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Dissolved Chemical ions in ice core drilled from Grigoriev Ice Cap in Kyrgyz Tien Shan

AMEMIYA, Shun[1*], TAKEUCHI, Nozomu[1], SERA, Shuntarou[1], HONDA, Megumi[1], FUJITA, Koji[2], OKAMOTO, Sachiko[2], NAOKI, Kazuhiro[3], Vladimir Aizen[4]

[1]Chiba Univ., [2]Nagoya Univ., [3]JAXA, [4]Idaho Univ.

Glacieres and ice sheets receive various chemical components from organic and inorganic matter supplied from surrounding atmosphere and soil, after that they change themselves conditions. Ice Cores drilled from such glacial areas have chronologically retained the snow which laid thick in the past dozens to ten thousands, and capable of holding unknown valuable paleoenvironment information. Therefore the analysis of dissolved chemical ions in ice cores drilled from all parts of the world is a convincing clue to show interpretation about a climate and environment that the earth experienced until now. Then, in this study, we intend to clarify long-term climatic and environmental variation in Tien Shan and the Central Asia based on the analysis of the dissolved main chemical ions in ice cores drilled from the cultivation area of Grigoriev Ice Cap in Tien Shan in September, 2011.

This ice core included Ca in richness through all layers. And, this core is 86.87 m in length, and maintains information until approximately 12,000 years ago. This means that the ice cap might strongly receive influence of sand (CaCO3) of huge drying area of the Central Asia, the Taklamakan from a last years of Pleistocene last glacial epoch. Moreover, as a result of having found the mean concentration of the chemical ions which dissolved in this ice core, Ca was with approximately 120 micro-Eq/kg, other (Cl, NO3, SO4, Na, NH4, K, Mg) less than 30 micro-Eq/kg. This result was similar to the chemical concentration of other glaciers, Urumqi No.1 Glacier in Tien Shan, Muztagata Glacier in Pamir and Chongce Ice Cap in Kunlun, located around the Taklamakan. This result suggest that Tian Shan is affected by the Taklamakan regardless of the west edge or the east edge and is the environment where the uniform chemical supply is accomplished.

The depth profile about dissolved chemical concentration of this ice cores showed large and small plural peaks. Especially, a peak of abnormal density (about 10-60 times of the mean) was confirmed approximately around 53.5 m in all ions. As a result of dating of this core, it was revealed that this peak was located in the layer about 1833. Because the oxygen stable isotope ratio profile of this time showed a change unlike the average year, the ice cap might experience some kind of specific snowfall events for the same period. And, as a result of having found the mean concentration of the chemical ions which dissolved in this ice core after 1990, Ca was with approximately 50 micro-Eq/kg, other (Cl, NO3, SO4, Na, NH4, K, Mg) less than 12 micro-Eq/kg. These density is approximately 40% of the mean concentration in all layers. This suggest that dissolved chemical ions in the ice cap is a tendency to decrement in late years.

Keywords: Tien Shan, Grigoriev Ice Cap, ice core, Dissolved chemical ions, oxygen stable isotope ratio, climatic and environmental variation