Climate change shown by mineral and seasalt aerosol flux derived from Dome Fuji ice core

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[Introduction] Since Antarctic is a convergence region of atmospheric circulation, aerosol originated from various sources on the earth deposit into the surface of the ice sheet and preserved in the ice layer. The particulate matters in the ice sheet have the important clue for evaluating the past climatic change. We measured total (particle+dissolved) concentration of metallic elements by applying a full-digestion analysis of Dome Fuji ice core, and clarified the change of mineral and seasalt particle flux accompanying a climate change over the last 340kyr. In this study, we compared the fluctuation of the mineral and the seasalt particle flux in decadal, millennial and glacial scale, and discuss aerosol climate change.

[Method] The 1st Dome Fuji ice core obtained in 1995-96 was used in this study. Based on the result of oxygen isotope ratio and laser particle counting, the pieces of ice of 5-10 cm thickness were cut from the depth of the termination which shows a rapid climate change. The samples used for high resolution analysis were cut by 2cm thickness. In order to collect the particles in a sample completely, a piece of ice was wholly evaporated to dryness in a Teflon vessel and decomposed by using the microwave acid digestion method with nitric acid and hydrofluoric acid. The total concentrations of Fe, Al, Mn, Mg, Ca, Sr, Ba and Na in the samples were measured by ICPMS and ICPAES.

[Results and Discussion] We calculated the mean value of the coefficient of variation of mineral and seasalt particle flux in decadal, millennial, and glacial scale. The mean value of the coefficient of variation of the particle flux of mineral and seasalt was 27.8% and 14.0% in decadal scale, 43.4% and 42.5% in millennial scale, 67.6% and 51.7% in glacial scale. In decadal scale, the coefficient of variation of seasalt flux is smaller than that of mineral flux. This indicates that the transport of seasalt aerosol was nearly constant in this time scale, but the transport of mineral aerosol was sporadically occurred. In millennial scale, the coefficient of variation of mineral and seasalt flux was increased, because atmospheric circulation was strengthened and sea ice was expanded. In glacial scale, the coefficient of variation of the fluxes further increased. Particularly, the coefficient of variation of the mineral flux increases as a result of continental expands. These results are indicating that the coefficient of variation of the aerosol flux obtained from the dome Fuji ice core reflects the climate change.