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Nature and Distribution of Deep Crustal Reservoirs in the South-western Part of the Baltic Shield: Evidence from Nd, Sr and Pb Isotope Data on Late Sveconorwegian Granites

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Late Sveconorwegian ("postorogenic") granites (1.0-0.93 Ga) make up a voluminous and widespread suite of intrusions across south Norway. From radiogenic isotope data, three groups of late Sveconorwegian granites can be distinguished: 1) Granite with more than 150 ppm Sr, $^{87}Rb/^{86}Sr < 5$, $^{87}Sr/^{86}Sr_{0.93\,Ga} < 0.710$ and $\varepsilon_{Nd}<0$, 2) Granite with less than 150 ppm Sr, $^{87}Rb/^{86}Sr > 5$, $^{87}Sr/^{86}Sr_{0.93\,Ga} > 0.710$ and $\varepsilon_{Nd}<0$, and 3) Juvenile granite with $^{87}Sr/^{86}Sr_{0.93\,Ga} < 0.705$ and $\varepsilon_{Nd}<0$. Granite plutons belonging to group 1 ("normal-Sr granite") occur all over south Norway and include the largest batholiths (Østfold, Flå, Herefoss). Granite plutons of group 2 ("low-Sr granites") are restricted to north-central Telemark (Rjukan rift), and are associated with ca. 1.5 Ga Rjukan Group rhyolite. Group 3 is represented by one intrusion only but still suggests input of mantle-derived magma, or the presence of young, mantle derived rocks in the deep crust in the region at ca. 0.93 Ga. The normal-Sr granites are similar in Sr and Nd characteristics to some of the older (1.05 Ga) Sveconorwegian granitic intrusions ("augen gneisses") in the region in terms of radiogenic isotope systematics, but Pb isotopes suggest that the magmas did not form by simple remelting of augen gneiss. The Nd, Sr, and Pb isotopic systematics of the late Sveconorwegian granites indicate mixing between a depleted-mantle derived component and two or more major components with an extended crustal history. One of the crustal end members is present throughout south Norway and has an isotopic signature similar to older granitic rocks of the Trans Scandinavian Igneous Belt (TIB). The other crustal end member is indistinguishable from Rjukan Group rhyolites and slightly younger intrusions associated with these, and is restricted to areas within the mid-Proterozoic Rjukan rift. The available data suggest that the deep continental crust of south Norway, both east and west of the Permian Oslo Rift, is an integral part of the Baltic Shield, with a common history back to 1.7 to 1.9 Ga, that is, to the end of the Svecofennian orogeny and the TIB magmatism.