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Discrete building of felsic magma chambers with implications from ore genesis to crustal growth

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Structural and geophysical data, geochemistry and age determinations make quite evident that felsic magma chambers were built from successive and discrete magma inputs. They do not result from the chemical evolution of a large volume of magma that progressively differentiates and fractionates. The discrete nature of the intrusions results from complex interaction between melting, rheology of the partially molten rocks and deformation.

Thermal perturbations induced by the successive magma inputs bear consequences in terms of elements exchange through generalised diffusion and elements partitioning. However, those are restricted to a metric scale. Successive intrusions also modify the mode and composition of fluid exsolution (first and second boiling). The later provides the conditions for metals segregation and transport. It thus determines the future formation of ore bodies.

The sequence, volume and order of the successive magma inputs is important in defining a more or less continuous suite of intrusions or a nearly chaotic magma suite. At present, the chemical aspects of successive intrusions have not yet been seriously considered for the petrological history of a magma chamber.

The rate of magma input also determines the bulk importance of magmatism in transferring elements toward the upper crust. Two major types of felsic magmatism have

been identified. One is related to plates convergence, leading to hb-bt-bearing granitoids. The second is associated to continent-continent collision, and results in mu-bt granitic magmas. The magmatic rate of each type is examined and compared with crustal growth rates.