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Magnetizations in Ordovician Petroleum Reservoir Rocks, Southwestern Ontario

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Paleomagnetic and rock magnetic analysis was conducted on specimens collected from vertical core in four wells drilled in two producing Ordovician petroleum reservoirs of Ontario. The rock magnetic signatures of both reservoirs are similar, a mixed combination of single domain to pseudosingle domain pyrrhotite and magnetite, with minor hematite content in a few specimens. Characteristic remanent magnetization (ChRM) directions were azimuth-corrected by aligning the viscous remanence magnetization (VRM) with the present Earth's magnetic field direction. Although four distinct ChRM populations were identified through rock magnetic analysis, combined with previous geochemical and petrologic data, only two of the populations produced reliable paleodirections; the limestone (Ls) specimens had a direction of D = 172.2˚, I = -0.1˚ (α_{95}= 33.5; N = 5; k = 6.18) and the calcite and dolomite fracture fill specimens (Cs) had a direction of D = 183.3˚, I = -10.4˚ (α_{95}= 3.8; N = 49; k = 130.71). A drilling-induced magnetization (VRMdi) affected a majority of the segments (74%) comprised of dolomitized rocks (Ds). In these segments, where the VRM correction could not be made, a paleolatitudinal arc calculated from the inclination-only mean of I= -10.2, (n= 70, α_{95}= 1.6) passes through the entire Permian and Early Triassic portions of the North American apparent polar wander path. The results provide evidence for vertically migrating fluid flow through the Trenton Group, which may have been associated with dolomitization. In isolated zones with favorably high porosity and permeability, the Cs magnetization is associated with a later Early Triassic event observed in fracture fill. Thus, dolomitization in these reservoirs occurred prior to this event, probably sometime between the late Permian (Ls age) and Early Triassic (Cs age).