

AIR EXTRACTION SYSTEMS FOR ICE CORE AND CO₂
AND CH₄ CONCENTRATIONS IN THE PAST
ATMOSPHERE (ABSTRACT)

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Dry and melt extraction systems have been developed to determine respectively the CO₂ and CH₄ concentrations of ancient air trapped in the polar ice core. The dry extraction system was confirmed to be capable of crushing a core sample of 1 kg to fine powder within 2 min, and its air extraction efficiency was estimated to be 98%. The air for the CH₄ measurements was extracted by melting core samples in an evacuated chamber. The CO₂ and CH₄ concentrations were determined using gas chromatography. The overall precision of our analyses is better than ±1 ppmv for CO₂ and ±10 ppbv for CH₄. Two Antarctic ice cores were used in this study. The ice core drilled at Mizuho Station (70°42'S, 44°20'E) showed that pre-industrial levels of the CO₂ and CH₄ concentrations (3300–200 yrs BP) were 279–287 ppmv and 690–750 ppbv, respectively and both concentrations increased rapidly for the last 200 years. It was also found that the CO₂ concentrations between 800 and 200 yrs BP were higher by almost 7 ppmv than those in remaining pre-industrial time, due probably to CO₂ release from the oceans and/or the biosphere. The Yamato core drilled near the end of ice flow (near the Yamato Mountains) showed concentrations of 230–240 ppmv and 530–580 ppbv for CO₂ and CH₄, respectively, which are apparently lower than post-glacial background levels, implying that the core was formed in the glacial period.

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