Abstract ID : **249**

A new Australian gas lab for the Million Year Ice Core project

Content

The aim of the Australian Million Year Ice Core Project (MYIC) in the framework of the IPICS oldest ice challenge is to drill and recover an ice core that extends to well over a million years ago. An ice core covering this period will enable us to investigate climate links between temperature and carbon dioxide during the mid-Pleistocene Transition, when the Earth's ice age cycles changed pacing from 41k to 100k year periods. The main objective of the project is to test competing hypotheses on the cause of this non-linear shift in the Earth's climate state with reconstruction of the relative timing and amplitude of glacial cycles beyond 800 kyr and the associated changes in atmospheric composition and biogeochemical markers. Delivering this interpretation necessitates a range of ice and gas phase measurements, ice core dating and analysis of the physical properties of the ice.

Due to the highly thinned nature of the ice close to the bedrock of the MYIC, the chronology is compressed requiring good vertical sampling resolution, and thus small sample capabilities, to resolve the variability in the climate records. This requirement demands major development of new ice core measurement capability, including a state-of-the-art ice continuous flow analysis facility and development and build of a new ice core gas laboratory.

The main envisaged capabilities for the gas laboratory include 1) concentration measurements of the primary greenhouse gases CO_2, CH_4, N_2O to constrain changes in radiative forcing, 2) isotope ratio measurements of CO_2 on discrete ice samples to constrain carbon cycle source and sink changes, 3) measurements of $\delta^{18}O$-O_2 and $\delta^{15}N$-N_2 for understanding of site conditions, gas trapping, firnification processes and to aid dating. We present our plans for the new Hobart ice core gas facility to achieve these measurements. The lab will combine a small sample sublimation extraction system coupled to a Quantum Cascade Laser spectrometer for CO_2, $\delta^{13}C$-CO_2, CH_4, and N_2O with traditional dual inlet mass spectrometry for the main air isotopes.

Primary author: BAGGENSTOS, Daniel (Australian Antarctic Division)

Co-authors: PEDRO, Joel (Australian Antarctic Division); MENKING, Andy (Australian Antarctic Partnership Program); VAN OMMAN, Tas (Australian Antarctic Division)

Presenter: BAGGENSTOS, Daniel (Australian Antarctic Division)

Track Classification: The Oldest Ice challenge, and the preservation of climatic signals in the deepest ice

Contribution Type: Poster

Submitted by **BAGGENSTOS, Daniel** on **Saturday, 30 April 2022**