グリーンランド南東部、高涵養量ドームにおける浅層アイスコアプロジェクトの概要と研究成果
Overview and recent activities for shallow ice core project on a high-accumulation dome, southeast Greenland

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On May 2015, we drilled a 90.45 m ice core in a high accumulation area of the southeastern Greenland Ice Sheet. The drilling site (SE-Dome; 67.18˚N, 36.37˚W, 3170 m a.s.l.) is located 185 km north of the town of Tasiilaq in southeastern Greenland [1]. Then we measure physical and chemical properties of the SE-Dome ice core. Based on the measurements, we show the general characteristics of the SE-Dome ice core. I) As for dating of the ice core [2], we propose a dating method based on matching the δ^{18}O variations between ice-core records and records simulated by isotope-enabled climate models. We applied this method to a δ^{18}O record from the SE-Dome ice core. The close similarity between the δ^{18}O records from the ice core and models enables correlation and the production of a precise age scale, with an accuracy of a few months. II) As for physical property [3], the ice was −20.9 ºC at 20-m depth. The

close-off density of 830 kg m^{-3} occurs at 83.4–86.8-m depth, which is about 20-m shallower than that obtained from empirical models, indicating that the firn with a higher density is softer than that from empirical result. We interpret that the high accumulation rate creates a high overburden pressure in a short time. The relative softness of the firn may arise from 1) there being not enough time to form bonds between grains as strong as those in a lower accumulation-rate area, and similarly, 2) the dislocation density in the firn being relatively high. III) As for chemical property [4], we measured the major ion fluxes, and obtained records of annual ion fluxes from 1957 to 2014. We find a high average NO_3^- flux (1.13 mmol m^{-2} yr^{-1}) in the ice core, which suggests a negligible effect from post-depositional NO_3^- loss, indicating the SE-Dome region is an excellent location for reconstructing nitrate fluxes. For the non-sea-salt (nss) SO_4^{2-} and NH_4^+ fluxes, a decreasing and increasing trend from 1970 to 2010, respectively, tracks well with the anthropogenic SO_x and NH_3 emissions. In contrast, the decadal trend of NO_3^- flux differs from the decreasing trend of anthropogenic NO_x emissions. We continue to investigate the paleoenvironment with multi proxies from several analyses (e.g. [5]) of the high-time-resolution and chemicals-well-preserved ice core.

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