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Paleomagnetic Data and Dyke Swarms Geometries – Important Tools for Precambrian Paleogeographic Reconstructions

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There are only two quantitative tools for Precambrian paleogeographic reconstructions – paleomagnetic data and dyke swarms geometries. Paleomagnetic data provide information about paleolatitudes and orientation of rigid continents and terranes with respect to the absolute geographical framework. Dyke swarm geometries allow to reconstruct the common configuration of currently separated pieces of continental crust, which have been parts of a single continent, or supercontinent during the time of the considering magmatic event(s). Precambrian paleomagnetic data are not yet sufficient enough to produce Apparent Polar Wander Paths (APWPs) for most Precambrian continents and reconstruct their relative position with respect to each other in the same way as it is done for Phanerozoic paleogeography. Comparison of geometries of coeval radial dyke swarms can fill this methodological gap. The presence of two coeval dyke swarms in two Proto-continents (or terranes) leads to a suggestion that these swarms are resulting from a single magmatic event, implying that these crustal blocks have been located close to each other. If this suggestion is supported by other lines of evidence, the swarms' geometries can be readjusted to each other and the original mutual orientation of these two blocks can be restored (Ernst, 2014). In combination with paleomagnetically determined paleolatitudes and absolute orientation this method provides a powerful tool for Precambrian paleogeographic reconstructions. There are several examples of this approach, e.g. Congo–São Francisco–Siberia reconstruction in Mesoproterozoic (Ernst et al., 2013) and Kola-Karelia–Superior reconstruction in Paleoproterozoic (Söderlund et al., 2010).

At present both paleomagnetic and LIPs Precambrian databases are still far from being as complete and reliable as Phanerozoic databases. Consequently, Precambrian paleogeographic reconstructions are various and constantly developing. For example, there are several different hypotheses about assembly, configuration and breakup of the Mesoproterozoic supercontinent Nuna (e.g. Zhang et al., 2012; Pisarevsky et al., 2014). The previously published reconstructions of the Neoproterozoic supercontinent Rodinia are also subjects for revisiting in view of new data (especially LIPs – related, paleomagnetic and geochronological). In this presentation I shall demonstrate some examples of new paleogeographic reconstructions and of testing older reconstructions with new data from Baltica, Amazonia, Siberia, Australia, China and North America.

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