Seasonal changes in atmospheric inputs of trace metals and halogen elements at EGRIP, Greenland

K. LEE[1*], S.B. HONG[1], S. KIM[1,2], J.I. LEE[1], S.-D. HUR[1]

[11]Korea Polar Research Institute, Songdomiraero 26, Yeonsugu, Incheon, Korea

[2]Ewha womans university, Ewhayeodae-gil, 52, Seodaemun-gu, Seoul, Korea

(*correspondence: leekh@kopri.re.kr)

Recently, the snow pit study from the East Greenland Ice Core Project (EGRIP) site has revealed the seasonal changes in atmospheric input of ion species and the influence of Holuhraun volcanic eruption in 2014 [1]. According to it, mineral dust and sea-salt increased during the winter-spring season and Holuhraun eruption lead 4-56 times larger deposition of non sea salt SO_4^{2-} [1]. However, little information of anthropogenic pollutant input was found from it. Therefore, in this study, we analyze the trace metals and halogen elements from another snow pit samples collected at EGRIP site in July 2017 using Element2 ICP-MS in Korea Polar Research Institute and University of Venice, respectively. In addition, water stable isotope ratios and ion species were determined for the age dating. The result of age dating indicates our samples cover the period of 2013~2017 summer. The concentrations of trace metals show large fluctuations with typically high concentrations during spring season. This strongly indicates that the trace metals input is closely related to mineral dust input. We also calculated EF value of a trace metal defined as the concentration ratio of a given element to Al, a reference element for crust dust, normalized to the same concentration ratio in the upper continental crust. Among trace metals, Ba, Mn, Rb, Sr and V show relatively low EF values of which mean values ranged from 4.9 (for Ba) to 10.8 (Mn) indicating these elements mainly originate from crust dust. On the other hand, the EF values of As, Bi, Cu, Mo, Pb, Sb and Zn are quite high with the mean values of 40.2 (for Mo) ~ 882.4 (for Bi). In addition, these elements show high EF values during winter to spring season in spite of large input of mineral dust. Considering that dust deposition from remote sources peaks in spring [2], the large enrichment during winter to spring season suggests long range transport of anthropogenic pollutants. Also, no unusual enrichments after the volcanic eruption represent the significant contributions from anthropogenic sources.

[1] Du *et al*. (2019) *Environ. Earth Sci.* 78:170, 1-10.

[2] Groot Zwaaftink *et al*. (2016) *J Geophys. Res*., 121:13, 613-678