

## Recent annual snow depositions and seasonal variations of major ion and dust concentrations clarified by pit observations at the EGRIP, Greenland

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East Greenland Ice Core Project (EGRIP), which is an international ice coring project led by University of Copenhagen in Denmark, commenced in 2015 to clarify the variations of climate and ice sheet in Greenland. We are participating in the project under the Arctic Challenge for Sustainability project (ArCS), and cooperative research is underway with various countries. In 2016, we dug two pits with depths of 4.02 and 3.18 m at the EGRIP camp (75°37'N, 35°59'W) to estimate recent annual snow depositions and examine seasonal variations of major ion species and dust particles in the snow samples. Snow sampling and snow density measurement were carried out at 0.03 m interval in those pits. We analyzed those snow samples for Na<sup>+</sup>, K<sup>+</sup>, NH<sub>4</sub><sup>+</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup>, Cl<sup>-</sup>, NO<sub>3</sub><sup>-</sup>, SO<sub>4</sub><sup>2-</sup>, CH<sub>3</sub>SO<sub>3</sub><sup>-</sup>, dust (particle size of 0.52–12 μm) and stable isotopes of water (δ<sup>18</sup>O and δD). Clear seasonal variations in the δ<sup>18</sup>O and δD values were observed in the depth profiles, which indicated that the 4.02 and 3.18 m deep pits included snow depositions corresponding to ten years from 2006 to 2016 and seven years covering 2009–2016, respectively. The annual snow depositions ranged from 58 to 202 mm water equivalent (w.e.)/yr, showing the mean value of 138 mm w.e./yr for the 4.02 m deep pit. The mean value in 2009–2016 was 146 mm w.e./yr. On the other hand, the deposition for the 3.18 m deep pit varied from 126 to 188 mm w.e./yr, averaging 147 mm w.e./yr. The mean values of the depositions examined in this study were higher than the average value of 0.10 m w.e./yr for the period 1607–2011 previously estimated by a 67 m firn core study in the same region. Seasonal variations of concentrations in the major ion species and dust were observed, which were similar to those previously reported for Greenland. The concentrations of Na<sup>+</sup>, K<sup>+</sup>, Mg<sup>2+</sup>, Ca<sup>2+</sup>, Cl<sup>-</sup>, SO<sub>4</sub><sup>2-</sup> and dust recorded an annual peak in the layers between winter and the next summer. Concentrations of NH<sub>4</sub><sup>+</sup> and NO<sub>3</sub><sup>-</sup> showed one peak in summer, while occasionally appearing another peak in winter to spring layers. In addition, concentrations of CH<sub>3</sub>SO<sub>3</sub><sup>-</sup> appeared one peak in late summer to autumn.

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