Map of "Dolerite dyke swarms and related units of Russia and selected adjacent regions"

Dyke swarm maps at a continental scale are a powerful tool for identification of large igneous provinces (LIPs), interpreting geodynamic settings, locating mantle plumes, characterizing the breakup history of supercontinents, and paleocontinental reconstructions. Such a map at 1:5 000 000 scale is now available for Canada and adjacent regions (Buchan & Ernst, 2004, Geol. Surv. Canada. Map 2022A) and has proven to be very important in this context. Preparation of a similar map for the dyke swarms of Russia and adjacent areas will undoubtedly prove equally useful.

THE MODERN VIEW OF DYKE SWARMS: In recent years there has been a revolution in the study and understanding of dyke swarms. Aeromagnetic maps reveal swarms of vast scale but simple geometry (linear and radiating). They can now be routinely dated to better than +/-5 million years precision using the U-Pb method on baddeleyite and zircon, and, in some instances, using the Ar-Ar technique. Dating indicates that many swarms are emplaced in short duration events of <10 million years. Paleomagnetic studies of precisely dated dykes can yield well constrained Apparent Polar Wander Paths (APWPs) and paleocontinental reconstructions.

CANADIAN NATIONAL DYKE SWARM MAP: The benefits of producing a Russian national dyke swarm map are well illustrated by the Canadian compilation (Buchan & Ernst 2004). This map compiles 453 swarms with an age distribution as follows: 35 Archean, 76 Paleoproterozoic, 60 Mesoproterozoic, 31 Neoproterozoic, and 162 Phanerozoic (97 Paleozoic, 27 Mesozoic, 38 Cenozoic) swarms, as well as 89 that are very poorly dated. Forty seven swarms are considered to be giant swarms because they have a length >300 km. At least 6 of these swarms are longer than 1000 km and 10 swarms have a radiating geometry (evidence for a mantle plume). The dykes are compiled from all regions and geological settings, including the Canadian Precambrian shield and Precambrian inliers, Phanerozoic cover terranes, and orogenic belts. The Canadian map shows 111 units that are related to the dyke swarms, including volcanics, sills and mafic-ultramafic intrusions. The map and associated report required about 2 ‘person years’ of work and was assembled by consulting more than 2000 detailed geological reports, and geological and aeromagnetic maps.

PROPOSAL FOR A RUSSIAN DYKE SWARM MAP: Herein we announce plans to produce a map of "Dolerite Dyke Swarms and Related Units of Russia and Selected Adjacent Regions". Based on the density and age distribution of swarms on the Canadian map, we estimate that such a map of Russia and adjacent regions would likely contain more than 700 swarms (>200 of Precambrian age and >500 of Phanerozoic age). Of these perhaps 100 would be giant swarms (>300 km in length), 10 would be >1000 km, and 20 would show a giant radiating geometry. As with the Canadian map the Russian map will undoubtedly prove to be of great use in solving fundamental tectonic and geodynamic problems.

Symposium titles

MPI-04 MPI-04 Mafic dyke swarms: A global perspective

Author Details

Ernst, Richard, Carleton University & Ernst Geosciences, Earth Sciences, Ottawa, Canada, Richard.Ernst@ErnstGeosciences.com (Presenting); Fedotov, Zh.A., Kola Science Centre, Apatity, Russian Federation, fedotov@geoksc.apatity.ru; Gladkochub, D.P., Institute of the Earth's Crust, Irkutsk, Russian Federation, gladkochub@mail.ru; Kulikov, V.S., Institute for Geology of Karelia Science Centre, Petrozavodsk, Russian Federation, vkulikova@onego.ru; Okrugin, A.V., Yakutian Institute of Geosciences, Yakutsk, Russian Federation, a.v.okrugin@diamond.ysn.ru; Pavlov, V., Institute for the Physics of the Earth, Moscow, Russian Federation, pavlov-home@rambler.ru; Puchkov, V.N., Ufimian Scientific Centre, Institute of Geology, Ufa, Russian Federation, puchkv@anrb.ru; Sharkov, E.V., IGEM, Moscow, Russian Federation, sharkov@igem.ru; Smelov, A.P., Yakutian Institute of Geosciences, Yakutsk, Russian Federation, a.p.smelov@diamond.ysn.ru; Yarmolyuk, V.V., IGEM, Moscow, Russian Federation, yarm@igem.ru; rest of Working Group, -, Russia, Russia, Russian Federation, Richard.Ernst@ErnstGeosciences.com