

Century ice core was completed (Hoar, 1977). Results show that this profile is heavily debris-laden with distinct debris/debris-free bands; the air content is one-half or less than that measured over the upper 1,000 meters; mineralogical and X-ray examination of the debris shows near uniformity in the composition of the particles but a slight increase in clay-size at the top. Scanning electron microscope study of the particles (Woo *et al.*, 1976) indicates severe abrasion and close packing of the particle in the aggregate.

The PICAP team prepared for and participated in the Greenland field work associated with GISP-77 during the summer of 1977 at Dye-2 (M. Herron and S. Hoar), Camp Century and North Central (E. Chiang and J. Cragin), and Camp III (M. Herron). This work was supported by National Science Foundation grant DPP 77-04509.

References

- Busenberg, E., and C.C. Langway, Jr. In preparation. Levels of ammonium, sulfate chloride, calcium, and sodium in snow and ice from southern Greenland.
- Chiang, E., and C.C. Langway, Jr. 1976. Physical properties of the 100-meter deep ice core from J-9, Ross Ice Shelf, Antarctica. Symposium of SCAR - Specialist Group on Ice Shelf Drilling Projects, Mendoza, Argentina, 19 October. *Abstract*.
- Herron, M.M., C.C. Langway, Jr., H.V. Weiss, and J.H. Cragin. 1977. Atmospheric trace metals and sulfate in the Greenland Ice Sheet. *Geochimica et Cosmochimica Acta*, 41: 915-920.
- Herron, M.M., and C.C. Langway, Jr. 1976. Glaciochemical regimes of the Ross Ice Shelf, Antarctica. Symposium of SCAR - Specialist Group on Ice Shelf Drilling Projects, Mendoza, Argentina, 19 October. *Abstract*.
- Hoar, S.L. 1977. The structure and composition of basal ice at Camp Century, Greenland. *M.A. thesis*, State University of New York, Buffalo. 56p.
- Klouta, G.A. 1977. An investigation of the geochemical uniformity of an ice sheet. *M.A. thesis*, State University of New York, Buffalo. 64p.
- Kohnen, H., and C.C. Langway, Jr. In preparation. Ultrasonic and related glaciological studies on two 400-meter deep ice cores from south central Greenland.
- Koide, M., E.D. Goldberg, M.M. Herron, and C.C. Langway, Jr. In press. Transuranic depositional history in South Greenland firn layers. *Nature*.
- Langway, C.C., Jr. 1975. Antarctic ice core studies. *Antarctic Journal of the U.S.*, X(4): 152-153.
- Langway, C.C., Jr., and E. Chiang. 1976. Ice core storage and information exchange. *Antarctic Journal of the U.S.*, XI(4): 290-291.
- Langway, C.C., Jr., J.H. Cragin, G.A. Klouta, and M.M. Herron. 1975. Seasonal variations of chemical constituents in annual layers of Greenland deep ice deposits. Presented at IUGG Symposium on Isotopes and Impurities in Snow and Ice, Grenoble, France, 28-30 August and USACRREL Research Report 347, December. 5p.
- Langway, C.C., Jr., M.M. Herron, and J.H. Cragin. 1974. Chemical profile of the Ross Ice Shelf at Little America V, Antarctica. *Journal of Glaciology*, 13: 431-435.
- Miller, K.J. 1977. The physical properties and fabrics of two 400-meter deep ice cores from interior Greenland. *M.A. thesis*, State University of New York, Buffalo. 50p.

Woo, C.C., R.F. Commeau, and C.C. Langway, Jr. 1976. Scanning electron microscope examination of sand-grain particles from an ice core from Camp Century, northwest Greenland. Geological Society of America Annual Meeting, Denver, Colorado, 24 November. *Abstract*.

Central ice core storage facility and information exchange

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Our facility is responsible for processing, cataloging, and distributing ice cores drilled in Antarctica, Greenland, and other polar and sub-polar regions to approved recipients in accordance with National Science Foundation ice core sample distribution policy. Under this arrangement a commercial freezer facility stores most of the cores, with some storage capacity located at the State University of New York, Buffalo. A curator handles and arranges for redistribution and shipment of the ice cores. A data bank is maintained for each core recovered in the field and the data bank is regularly updated (Langway, 1974; Langway and Chiang, 1976).

The objective of maintaining central core storage facilities is to centralize and to maintain an accurate inventory of the ice cores and other snow surface samples recovered in National Science Foundation polar core drilling operations in both the Northern and Southern Hemispheres and to make portions of these samples available to approved recipients at worldwide locations for various physical and chemical investigations. Prior to sectioning and redistribution of the core samples, preliminary physical measurements are made. These and other data from other investigations on each core are contained in a computerized data bank. Pertinent information is available to participating scientists either by print-out sheets or by responding to specific requests.

