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PROGRAMME AND EXTENDED ABSTRACTS

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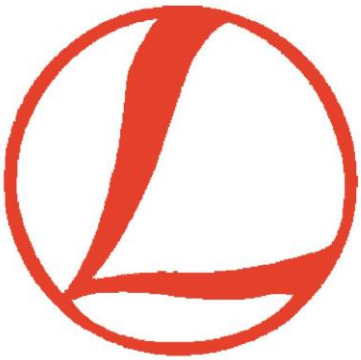
Ilmo Kukkonen, Suvi Heinonen, Hanna Silvennoinen, Fredrik Karell, Elena Kozlovskaya, Arto Luttinen, Kaisa Nikkilä, Vesa Nykänen, Markku Poutanen, Pietari Skyttä, Eija Tanskanen, Timo Tiira and Kati Oinonen



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Characterisation of the structural evolution and structural control of the gold mineralisations in the Kullaa area, SW Finland

J. Kara[1], J. Manninen[1], T. Leskelä[1], P. Skyttä[1], M. Väisänen[1], M. Tiainen[2] and H. Leväniemi[2]

[1] Department of Geography and Geology, University of Turku, FI-20014 Turku, Finland
[2] Geological Survey of Finland, P.O. Box 96, FI-02151 Espoo, Finland
E-mail: jkmkar@utu.fi

Field work was conducted in the Kullaa area in SW Finland to study the tectonic evolution and structural setting of the gold mineralisations in the area. Our structural data and interpretation recognises the structural complexity associated with the mineralised zone. We suggest that the NE-SW trending faults in association with the second-order structures related to the NW-SE trending Kynsikangas shear zone have controlled the precipitation of the gold-bearing fluids.

Keywords: Shear zone, gold mineralization, Svecofennian orogeny, structural geology

1. Introduction

The Kullaa area, located in SW Finland, is characterised by several known gold occurrences (Kärkkäinen et al. 2016 and references therein) and a complex tectonic history (e.g., Pietikäinen 1994). It belongs to the central part of the 1.90-1.80 Ga Svecofennian orogen and it has been suggested that it is the western continuation of the high-grade Pirkanmaa belt (Kähkönen 2005, Nironen et al. 2016, Lahtinen et al. 2017). The area has been utilised for a small scale gold exploration since 1950s by Outokumpu Company (Eilu & Pankka 2009) and more extensively after late 1990s by the Geological Survey of Finland (Kärkkäinen et al. 2012). However, previous research has mainly focused on the geochemical features of the mineralisations and the tectonic evolution at both regional and target scales have remained ambiguous. In this study we focus on the structural evolution of the area and the structural control of the mineralisations.

The study is part of a joint-project between the Geological Survey of Finland and the University of Turku focusing on the spatial distribution of the known gold occurrences and their genetic linkage to the evolution of the regional-scale structures and lithologies in SW Finland (see also Leskelä et al. 2018, Pitkälä et al. 2018, this issue).

2. Geological setting

The study area is located within the Pomarkku block (Pietikäinen 1994) which lies between the Central Finland Granitoid Complex (CFGC) and the Satakunta sandstone basin (Fig. 1). The study area consists mostly of syn-tectonic granitoids which have intruded into the Svecofennian supracrustal rocks; paraschists and -gneisses, and mafic to intermediate metavolcanic rocks and black schists. Gabbros and diorites occur as small intrusive bodies. The Pomarkku block is bordered by two crustal scale NW-SE striking high-strain zones: the sinistral strike-slip Kynsikangas shear zone in the south (Pietikäinen 1994, this study) and the dextral oblique Kankaanpää shear zone in the north (Pajunen et al. 2008, this study). The internal structure of the Pomarkku block is characterised by E-W to ENE-WSW structural trends, including horizontal to sub-horizontal mineral-stretching lineations which are deflected towards the sub-vertical Kynsikangas zone in the south-west (Pajunen et al. 2001, Pajunen et al. 2008, Fig. 2). The bedrock of Kullaa has been metamorphosed under upper amphibolite facies condition during the regional metamorphic peak (Pietikäinen 1994, Hölttä & Heilimo 2017). The age of the metamorphisms in the area is, however, not known.

