Moukkori

Alternative Names: Housuvaara
Occurence type: prospect

Commodity	Rank	Total measure	Total production	Total resource	Importance
gold	1	0,22 t	NA	0,22 t	Occurrence

Easting EUREF: 620600,774
Northing EUREF: 7243287,596
Easting YKJ: 3620822
Northing YKJ: 7246319

Discovery year: 1990
Discovered by: Geological Survey of Finland
Province: Kuhmo (Ni, Ag, Au)
District: Tormua (Au)
Comments: A tiny mineralised outcrop found in a forest road ditch, during exploration for base metals. First indication for gold in the region were the auriferous glacial erratics found by an amateur prospector in 1989.
References: 1, 3, 4, 7, 9, 12

Mineral deposit type

Group: Metallogenic deposit
Main type: Orogenic (metamorphic hydrothermal)
Comments: Formed after the peak metamorphic event under slightly retrograde conditions near the ductile-brittle and amphibolite-greenschist facies transition zones, in still dominantly ductile regime, during late-Archaean cratonisation. Deposition of gold occurred primarily as a consequence of sulphidation of iron of the mafic country rock.
References: 3, 7, 11, 15, 16

Dimension

Expression: exposed
Form: discordant
Shape: irregular
Length (m): NA
Width (m): NA
Thickness (m): NA
Depth (m): NA
Area (ha): NA
Dip azim: NA
Dip: 85
Plunge azim: 180
Plunge dip: 45
Orientation method: NA
Dimension comments: The deposit comprises, at least, three or four parallel, narrow lodes

Holder history

Previous holders:

Company	Years	Holding type	Comments
Geological Survey of Finland	NA	NA	NA
Nordic Mines AB	2005-2013	Claim (old law)	From 2013--> application to exploration permit
Endomines Oy	2000-2005	NA	NA

EXPLORATION ACTIVITY

Geological Survey of Finland

Years	Activity type	Geologist	Exploration result	Ref
1996-1996	regional geophysics	Erkki Luukkonen	key geological features	
	Low-altitude airborne magnetic, electromagnetic and radiometric survey			

1990-1997	detailed geophysics	Erkki Luukkonen	geophysical anomaly	2, 3, 6, 8, 10, 14
	Ground magnetic, slingram, VLF-R, total intensity and IP survey			

1990-1997	detailed geochemistry	Erkki Luukkonen.	geochemical anomaly	2, 3, 6, 8, 10, 14

1990-1997	core drilling	Erkki Luukkonen.	mineral occurrences	8, 10, 11, 12
	Core drilling (reconnaissance drilling): 17 diamond-drill holes, total 1746 m.			
	Intersections			
	HoleID	NA		
	From-To	NA		
	Length	1,3m		
	gold	15ppm		
	HoleID	NA		
	From-To	NA		
	Length	3,5m		
	gold	30,9ppm		

1990-1997	detailed heavy mineral sampling	Erkki Luukkonen.	geochemical anomaly	2, 3, 6, 8, 10, 14

1990-1997	detailed geology	Erkki Luukkonen	key geological features	2, 3, 6, 8, 10, 14
	A tiny mineralised outcrop found in a forest road ditch, during exploration for base metals. First indication for gold in the region were the auriferous glacial erratics found by an amateur prospector.			

