

Reduced Marine Biogenic Sulphate Flux in East Antarctica during Glacial Periods - Based on Ion Chemistry Records from Dome Fuji Ice Core -

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Marine biogenic sulphate affects Earth's radiation budget and may be an indicator of primary productivity in the Southern Ocean, which is closely related to atmospheric CO₂ variability through the biological pump. Previous ice-core studies in Antarctica show little climate dependence of marine biogenic sulphate flux over glacial cycles, suggesting almost constant dimethylsulphide (DMS) emissions, hence primary productivity, in the Antarctic Zone of the Southern Ocean. On the other hand, marine sediment records show reduced export productions in the Antarctic Zone of the Southern Ocean during glacial periods, suggesting increased primary productivity. The disparity between ice-core and marine sediment records has been attributed to differences in marine organisms that contribute to these records. We present new 720,000-year ice core records from Dome Fuji in East Antarctica and show that a large portion of non-sea-salt sulphate, which was traditionally used as a proxy for marine biogenic sulphate, likely originates from terrestrial dust during glacial periods. By correcting for this, we make a revised calculation of marine biogenic sulphate and find that its flux is reduced in glacial periods. Our results suggest reduced dimethylsulphide emissions in the Antarctic Zone of the Southern Ocean during glacial periods and provide new evidence for the coupling between climate and the Southern Ocean sulphur cycle.

Reference

Goto-Azuma, K., M. Hirabayashi, H. Motoyama, T. Miyake, T. Kuramoto, R. Uemura, M. Igarashi, Y. Iizuka, T. Sakurai, S. Horikawa, K. Suzuki, T. Suzuki, K. Fujita, Y. Kondo, S. Hattori, Y. Fujii, Reduced marine phytoplankton sulphur emissions in the Southern Ocean during the past seven glacials, *Nature Communications*, DOI: 10.1038/s41467-019-11128-6, 2019.