Geophysical Research Abstracts
Vol. 13, EGU2011-4449, 2011
EGU General Assembly 2011

Paleogeography of the Early Earth and Paleomagnetic Data

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Several paleomagnetic results from Archean and Paleoproterozoic rocks, supported by field tests, suggest that the geomagnetic field has existed since at least 3.5 Ga , and paleomagnetism is a valuable tool for ancient paleogeographic reconstructions. Paleomagnetic studies of Archean rocks are rare, but they provide the only quantitative tool to answer a fundamental question – when did the plate tectonics start? Series of coeval paleomagnetic data from different ancient cratons provide an unequivocal proof of differential movements of these cratons, or the absence of such movements. Consequently it helps to estimate a speed of plate movements and to establish the timing of such fundamental geological processes as spreading and subduction. The reconstruction of positions of Archean cratons provides a wide range of implication for understanding of Archean paleoclimate, global distribution of large igneous provinces, sedimentary basins and mineral deposits. Recent developments in paleomagnetic and rock magnetic methodology and equipment make it possible to obtain valuable results from various Archean rocks previously considered to be unsuitable. IAGA Paleomagnetic Database contains 46 Archean results including 6 highly reliable paleomagnetic poles from Superior, Wyoming, Tanzania, Pilbara and Kaapvaal cratons. Most recent Archean paleopoles were published from Russian Karelia, Australia, India and South Africa. There are several ongoing studies in various continents. Additionally, new developments in geochronology now provide precise ages for some good but previously poorly dated paleomagnetic data. At present Archean and Paleoproterozoic paleomagnetic data are useful for testing various 'non-paleomagnetic' paleogeographic hypothesis, but in few years some paleomagnetic reconstructions for these ancient times will be possible.