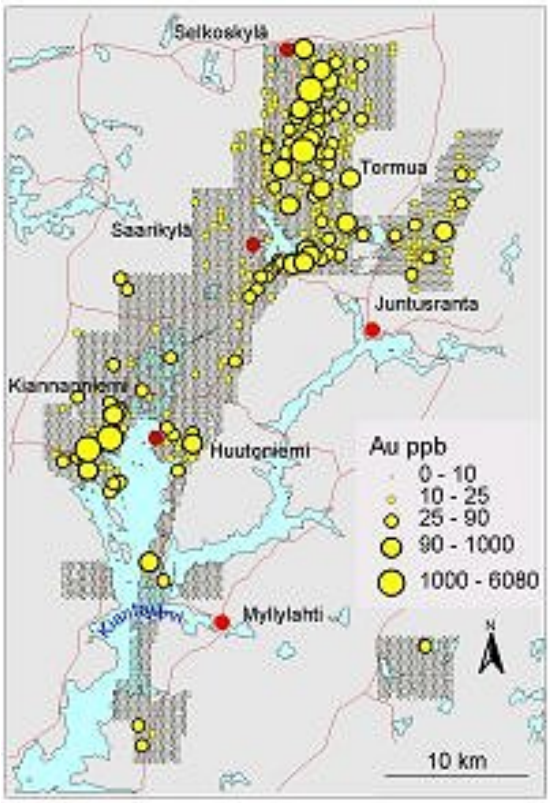
1990-1997	excavation	Erkki Luukkonen.	mineral occurrences	2, 3, 6, 8, 10, 14

1990-2001	regional geochemistry	Markku Tenhola	geochemical anomaly	7
	Greenstone belt-wide till-geochemical survey with 16 damples per one sq.km			

1987-1987	regional geochemistry	Markku Tenhola	geochemical anomaly	7
	Country-wide till-geochemical survey			

Figures

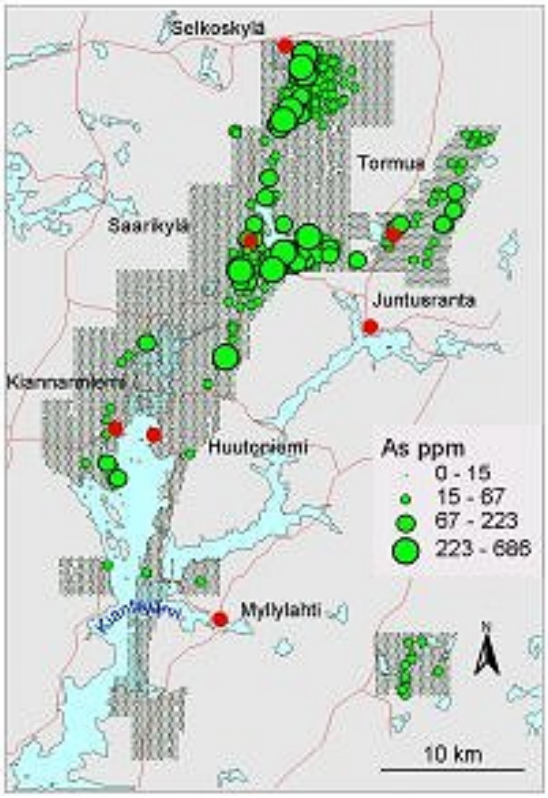
Suomussalmi greenstone belt: aeromagnetic image and gold occurrences:

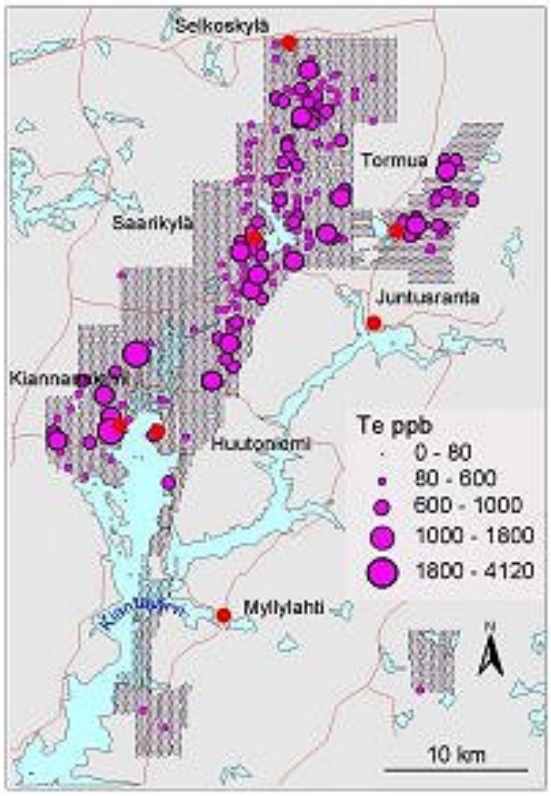


Suomussalmi greenstone belt

As, Au and Te in till

(Luukkonen et al. 2002)





