Deep electromagnetic imaging of a Paleoproterozoic failed rift – the Fennoscandian Kuusamo Shist Belt and its mineral system

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SUMMARY

The Kuusamo schist belt (KuSB) hosts ca 20 Co-Au deposits with potential for future discoveries. However, belt-scale structures of the KuSB and their role in the mineralization processes are enigmatic. The KuSB belt was formed as a failed rift (2.50-1.94 Ga) with basin inversion following (multiple events, 1.90-1.75), cf. [1]. Ca 160 magnetotelluric stations were collected to illuminate the deep root of the rift and shed light on its connection with the KuSB mineral system. As a result, we present the first 3D geo-electric model of the KuSB that exhibits a resistive upper crust, decreased only by interruptions by fault structures, while in the NW, the middle crust is conductive. In addition, from airborne magnetic data a regional 3D magnetic susceptibility model was created showing high magnetic susceptibility in the NW. Electrical and susceptibility images are geometrically mutually consistent. They correlate well with surface metamorphism and stratigraphic observations, which were earlier used to posit the existence the blind Kitka fault [2]. We interpret that the NW block was uplifted several kilometers compared to the SE block during reactivation of the Kitka fault, not only supporting the fault hypothesis, but reinforcing the role of Kitka as a major, deep reaching crustal structure, which possibly constitutes the original rift axis. The Kitka fault is interpreted as a pathway for metallogenic fluid transport, exerting major control on the KuSB mineralization.

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