

Multi-mineral geochronology as a means of understanding fluid assisted reworking: in situ Lu-Hf applied to the Hattu Schist belt, eastern Finland

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The Ilomantsi Greenstone Belt of the Archean Karelian Province in eastern Finland (Fig 1A) records amphibolite facies metamorphism at 2.66-2.62 Ga with overprinting at 1.84 Ga based on resetting of monazite ages [1] (Fig. 1C). The Hattu Schist Belt occurs within the Ilomantsi Greenstone Belt and is host to Archean orogenic gold deposits. Two samples from the Hosko gold deposit were dated by in situ garnet Lu-Hf. In mineralised sediments (sample HOS38, Fig 1B), garnet associated with vein quartz produced an age of 1837 ± 16 Ma. Garnet in a granitic vein cross-cutting the gold hosting sediments (sample ASKA 14, Fig 1D) gave an age of 2620 ± 24 Ma. This sample clearly recorded a resetting event with younger ages obtained from the rim. Mineral chemistry also indicates distinct compositional differences between core and rim garnet and white mica associated with garnet also contains clear cores and rims based on Si content (Fig. 1D). Garnet P-T modelling indicates conditions of at least 450 °C and 2 kbar during growth of garnet rims. Existing K-Ar data from the Ilomantsi region indicate ages of ca. 1.8 Ga for biotite and 2.7 to 1.9 Ga for hornblende [2]. This is consistent with our results, suggesting a >400°C (biotite closure T) but less than 600 °C (hornblende closure T) conditions for the 1.8 Ga event.

The results presented here indicate that the Svecofennian had a larger role in reworking mineralisation at slightly higher P-T conditions than previously thought (i.e. [3]).

[1] Hölttä, P., 2017. Geological Society, London, Special Publication 449, 231-250.

[2] Kontinen, A., 1992. Geological Survey of Finland, Bulletin 365.

[3] Molnár, F., 2016. Economic Geology, 111, 1659-1703.