RESOURCES AND RESERVES

Most recent

Type:	Company:	Year:	Date:	Calc Method:	Reference:
Resource	Geological Survey of Finland	2003	NA	Non-compliant resource estimate	13
	Comments: Three or four parallel lodes. For indicated and inferred resources, see Table 11 in Parkkinen (2003), in which this deposit appears as "Housuvaara". The report is confidencial.				
	Category:	**Indicated mineral resource**			
	Tonnage:	**3400 t**			
	gold	13,4 ppm			
	Cutoff:	**gold 2 ppm**			
	Category:	**Inferred mineral resource**			
	Tonnage:	**0,017 Mt**			
	gold	10 ppm			
	Cutoff:	**gold 2 ppm**			
	Category:	**Indicated and inferred mineral resource**			
	Tonnage:	**0,02 Mt**			
	gold	10,567 ppm			
	Cutoff:	**NA**			

GEOLOGY

Host rock: Uralite porphyrite, Quartz vein, Intermediate tuff

Uralite porphyrite (Host rock)

Rock type: Host rock
Proportion: major
Grain size: NA
Color: NA
References: 2, 3, 5, 6, 8, 14, 15, 17, 18
Comments: The deposit is in the Tormua Schist Belt which forms the NE part of the late Archaean Suomussalmi Greenstone Belt and is in the rocks of the 3.0-2.8 Ga Luoma Group of the greenstone belt. Narrow lodes in mafic metavolcanic rock in a second-order D3 fault zone

Ore minerals:

Mineral	Proportion	Mineral texture
Altaite	minor	
Cervelleite	minor	
Chalcopyrite	minor	
Galena	minor	
Goethite	minor	
Gold	minor	
	80% of gold occurs as free grains (avg. grain size 25 µm, locally up to millimetres in diameter) with gangue minerals, chiefly with quartz in quartz veins, 15% is as inclusions in practically all sulphides and tellurides, and some gold is in the lattice of the tellurides. Fineness 6.1-13.4% Ag; inclusions: 18.4-22.4% Ag.	
Hessite	minor	
Marcasite	minor	
Petzite	minor	
Pyrite	minor	
Pyrrhotite	major	
Rutile	minor	
Sphalerite	minor	
Tsumoite	minor	
Volynskite	minor	

Other minerals:

Mineral	Proportion	Mineral texture
Calcite	present	Alteration product
Chlorite	present	Alteration product
Epidote	present	Alteration product
Ilmenite	present	Alteration product
Quartz	present	
Scheelite	present	
Sericite	present	Alteration product
Tourmaline	present	

Alteration:	Distribution:	Degree:	Relation to mineralization:
biotite alteration	Disseminated	Moderate	Syn
Comments: Proximal slteration assemblage quartz-biotite-epidote(?)-chlorite-plagioclase-K feldspar-sericite-calcite-pyrrhotite			
potassic alteration	Disseminated	Moderate	Syn

Comments: Indiaceted by the presence of biotite and K feldspar in the proximal assemblage in the mafic host rock			
sulphidation	Disseminated	Weak	Syn
carbonate alteration	Disseminated	Weak	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	NA		
Comments: Metamorphic mineral assemblage: plagioclase-hornblende-biotite-quartz ± K feldspar, ilmenite. Possibly, a retrograde overprint at greenschist-facies PT conditions.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:		
Mesoarchean (3200-2800 Ma)	2800-3000		N		
Comments: Inferred host rock sequence age					

