Geophysical Research Abstracts
Vol. 21, EGU2019-15490, 2019
EGU General Assembly 2019

Gold as tracer of fluid flow during exhumation of the Variscan orogenic root in the Canigou massif (Eastern Pyrénées, France)

Gaétan Link (1), Olivier Vanderhaeghe (1), Didier Béziat (1), Laurent Guillou-Frottier (2), Eric Gloaguen (2), and Jérémie Melleton (2)

(1) UMR 5563 GET, Université Paul Sabatier-Toulouse III/CNRS/IRD/CNES, Toulouse, France (gaetan.link@get.omp.eu), (2) UMR 7327 ISTO, Université d'Orléans/CNRS/BRGM, Orléans, France

Orogenic gold is attributed to element mobilization, transfer, and deposit linked to circulation of magmatic and metamorphic fluids through transcrustal fault system at a rate faster than metamorphic reactions (Ague, 2014; Goldfarb & Groves, 2015). In order to test this model, we combine detailed structural and petrological studies of gold orebodies of the Canigou massif (Eastern Pyrénées, France) and their host rock at local and regional scales. By using this approach, we are able to replace the time and the space scale of the fluid flow relative to the tectonic and metamorphic evolution of the orogenic crust.

The Canigou massif, characterized by a LP/HT tectonic-metamorphic event of Variscan age, exposes a migmatitic infrastructure and a weakly metamorphosed suprastructure dominated by pelitic schists. These two units are juxtaposed along a mylonitic contact associated with an attenuation of metamorphic isograds. Peak temperatures of 610°C and 450°C are obtained by RSCM in the infrastructure and suprastructure, respectively. Transposition of the main foliation into vertical shear zones is associated with retrogression of the suprastructure at 0.15-0.35 GPa / 350-400°C. These shear zones are rooted in the migmatitic level and are associated with the collect of granitic magmas and the precipitation of quartz veins. Gold mineralizations are hosted by quartz-arsenopyrite veins, highly deformed and localized in these vertical shear zones. Quartz microstructures show a dynamic recrystallization in the ductile regime (> 400°C). The temperature of the arsenopyrite crystallization was estimated at ca. 450°C (Polizzi, 1990). Although the ore-forming fluid flow is coeval with the retrograde metamorphism event, the temperature of the fluid circulation in the veins is higher than the temperature conditions of the host rock.

Based on these data, we propose that the gold-ore forming fluids circulated upward from the infrastructure to the suprastructure through vertical shear zones during retrogression of the suprastructure and exhumation of the infrastructure.