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Stratified Magma Chambers Versus Granitization in the Central Bohemian Plutonic Complex (CBPC)

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It is well known from gravimetric data that the NW and N parts of CBPC of Lower Carboniferous age (Holub et al. 1997) comprise some great volumes of mafic rocks in some depth. On the surface, there are isolated bodies of gabbroic to dioritic rocks and enclave swarms surrounded by prevailing granitoids of the calc-alkaline (the Sázava type) and the high-K calc-alkaline to shoshonitic series (the Kozárovice, Blatná and "marginal" types).

In the Příbram area in NW margin of CBPC, Vlašímský has found that volumes of mafic rocks increase with depth. From investigation of many mining works he was able to draw a profile with some subhorizontal or gently dipping enclave-rich layers, forming a "shallow synclinal structure", and some subvertical mafic bodies within the granitoid complex. Such a structure has been interpreted in terms of "relict stratigraphy" and granitisation hypothesis (Vlašímský et al. 1992; Vlašímský 1993). Accordingly, the mafic enclaves (referred to as "amphibole hornfelses" by Vlašímský or "granitised basic xenoliths" by Patočka) represent strata of Cambrian volcanic and pyroclastic rocks interbedded with sediments (now granitoids) and intruded by pre-granitisation subvolcanic mafic stocks and dikes (now the subvertical gabbroic to dioritic masses). The major process responsible for changing the volcanic and sedimentary rocks to granitoids and mafic plutonites is called the "isochemical granitisation in situ" (see Palivcová et al. 1989; Vlašímský et al. 1992).

Recently, extensive mining works for the artificial reservoir of gas in NW marginal part of CBPC near Příbram, about 1 km below the present surface, enabled us to evaluate the granitisation hypothesis and to suggest a new explanation of the geological structure.

This part of CBPC is built of two granitoid groups: (1) the so-called "marginal type" of medium to coarse-grained, often porphyritic biotite to amphibole-biotite granite, containing abundant pink to reddish K-feldspar, (2) the group of variable grey-coloured amphibole-biotite to biotite granodiorites, corresponding to the Kozárovice and Blatná types, and grading into heterogeneous granodiorite to tonalite without any special local name.

Many parts of these granitoids contain huge amounts of mafic enclaves, which could be pillow-shaped or irregular and often tabular with subparallel alignment. Enclaves correspond petrographically to typical mafic microgranular enclaves (MME) with well-developed magmatic textures and no signs of metamorphic recrystallisation. Some MME are ocellar and/or display an increasing grain size from chilled margin to inner parts.

More voluminous mafic masses within the grey granitoids also occur, often surrounded by and passing to, an extreme accumulation of MME. At their contacts we may observe diverse interaction phenomena linked with various stages of granitoid and mafic magma solidification. Early contacts are lobate or crenulate with chilled margins of the mafic magma bodies, pillows and blobs, whereas some later stages of interaction are characterised by mechanical disruption of mafic masses and veining by granitoids with development of enclave swarms. Such enclaves are typically angular and of a block shape without the chilled margin, or with it only along one side of the inclusion.

The most important for our interpretation are those parts of the complex where the mafic and granitoid rocks are interlayered with preserved original shapes and interfaces. Gently dipping to subhorizontal mafic layers are chilled against and separated by much thinner layers of granitoid, which often display textures typical for cumulitic rocks. Basal contacts of the mafic masses are lobate with crests filled by a mobilised granitoid which sometimes form also small pipes and veins extending upward and injecting the mafic layer.

Such phenomena are fully comparable to the stratified mafic-silicic magma chambers, which have been recognised in calc-alkaline plutonic complexes in various part of the world, e.g. in Maine, USA (see Wiebe 1996 and references therein). It can be stated that similar chambers periodically injected by mafic magmas existed also in CBPC. Early mafic intrusions