Quartz vein (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA
Color: NA
References: 2, 3, 5, 6, 16
Comments: Quartz veins with variable amount of sulphides. Low-salinity H2O-CO2±CH4 fluid(s); fluid inclusions: homogenisation T = 195-235°C, min. pressure <2.5 kbar (these figures probably reflect minimum PT conditions, not neccessarily the actual mineralising PT)

Geological age:
Ore minerals:

Mineral	Proportion	Mineral texture
Gold	present	
Pyrrhotite	minor	
Scheelite	present	

Other minerals:

Mineral	Proportion	Mineral texture
Quartz	major	

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:		
Neoarchean (2800-2500 Ma)	2676-2676		Y		
Radiometric age:	**Method:**	**Age:**	**Error (Ma):**	**Mineral:**	**Reference:**
	U-Pb	2676	20	Titanite	

Intermediate tuff (Host rock)

Rock type: Host rock
Proportion: minor
Grain size: NA

Color: NA
References: 2, 3, 14, 15, 17, 18

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	NA		
Comments: Possibly, a retrograde overprint at greenschist-facies PT conditions.					

Geological age:

Geological era:	Max age - Minage (Ma):	Inferred age (Ma):	Age of mineralization:
Mesoarchean (3200-2800 Ma)	2800-3000		N
Comments: Inferred host rock sequence age			

