Ross Ice Shelf Project 1978–79

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The final field season of the Ross Ice Shelf Project (RISP) was highlighted by the completion of several important experiments at the drill camp at J–9.

One major achievement was the acquisition of ice core through the lower portion of the ice shelf. The core drilling was accomplished by Dr. Igor A. Zotikov of the Institute of Geography in Moscow, U.S.S.R.

A hot-water drilling system designed and operated by the Browning Engineering Corporation provided access through the ice shelf. A great improvement over the previous season's flame-jet drilling system, the hot-water drill produced clean holes of large diameter.

A total of three holes were drilled through the ice shelf in this final season. The first two holes, completed on 1 December and 3 December 1978 were assigned to the Norwegian and Soviet "freeze-in" projects. The third hole, drilled and reamed on 6–7 December, was used to provide access through the shelf for all of the other projects. This third hole was used for a 26-day period, with use being interrupted twice when the hole, reduced in diameter by freezing, had to be reamed.

Descriptions of the drilling and scientific investigations conducted at J–9 are reported elsewhere in this issue of the *Antarctic Journal of the United States*.

One major task during this final field season was to transport equipment and material back to McMurdo Station. In the month beginning 26 December, a total of 13 flights were made from J–9 to McMurdo Station carrying approximately 300,000 pounds of equipment and material. We closed J–9 on 25 January 1979.

Our plans for the 1979–80 season are that J–9 will be visited briefly to collect data being automatically recorded throughout the year and to obtain new measurements from sensors within and beneath the ice.

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Hot-water drilling and coring at site J–9, Ross Ice Shelf

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In our second year at site J–9 with the Ross Ice Shelf Project (RISP) we drilled many holes that had a total footage of nearly 9,000 feet. Three of the holes penetrated through the nearly 1,400 feet of ice shelf to give access to the sea below. Average hole diameter was 3 feet. We obtained several ice cores 1 foot in diameter and up to 6 feet in length.

Both drilling and coring operations used the full output of a 250-horsepower boiler, which consumed 75 gallons per hour of fuel oil to heat 70 gallons of water per minute from 2° C to 98° C. A 10-horsepower submersible pump suspended in a Rodrigues well 170 feet below the surface of the firn pumped water to the boiler. The main hole passed through this well, allowing water to circulate from the drill to the pump.

In initial drilling tests, small-nozzle diameters yielding high water jet velocities were used. However, the results were disappointing. On the recommendation of both I. Zotikov and H. Ruffli, we switched to a much lower jet velocity. This proved to be the key to successful drilling. The average drilling speed for the 3-foot diameter holes was 2 feet per minute. The 3-inch diameter, 10-foot-long head was attached to 1,500 feet of reel-mounted 2-inch hose. A cable winch carried the load. The hose was clamped to the cable every 100 feet.

A thermistor in the drill head measured the drop in hot-water temperature with increasing depth and found a temperature gradient of −1° C. Heat passing through the walls of the hose to the cold water filling the hole should not be considered a loss, as it was required to