

Paleomagnetic age dating of the White Pine Cu mineralization, northern Michigan, U.S.A.

Kazuo Kawasaki^{1*}, SYMONS, David², DIEHL, Jimmy F.³

¹University of Toyama, ²University of Windsor, ³Michigan Technological University

Paleomagnetic results are reported for the White Pine stratiform sedimentary copper (SSC) mineralization, northern Michigan, U.S.A. Paleomagnetic analysis of 176 specimens (19 sites) using mostly thermal step demagnetization isolated collinear characteristic remanent magnetization (ChRM) directions in both magnetite and hematite in both the SSC zones and overlying pyritic and upper zones of the Nonesuch Formation. A paleomagnetic fold test is positive, showing that the normal-polarity ChRM is pre-folding in origin. There is no statistically significant difference at 95% confidence between the tilt-corrected paleopoles for the SSC zone and the overlying unmineralized host rocks of the pyritic and upper oxidized zone of the Nonesuch Formation, indicating that the SSC mineralization is co-eval with host rock oxidation. Combining the ChRM directions from this study and from Henry et al. (1977) gives a paleopole at 7.3°N, 174.7°E (N = 29, A₉₅ = 3.0°) for the SSC mineralization and nonmineralized host rocks sites, yielding an age of 1063±8 Ma on the Keweenawan Apparent Polar Wander Path. Thus the observed paleomagnetic age is likely to date both the average age of oxidation and mineralization of the SSC zone, supporting the need for gravity-driven recharge of subsurface brines by meteoric water from adjacent highlands to supply the epigenetic oxygen and copper to form the White Pine deposit.

Keywords: Paleomagnetism, Ore Genesis, Stratiform Sedimentary Copper, Mesoproterozoic, U.S.A.