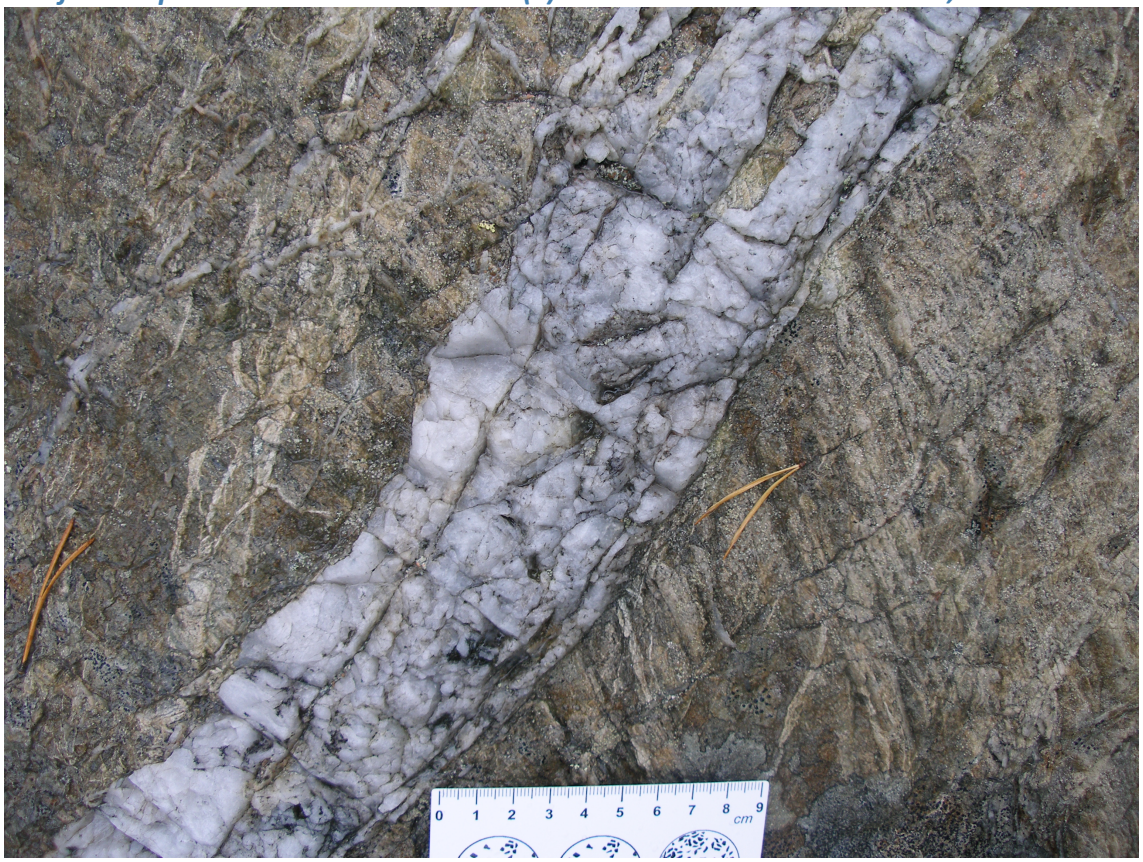
Figures

Mineralised outcrop photo:

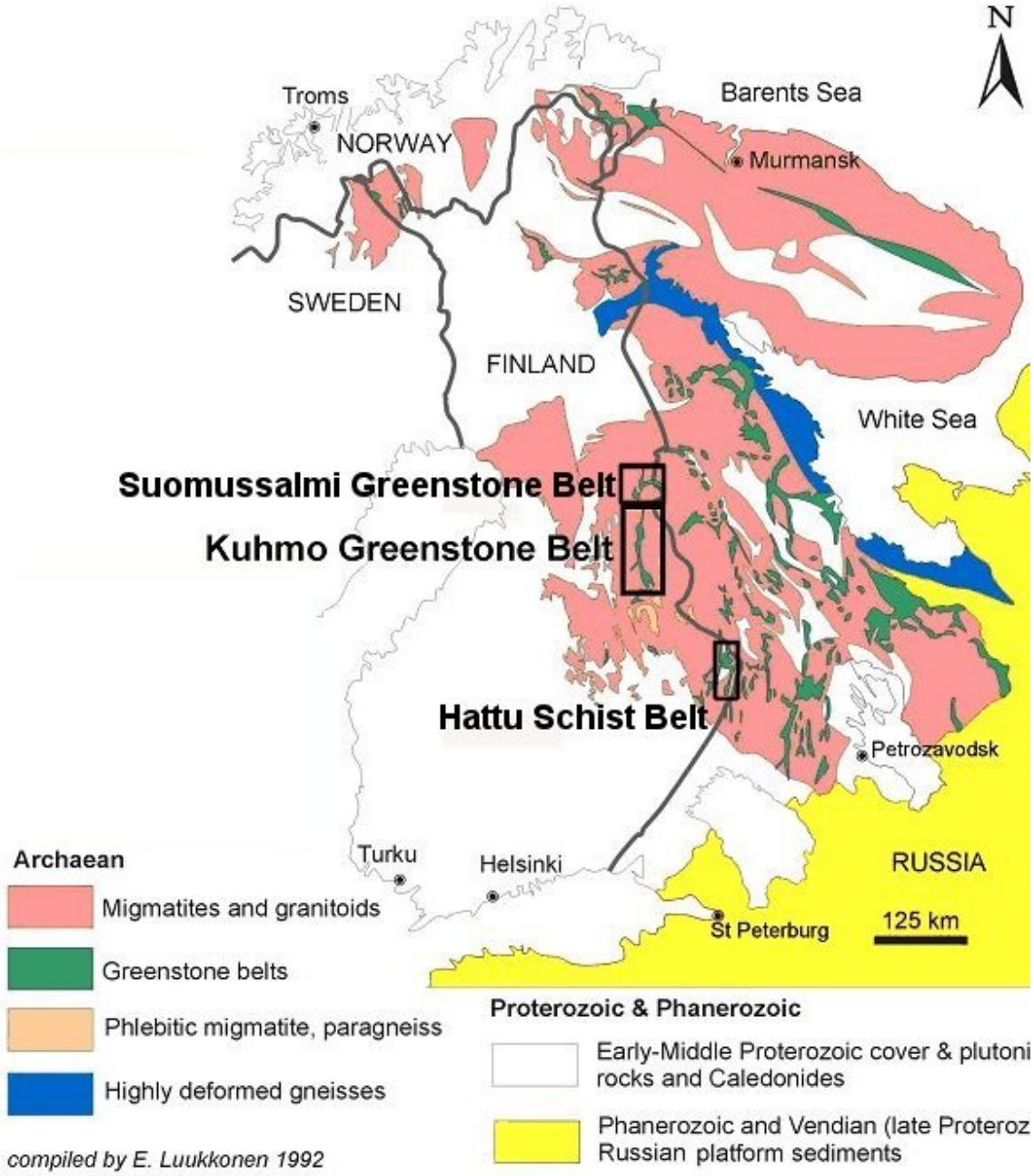
Banded, intermediate and mafic metatuffite hosting gold mineralisation at Moukkori. The hammer handle is 60 cm long. Photo Pasi Eilu 14/9/1998.

