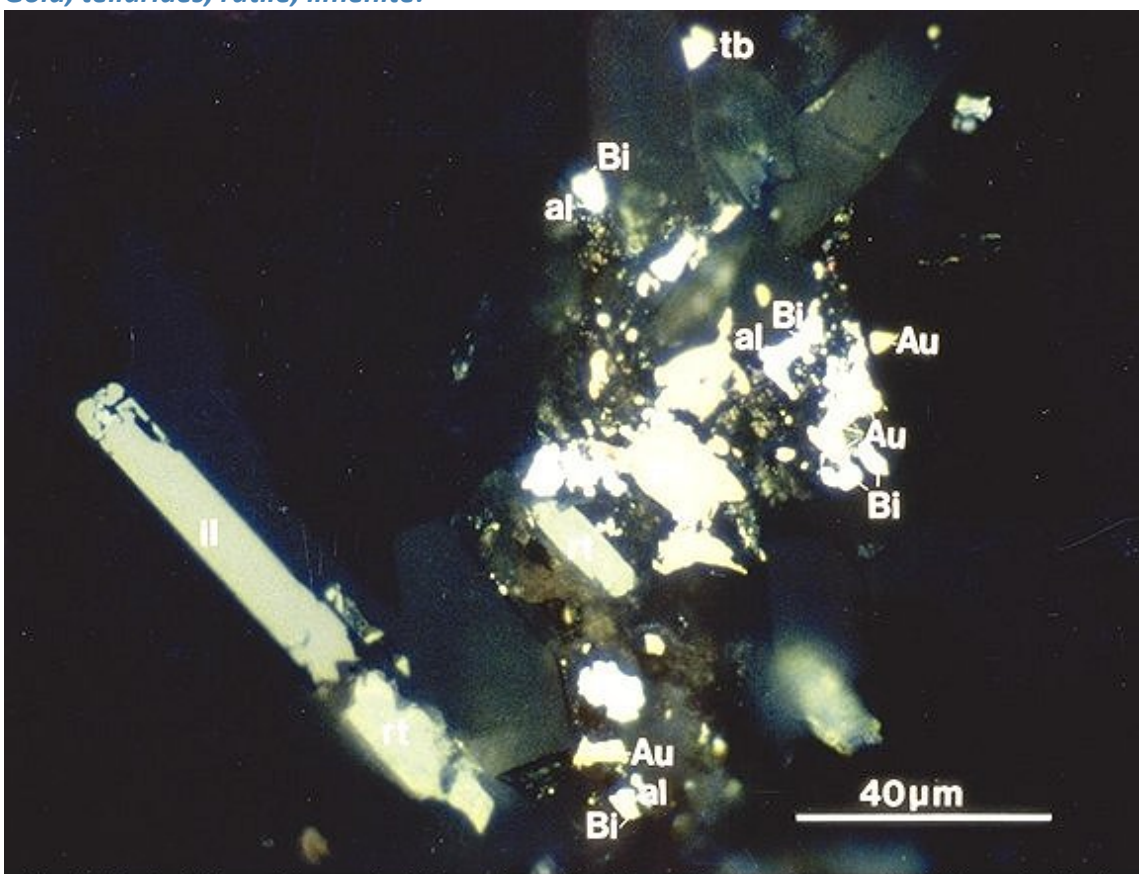
Tellurobismuthite (tb) and native gold (Au) as inclusions in rutile (rt) altered from ilmenite (il), host rock tourmalinite, Korvilansuo, Ilomantsi. Ddh 325, depth 135.65 m.
(from Kojonen et al. 1991)

Gold, tellurides:



