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Setup and first testing of Laser Ablation - ICP-MS measurements for high resolution chemical ice core analyses at University of Cambridge

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The ice in the deepest and therefore oldest parts of polar ice cores is highly compressed and therefore annual layers, although potentially preserved, can be thinned to a millimeter level or even below. However, for many palaeoclimate studies these are the most interesting sections. Within the WACSWAIN project we aim to investigate the basal part of an ice core recently drilled to bedrock at the Skytrain ice rise in West Antarctica to obtain unique information on the state of the Filchner-Ronne ice shelf during the last interglacial. To achieve this we have set up a system to perform high resolution laser-ablation ICP-MS measurements using a cryocell stage on selected segments of the deepest parts of the ice cores.

Here we present first results of system performance including assessment of measurement sensitivity and precision with respect to analyses of the most relevant components, namely sodium, calcium and aluminium. We also report on the development and the performance of a matrix matched calibration method using flash-frozen water samples of known composition to convert relative signal intensities into concentrations. This especially focuses on homogeneity and reproducibility of the in-house produced standard. Finally, the results of laser ablation ICP-MS results are compared to parallel low resolution data from continuous flow analysis of the Skytrain core to evaluate the capabilities of the method in terms of improving depth resolution.