Auriferous quartz veins in intermediate(?) volcanic rock. Photo Pasi Eilu, 2005:

Auriferous quartz veins in intermediate(?) volcanic rock. Photo Pasi Eilu, 2005:



East Finland greenstone belts in the Archaean of Fennoscandia:



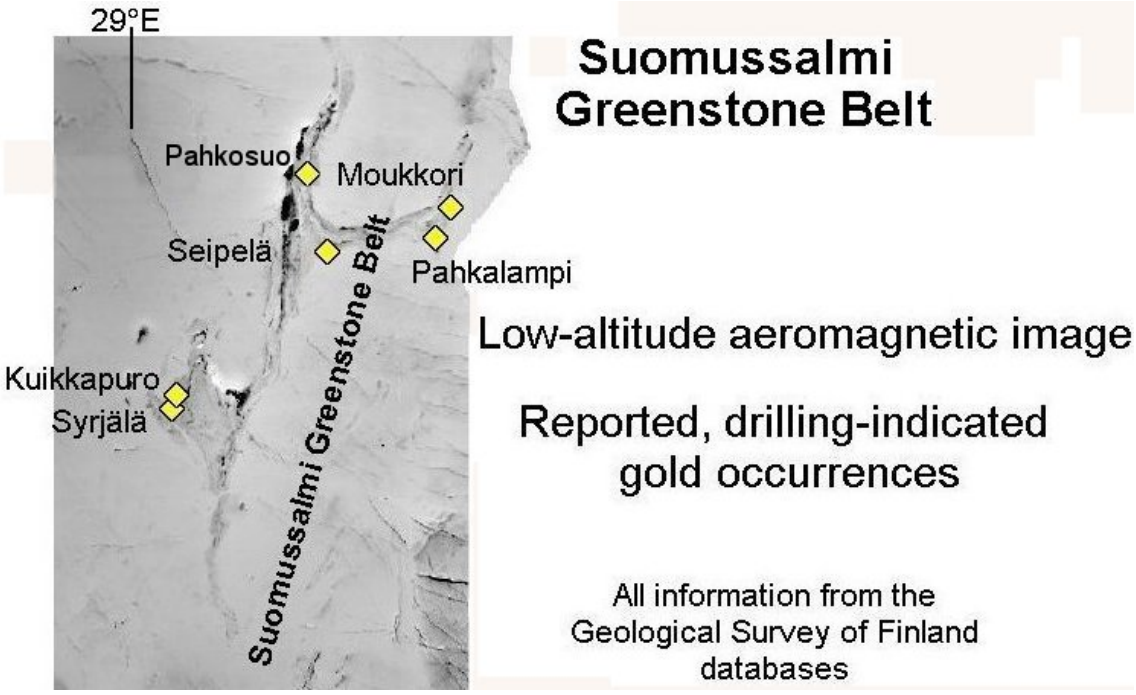
Auriferous quartz vein, a hand sample:

Auriferous quartz vein with minor pyrrhotite and scheelite in metavolcanic host rock at Moukkori. Photo Tero Niiranen.

