Tightening the Belt: Paleomagnetic-Stratigraphic Constraints on Deposition, Correlation, and Deformation of the Middle Proterozoic (ca. 1.4 Ga) Belt-Purcell Supergroup, United States and Canada

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The Belt-Purcell Supergroup crops out in Montana, Idaho, Washington, British Columbia, and Alberta. It is the largest and most intensively studied Middle Proterozoic succession in North America. A major paleomagnetic survey of the Belt-Purcell basin in Montana was carried out by the U.S. Geological Survey between 1975 and 1985, but only partial results have been published. We reanalyze these data and add new data from the Canadian part of the basin. Results come from >2700 samples (mostly red beds) from 93 localities, spanning 13 formations or members of formations. They typically exhibit stable magnetizations carried by hematite in detrital specularite grains and pigment. Coherent paleomagnetic directions have either southwest declinations and moderate positive inclinations (normal polarity) or northeast declinations and moderate negative inclinations (reverse polarity). These directions clearly pass fold and reversal tests. A stratigraphically coherent directional swing and a reproducible polarity zonation indicate that the stable magnetization is primary and was acquired during the course of deposition. U-Pb dates suggest an ~50 m.y. duration of deposition of the upper part of the Belt-Purcell Supergroup. The limited amount of apparent polar wander and the few polarity reversals across the recorded in the Belt-Purcell deposits are similar to the rates of polar wander and a long interval of stable polarity observed for the middle Cretaceous. An apparent incompatibility between early Middle Proterozoic (Elsonian) paleomagnetic poles from different regions of North America is now resolved; the Belt-Purcell poles are middle Elsonian in age and form the southern extreme point on a hairpin loop of the 1500–1400 Ma part of a refined Elsonian apparent polar wander path.