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# Characteristics and Significance of Rock Glaciers in Southern Victoria Land, Antarctica

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Table. Air, $CO_2$, and $^{14}C$ contents in ice.

| Ice Sample Weight (depth) | Air ($cm^3$ STP) | Air/Ice ($cm^3/kg$) | $CO_2$ ($cm^3$ STP) | $[CO_2]$Total/Air (%) | $^{14}C$ ($10^{-3}$ dpm/$cm^3$) | $^{14}C$ ($10^3$ yr) | $^{222}Rn$ (dpm/kg) |
|---|---|---|---|---|---|---|---|
| 8 day blank | 14 | – | <0.02 | <0.1 | – | – | – |
| Byrd Core 14.2 kg (362 m) | 1028 | 73 | 0.53 | 0.051 | 6.0 ± 0.5 | 2.0 ± 0.7 | 7.5 ± 0.4 |
| ALH. (St. 12) 31.15 kg (surface) | 983 | 31 | 1.86 | 0.189 | 27 ± 3 | (bomb) | – |
| ALH. (St. 18) 16.6 kg (surface) | 309* / 35† | 18.6* / 2.1† | 0.244* / 0.187† | 0.125 | 25 ± 6 | (bomb) | – |
| Byrd Core 16.4 kg (270 m) | 945* / 68† | 58* / 4.1† | 0.165* / 0.176† | 0.0336 | 6.8 ± 1.0 | 1.0 ± 1.0 | ≤0.5 |
| Frozen Water‡ 7.8 kg | 120* / 20‡ | 17.8* / 2.6† | 1.20* / 0.70† | 1.35 | 8.5 ± 1.0 | (contemp. air) | <0.2 |
| Byrd Core 9.2 kg (1070 m) | 1002* / 83† | 111* / 9.0† | 0.145* / 0.176† | 0.0296 | ≤3.0 | $\geq 8.0 \times 10^3$ | 12.9±0.5 |

*Bubbles released on melt.
†Purged with He – acidified, heated, and repurged with He.
‡Distilled water in freezer.


Cassidy, W. A. 1978. Antarctic search for meteorites during the 1977–1978 field season. *Antarctic Journal of the U.S.*, 13(4), 39–40.

Epstein, S., Sharp, R. P., and Gow, A. J. 1970. Antarctic ice sheet: Stable isotope analyses of Byrd station cores and interhemispheric climatic implications. *Science*, 168(3939), 1570–1572.

Evans, J. C., Rancitelli, L. A., and Reeves, J. H. 1979. $^{26}Al$ content of Antarctic meteorites: Implications for terrestrial ages and bombardment history. *Proceedings of the 10th Lunar Plantetary Science Conference*, 1, 1061–1072.

Fireman, E. L. 1979. $^{14}C$ and $^{39}Ar$ abundances in Allan Hills meteorites. *Proceedings of the 10th Lunar Planetary Science Conference*, 1, 1053–1060.

Fireman, E. L. 1980. Carbon-14 dating of Antarctic meteorites and Antarctic ice. *Lunar and Planetary Science XI*, 288–290 (Abstract).

Fireman, E. L., and Norris, T. L. In press. Dating Polar Ice by $^{14}C$ and $^{222}Rn$. American Chemical Society Monogram on Nuclear Dating Techniques.

Johnson, S. J., Dansgaard, W., Clausen, H. B., and Langway C. C. 1972. Oxygen isotope profiles through the Antarctic and Greenland ice sheets. *Nature*, 235(5339), 429–434.

Nishiizumi, K. and Arnold, J.R. 1980. Ages of Antarctic meteorites. *Lunar and Planetary Science XI*, 815–817 (Abstract).


# Characteristics and significance of rock glaciers in southern Victoria Land, Antarctica


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Rock glaciers, large-scale masses of frozen debris (figure 1), form a group of features that, because of their dependence on temperature and precipitation, can be used as monitors of climatic change. Thirty-two of these features were described this season in Wright, Taylor, and Victoria Valleys, and at Bull Pass.

