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Model Forming of Mesoarchean Gridino Mafic Dyke Swarm during Subduction "Mid-Ocean Ridge – Continent"

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The high-pressure metamorphosed Gridino dyke swarm comprises a major group of Mesoarchean 2.87–2.82 Ga mafic dykes intruded within the Mesoarchean continental crust of the Kola craton (the Belomorian tectonic province of the Archean nucleus of the Fennoscandian Shield). An injection of mafic magma into the Kola active continental margin setting, recorded by the Gridino dyke swarm, is attributed to subduction of a mid-ocean ridge, commencing at 2.87 Ga (Mints et al., 2014). The Gridino dykes range from undeformed to strongly deformed. Undeformed dykes have intrusive contacts and crosscut the felsic gneiss. Deformed dykes vary in thickness and degree of deformation, including folding, boudinage and migmatization. Extreme deformation of the dykes led to their breakup into pods and lenses concordant with the foliation of the host gneisses. Eclogitized mafic dykes crosscut a brittle-plastic tectonic breccia on the Izbnya Luda island (VGS-84: N 65°54', E 34°45'). Regular oriented apophyses of the dykes and their brittle displacements are evidences of dyke emplacement during brittle deformations within an upper level of the crust at 3–5 kbar but no deeper.

Here is present a model of seismic brittle-plastic deformations and following intrusions of mafic magma in the Mesoarchean subduction zone. At plugging of a

spreading center in the subduction zone, excess stress has been and compression deformations have been realized as tectonic breccia. Excess stress have been removed due to stretching forces of spreading center and a subduction window forming. Modern analog is a flat subduction of Cocos mid-ocean ridge under Caribbean plate (Johnston, Thorkelson, 1997). The subduction window has become a source of mafic melts between 2.87–2.82 Ga ago. During this time span the subduction window expanded, several generation of mafic dykes were injected which occupied an increasingly wide area. Mantle magmas interacted with Kola continental rocks and metamorphism, anatexis with synplutonic felsic magma forming took place. Subduction processes were recommenced at 2.82 Ga ago and closed crustal delamination and subsequent involvement of the lower crust in subduction between 2.87 and 2.82 Ga ago caused high-pressure metamorphism of the Gridino dykes between 2.82 and 2.74 Ga.

References

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