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The Geological and Paleomagnetic Evidence for a Late Neoarchean to Early Paleoproterozoic Supercontinent

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Abstract

Late Neoarchean to early Paleoproterozoic cratons have traditionally been grouped into 'clans' distinguished by their basement ages and supracrustal volcanic-sedimentary cover successions (e.g., Bleeker 2003). However, with the recent development of the large igneous province (LIP)-barcode method of craton juxtaposition, which is based primarily on coeval U-Pb ages of mafic dyke swarms and sill provinces, has suggested a continuity of ancient crust that brings together members of separate clans. One such reconstruction is presented in Gumsley *et al*. (2017): the Vaalbara supercraton is presented immediately adjacent to the western part of Superior Craton, along with the Wyoming Craton in its rotated reconstruction south of the Superior Craton. However, it is likely that Vaalbara supercraton never existed in its present form, and that instead, one or two large continents existed at this time. If such a scenario, or 'Kenorland' supercontinent amalgamation existed in Paleoproterozoic time, it likely assembled during Neoarchean accretion. Such a model predicts a single paleomagnetic apparent polar wander (APW) path for all the constituent cratons, where all of the individual paleomagnetic poles are rotated quantitatively into the reconstruction for the duration of their tectonic continuity. This contribution evaluates the rates and styles of the

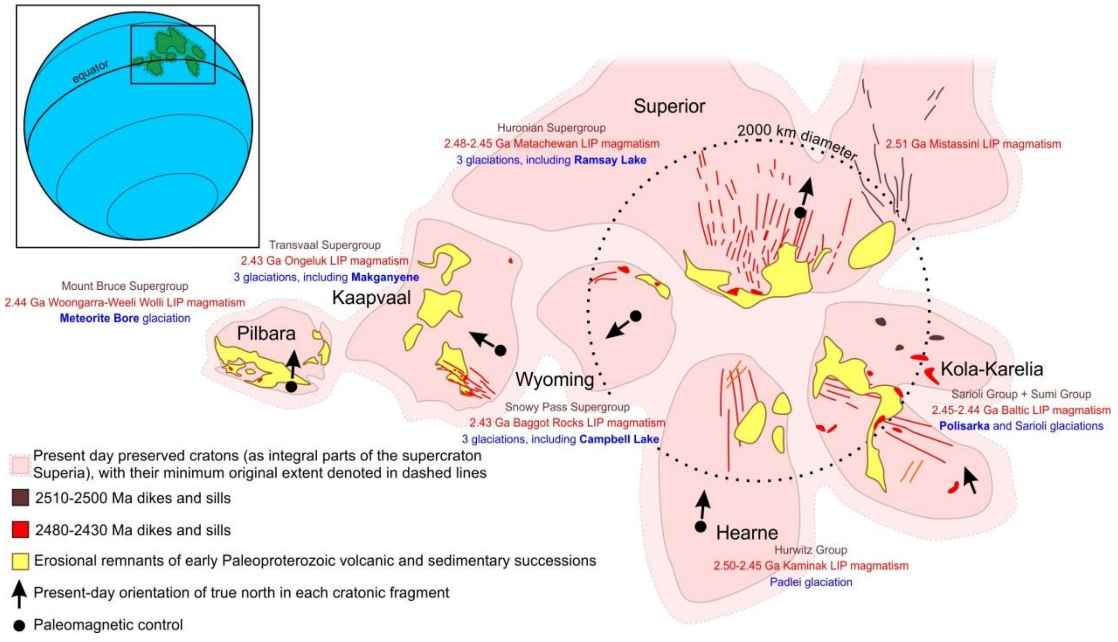

Fig. 1. The early Paleoproterozoic paleogeography of the Superior, Kola-Karelia, Hearne and Wyoming cratons as integral parts of the supercraton Superia, with the addition of the Kaapvaal and Pilbara cratons in the supercraton Vaalbara configuration. Available paleomagnetic studies indicate that the majority of the cratonic fragments (as part of supercraton Superia) were positioned near the paleo-equator. Inset: The hypothesized paleo-latitude of these Archean cratons in the early Paleoproterozoic.

APW implied by the Kenorland model scenario. While the model is consistent with geology, and a few published paleomagnetic poles of broadly similar ages, relevant high-quality data, and especially key paleomagnetic poles are sparse. Some of the motions implied by the aggregate APW path are rapid relative to typical Phanerozoic plate movement rates, but not to the extreme. One challenge to the Kenorland supercontinent model scenario is its post-breakup kinematic evolution. Cratonic juxtapositions via the LIP-barcode method present intriguing hypotheses that demand quantitative evaluation in the continuous kinematic framework provided by visualizable software packages such as GPlates.

Keywords: Archean-Paleoproterozoic, supercontinent, APW, LIP-barcode.

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