New ice cores and snow samples were obtained in Antarctica during the 1976-1977 austral summer (table 1). A core was bored at site J-9 (100 meters, 6-centimeters diameter) using the new wireline coring system and the U.S. Army Cold Regions Research and Engineering Laboratory thermal drill (5.1 meters, 12.7-centimeters diameter). Shallow (7.6-centimeters diameter) ice cores were also obtained from sites C-7 (50 meters) and the Roosevelt Island dome (51 meters) using the Swiss shallow drill. In addition, 48 bulk surface sample were specially collected for investigation of the ^{238}Pu , $^{239} + ^{240}\text{Pu}$, and ^{241}Am concentrations and 10

meters of the Vostok Station thermal core were obtained from a Soviet field team. Forty-two shallow (10 meters deep) firn cores collected by the University of Copenhagen, at Ross Ice Shelf Geophysical and Glaciological Survey sites and the South Pole, were also included in the total ice shipment from Antarctica. All ice cores were safely transported from the field to McMurdo and then transported in a refrigerated compartment aboard USNS *Towle* to California and subsequently to the central ice core storage facility at State University of New York, Buffalo. The entire shipment consisted of 872 cubic feet (24.7 cubic meters) of samples weighing approximately 9,000 lbs. (4,090 kilograms). The samples arrived in Buffalo on 21 April 1977.

As shown in table 1, approximately 675 meters of new shallow ice cores have been recovered from both northern and southern polar ice sheets during this reporting period (200 meters from Antarctica and 470 meters from Greenland). Samples obtained in Antarctica in 1976-1977 and in Greenland in 1977 were expected to be available for study by 1 September 1977.

The curator often assists in arranging for transport of ice cores and other samples from the field. Two groups of

samples were taken to J.F.K. International Airport, New York, for overseas shipment (Switzerland and Japan). Table 2 lists polar ice core samples distributed between January 1976 and August 1977.

All computer programs related to data analysis, the data bank, and information exchange activities (Langway and Chiang, 1976) were improved and translated from BASIC language (DTSS) to FORTRAN (KRONOS). This included an updated data bank for all the 400 meter and shallow cores obtained in Greenland and Antarctica since 1971 (Dye-3, Milcent, Crete, South Dome, Dye-2 and Dye-3, South Pole, C-7-1, C-7-2, and C-7-3, Roosevelt Island dome, and J-9). A technical note (Miller and Chiang, 1976) and 12 new Ice Core Laboratory Data Bank Report Series (computer printouts of the data bank storage) were written describing this effort. Data plotter computer programs were developed for depth/density, bubble pressure, and chemical property studies for standardization of data treatment and analysis (Miller and Chiang, 1976b; 1976c).

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Table 1. Arctic and antarctic ice core inventory.

Year drilled	Location	Drilling method	Core Diameter (cm)	Core Quality	Depth of drilling (m)
<i>Antarctica</i>					
1976	J-9, Ross Ice Shelf	Wireline (thermal)	6.0 (12.7)	Fair to Excellent	100 150-155.1
1976	C-7 Satellite, Ross Ice Shelf	Swiss shallow	7.6	Excellent	50
1976	Roosevelt Island Dome	Swiss shallow	7.6	Excellent	51
<i>Greenland</i>					
1977	Camp Century*	Danish shallow	7.8 7.8	Excellent Excellent	100.2 78.0
1977	North Central**	Danish shallow	7.8 7.8	Excellent Excellent	100.1 109.0
1977	Dye-2	CRREL intermediate	7.8	Excellent	82

*Four cores augered, the second core (100.7 meters) and fourth core (70 meters) were transported directly to the University of Copenhagen.

**Three cores augered, the second core (102 meters) was transported directly to the University of Copenhagen.

Table 2. Sample distribution: 1976-1977.

