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A high-accuracy Total Air Content setup: System performance and first results from Skytrain Ice Rise, Antarctica

Content

Modelling studies and sea level reconstructions suggest the loss of the West Antarctic Ice Sheet (WAIS) during the Last Interglacial (LIG) about ~120'000 ago, but direct evidence for a collapse of the WAIS is lacking. The Warm Climate Stability of the West Antarctic ice sheet in the last INterglacial (WACSWAIN) project aims at providing direct evidence allowing for a comprehensive assessment of whether or not the WAIS collapsed during the LIG. One of the expected consequences of such massive ice mass loss is the change of the elevation of land masses in close proximity of the WAIS due to isostatic adjustments. This process may have altered the elevation of Skytrain Ice Rise on the order of 200 m. Such major changes in the elevation should be imprinted in the Total Air Content (TAC) based on simple barometric considerations. Here we present a new experimental setup of a high-accuracy TAC measurement system constructed at the British Antarctic Survey. This experimental setup is dedicated to and optimised for the measurement of TAC and is based on a vacuum extraction principle. The air is extracted from the ice by melting the sample by infrared radiation and the released air is dried and directly expanded into a large expansion chamber. State-of-the-art pressure gauges and thorough temperature control allow for high-accuracy measurements. Here, we discuss the performance of this new TAC system and present first TAC data from the Skytrain Ice Core, Antarctica.

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