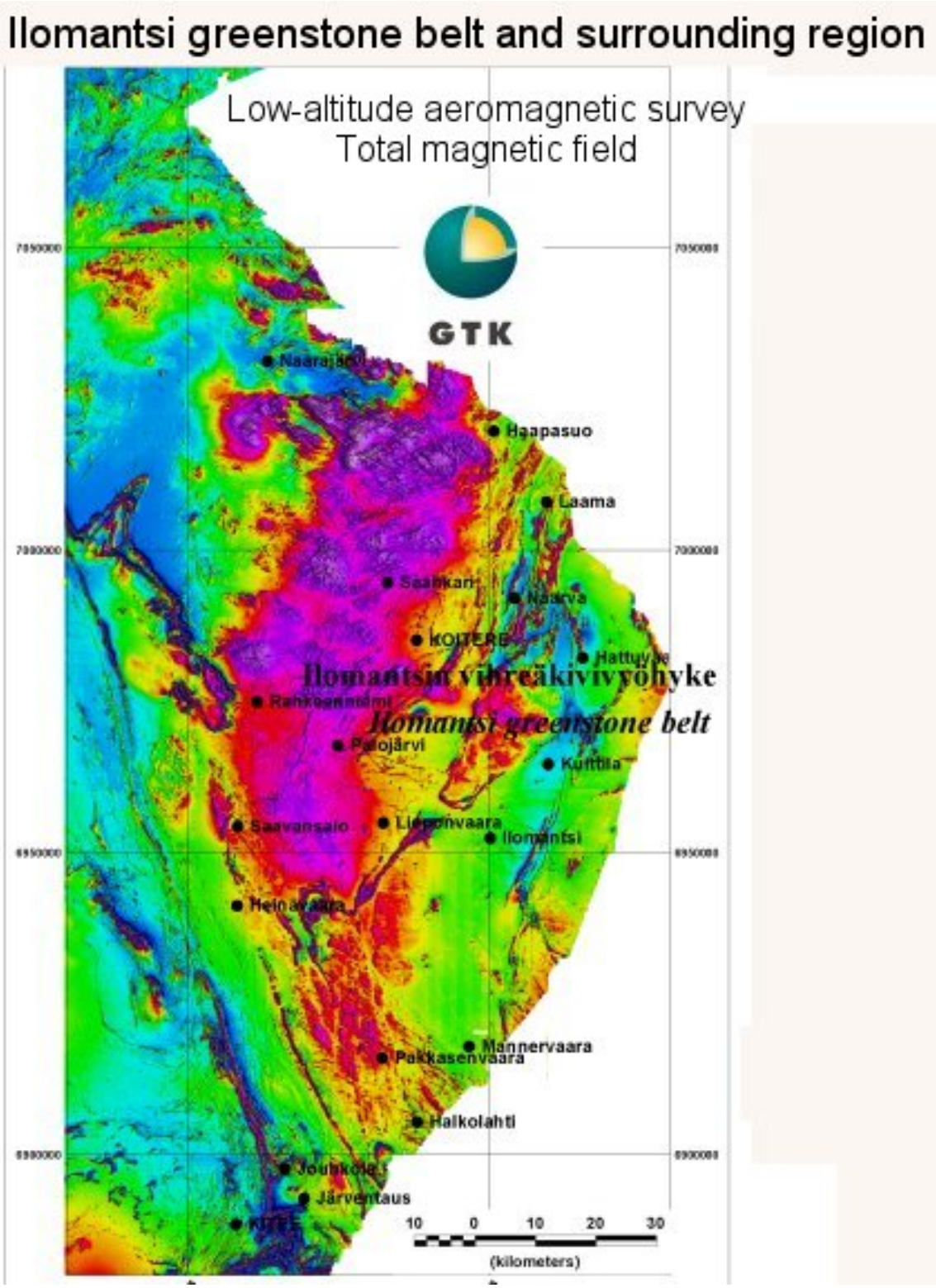
Gold (Au), BiTe (bt), and (Ag,Tl)2Te2 (att) intergrown with hessite (hs) at Korvilansuo, Hattu Schist Belt, Ilomantsi. Sample ddh 356, 81.50 m. Photo Kari Kojonen

Gold, tellurides, rutile, ilmenite:



