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Paleoproterozoic continent-arc/continent collision zones

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The Earth has cooled from Archean to Present by the loss of original heat and by decreasing production of radiogenic heat. This has led to secular evolution from depleted low-density Archean lithospheric mantle (SCLM) to more fertile denser Phanerozoic lithospheric mantle beneath continents. It is controversial whether modern subduction-type tectonics begun during Archean, Paleoproterozoic or during Neoproterozoic era when first abundant eclogites and UHP rocks occur.

The Svecofennian Orogen is one of the largest Paleoproterozoic orogens in the world covering over 1 mill. km^2. It is atypically non-linear and is suggested to have formed in four partly overlapping orogenies (1.9-1.8 Ga) including both accretionary and continent-arc/continent collision stages. Seismic reflection data reveal a crocodile structure within the thickened Archean-Proterozoic continent-arc/continent collision zone; rigid Karelian passive margin wedge has split the young and hot island arc to an upper part, thrust on the Karelian plate, and a lower part, buried under the stacked continental edge. Similar structures are found at other major 1.9-1.7 Ga Archean-Proterozoic boundaries in the Trans-Hudson Orogen, Wopmay Orogen and Yavapai province. This type of collision prevents the exhumation of subduction-related eclogites characteristic to modern continent-arc/continent collision zones. Another result is thickened crust and lithosphere, which are often attenuated during subsequent extension. During long-lived convergence and associated cooling the thick crust and the lithospheric mantle may be stabilized (e.g. Svecofennian Orogen and Yavapai province, USA).

Subduction-related processes operated in the Paleoproterozoic but the buoyant nature of the Archean lithosphere in combination with denser Paleoproterozoic lithosphere may cause the differences between Paleoproterozoic and Neoproterozoic-Phanerozoic

continent-arc/continent collision zones.