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Paleomagnetism of Mesoproterozoic intrusive complexes of the Bunger Hills (East Antarctica)

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The almost complete absence of reliable paleomagnetic poles for the Precambrian of East Antarctica determines the relevance of our research. In this paper we summarize the results of a paleomagnetic study of rocks from two Mesoproterozoic basitic complexes of the Bunger Hills. It is one of the largest exposed fragments of Precambrian basement in East Antarctica. The geological structure of the Bunger Hills includes 8 complexes of metamorphic rocks from the Neoarchean to Mesoproterozoic and at least 5 complexes of Mesoproterozoic intrusive rocks.

The priority object for obtaining paleomagnetic pole was a gabbro-dolerite dike swarm aged 1131-1134 Ma [1]. The dikes are post-kinematic, weakly metamorphosed, and contain a large number of bodies. This is one of the best Precambrian geological objects of East Antarctica for paleomagnetic analysis. A total of 503 samples from 38 dikes of this complex were studied. The paleomagnetic record of gabbro-dolerites reveals high-temperature components of NRM and remagnetization circles. The mean directions of the high-temperature components of dikes form the bipolar distribution on the stereogram, but the reversal test is negative ($\gamma/\gamma c$ = 23.5/17.9). The primary nature of the components is confirmed by a positive contact test. The paleomagnetic pole calculated using 38 VGP: Plat=-23.4° Plong=263.5° A95=5.8°. This pole coincides with one of two reliable paleomagnetic poles for the Precambrian of East Antarctica – obtained of the Coats Land intrusions of similar age [2]. A rigid connection can be assumed between Mawson and the Coats Land, starting at about 1110 Ma.

The second object of our study was the largest intrusive of Bunger – the Paz Cove massif. The rocks of the massif are represented by metamorphosed quartz gabbro, monzogabbro and monzodiorite. The crystallization age of the rocks is 1170+/-4 million years, in the interval of 1170-1150 Ma the rocks were metamorphosed [3]. A total of 214 samples from 18 sites were studied. On Zijderveld diagrams can be distinguished components of NRM and remagnetization circles. Mean high-temperature components of NRM form bipolar distribution, but the reversal test is negative ($\gamma/\gamma c$ =18.3/10.7). Mean direction of distribution: D=175.2° I=-18.8° k=28.8 a95=6.6°. A positive contact test with gabbro-dolerite dikes suggests the primary nature of the remanent magnetization. The paleomagnetic pole, calculated from 18 VGP (Plat=-13.7° Plong=276.3° A95=5.3°), is close to the pole of the Bunger gabbro-dolerite complex, but differs from both it and other Mesoproterozoic poles East Antarctica. The age of the obtained pole probably corresponds to the time of partial metamorphism of the rocks; that is corresponds to the interval of 1170-1150 Ma.

Our results represent an important limit for interpreting the accretion and breakup of Rodinia with the participation of East Antarctica and demonstrate to the need to correct the paleogeodynamic models for the amalgamation of Gondwana.

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