A novel ^{10}Be proxy of cosmic-ray intensity between 11-28 ka from Dome Fuji, Antarctica

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Cosmogenic ^{10}Be is thought to be a paleoproxy of the cosmic ray intensity, which is strongly connected to the solar activity and geomagnetic field intensity. Thus, detailed ^{10}Be records obtained from bipolar ice cores were often utilized for elucidating the history of those during the Holocene epoch (e.g. Vonmoos et al., 2006; Horiuchi et al., 2008). However, such records are very few for the last glacial period. We present herein a novel, detailed ^{10}Be record covering the period of 11–28 ka BP, which was obtained from an ice core recovered from the Dome Fuji station, Eastern Antarctica (77˚19′S, 39˚42′E).

The ^{10}Be flux recorded in the Dome Fuji ice core varied independently of the δ^{18}O changes, and the contributing dust ratio to the ^{10}Be concentration was calculated to be within 6%. These facts suggest that the meteorological effects on the ^{10}Be deposition have not been so significant in the Dome Fuji ice core. A remarkable feature in the chronostratigraphic variations of the both ^{10}Be concentration and flux was sub-millennial to multi-mullennial fluctuations found in throughout the investigated interval. The fluctuations are significantly correlative with those observed in the IntCal09 Δ^{14}C records (Reimer et al., 2009) although only the latter shows a long-term decreasing trend presumably caused by the influence of the past high production through the global carbon circulation (a memory effect). A long-term trend and low-frequency fluctuations of the ^{10}Be flux are fairly similar with the inverse of the paleointensity in a stacked high-resolution paleomagnetic record GLOPIS-75 (Laj et al., 2004). These facts strongly suggest that the variations in the ^{10}Be flux correctly reflect changing of the ^{10}Be production rate in the atmosphere. Apparent minor discrepancies between the ^{10}Be and Δ^{14}C records were found at certain intervals of distinct climatic transitions such as around 12 and 15 kyr BP. These inconsistencies were presumably caused by the different transportation systems of ^{10}Be and ^{14}C, the latter must have been significantly affected by changes in the global carbon circulation with large climatic changes. Hence, the discrepancies can be utilized for evaluating the global carbon circulation during the later part of the last glaciation.

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