Lithium isotope geochemistry in the Barton peninsula, King George Island, Antarctica

H.-B. CHOI[1,2], J.-S. RYU[2*], H.S. LIM [3], J.H. LEE[1], H.I. YOON[4]

[1] Departments of Science education, Ewha Womans University, Seoul 03760, Republic of Korea (Hyeb.Choi@gmail.com, *correspondence: jongsikryu@gmail.com)

[2] Division of Environmental and Material Sciences, Korea Basic Science Institute, Chungbuk 28119, Republic of Korea

[3] Department of Geological Sciences, Pusan National University, Busan 46241, Republic of Korea

[4] Korea Polar Research Institute (KOPRI), Incheon 406-840, Republic of Korea

It has been known that physical weathering prevails over chemical weathering in extreme environments, such as Arctic and Antarctica. We investigated elemental and lithium isotope geochemistry in various types of samples collected at the Barton peninsula, King George Island, Antarctica, in order to see how and to what extent Li isotope fractionation may occur during chemical weathering. Although elemental and lithium isotope geochemistry indicates that dissolved lithium is mainly derived from four different end-members (i.e., seawater, manure, bedrock, and dust), of which seawater contributes, on average, 74%, lithium isotope compositions (δ^7Li) of water however could not be explained by a mixing. Therefore, the difference of δ^7Li values between dissolved and suspended phases results from Li isotope fractionation during chemical weathering in the study area. We estimated a Li isotope fractionation factor of 0.987 ± 0.007 using Rayleigh fractionation equations, consistent with reported value of 0.980 associated with Fe-oxyhydroxides in Greenland Rivers [1]. This is supported by PHREEQC results that water chemistry is supersaturated with secondary mineral formations, such as goethite and hematite. This study implies that lithium isotopes can be a potential tracer of silicate weathering during glacial-interglacial period.

[1] Wimpenny et al. (2010) EPSL 290, 427-437