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New 1.86 GA paleointensity data from the Kola peninsula intrusions, NE Fennoscandia

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The Precambrian period occupies ≈ 85% of the Earth's geological history and accommodates all the main formation stages of the Earth as a planet, including the emergence of its magnetic field. Variations in the time-averaged geomagnetic dipole moment have the potential to learn about the long-term development of the geodynamo and its response to mantle forcing and the thermal evolution of the core. But determinations of paleointensity (Banc) of the geomagnetic field during this period are sparse and of limited reliability. Here we report detailed palaeomagnetic studies, determinations of Banc and comprehensive investigations of magnetic properties have been performed with the Kola Peninsula poikilo-ophitic sill rocks of the age 1860±4 Ma (according to U-Pb ID-TIMS analysis on baddeleyite grains). The electron microscopic images of thin sections and X-ray diffractograms were also performed on these rocks. Palaeomagnetic directions calculated after stepwise thermal demagnetization yielded D=352.4, J=56.8 degrees. Rocks demonstrate thermally stable successive Msi(T) curves with clearly pronounced near-magnetite Tc. According to the thermomagnetic criterion, high-temperature pTRMs show typical SD-PSD behavior while low-temperature pTRMs demonstrate PSD-MD characteristics. Thellier palaeointensity determinations including the check-points procedure completed by the Wilson's experiments were carried out on 6 sites. Reliable Banc values give generally low palaeofield (less than 10 μT) with corresponding VDM values in the range (1.2-2.4)x10^{22} Am^2. This finding agrees with the World paleointensity databases (http://wwwbrk.adm.yar.ru/palmag/index_e.html and others) data, which also provide a noticeably low paleofield intensity with mean VDM = 3.2x10^{22} Am^2 for the the Paleo-Proterozoic period. Thus, our new data support the Proterozoic dipole low hypothesize by Biggin et al., 2009.
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