Variations in Mid-Continent Rift magma volumes consistent with microplate evolution

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Modeling of gravity data along the 1.1 Ga failed Mid-Continent Rift System shows consistent patterns in magma volume between and along the rift's two arms. The volume of magma increases towards the Lake Superior region, consistent with magma flowing away from a hotspot source there. The western arm experienced significantly more magmatism, which is not an obvious consequence of flow from a northern source, although not precluded. However, these patterns are consistent with a model in which the two rift arms acted as boundaries of a microplate between them. The volume of magma along the western arm increases with distance from the Euler pole, indicating that it acted essentially as a spreading ridge, whereas the much smaller magma volumes along the eastern arm are consistent with its acting as a leaky transform. This view of the rift system's evolution does not preclude its being started by a mantle plume, but is consistent with the rift being part of an evolving regional plate boundary system that resulted in a successful episode of seafloor spreading, rather than an isolated episode of midplate volcanism within the ~1.3-~0.98 Ga Grenville orogeny.

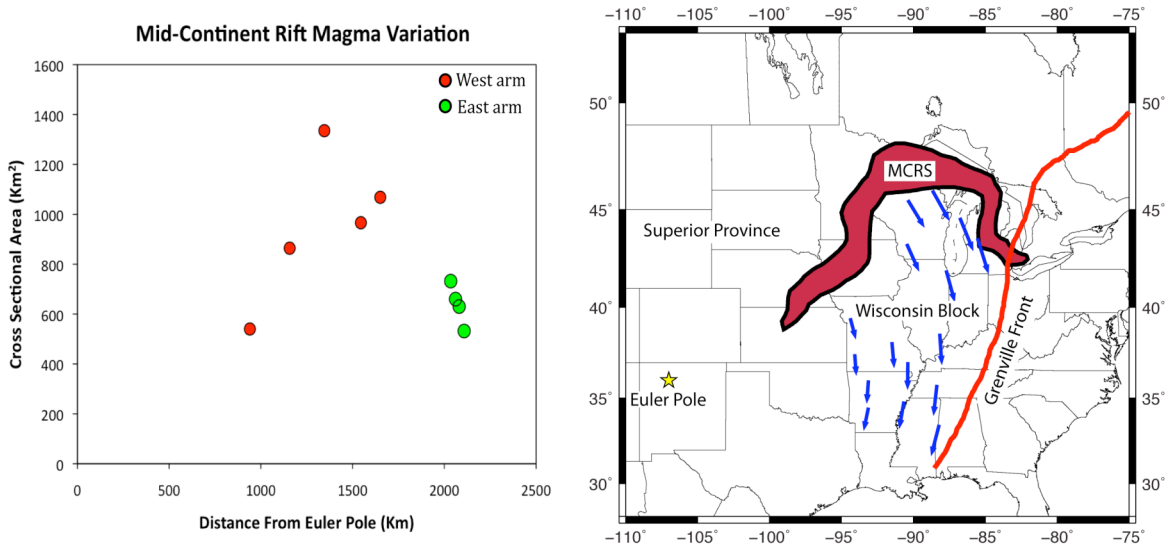

Figure 1: Left: Cross sectional magma areas in the models plotted against distance from the Euler pole. Right) Microplate model, with the Wisconsin Block rotating away from the Superior Province, consistent with the magma variations. (Merino et al., *GRL*, in press)