

Sedimentary rock record and rapakivi granite emplacement as components of rift basin evolution model

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Emplacement of the rapakivi granites and associated mafic intrusions is the latest major crustal-scale event in the eastern part of the Fennoscandian Shield. Most realistic models of anorogenic bimodal magmatism involve crustal extension with subsequent downfaulting and development of intracratonic rift basins. The range of the rapakivi intrusion ages is rather well defined (1.65-1.53 Ga). In contrast, the knowledge regarding the basin set-up, deposition and stratigraphy of the corresponding time span (c. 170 Ma) is poorly known. The presentation opens new insights both to unmetamorphic sedimentary cover pre-dating the rapakivi's and to the basin development directly (spatially and temporally) connected to the anorogenic magmatism.

Mesoproterozoic sedimentary sequences (arkose, siltstone, shale, conglomerate) are known in some ten localities within the shield area. All these occupy tectonic depressions or graben-like basins bordered by fractures or fault zones most of which are NW-SE oriented. Both the lithology (dominantly arkosic sandstones) and basin architecture of the typical examples (e.g. Satakunta, Lake Ladoga) are in accord with an overall intracratonic setting. Although the original extent of the basin system is hard to estimate reliably, the comparisons to the assumed scale of Mesoproterozoic basins of the Russian platform suggest that deposition may have been more widespread than the currently preserved deposits indicate.

A minimum age (1265 Ma) is well constrained for the Satakunta sandstone, and the results from the Lake Ladoga area indicate that sedimentation occurred here shortly after or concurrently with the emplacement of the 1560–1530 Ma Salmi rapakivi granite complex. In general, however, the depositional age of Mesoproterozoic sequences is still poorly constrained.

Special emphasis is put in re-interpretation of some classical localities (Suursaari, Taalikkala, Eräjärvi) with quartz-arenitic sandstones. It is envisaged that these represent remnants of widespread cratonic deposits pre-dating the extension manifested by mantle derived mafic dykes and – finally – rapakivi's. The evidence supports rapakivi granite emplacement in very shallow crustal depths.

In summary, all the evidence collected during the last 15 years point to two major conclusions: (1) the first supracrustal rocks directly related to 'rapakivi stage' (mafic lavas) deposited on top of quartz-arenitic rocks representing cratonic platform cover on deeply eroded Svecofennian crystalline rocks and (2) all known Mesoproterozoic sedimentary sequences can be interpreted as deposits reflecting basin formation coeval to rapakivi emplacement. Nevertheless, it is possible that the preserved Mesoproterozoic strata represent repeated rifting, complex basin configuration and multiple depositional stages.