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High-resolution analyses of dust in the Dome Fuji deep ice-core from the LGM to mid-Holocene

Content

To study the dust variability from the LGM to mid-Holocene, we have analyzed the Dome Fuji deep ice-core using a Continuous Flow Analysis (CFA) system developed at the National Institute of Polar Research. With the CFA system, we measured microparticles, seven elements (Na, Mg, Al, Si, K, Ca and Fe), stable isotopes of water, black carbon and methane for the depth interval between 200 and 640 m. For accurate measurements of microparticle concentrations using a laser particle counter (Abakus, Klotz), we improved the software. In addition to the CFA measurements, we collected discrete samples continuously at a 50 cm interval, and analyzed concentrations and size distributions using a Coulter counter (Coulter Multisizer 4). Abakus and Coulter counter data agree well, and both particle counters could detect small changes in concentrations even during the Holocene when concentrations were low. The dust flux at Dome Fuji around the LGM was higher than that at Dome C (EDC) and lower than that at EDML (Kohnen), which reflects their distances from the major dust sources in South America. Dust size changes from the LGM to the Holocene at inland sites in East Antarctica have been reported to show regional differences. At Dome Fuji, the dust size increased from the LGM to the Holocene, which is similar to EDC and EDML, but opposite to Dome B. By 16ka BP, the dust flux at Dome Fuji had decreased to the Holocene level, as was previously reported at other Antarctic deep core sites. Around that time, the relationship between dust size and dust concentration changed. Before that time, the dust size was almost constant, independent of dust concentrations, while after that time, dust size increased with dust concentration. Furthermore, the element compositions changed at that time. These results suggest that dust sources and/or transport pathways changed around 16ka BP.

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