zonaly in the middle latitude (40–50°S). Therefore, the climate of middle-high latitudes in the Southern Hemisphere is strongly influenced by interaction of air and sea-ice. (*Present address: Geographisches Institut, ETH Zürich, Winterthurstrasse 190, CH-8057 Zürich, Switzerland)

(Received May 8, 1985)

INTERMEDIATE-DEPTH AND SHALLOW CORE DRILLING OPERATIONS IN MIZUHO PLATEAU, ANTARCTICA, IN 1983–84 FIELD SEASON (Abstract)

Hideki NARITA[1], Yoshiki NAKAYAMA[2], Masayoshi NAKAWO[3] and Yosio SUZUKI[1]

[1]*Institute of Low Temperature Science, Hokkaido University, Kita-19, Nishi-8, Kita-ku, Sapporo 060*
[2]*Japanese Public Engineering Co. Ltd., Iida-biru, 24-9, Nishi-Shinbashi 3-chome, Minato-ku, Tokyo 105*
[3]*Department of Applied Physics, Faculty of Engineering, Hokkaido University, Kita-13, Nishi-8, Kita-ku, Sapporo 060*

The 24th Japanese Antarctic Research Expedition (JARE-24) drilled a 413-m hole at Mizuho Station (70°41′53″ S, 44°19′54″ E) with a thermal drill, and a 101.5-m hole at Minami-Yamato Mts. (72°05′13″ S, 35°11′00″ E) and a 100.4-m hole at G15 (71°11′40″ S, 54°58′45″ E) with an electro-mechanical drill.

The thermal drill, made by Chikyu Kogaku Kenkyusho K. K., 3.9 m long and capable of taking a core 1.5 m long and 130 mm in diameter, is an improved version of the drill used by JARE-15 in 1975. The most important improvement was the increase in the amount of data sent to the surface. Besides the previous two bits of the cable tension at the drill head and one bit of the core length, the drill could send, with an aid of a micro-computer, analogue data (each converted to 8 bit) of the main heater temperature, the water temperature and level in the tank, the input voltage to the main heater and that to the pump, so that such accidents as the heater burn-out, the tank overflow, and the failure of water suction could be immediately alarmed. Other improvements were the reinforced mechanical strength and the addition of heaters on every necessary part. (Previously, only the suction pipes and the pump were heated.) The allowable output of the main heater, 168 and 134 mm in outer and inner diameters (same as the previous one), was increased from 3 to 6 kW. However, the field experience showed that the optimum output was 3.6 kW, which gave a drilling speed of about 1.6 m/h.

The winch with 700-m armored cable, whose specifications were the same as those of the cable used in 1975 and 1976, was driven by a 3.7-kW motor, which gave a hoisting speed ranging from 0.1 to 1 m/s with an aid of a frequency inverter. The winch had also an auxiliary motor for slow lowering of less than 0.001 m/s during drilling. This motor and the brake were alternatively activated by the two-bit data of the tension to keep it in the pre-assigned range and to give an average lowering speed matched to the output of the main heater.

The drilling at Mizuho Station began on April 22, 1983 and terminated on July 22 at 413 m, where the hole closure became dangerous for further drilling. It took 499 working hours by a four-man team. Physical properties of the cores were measured simultaneously.

Two shallow drillings were done in December 1983. The drill, ILTS-130F, was designed and manufactured by the Institute of Low Temperature Science. Although two types of barrel (Mk II and Mk III) were provided, only the former was used which could take an ice core 0.85 m long and 106 mm in diameter making a hole 133 mm in diameter. The rated output of the drill motor is 350 W but was used usually below 70% capacity, which was enough to attain a drilling speed over 0.01 m/s. The which was the one used successfully by JARE-21 and -23 in 1980 and 1982, which gave an hoisting speed up to 0.4 m/s. The drillings were done by a four-man team. It took about 60 hours in each drilling. Cores were examined on site.

This paper is a contribution from the Glaciological Research Program in East Queen Maud Land, Antarctica.

(Received July 1, 1985)

IDENTIFICATION OF TEPHRA LAYERS IN THE METEORITE ICE FIELD BASED ON TRACE ELEMENT COMPOSITIONS AND REFRACTIVE INDICES OF GLASS (Abstract)

Takaaki FUKUOKA[1], Fusao ARAI[2] and Fumihiko NISHIO[3]

[1]*Department of Chemistry, Gakushuin University, 5–1, Mejiro 1-chome, Toshima-ku, Tokyo 171*
[2]*Department of Geology, Gunma University, 4–2, Aramaki-cho, Maebashi 371*
[3]*National Institute of Polar Research, 9–10, Kaga 1-chome, Itabashi-ku, Tokyo 173*

From the age of the ice in the meteorite ice field, it is possible not only to get information on ice dynamics but also to date the meteorite fall indirectly. Unfortunately, we have not succeeded so far in getting the age of the ice by a direct determination method like ^{14}C.

There are many dirt bands in the ice at the Yamato and Allan Hills meteorite ice field. It was confirmed recently that a dirt band consists of volcanic ash (tephra) layers. As one tephra layer is considered to have been produced by single volcanic event, we can estimate the age of the ice from the age of the tephra layer. That is, a tephra layer will serve as a possible time marker of the ice. Therefore, it is possible to know the age of meteorite fall from that of tephra layer indirectly.

In this study, in order to test the role of tephra layers as a time marker of the ice, the abundances of more than 20 elements in glass separated from three dirt bands in the Yamato region and five in the Allan Hills region have been determined by instrumental neutron activation analysis (INAA). The refractive indices of glass samples have been also determined.

Three tephra layers of the Yamato region were classified into two, and six tephra layers of five sampling sites of the Allan Hills region were classified into four.

(Received March 30, 1985)