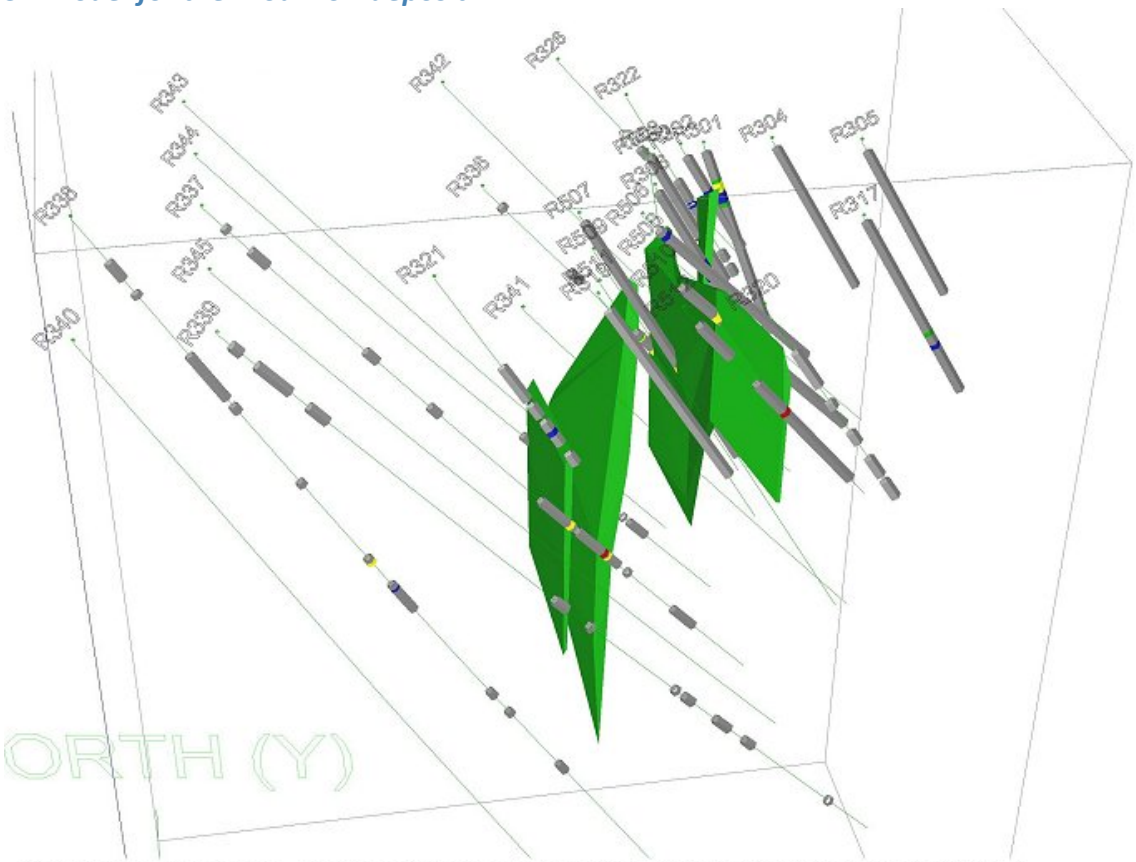
Mineralised outcrop in exploration trench:

Part of the main exploration trench at Moukkori, Suomussalmi. Gold mineralisation in rusty areas. The width of the trench varies between 5 and 10 m.
Photo Pasi Eilu 14/9/1998.

