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Building upon the paleomagnetic history of mafic intrusions in the pre-North American Mid-Continent Rift system, Western Upper Peninsula of Michigan.

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The Western Upper Peninsula of Michigan (WUP), located in the north-central United States, is part of the Paleoproterozoic North American Continent accreted onto the ~2.6 Ga Superior craton. The WUP is intersected by several generations of diabase dikes associated with the ~1.1 Ga North American Mid-Continent Rift system (MCR). In addition to these dikes, recent aeromagnetic and geological surveys of the WUP have revealed multiple sets of dikes in the southeastern and north-northeastern portions of the region that trend either perpendicular or obliquely to the MCR rift axis. Geological relationships derived from stratigraphic field studies, along with paleomagnetic and geochemical analyses, suggest that these dikes predate the Keweenawan dikes of the main-stage MCR, likely dating to the early Mesoproterozoic to late Paleoproterozoic. The dikes in the southeastern part of the WUP intrude the Archean Carney Lake Gneiss Complex (CLGC) and can be subdivided into several small but distinct swarms with varying orientation and geomagnetic polarities. These findings point to a possible circumferential dike structure (Buchan and Ernst, 2019)[1] of middle Paleoproterozoic age at the locus of the CLGC. A set of dikes located directly North of the CLGC, in the Neoarchean Dickinson Group, were also sampled to test this theory and constrain the region's metamorphic conditions. Meanwhile, newly obtained geochemical data from dikes belonging to three distinct swarms in the north-central to northeastern portion of the region provide support for previous paleomagnetic interpretations linking these swarms to the earliest stages of hotspot activity which indicate the onset of the MCR. Further, new paleomagnetic and geochemical data collected from north-south trending dikes of the Huron Mountains in the northernmost portion of the northeast WUP, were analyzed to determine if they are constituent to the ~2.1 Ga Marathon dike swarm in Ontario, Canada, or evidence of fault-fracture infilling caused by the onset of the main stage MCR volcanism. We will present new results of geochemical, paleomagnetic, and rock-magnetic investigations of the pre-MCR dikes in the WUP and discuss their implications to the regional tectonic history.

[1] Buchan, K.L., Ernst, R.E. (2019). Giant Circumferential Dyke Swarms: Catalogue and Characteristics. In: Srivastava, R., Ernst, R., Peng, P. (eds) Dyke Swarms of the World: A Modern Perspective. Springer Geology. Springer, Singapore. https://doi.org/10.1007/978-981-13-1666-1_1