References

Date sampled	Institution	Core sample	Study
1/15/76	CRREL (Cragin)	Milcent (Greenland)	Chemistry; Hg absorption study
1/19/76	ICL/SUNYAB (Herron)	Milcent (Greenland)	Chemistry; volcanic constituents
2/24/76	CRREL (Cragin)	Milcent (Greenland)	Chemistry; Hg absorption study
4/21/76	ICL/SUNYAB (Chiang)	J-9 (Antarctica)	Bubble Pressures; physical properties
5/19/76	ICL/SUNYAB (Miller)	Crete (Greenland)	Physical Properties; crystal size, ice fabrics, bubble pressures
6/1/76	ICL/SUNYAB (Klouda)	Byrd Station (Antarctica)	Particle analysis; Chemistry
6/20/76	Univ. Copenhagen (Dansgaard)	J-9 (Antarctica)	O-isotope
7/15/76	ICL/SUNYAB (Busenberg)	Dye-3, 1971 (Greenland)	Ammonia
7/29/76	ICL/SUNYAB (Busenberg)	Dye-3, 1971 (Greenland)	Ammonia
8/9/76	Washington State Univ. (Rasmussen)	Byrd Station (Antarctica)	Chlorofluorocarbons
9/8/76	ICL/SUNYAB (Busenberg)	Dye-3, 1971 (Greenland)	Ammonia
8/16/76	ICL/SUNYAB (Hoar)	Camp Century (Greenland)	Embedded debris; physical properties
8/16/76	ICL/SUNYAB (Klouda)	Crete, Milcent (Greenland)	Chemical horizontal and vertical variability
11/10/76-12/10/76	Univ. Munster (Kohnen)	J-9 (Antarctica)	Sonic velocities
1/17/77	ICL/SUNYAB (Busenberg)	Dye-3, 1971 (Greenland)	Ammonia, Sulfate, chloride determinations
1/20/77	ICL/SUNYAB (Hoar)	Camp Century (Greenland)	Embedded debris; physical properties
2/6/77	ICL/SUNYAB (Hoar)	Camp Century (Greenland)	Ice fabric
2/17/77	Hokkaido Univ.	Byrd Station (Antarctica)	Viscoelastic, dielectrics (clear and debris-laden ice)
3/10/77	Univ. Bern (Oeschger)	Camp Century (Greenland)	Gas analysis
3/21/77	ICL/SUNYAB (Herron)	J-9 (Antarctica)	Sodium
3/23/77	Virg. Polytech. Inst. (Parker)	South Pole (Antarctica)	Nitrates
3/23/77	Univ. Kansas (Zeller)	South Pole (Antarctica)	Radio isotopes
5/6/77	Virg. Polytech. Inst. (Parker)	South Pole (Antarctica)	Nitrates
5/23/77	ICL/SUNYAB (Chiang)	J-9 (Antarctica)	Bubble pressure; physical properties
5/26/77	Washington State Univ. (Rasmussen)	Byrd Station (Antarctica)	Chlorofluorocarbons
6/1/77	Virg. Polytech. Inst. (Parker)	South Pole (Antarctica)	Nitrates
6/1/77-6/30/77	ICL/SUNYAB (Usselman)	Camp Century (Greenland)	Sub-ice cobble composition; radiometric dating
8/15/77-9/9/77	Univ. Copenhagen (Dansgaard)	Ross Ice Shelf, South Pole (Antarctica)	O-isotope

Langway, Chester C., Jr. 1974. Ice core storage facility. *Antarctic Journal of the U.S.*, IX(6): 322-325.

Langway, Chester C., Jr., and E. Chiang. 1976. Ice core storage and information exchange. *Antarctic Journal of the U.S.*, XI(4): 290-291.

Miller, K.J., and E. Chiang. 1976. Technical computer manual: introduction to the design and operation of the ice core data bank. *Ice Core Laboratory (ICL) Report Series*. SUNY-Buffalo, Department of Geological Sciences, 15p.

Miller, K.J., and E. Chiang. 1976. Technical computer manual: hydrostatic determinations of glacier ice density. *Ice Core Laboratory (ICL) Report Series*. SUNY-Buffalo, Department of Geological Sciences, 7p.

Miller, K.J. 1976. Technical computer manual: plotting Schmidt stereographic projections. *Ice Core Laboratory (ICL) Report Series*. SUNY-Buffalo, Department of Geological Sciences, 4p.

Meteorology

Temperature regime of the South Pole: results of 20 years' observations at Amundsen-Scott Station

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When Amundsen in Norway and Scott in England planned their expeditions to the South Pole about 67 years ago, some information regarding the conditions to be expected on the antarctic plateau was already available. In one of the greatest pioneering journeys of all time, Shackleton and his companions had discovered and mastered the Beardmore Glacier in December 1908 and had progressed south to latitude 88°23'S., only 180 kilometers from the Pole. They had to turn back that close to their goal since their supplies, food and fuel were insufficient, and made it to their base on Ross Island only because of the stamina of their leader. For 15 days, 1-15 January, they had stayed south of 87°S. at an elevation of approximately 3,000