Four gold mineralizations have been identified from the area: Saarijärvi, Silmusuo, Välimäki and Kultakallio (Fig. 2). Gold occurs mostly in narrow shear zones and in narrow quartz veins of different generations within deformed and altered mafic rocks (Kärkkäinen et al. 2012).

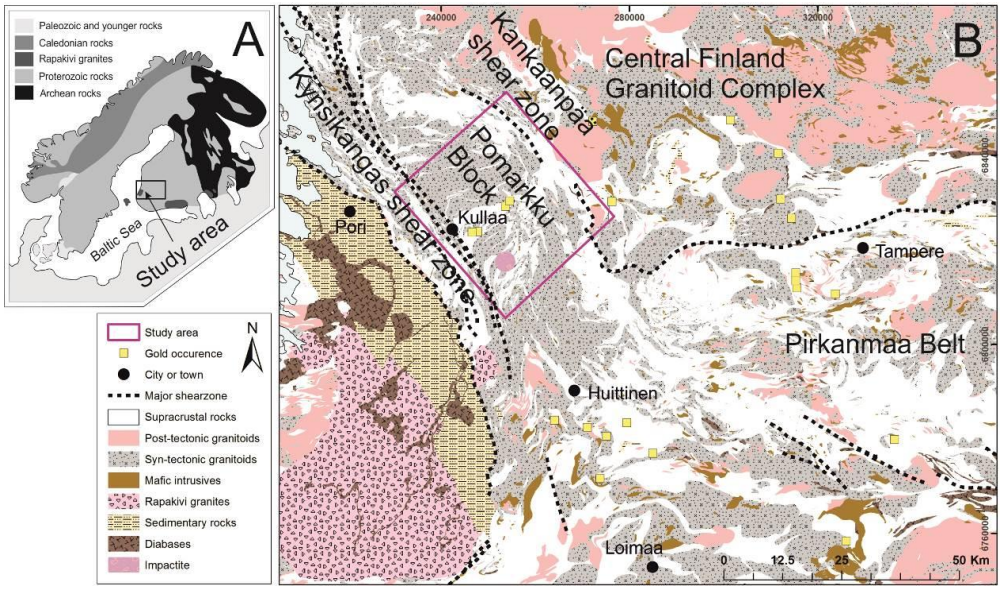

Fig. 1. A) Geological overview of the Fennoscandian shield (Koistinen et al. 2001). B) Generalised lithological map of the study area and surroundings. Geological data modified after ©Geological Survey of Finland.

3. Results

During the field work 180 measurements on lineations and fold axes and 281 measurements on foliations and axial planes were conducted. The formline map of the structural trends was composed based on the observations and the aeromagnetic map from the area (Fig. 2). The homogeneously distributed structural data from the northern part of the Pomarkku block provides the reference for the gold deposits, where the spatially associated foliation data shows more scatter, reflecting greater structural heterogeneity.

4. Discussion and conclusions

The northern part of the study area shows very gently inclined lineations and foliations which stay constant over the area. This indicates that the northern part has acted as a single block (Pajunen et al. 2008). By contrast, the dominant structural trend within the gold mineralisations is striking to NE-SW, which Kärkkäinen et al. (2016) attributed to a NE-SW striking shear zone. Our structural data and interpretation further recognizes the structural complexity associated with the mineralized zone, including NE-SW trending ductile fabrics obliquely overprinting the dominant ENE-WSW structural trends. We attribute the above NE-SW features to the presence of set of NE-SW trending faults providing the conduits for the gold-bearing fluids. The exact location of the gold mineralization have been controlled by the interplay between the NE-SW zone and second-order deformation zones related to the approximately orthogonal, NW-SW trending Kynsikangas shear zone.

