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Oxisolic processes and geochemical constraints on duration of weathering for Neoproterozoic Baltic paleosol

Steven G. Driese^{1*}, L. Gordon Medaris, Jr.², Kalle Kirsimäe³, Peeter Somelar³, and Gary E. Stinchcomb⁴

¹Terrestrial Paleoclimatology Research Group, Department of Geosciences, Baylor University, One Bear Place #97354, Waco, Texas, USA; *E-mail: Steven_Driese@baylor.edu

²Department of Geoscience, University of Wisconsin-Madison, Madison, WI 53706 USA

³Department of Geology, Tartu University, 50411 Tartu, ESTONIA

⁴Watershed Studies Institute & Department of Geosciences, Murray State University, Murray, KY 42071 USA

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ABSTRACT

A transient greenhouse warming event during the late Neoproterozoic has been invoked to explain the incongruence of cooler temperatures and intense weathering at high latitudes. We explore this further by examining three deep weathering profiles of the Neoproterozoic Baltic paleosol (600-560 Ma). These profiles have an Oxisolic horizon dominated by quartz, kaolinite, phlogopite/vermiculite, hematite and goethite. Mass-balance calculations (assuming immobile Al_2O_3) for the newly characterized Erra profile studied here showed loss of 25-50% SiO_2 and MgO , complete loss of CaO and Na_2O , 25-50% loss of K_2O , and 25-100% gain in Fe_2O_3 in the upper Oxisolic horizon. pH was estimated as moderately acid to very acidic (4.5-6) during weathering using a new paleo-pH proxy. MAP (1500-1600 mm yr^{-1} : CIA-K) and MAT (13-15(+) $^{\circ}\text{C}$: $\text{PPM}_{1.0}$) were also estimated using bulk geochemical proxies. Calculations for $p\text{CO}_2$ follow an earlier thermodynamic method with evaluation of total mass flux for CaO , MgO ,

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