EGU24-6585, updated on 18 May 2024
https://doi.org/10.5194/egusphere-egu24-6585
EGU General Assembly 2024

Isotopic and elemental ratios in the open and closed porosity for two Antarctic firn cores (D47 and Little Dome C) of very different surface characteristics.

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Understanding the processes during gas trapping in ice is essential to accurately interpret the gas records in ice cores. As a consequence, it is very desirable to have firn core and firn air sampling campaigns associated with deep ice coring. We know that elemental fractionation occurs during bubble close-off, hence largely affecting the $\delta O_2/N_2$ measurements further used to date the ice cores on orbital timescales. A recent study also suggested that this elemental fractionation can be linked to surface characteristics (i.e. temperature and / or accumulation rate).

The aim of this study is to investigate the elemental and isotopic fractionation of N_2 and O_2 during bubbles close-off at two sites of very different characteristics (D47 located at the edge of the East Antarctic plateau with high temperature and accumulation rate and Little Dome C at the center of the East Antarctic plateau with low accumulation and accumulation rate). For this study, we did measurements both in the open and closed porosity of the firn in the lock-in zone. The D47 lock-in zone extends over nearly 20 m and, over these 20 m, strong signals of increasing $\delta O_2/N_2$ (+ 7 permil) and decreasing $\delta^{15}N$ (-0.05 permil) are observed with increasing depths. At Little Dome C, the site of the Beyond EPICA deep ice core, the lock-in depth is much thinner (a few meters thick only) and fractionation much smaller. We discuss how these signals relate to the signals measured in the closed porosity in both sites and present some perspectives for the interpretation of the gas records in the deep ice cores.