Flux, provenance and modification of terrestrial dust and sea salt in the Dome C and Dome Fuji ice cores from Last Glacial Maximum to early Holocene by ice-sublimation and single-particle measurement of soluble and insoluble particles

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We analyzed chemical compositions of dust and sea-salt particles in the EPICA Dome C (EDC) ice core between 26 and 7kyr BP by using an ice sublimation technique, and compared the results with existing data of the Dome Fuji (DF) ice core. Combining the results of non-sea-salt Na and sea-salt Na fractions in total Na from the sublimation measurement and Na^+concentrations from ion measurement, we estimated that sea-salt flux in the two cores are roughly the same, while dust flux in the EDC core is significantly lower than that in the DF core throughout the studied period. Al/Si ratio of dust particles in the EDC core increased since around 16 kyr BP, suggesting that the average mixing ratios of minerals, presumably from different source locations, are different before and after 16 kyr BP. The composition of calcic dust also changed around 16 kyr BP; the fraction of calcium sulfate (calcic dust sulfatized during transport through lower troposphere) decreased and that of calcium nitrate (calcic dust reacted with nitric acid during transport through the middle to upper troposphere) increased. Previous studies on the mineralogy of EDC dust have suggested that dominant dust source area was Patagonia before 16 kyr BP and that multiple dust sources may have contributed thereafter (Siggaard-Andersen et al., 2007; Marino et al., 2008; Vallelonga et al., 2010).On the other hand, atmospheric model simulations have suggested that Patagonian dust is transported via lower troposphere, while Australian dust is transported via middle to upper troposphere (Li et al., 2008; Krinner et al., 2010). Thus, our data collectively confirm the dominance of Patagonian dust during the LGM and support the hypothesis of increased Australian dust contribution during the Termination and Holocene. The Dome Fuji Al/Si ratios were lower than those in the EDC core, and the fraction of calcium sulfate in the DF core are higher than those in the EDC core after around 16 kyr BP. The results suggest that Patagonian dust continued to be the dominant contributor to the Dome Fuji region after 16 kyr BP.

References

Siggaard-Andersen et al. (2007), *Earth Planet. Sci. Lett.*, *258*(1-2), 32-43.
Marino, F., (2008), *Geochem. Geophys. Geosyst.*, *9*(10), Q10018.
Vallelonga, P., et al. (2010), *Quat. Sci. Rev.*, *29*(1-2), 247-255.
Li, F. (2008), *J. Geophys. Res. Oceans*, *113*(D10), 573-515.
Krinner, G. (2010), *Quat. Sci. Rev.*, *29*, 274-284.

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