In the future, U-Pb zircon dating will be performed on leucosome vein collected from a migmatised paragneiss to determine the age of metamorphism within the area

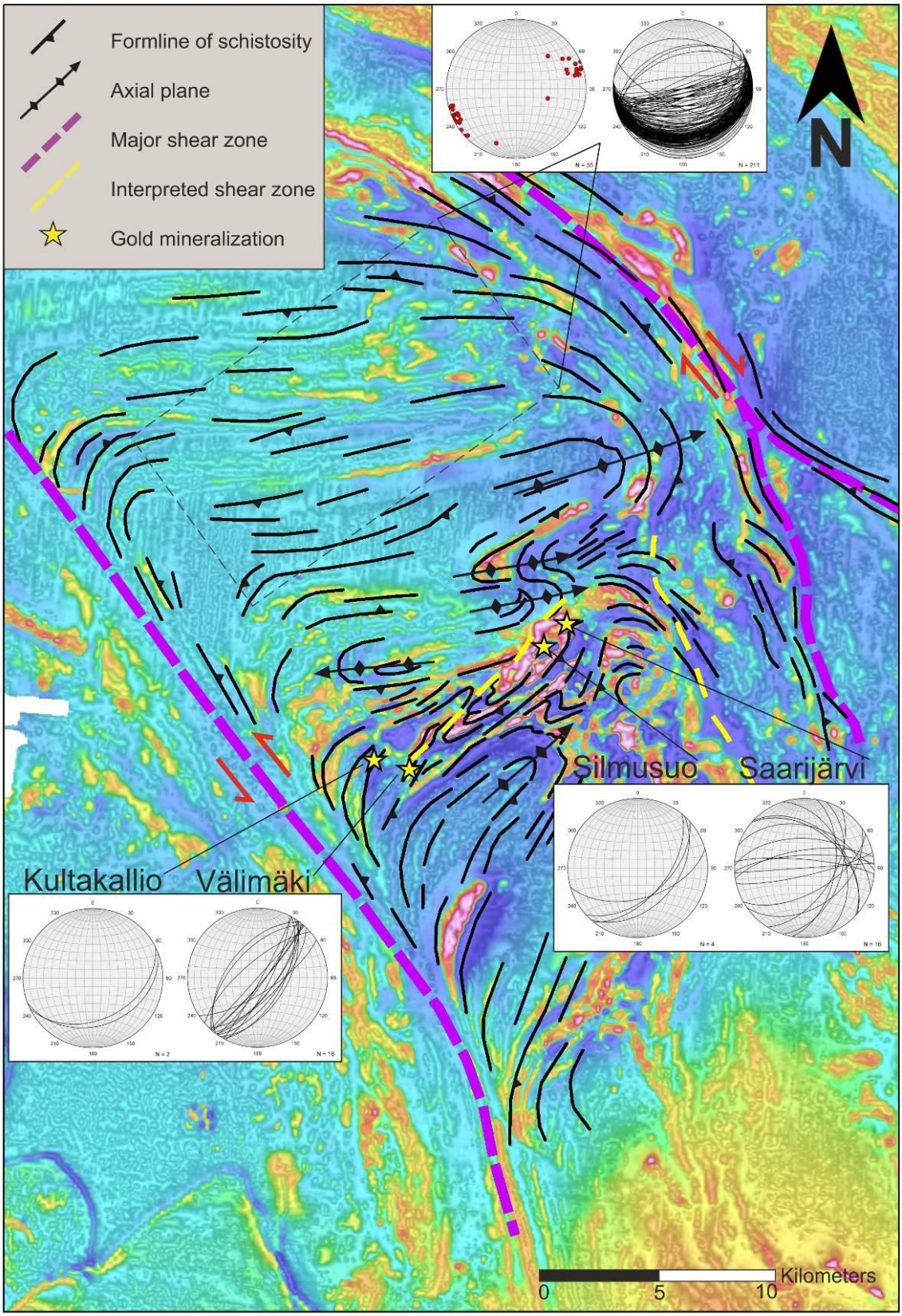

Figure 2. The formline map of the study area with Tilt Derivate (TDR) processed aeromagnetic map ©Geological Survey of Finland. Stereographic projections for the foliation data from each gold occurrence and for foliation and lineation data (red dots) from northern part of the study area for comparison.

Acknowledgements
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