Corestone-saprolite interfaces as tracers of the Paleoproterozoic surface environment

GABRIEL SINDOL AND MICHAEL BABECHUCK

Department of Earth Sciences, Memorial University of Newfoundland, St. John's, Newfoundland and Labrador A1B 3X5

The ca. 1.85 Ga Flin Flon paleosol that developed on dolerite intrusions situated along the Manitoba-Saskatchewan border is one of the earliest explicit evidence for subaerial weathering under oxic conditions, which postdates the ca. 2.45 Ga Great Oxidation Event (GOE). Inferences from marine deposits around 1.85 Ga imply a decline in atmospheric oxygen levels. On the contrary, constraints from continental deposits, such as paleosols, remain sparse. This study aims to analyze corestone-saprolite interfaces, which are small-scale chemical weathering fronts, to study the changes occurring in the dolerite intrusions during early weathering reactions. Initial work using both petrographic analysis and scanning electron microscope and mineral liberation analyzer (SEM-MLA) has revealed albite-dominated cores surrounded by rinds primarily composed of clinochlore, chamosite, and illite. Hematite and magnetite are preferentially preserved in the cores, whereas muscovite progressively increased outwards from the cores. Solution-based geochemistry using a quadrupole inductively coupled plasma mass spectrometer (Q ICP-MS) will be used to obtain high precision major to ultra-trace element data across the corestone-saprolite interface. Once completed, this study will provide a full elemental and mineralogical data set that can provide new insights into the poorly understood surficial conditions of the Paleoproterozoic. By combining the different data obtained from corestone-saprolite interfaces, the study will attempt to shed light on the processes that occurred during the incipient stages of oxidative weathering, which reflect the composition of the ancient atmosphere and have further implications for seawater composition and metal cycling in the Paleoproterozoic.

Atlantic Geology, 2017, Volume 53
Atlantic Universities Geoscience Conference 2017 – 67th Annual Conference, October 26–28, 2017
doi: 10.4138/atlgeol.2017.014