

## **Studies on the variability of the Greenland Ice Sheet and climate**

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### **ABSTRACT**

This paper reviews the major scientific results obtained from Subtheme (1) “Variability of the Greenland ice sheet and climate” under Theme 2 “Variations in the ice sheet, glaciers, and the environment in the Greenland region” of the ArCS (Arctic Challenge for Sustainability) project. We participated in the international ice coring project (East Greenland Ice Core Project, EGRIP) led by Denmark. Under EGRIP, we conducted snow pit observations near the ice coring site and reconstructed the surface mass balance during the past 10 years. Ice cores drilled previously were also analyzed. Analyses of an ice core from Northwest Greenland revealed temporal variability in black carbon concentration over the past 350 years and mineral dust variability over the past 100 years. To understand the mechanisms of ice-sheet flow that is closely related to predictions of future sea-level rise, we conducted laboratory experiments using artificial ice and ice-core samples. This resulted in an improved flow law for impurity-containing ice. We also improved ice sheet modeling by taking into account impurity effects and ice stream dynamics. Within the Ice Sheet Model Intercomparison Project for CMIP6 (ISMIP6), we conducted simulations of the mass loss of the ice sheet and the resulting contribution to sea-level rise over the 21st century. Furthermore, we carried out GIA (Glacial Isostatic Adjustment) modeling to better constrain ice sheet modeling.