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Cosmogenic Radionuclides In Ice Cores From West Antarctica

Zhijie Chen, Thomas Woodruff, and Marc Caffee
Department of Physics, University of Purdue

ABSTRACT

Cosmogenic nuclides such as ^{10}Be and ^{26}Al are formed in the atmosphere by cosmic rays and come down to the ground through snow which became ice in Antarctica. The concentrations of ^{10}Be and ^{26}Al in ice cores can reveal important information about climate change, solar activity and geomagnetic change in the past. They can also be used to date very old ice. Since there is very little ^{26}Al in the ice, its actual concentration is poorly known and the measured results don't agree with each other. My research is focused on the measurement of the concentration of ^{26}Al as well as ^{10}Be in an ice core from Antarctica. The ice samples undergo several chemical and physical processes to be ready for measurement. Some key process includes separating different ions using ion chromatography, oxidizing the samples at high temperature, and loading the final sample holders. Finally the samples are measured by accelerator mass spectrometry (AMS). After the AMS measurement, we calculated the average concentrations of ^{10}Be for our sample to be 40,000 atoms g^{-1} and the concentration for ^{26}Al is around 76 atoms g^{-1}. The average ratio of ^{26}Al/^{10}Be is $(2.40 \pm 0.32) \times 10^{-3}$. This study will contribute to our knowledge of using ^{26}Al/^{10}Be to date very old ice. Combined with other similar studies at different ice core depths, we can also have a full picture of the change of concentration of cosmogenic nuclides through time.

KEYWORDS

cosmogenic radionuclides, aluminum-26, beryllium-10, accelerator mass spectrometry, ice core

REFERENCES

Fudge T. J. et al. (2012) AGU Fall Meeting, 2012, GC24B-06

Auer, M., D. Wagenbach, E. M. Wild, A. Wallner, A. Priller, H. Miller, C. Schlosser, and W. Kutschera, 2009, Cosmogenic Al-26 in the atmosphere and the prospect of a Al-26/Be-10 chronometer to date old ice: Earth and Planetary Science Letters, v. 287, p. 453-462.

Finkel, R. C., and K. Nishiizumi, 1997, Beryllium 10 concentrations in the Greenland Ice Sheet Project 2 ice core from 3-40 ka: Journal of Geophysical Research-Oceans, v. 102, p. 26699-26706.

Woodruff T., Welten K., Caffee M., Nishiizumi K. (2013) WAIS Divide Annual Science Meeting.