Cosmogenic Cl-36 in the Dome Fuji ice core, Antarctica: a potential tool for the reconstruction of global environmental change

Kimikazu Sasa[1]; Yuki Matsushi[2]; Tsutomu Takahashi[3]; Yuki Tosaki[4]; Michiko Tamari[1]; Keisuke Sueki[1]; Yasuo Nagashima[3]; Hiroshi Matsumura[5]; Hiroyuki Matsuzaki[6]; Kazuho Horiuchi[7]; Yasuyuki Shibata[8]; Hideaki Motoyama[9]

[1] Pure & Appl. Sci., Univ. Tsukuba; [2] MALT, Univ. Tokyo; [3] Appl. Accel. Div., Univ. Tsukuba; [4] Life & Environ. Sci., Univ. Tsukuba; [5] Radiat. Sci. Cent., KEK; [6] MALT, Univ.Tokyo; [7] Fac. Sci. Tech., Hirosaki Univ.; [8] Environ. Chem. Div., Natl Inst Environ Studies; [9] NIPR

http://www.tac.tsukuba.ac.jp/˜ams/

We have measured cosmogenic ^{36}Cl ($T_{1/2}$: 301 kyr) in the ice core from the Dome Fuji station, Antarctica. The ^{36}Cl measurements were conducted by the accelerator mass spectrometry (AMS) at the University of Tsukuba, for about 150 samples to date. The samples were mainly ice chips by-produced from the core trimmings for electrical conductivity measurements, which corresponded to the core length of 0.5 to 7 m per sample. The ^{36}Cl concentrations in the ice ranged from $2*10^4$ atoms g^{-1} at the last glacial maximum to $1*10^3$ atoms g^{-1} at the core depth of around 3,000 m. The concentrations were converted to apparent ^{36}Cl flux onto the ice sheet, by using the snow accumulation rate as a function of oxygen isotope ratio $d^{18}O$. The values of the apparent ^{36}Cl flux decreased with the model age-scale of the core, corresponding to the radioactive decay. The initial ^{36}Cl concentrations were calculated by correcting the decay loss with the model age. The initial ^{36}Cl concentrations in the samples of $d^{18}O$ over -55 permil showed slightly larger values than those expected from dilution during the interglacial periods. This implied the shift in the relationship between the moisture flux through the Antarctic air mass and isotopic composition of the vapor supplied onto the ice sheet during the glacial to interglacial transitions. The cosmogenic nuclide variations in the ice core have a potential for reconstructing various earth's environments, not only the history of geomagnetic field intensity or solar activity, but especially paleo-conditions of polar atmospheric circulation.