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Palaeointensity determinations on rocks from the Achaean-Paleoproterozoic dykes from the Karelian craton

Valera Shcherbakov (1,3), Valentina Shcherbakova (1), Natalia Lubnina (2), Grigory Zhidkov (1), and Vladimir Tsel'movich (1)

(1) Institute of Physics of the Earth of RAS, Geophysical Observatory Borok, Nekouzskiy region Yaroslavskaya oblast, Russian Federation (shcherbakovv@list.ru), (3) Institute of Geology and Petroleum Technologies, Kazan (Volga region) Federal University, (2) Geological Department, Lomonosov State University, Moscow

The Karelian craton was a fragment of either an earlier late Archean supercontinent, sometimes referred to as Kenorland. Now the craton is a large Archean composite granite-greenstone terrane in the eastern part of the Fennoscandian Shield bounded by Paleoproterozoic Svecofennian orogen in the south-west and by Lapland-Kola orogen in the north-east and Belomorian province in the east–north-east. Ma[U+FB01]c dykes, volcanic rocks, sills, and layered intrusions with ages of ca. 2.51–2.45 Ga and ca. 2.06–1.95 Ga are widespread and well-studied in the Karelian Craton. Paleointensity (Banc) results obtained on the Shala dike (age of 2504 Ma by U-Pb, ID TIMS) tracked near vl. Shala and on the Deda island are discussed here. Eighteen block samples of gabbronotires were collected in two sites in the Shala quarry. Stepwise thermal demagnetization ($\leq$ 20 steps, up to 600 [U+F0B0]C) and stepwise AF demagnetization were done. To monitor possible mineralogical changes during thermal cleaning, magnetic susceptibility was measured after each heating step. Intensive rock magnetic investigations and thermal palaeointensity experiments using the Thellier-Coe (with check-points) and Wilson procedures were carried out. Electronic microscopy study of two samples was made too. For the exception of a viscous component some specimens from the contact zone of the gabbronorite dyke with thin dolerite dyke show two distinct components. The first E–NE intermediate-down direction component was separated at fields up to 50–60 mT and unblocking temperatures up to 520–540 [U+F0B0]C. The other S–SE low-down direction component is separated at fields from 60 to 100 mT and unblocking temperatures from 540 to 590–600 [U+F0B0]C. Based on the positive contact tests for the gabbronorite dyke, the S−SE shallow inclination remanence (I = -5.7 degrees) is interpreted to be of primary origin. Reliable palaeointensity determinations Banc fitting a set of selection criteria were determined on 13 samples from 2 sites carrying well-identified S–SE high-temperature components. Mean values of Banc = 49 μT and 48 μT by the Thellier-Coe and Wilson procedures, correspondingly with mean VDM = 12.6x10^{22} Am^{2} what considerably exceeds modern VDM = 7.8x10^{22} Am^{2}). Our finding is in line with the previously reported high VDM [U+F0BB] 8.4x10^{22} Am^{2} determined on the same Karelian craton for the Burakovka intrusion from mafic dikes of very close age 2450 Ma (Tarduno et al., 2003) thus supporting the idea of high Paleoproterozoic/NeoAchaean geomagnetic field intensity suggested by Tarduno et al. (2006) and Biggin et al. (2009).