

The Precambrian crust in the Baltic Sea region

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The Precambrian crust under the Baltic Sea represents the southeastern extension of the Fennoscandian Shield, covered by Phanerozoic sedimentary rocks up to 1.5 km thick. Sundblad et al. (2003) recognized a shift from 1.89-1.90 Ga Svecofennian crust in north and central Gotland to 1.77-1.81 Ga Transscandinavian Igneous Belt (TIB) granitoids at Kvarne on southernmost Gotland, as well as 1.49 Ga igneous activity at Grötlingbo, southern Gotland.

In this study, K-feldspar Pb-Pb isotopic results from a number of Precambrian units at 15 drill sites (mostly percussion drilling) on Gotland and adjacent offshore regions are reported, along with a U-Pb zircon age from a granitoid in an offshore drill core from Latvia. We acknowledge the Geological Surveys of Sweden and Latvia for providing access to the study material.

The least radiogenic Pb isotope signature of each sample revealed four distinct populations. Deformed granitoids east of Gotland have $^{206}\text{Pb}/^{204}\text{Pb}$ ratios as low as 15.77, comparable with the Svecofennian ore lead signature of Bergslagen, Sweden. This implies the presence of Svecofennian crust beneath the Baltic Sea 100 km west of the Latvian coast. The $^{206}\text{Pb}/^{204}\text{Pb}$ ratios from the Kvarne granite are as low as 15.81, nearly identical to the ore lead composition of TIB in the adjacent Vimmerby Batholith. This confirms the presence of TIB granitoids on the southernmost tip of Gotland. $^{206}\text{Pb}/^{204}\text{Pb}$ ratios of ~ 16.45 were recognized at several sites on southern Gotland and adjacent offshore regions, among them the 1.49 Ga Grötlingbo granite. Very high $^{206}\text{Pb}/^{204}\text{Pb}$ ratios (> 25) were recognized in a granitoid immediately adjacent to a fracture zone in offshore Latvia. This likely reflects Caledonian reactivation of the U-Pb system in a TIB granite.

The granitoid from offshore Latvia yielded a U-Pb zircon age of 1764 ± 7 Ma, which is only marginally younger than the TIB granitoids in the Växjö region, Sweden. This age, along with drill core observations from Öland and offshore Poland, may imply that TIB granitoids occur in vast areas in the southern part of the Baltic Sea.

References:

Sundblad, K., Claesson, S. & Gyllencreutz, R., 2003. Helsinki, Abstract volume, 102-106.