Suomussalmi greenstone belt: aeromagnetic image and gold occurrences:

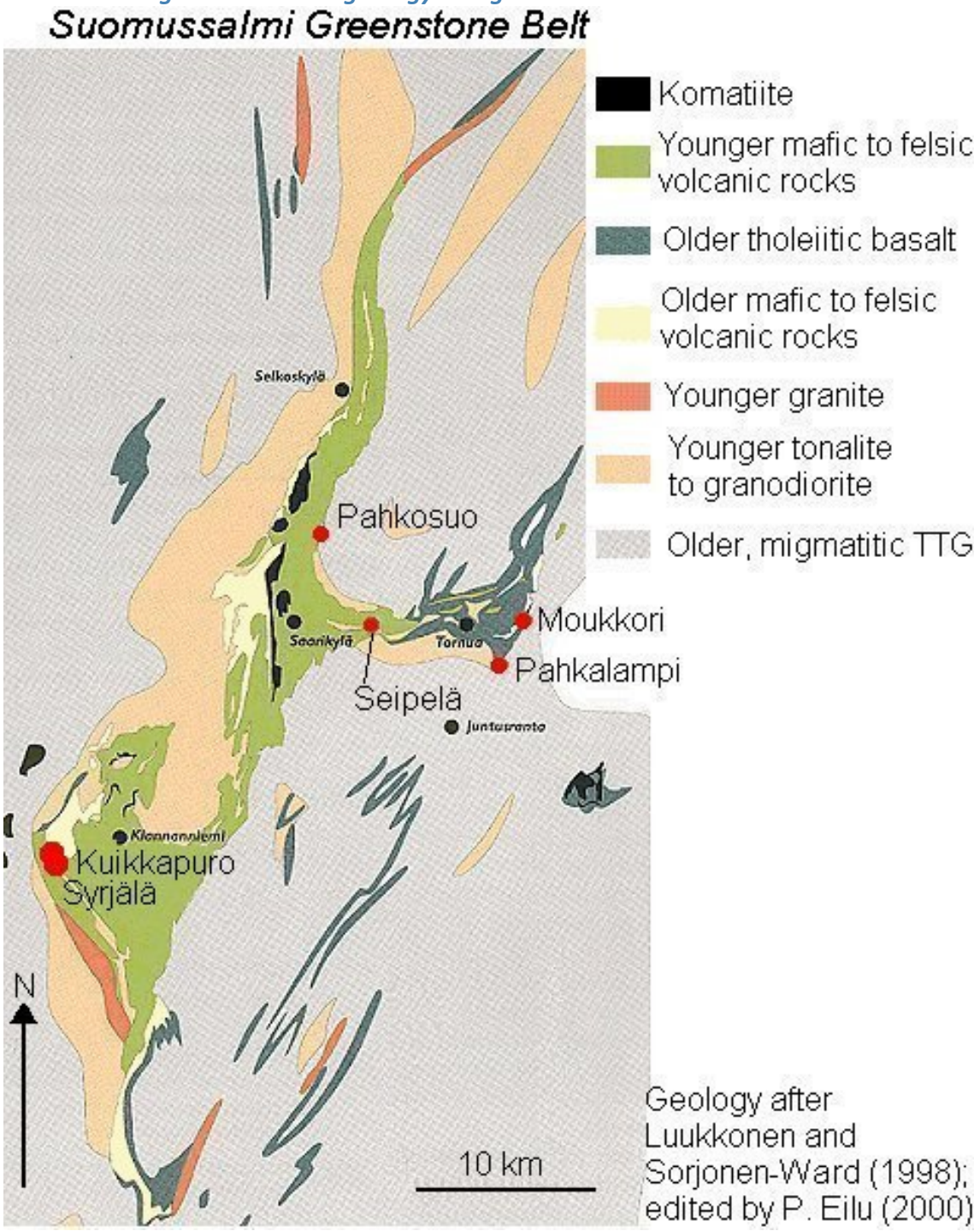


3D model for the Moukkori deposit:



Moukkori (Housuvaara), Suomussalmi Greenstone Belt. Drilling at and a 3D model of the deposit. Lodes are marked by green. Field of view 250 m. Parkkinen (2001)

Suomussalmi greenstone belt geology and gold occurrences:



Geology after Luukkonen and Sorjonen-Ward (1998); edited by P. Eilu (2000)

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