

Pb and C isotopes in Paleoproterozoic carbonates in North America: Implications for the correlation with a snowball Earth at 2.2Ga

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In the Transvaal Supergroup, South Africa, volcanic and sedimentary rocks including glacial diamictites and cap carbonates preserve geological record during late Archean to Paleoproterozoic time. A paleomagnetic study of the Transvaal Supergroup shows that the glacial diamictites were deposited within about 11 degree of the equator at 2.22 Ga [Evans et al., 1997, Nature 386, 262-266]; suggesting that the Earth was experienced global glaciation, snowball Earth condition, at this time. However, the global correlation of the Paleoproterozoic snowball Earth event has been uncertain due to lack of information on the depositional ages of glacial diamictites and cap carbonates in other area. In this study, we analyze Pb and C isotopes in the carbonate rocks of the Marquette Range in the Lake Superior region, USA, and of the Gordon lake Formation in the Huronian Supergroup, Canada, both of which are suggested as cap carbonates of glacial diamictites in each region. Our objectives are (1) to investigate the correlation of glacial diamictites and cap carbonates in North America with those in South Africa using Pb-Pb isochron ages of the carbonate rocks and (2) to characterize the serial carbon isotope variations following the snowball Earth event preserved in both carbonates and organics in the Great Lakes area.