Paleomagnetic Indications for a Late Paleozoic Age for Part of the Watrous Formation, Williston Basin, Southern Saskatchewan

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There remain profound uncertainties concerning the origin, tectonics and even stratigraphy of the Williston Basin which hamper the understanding of its petroleum systems. The red bed siliciclastics and anhydrites of the Watrous Formation onlaps a major regional unconformity underlain by the deeply eroded Paleozoic carbonate succession. In an attempt at better determining the age of this non-fossiliferous formation, we sampled an oil exploration borecore for paleomagnetic study. The observed magnetic paleolatitude is compared to North America's paleolatitude history to derive the formation's age.

We sampled the Imperial Herald core (1-31-1-20W2; 49.1°N, 104.5°W). The observed remanence directions clearly separate into two groups. The A group, from depths of 5484 to 5560 ft, has positive (down) inclinations, while the B group, from 5563 to 5583 ft, negative (up) inclinations. The mean inclination of Group A is 25.0°±4.1°. This observed inclination is consistent with the expected inclination derived from the North American APWP for ages between 209 to 311 Ma. The B Group has significantly shallower inclination (-13.5°±3.8°), consistent with the APWP between 351 and 303 Ma .

The Lower Watrous recovered in the Imperial Herald core was not deposited after Triassic time, and is most likely latest Permian to Triassic in age. Furthermore, there is an unconformity which represents tens of millions of years missing near the bottom of the Watrous in this core.