



Convergent plate margin tectonic and magmatic processes in the Archean, Western Greenland

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The Archean craton of West Greenland consists of a collage of Eoarchean (3850 Ma) to Neoproterozoic (2600 Ma) tectonic blocks that are separated by suture zones along which Archean oceans were closed. The tectonic blocks are composed mainly of an association of tonalite-trondhjemite-granodiorite (TTG) gneisses, granites, mafic volcanic rocks, and layered anorthositic intrusions. The gneisses, volcanic rocks and layered intrusions underwent multiple phases of deformation and greenschist to granulite facies metamorphism. The associations of tholeiitic basalt, boninite, picrite, mafic to ultramafic sills, anorthosite, and leucogabbro, with subduction zone geochemical signatures, are interpreted as fragments of suprasubduction zone oceanic crust, representing Archean ophiolites. The style of deformation, rock assemblages, and geochemical signatures in the Archean craton of West Greenland are similar to those in Phanerozoic orogenic belts, such as the Altai. The presence of widespread shearing in all tectonic blocks is consistent with the growth of the Archean craton of West Greenland by tectonic accretion. Partial melting of metamorphosed volcanic rocks in thickened arcs played an important role in the origin of TTGs. Field relationships, structural patterns, the composition of intrusive and extrusive magmatic rocks, and metamorphic processes recorded in the Archean craton of West Greenland, as well as those in other Archean cratons, are collectively consistent with the operation of plate tectonics throughout the Archean.