Palaeomagnetic configuration of continents during the Proterozoic

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Abstract

Palaeomagnetic data are used to study the configurations of continents during the Proterozoic. Applying stringent reliability criteria, the positions of the continents at 12 times in the 2.45- to 1.00-Ga period have been constructed. The continents lie predominantly in low to intermediate latitudes. The sedimentological indicators of palaeoclimate are generally consistent with the palaeomagnetic latitudes, with the exception of the Early Proterozoic, when low latitude glaciations took place on several continents.

The Proterozoic continental configurations are generally in agreement with current geological models of the evolution of the continents. The data suggest that three large continental landmasses existed during the Proterozoic. The oldest one is the Neoarchaean Kenorland, which comprised at least Laurentia, Baltica, Australia and the Kalahari craton. The protracted breakup of Kenorland during the 2.45- to 2.10-Ga interval is manifested by mafic dykes and sedimentary rift-basins on many continents. The second ‘supercontinental’ landmass is Hudsonland (also known as Columbia). On the basis of purely palaeomagnetic data, this supercontinent consisted of Laurentia, Baltica, Ukraine, Amazonia and Australia and perhaps also Siberia, North China and Kalahari. Hudsonland existed from 1.83 to ca. 1.50–1.25 Ga. The youngest assembly is the

Neoproterozoic supercontinent of Rodinia, which was formed by continent–continent collisions during ~1.10–1.00 Ga and which involved most of the continents. A new model for its assembly and configuration is presented, which suggests that multiple Grenvillian age collisions took place during 1.10–1.00 Ga. The configurations of Kenorland, Hudsonland and Rodinia depart from each other and also from the Pangaea assembly. The tectonic styles of their amalgamation are also different reflecting probable changes in sizes and thicknesses of the cratonic blocks as well as changes in the thermal conditions of the mantle through time.

Author Keywords: Palaeomagnetism; Proterozoic; Supercontinent; Mantle plume; Kenorland; Hudsonland; Columbia; Rodinia; Palaeolatitude; Palaeogeography; Accretion; Mafic dykes