Abstract ID : **237**

A GC-IRMS system for improving Holocene records of CO2 and N2O isotopes, and future work on IPICS oldest ice

Content

We present an analytical system for the measurement of CO2 and N2O isotopes in air extracted from ice core samples. An extraction and purification line is connected to a Thermo 253 Plus isotope ratio mass spectrometer that measures CO2 isotopes (δ13C-CO2 and δ18O-CO2) using a dual-inlet fitted with a microvolume, as well as N2O concentration and N2O isotopes (δ15N-N2O and δ18O-N2O) using an open-split in continuous-flow mode. Primary air extraction is performed with a dry "cheese grater" technique (Etheridge et al. 1998; Rubino et al. 2019). The purification system is based on that used at Oregon State University (Bauska et al . 2014, Schilt et al. 2014) with the addition of an expansion volume for CO2 manometry.

The system is installed at CSIRO Oceans & Atmosphere in Aspendale where it is being used to improve records of CO2 and N2O isotopes from 0.2-1.0 kg samples from Law Dome and Aurora Basin North ice cores. In 2023, the system will be moved to the AAD in Hobart for analysis of < 0.1 kg samples for the Australian Million Year Ice Core (MYIC) project contribution to the IPICS oldest ice challenge.

We describe the system performance on ice samples and whole-air standards, with emphasis on the lower limits of performance for small sample analysis. We also describe linkages to international calibration scales, and present preliminary measurements on late Holocene ice core samples.

We highlight intervals in the ice core record where we intend to "fill gaps" and reduce the uncertainty of existing data sets (Etheridge et al. 1996, Francey et al. 1999, Rubino et al. 2019, Bauska et al. 2015, Park et al. 2012, Prokopiou et al. 2017, Prokopiou et al. 2018). With improved records for the Little Ice Age, the Medieval Warm Period, and the industrial period, we will test hypotheses about the relationships between the carbon cycle, the nitrogen cycle, and climate.

Primary authors: MENKING, Andy (University of Tasmania); ETHERIDGE, David (CSIRO Oceans and Atmosphere); TRUDINGER, Cathy (CSIRO); Dr ALLISON, Colin (CSIRO); PEDRO, Joel B. (Institute of Marine and Antarctic Studies, University of Tasmania, Hobart, Tasmania, Australia); BAGGENSTOS, Daniel; THORNTON, David (CSIRO); LANGENFELDS, Ray (CSIRO); Mr SPENCER, Darren (CSIRO); Dr GUERETTE, Elise-Andree (CSIRO); MOY, Andrew (Australian Antarctic Division); CURRAN, Mark (Australian Antarctic Division); VAN OMMEN, Tas (Australian Antarctic Division)

Presenter: MENKING, Andy (University of Tasmania)

Track Classification: Progress in proxy development