Since dynamic aspects such as velocity, strain, viscosity, response time, and intraformational components of antarctic rock glaciers are not known, monitoring experiments were set up on nine of these features (figure 2) to investigate them. The features chosen for these experiments face north,

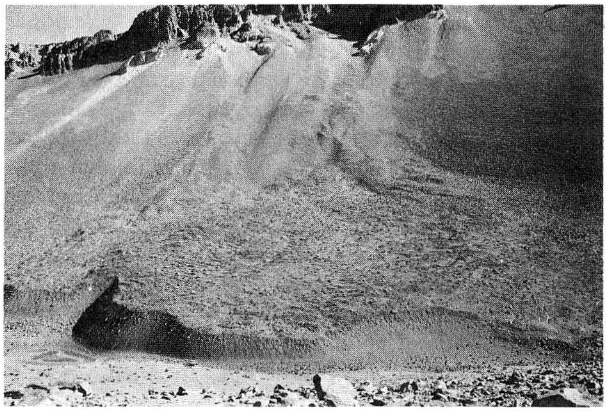

**Figure 1. Rock glacier in north fork of Wright Valley.**

south, east, and west; their snouts span an elevation range of 120–500 meters above sea level, while their heads span an elevation range of 260–1,300 meters above sea level. Velocity/strain nets in conjunction with micromovement monitoring systems, 22 shallow seismic refraction profiles, and 52 resistivity profiles and stratigraphic associations provide the field basis for the data set necessary to model the dynamics of these features.

Regional aerial photographic study of all identifiable rock glaciers in the study area will be undertaken to compare these features with respect to distribution of incoming radiation, groundwater and surface runoff, precipitation, and geographic location. Future re-occupation of experimental sites in conjunction with photographic and field data already gathered for these features will allow estimates of former changes in climate as interpretable through the impact of such changes on the dynamics of these rock glaciers.

Additional studies conducted during this season included collection of a 12.5-meter-deep ice core from the accumulation zone of Meserve Glacier and testing of a radio-echo sounder on Meserve and Taylor Glaciers. Analysis of chemical species (nitrate, nitrite, sulfate, phosphate, silica, iron, sodium, and chloride), as well as pH and conductivity, will allow determination of source area and amount of precipitation entering the accumulation area of Meserve and the amount and type of pollutants entering the region.

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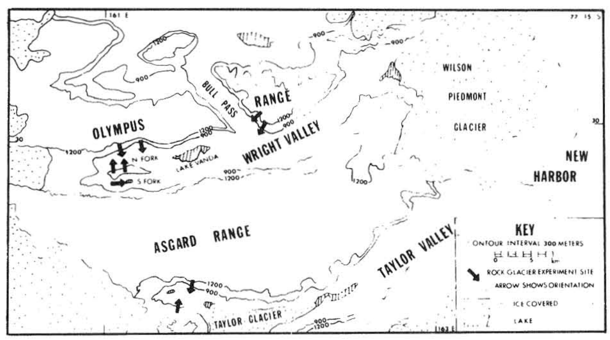


**Figure 2. Location of rock glaciers on which experiments were emplaced.**

# Deep geoelectric and electromagnetic soundings at Dome C

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During the 1979–80 field season, the University of Münster and the University of Wisconsin-Madison conducted deep geoelectric and radio-echo sounding of the polar ice at Dome C. The deep geoelectric sounding was extended to the largest electrode separation yet made on polar ice, leading to a better understanding of the electrical parameters in the interior of, and beneath, the ice sheet. As an experimental program, a monopulse echo sounder with a digital recording system was tested. The experiment was aimed at recording reflections from layers within the subglacial rock. This system has successfully sounded subglacial sedimentary layers beneath temperate glaciers in Europe.

Using a Schlumberger array technique, two detailed direct current electrical resistivity profiles with electrode half-spacings of 1 meter to a maximum of 6 and 8 kilometers respectively, yielded well-determined apparent resistivity curves (see Shabtaie, Bentley, Blankenship, Lovell, and Gassett, *Antarctic Journal of the U.S.*, this volume, figure 1). Seven to nine points per decade on a logarithmic scale were measured. A constant-current (direct current) transmitter supplied voltages up to 10 kilovolts. For each