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Contemporaneous arc-related magmatism and migmatization in the central part of the Svecofennian Domain in Sweden

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The Ljusdal Batholith (LjB) is a major component of the central Svecofennian domain in Sweden. It is separated from the Bothnian Basin to the north by the crustal scale 1.82-1.80 Ga Hassela Shear Zone (HSZ). Also the western and southern boundaries roughly coincide with shear zones; the 1.70 Ga Storsjön-Edsbyn Deformation Zone and the Gävle-Rättvik Zone, respectively.

The LjB has emplacement ages of 1.86-1.84 Ga, is mainly alkali-calcic, metaluminous, has ε_{Nd} values between -0.3 and +1.2, and was probably formed in a magmatic arc setting.

During the Svecokarelian/Svecofennian orogeny the LjB was affected by at least three deformation episodes. Combined with LP-HT metamorphism under generally amphibolite- or locally granulite facies conditions the porphyritic granitoids were transformed to augen-gneisses. Large-scale folded slivers of migmatised metasedimentary rocks occur in the eastern part of the batholith, and to the north of the HSZ, there is a 50 km wide migmatite belt. Three different types of migmatites exist within and to the north of LjB: 1) Stromatic migmatites. 2) Heterogeneous diatexites with variable amounts of restitic material (schollen migmatites) and schlieren-rich granites. These types often host preserved calc-silicate-rich metapsammitic fragments with mm-thick folded white phlebitic leucosome. 3) Leucocratic, more homogeneous garnet-bearing, peraluminous granites and granodiorites.

Stromatic migmatites are the most common type south of the HSZ, whereas all varieties are represented to the north of the deformation zone.

U-Pb SIMS data on zircon rims from veined migmatites and diatexites to the north and east of LjB yield ages of 1.86 Ga, i.e. coeval with the granitoids of the LjB. A melt generating metamorphic overprint at 1.82 Ga has also been recorded both to the north and south of the HSZ. Within the LjB the 1.82 Ga stromatic migmatites are folded by F2, and the fabric is truncated by 1.80 Ga pegmatites.

The BABEL-profiles across the eastwards projection of the HSZ and the LjB in the Baltic Sea show the HSZ as a 15 km wide, south dipping corridor at depth, lacking seismic reflectors (Korja & Heikkinen, 2005). The expected continuation of the migmatite belt to the north of the HSZ is recorded as a wedge shaped area similar to an accretionary wedge squeezed in front of an arc. If so, the relatively juvenile LjB granitoids represent the arc-related pluton and a subduction zone (terrane boundary at the surface) is the precursor of the 1.82-1.80 Ga HSZ.

Alternatively there is a closer relationship between the LjB and the contemporaneous migmatites, i.e. that the latter represent more shallowly derived accumulations of melts attracted by the crustal scale HSZ. Such shear zone systems are known to act as ascent pathways for sheet-like flow in convergent orogens (Brown & Solar, 1998).

In any of these cases, the continued convergence resulted in regional dextral shear folds and minor shear zones within the LjB. This shearing affected pre-existing thrusts, juxtaposing 1.86 Ga granulites and charnockites onto high amphibolite facies migmatites. This thrusting and the resulting overthickening promoted the formation of the 1.82 Ga migmatites and granites.

Brown, M & Solar,G, (1998) J. of Struct. Geol. 20, 1365-1393.

Korja, A & Heikkinen, P, (2005). Precambrian Research 136, 241-268.