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SOM guided fuzzy logic prospectivity model for gold in the Häme Belt, southwestern Finland

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**ABSTRACT**

This study investigated gold prospectivity in the Paleoproterozoic Häme Belt, located in southwestern Finland. The Häme Belt comprises calc-alkaline and tholeitic volcanic rocks, migmatites, granitoids, and mafic to ultramafic intrusions. Mineral exploration in the region has resulted in the discovery of several gold occurrences during recent decades; however, no prospectivity modeling for gold has yet been conducted. This study integrated till geochemical and geophysical data to examine and extract data characteristics critical for gold occurrences. Modeling was guided by self-organizing map (SOM) analysis to define essential data associations and to aid in model input data selection and generation. The final fuzzy logic prospectivity model map yielded high predictability values for most known Au or Cu-Au occurrences, but also highlighted new targets for exploration.

**Keywords**: Self-organizing maps; fuzzy logic; prospectivity; gold; Häme Belt; Finland

## 1 Introduction

Finland is one of the most significant gold producers in Europe, mainly due to the large Kittilä (Suurikuusikko) Mine located in the northern part of the country. The Paleoproterozoic Häme Belt (Sipilä & Kujala, 2014) in southwestern Finland (Figure 1) also hosts one operating gold mine and several drill-core-indicated gold occurrences. The Geological Survey of Finland (GTK) has been actively working on the Häme Belt for the last decade in order to determine the region's mineral potential and mineralization characteristics. These studies have included updating of the bedrock map (Sipilä & Kujala, 2014), regional till geochemical sampling and data analysis (Kärkkäinen et al., 2012), target-scale ore exploration (e.g. Kärkkäinen et al., 2006: Tiainen et al., 2012), and airborne (Hautaniemi et al., 2005; Lohva & Jokinen, 2012) and ground geophysical surveys.

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