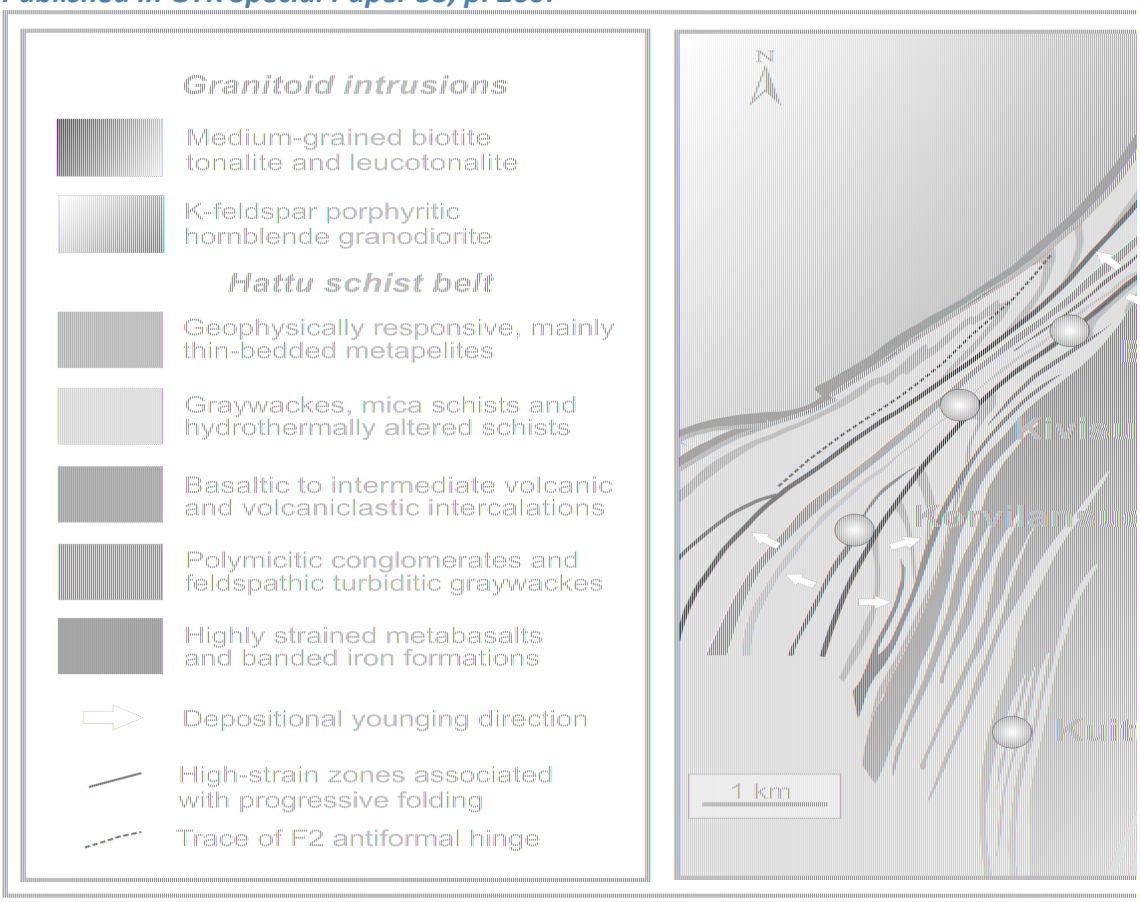
Gold (Au), tellurobismuth (tb), rutile (rt), ilmenite (il), bismuth (Bi),and altaite (al) at Korvilansuo, Hattu Schist Belt, Ilomantsi. Sample ddh 325, 135.85 m. Photo Kari Kojonen.

Regional low-altitude airborne magnetic image:



Kuttila-Muurinsuo area, Ilomantsi greenstone belt. Image by Peter Sorjonen-Ward, 2011.

Published in GTK Special Paper 53, p. 260:



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2. Damsten, M., Hartikainen, A., Koistinen, E. & Nurmi, P.A. 1994. Tutkimustyöselostus Ilomantsin kunnassa valtausalueilla Muurinsuo (kaivosrekisterinro 4273/1), Korvilansuo 1 (4165/1), Kelokorpi 1 (4165/2), Palosuo (5027/1), Muurinsuo 2 (5359/1), Muurinsuo 3 (5359/2) sekä valtausvarausalueilla Elinsuo (156/93), Kiimasuo (156/93) ja Viinivaara (25/94) suoritetuista kultamalmitutkimuksista vuosina 1984-1993. English summary: Report on exploration in Ilomantsi during 1984-1993 in claims Muurinsuo (Mine Reg. No. 4273/1), Korvilansuo 1 (4165/1), Kelokorpi 1 (4165/2), Palosuo (5027/1), Muurinsuo 2 (5359/1), Muurinsuo 3 (5359/2) and claim reservation areas Elinsuo (156/93), Kiimasuo (156/93) and Viinivaara (25/94). Geological Survey of Finland, Report M06/4244/-94/1/10. 14 p. *http://tupa.gtk.fi/raportti/valtaus/m06_4244_94_1_10.pdf*

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12. Endomines 2021. Endominesin malmivara- ja mineraalivarantoarvioiden päivitys. 7.4.2021
http://tupa.gtk.fi/karttasovellus/mdae/references/284_Pampalo/284_Endomines_2021_04_07.pdf

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