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# GAS DIFFUSION AND FRACTIONATION IN CLATHRATED ICE-CORE SAMPLES

## (Abstract)

by

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ABSTRACT

The evolution of gas content from clathrated ice is very sensitive to pressure and to storage temperature. As such substances are likely to be found in deep Antarctic ice and the Greenland ice sheet (Miller 1969, Shoji and Langway 1982), the influence of clathrate formation and incomplete back-diffusion on the measured air composition was investigated.

We have undertaken laboratory studies on the kinetics of formation and decomposition of clathrate hydrates of air and carbon dioxide. The kinetics were found to be controlled mainly by the self-diffusion of water molecules. The clathrate structure being of type II (Davidson and others 1984), the diffusion of guest molecules and the role of auxiliary gases was studied.

A bubble-relaxation model is presented for air–hydrate inclusions in fresh ice cores. It takes into account the diffusion constant for desorption of clathrates and the mechanical relaxation of the bulk ice. The increasing pressure and the initially low bubble surface are factors which limit the rate of decomposition. The rate of decomposition was compared with the natural bubble relaxation measured in deep ice cores (Gow and Williamson 1975).

Fractionation was also observed through the formation and decomposition of mixed hydrates. The diffusion control of the recrystallization process affects this fractionation.

On the basis of this study we make some recommendations for the analysis of deep ice-core samples.

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# ISOTOPE MEASUREMENTS IN AN ICE CORE FROM A TEMPERATE ALPINE GLACIER (VERNAGTFERNER, AUSTRIA)

## (Abstract)

by

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ABSTRACT

In 1979 ice-core drilling was carried out in the accumulation area of the temperate Alpine glacier Vernagtferner (Ötztaler Alpen, Austria). The cores are among the few cores from temperate glaciers in the eastern Alps. Encouraged by the results of the isotope analysis ($^{2}H$, $^{18}O$, $^{3}H$) of this core, which proved that it was possible to detect the annual layering in the firn, a second drilling operation was undertaken in 1983. One core (IV) was drilled near the 1979 drilling site, in order to check the results from the first core. A second one (VI) was drilled near the equilibrium line, in order to obtain information on the isotope content of the ice body near the ablation area. In addition, the electrical conductivity was also measured. The paper presents the measurements of the 80 m core VI of 1983: $^{18}O$ and $^{2}H$ profile, together with the calculated deuterium excess d, as well as the $^{3}H$ profile, which gives evidence of the 1952–63 nuclear-bomb tests already at a

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