



Granites and Associated Basic Rocks in the Stavsjö Area, Sweden: a Historical Magma Mixing Province Revisited

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The Stavsjö Plutonic Complex (some 115 kms SW of Stockholm) consists of a variety of granites with associated noritic to intermediate rocks of still uncertain Proterozoic age (Wikström et al., 1980, *Sv. Geol. Unders.*). This plutonic complex shows very well preserved primary magmatic structures, mostly post- to late-orogenic in relation to the Svecofennian Event, however locally affected by Svecofennian Deformation (Högdahl et al., 2004, *Geol. Surv. Finn.SP*). As the concept of a coherent Svecofennian orogeny is now under discussion (e.g. Lahtinen, 2008, *Episodes*), the position of the Stavsjö intrusion in that context is uncertain.

In the early 1920's (Asklund, 1925, *Sv. Geol. Unders*; Bowen, 1928: 13–19, *Princ.Univ.*) this complex was the focus of petrologic studies and discussion. Asklund's first descriptions and petrologic considerations point towards a new hypothesis of differentiation which diverged from Bowen's classical fractional crystallization.

Later studies from Wikström et al. (1980, *Sv. Geol. Unders.*) indicate that the norite interacts with the granite to form intermediate rocks although the magma mixing and mingling process was not understood at that time.

In this work we confirm this interaction with results from detailed field work aiming a closer petrologic mapping of the impact zones between norite and granite. Several magmatic features, which are typical for magma mixing processes, will be described, such as: viscous fingering, side by side diffusive gradational and abrupt contacts, pillow-like structures, enclave swarms showing differential hybridization along main magmatic flow directions and/or surrounding contrasting convection cells, *rapakivi*-like textures in feldspars, disequilibrium- and corona-textures around pyroxene, amphibole and/or biotite.

Interaction patterns show a scale invariance (or fractal) nature. This will be documented, for example, through the repetition of similar cauliflower structures in viscous fingers from centimetre to kilometre scales.

Our observations indicate that along compositional gradients (i.e. contact surfaces between volumes of magma with different compositions) highly heterogeneous hybrid melts can co-exist in the same system in space and time. The Stavsjö Plutonic Complex is therefore a clear natural example, confirming recent results from experimental studies on the complexity of the magma mixing process (De Campos, Perugini et al., 2010, *Cont. Min. Petrol.* on-line ed.).