

Glaciological studies in the South Shetland Islands

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In January 1974, Mr. J. Birchell, Institute of Polar Studies, The Ohio State University, and I carried out field work at Livingston Island and at Deception Island.

The conditions at Rotch Ice Dome, Livingston Island, were studied to ascertain whether this would be a suitable site for medium depth drilling by the Glaciology of the Antarctic Peninsula (GAP) program. GAP, an international project, is aimed at gathering data on past and present climates in the Antarctic Peninsula region, with some studies also in South America. One major aspect of GAP is to obtain records of past atmospheric conditions by analyzing core drilled from ice domes. The work this season showed that the upper part of Rotch Ice Dome (elevation: 355 meters) is intermediate between the percolation zone and the soak zone. Practically all of the winter snow is heated to 0°C. by refreezing of percolating meltwater. Analysis at the Geophysical Isotope Laboratory, University of Copenhagen, of snow and firn samples collected at various Rotch Ice Dome localities shows that even at the highest elevations the seasonal oxygen¹⁸/oxygen¹⁶ variations are smoothed within 2 years; this, no doubt, is a result of the meltwater percolation. The mass balance of Rotch Ice Dome increases regularly with elevation, and reaches 1.3 meters water equivalent at the highest part. It is concluded that Rotch Ice Dome is not a very suitable location for core drilling to bedrock. The smoothing of the seasonal oxygen¹⁸ / oxygen¹⁶ variations means that these cannot be used to provide reliable dates (possibly particle counting can be used instead). Moreover, the high net balance, combined with an estimated maximum thickness of 200 meters, indicate that perhaps only about 800 years of record can be obtained.

Mass balance programs were continued on glacier G-1 (on Deception Island) and on Rotch Ice Dome, initiated respectively in the 1968-1969 and 1970-1971 seasons (Orheim, 1972). The continuing series of measurements at these glaciers makes the records of increasing significance for each year they are kept in operation, and some effort was spent this season to replace parts of the stake system that had been lost during the past few years. When we left the glaciers there were 12 measurement stakes exposed on G-1 and 24 exposed on Rotch Ice Dome.

Snow and firn samples were collected at G-1. Silicon was extracted to determine contemporary silicon³²

activity in this area. These data were needed in conjunction with a silicon³² sampling program of older ice that was conducted in the 1971-1972 season. The silicon³² samples are being analyzed at the Geophysical Isotope Laboratory by Dr. Henrik Clausen.

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Reference

- Orheim, O. 1972. A 200-year record of glacier mass balance at Deception Island, southwest Atlantic Ocean, and its bearing on models of global climatic change. Columbus, Ohio State University, Institute of Polar Studies. *Report*, 42. 118p.

Ice crater closure studies on Deception Island

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Final measurements of the glaciological regime resulting from an ice crater blasted through the snout of Bynon Hill glacier, Deception Island (63°S. 60.6°W.), during an August 1970 volcanic eruption, were completed during the 1973-1974 austral summer. A preliminary investigation was made during the 1970-1971 austral summer (Hughes, 1971) and a comprehensive investigation was initiated during the 1972-1973 austral summer (Hughes, 1973). Members of the 1973-1974 field party were Mr. Henry Brecher, Mr. Michael Scholz, Ms. Claire Parkinson, and myself as the principal investigator. The investigation was in two parts: measurement of the surface strain and of the mass balance regime by using two strain networks and by using isolated stakes (fig. 1), and measurement of shear band deformation around the ice crater walls by using strain networks constructed inside four tunnels cut into the glacier (fig. 2).

Results of the surface strain and of the mass balance studies will be presented in two separate papers at the International Symposium on Volcanology, International Association of Volcanology and Chemistry of