EGU2020-8537
https://doi.org/10.5194/egusphere-egu2020-8537
EGU General Assembly 2020

Towards an improved understanding of high-resolution impurity signals in deep Antarctic ice cores

Pascal Bohleber[1], Marco Roman[1], Carlo Barbante[1], Barbara Stenni[1], and Barbara Delmonte[2,3]
[1]Ca'Foscari University of Venice, Italy (pascal.bohleber@unive.it)
[2]Università degli Studi di Milano-Bicocca, Dept. of Earth and Environmental Sciences, Milano, Italy
[3]EUROCOLD Laboratory for Glaciology and Paleoclimate, Milano, Italy

Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) offers minimally destructive ice core impurity analysis at micron-scale resolution. This technique is especially suited for exploring closely spaced layers of ice within samples collected at low accumulation sites or in regions of highly compressed and thinned ice. Accordingly, LA-ICP-MS promises invaluable insights in the analysis of a future “Oldest ice core” from Antarctica. However, in contrast to ice core melting techniques, taking into account the location of impurities is crucial to avoid misinterpretation of ultra-fine resolution signals obtained from newly emerging laser ablation technologies. Here we present first results from a new LA-ICP-MS setup developed at the University of Venice, based on a customized two-volume cryogenic ablation chamber optimized for fast wash-out times. We apply our method for high-resolution chemical imagining analysis of impurities in samples from intermediate and deep sections of the Talos Dome and EPICA Dome C ice cores. We discuss the localization of both soluble and insoluble impurities within the ice matrix and evaluate the spatial significance of a single profile along the main core axis. With this, we aim at establishing a firm basis for a future deployment of the LA-ICP-MS in an “Oldest Ice Core”. Moreover, our work illustrates how LA-ICP-MS may offer new means to study the impurity-microstructure interplay in deep polar ice, thereby promising to advance our understanding of these fundamental processes.