

## GLACIOLOGICAL LITERATURE

THIS is a selected list of glaciological literature on the scientific study of snow and ice and of their effects on the Earth; for the literature on polar expeditions, and also on the "applied" aspects of glaciology, such as snow ploughs, readers should consult the bibliographies in each issue of the *Polar Record*. For Russian material the system of transliteration used is that agreed by the U.S. Board on Geographic Names and the Permanent Committee on Geographical Names for British Official Use in 1947. Readers can greatly assist by sending reprints of their publications to the Society, or by informing Dr J. W. Glen of publications of glaciological interest. It should be noted that the Society does not necessarily hold copies of the items in this list, and also that the Society does not possess facilities for microfilming or photocopying.

### GENERAL GLACIOLOGY

- BJÖRNSSON, H. Hugleiðing um jöklarannsóknir á Íslandi. *Jökull*, Ár 20, 1970, p. 15–26. [General account of modern glaciological theories and techniques; measurements of glacier variations and proposed research projects in Iceland. English summary, p. 15.]
- CAMPBELL, W. J. The remote sensing needs of Arctic geophysics. (In *Third annual earth resources program review*. Vol. 3. *Hydrology and oceanography*. Presented at the NASA Manned Spacecraft Center, Houston, Texas. December 1 to 3, 1970. Houston, Texas, NASA Manned Spacecraft Center, [1971], p. 60-1–60-15.) [Discusses value of remote sensing in studying permafrost, snowpacks, glaciers, ice caps and, particularly in the Arctic, sea ice.]
- EYTHORSSON, J., and SIGTRYGGSSON, H. The climate and weather of Iceland. (In *The zoology of Iceland*. Vol. 1, Pt. 3. Copenhagen and Reykjavik, Ejnar Munksgaard, 1971, 62 p.) [Includes chapters on sea, lake and river ice and on glaciers.]
- HODAREV, YU. K., and others. Some possible uses of optical and radio-physical remote measurements for earth investigations, [by] Yu. K. Hodarev, B. S. Dunayev, B. N. Rodionov, A. L. Serebryakyan, Yu. M. Tchesnokov, V. S. Etkin. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 99–118. [Mentions investigations of sea ice and albedo of snow cover.]
- KAMINSKI, H. Bestimmung von kurz- und langzeitlichen Eis-, Meereis- und Schneebewegungen in der Arktis aus Satelliten-Luftbildern. *Polarforschung*, Bd. 7, Jahrg. 41, Nr. 1–2, 1971, p. 89–111. [Discusses results of satellite observations of the movements (including ablation) of ice, sea ice and snow in Arctic regions.]
- MARUYASU, T., and others. Remote sensing of environment in Japan, [by] T. Maruyasu [and 9 others]. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 223–30. [Mentions work on sea ice and snow distribution.]
- MICHEL, B. La mécanique des glaces; avenir de la recherche. *Ressources: Bulletin de la Direction Générale des Eaux, Gouvernement du Québec*, Vol. 3, No. 2, 1972, p. 13–14. [Outlines some problems in applied glaciology in Quebec.]
- MORLEY, L. W. Canada's approach to remote sensing. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 3–18. [Present progress and future plans are discussed, including those for ice reconnaissance and glaciology.]
- SHILIN, B. V., and others. The investigation of natural resources by infrared remote sensing methods, [by] B. V. Shilin, N. A. Gusyev, M. M. Miroshnikov, Ye. Ya. Karizhenski. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 133–46. [Mentions use of method in studies of sea and land ice.]

### GLACIOLOGICAL INSTRUMENTS AND METHODS

- ANDREWS, J. T. Techniques of till fabric analysis. *British Geomorphological Research Group. Technical Bulletin* No. 6, 1971, 43 p. [Deals with equipment, field procedures and analysis of results (graphical display and statistical analysis).]
- COX, L. M. Field performance of the universal surface precipitation gage. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 84–88. [Describes design, operation and performance of this gage.]
- DIRMHORN, I., and CRAW, C. An economical device for optically detecting snow depth at remote stations. *Water Resources Research*, Vol. 7, No. 5, 1971, p. 1328–32. [Describes reliable, inexpensive, adaptable instrument.]
- JAMES, P. A. The measurement of soil frost-heave in the field. *British Geomorphological Research Group. Technical Bulletin* No. 8, 1971, 43 p. [Describes heave-measuring techniques employed in widely differing climatic environments, and presents details of an instrument designed for use where heave is of small amplitude.]
- MCCORMICK, G. Frost penetration factors. *Northern Engineer*, Vol. 3, No. 3, 1971, p. 14–16. [Describes method and calculation for estimating depth of frost penetration in soil.]
- MORELAND, R. E. Development of the fulcrum weighing device for precipitation gages. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 77–83. [An easy-to-use and quick device.]
- RACKETS, H. M. A low-noise seismic method for use in permafrost regions. *Geophysics*, Vol. 36, No. 6, 1971, p. 1150–61. [Small charges at shallow depths gave satisfactory results, and were inexpensive and safe.]



## PHYSICS OF ICE

- ADAMSON, A. W., and JONES, B. R. Physical adsorption of vapors on ice. IV. Carbon dioxide. *Journal of Colloid and Interface Science*, Vol. 37, No. 4, 1971, p. 831-35. [Study of adsorption and desorption. At low pressures CO<sub>2</sub> adsorbs rapidly and reversibly, but above a critical pressure massive uptake probably due to clathrate formation occurs. Desorption leaves a monolayer unremovable.]
- AHLBORN, B. Trigger criterion for steady fusion detonations in D-T ice. *Physics Letters A*, Vol. 37, No. 3, 1971, p. 227-28. [Possibility of initiating a nuclear fusion reaction by focusing laser or electron beams in ice with equal amounts of deuterium and tritium.]
- BUSTANY, S. N. Growth of ice in salt water drops dispersed in an organic phase. *Dissertation Abstracts International*, B, Vol. 31, No. 6, 1970, p. 3346-B. [Observations of process and possibility of its use in desalination. Abstract of Ph.D. thesis, Cornell University, 1970. University Microfilms order no. 70-24921.]
- CHANG, K. S., and others. Circle theorem for the ice-rule ferroelectric models, by K. S. Chang, S. Y. Wang and F. Y. Wu. *Physical Review A*, Third Ser., Vol. 4, No. 6, 1971, p. 2324-27. [Shows that this theorem, of use in the theory of phase transitions, breaks down under certain circumstances.]
- COLBECK, S. C. The flow law for temperate glacier ice. *Dissertation Abstracts International*, B, Vol. 32, No. 1, 1971, p. 383-B. [Tests on glacier ice used to deduce flow law and to construct theory of glacier flow. Abstract of Ph.D. thesis, University of Washington, 1970. University Microfilms order no. 71-16934.]
- DAVY, J. G. Vaporization mechanism of ice single crystals. *Dissertation Abstracts International*, B, Vol. 31, No. 7, 1971, p. 3950-B-51-B. [Microbalance used to study sublimation at -90° C to -40° C. Effect of doping and of NH<sub>3</sub> and HF in the vapour phase. Abstract of Ph.D. thesis, University of California, Berkeley, 1970. University Microfilms order no. 71-759.]
- EDWARDS, G. R., and EVANS, L. F. The mechanism of activation of ice nuclei. *Journal of the Atmospheric Sciences*, Vol. 28, No. 8, 1971, p. 1443-47. [Evidence that process is surface phase change in H<sub>2</sub>O layer adsorbed on substrate.]
- ENGELHARDT, H., and WHALLEY, E. Ice IV. *Journal of Chemical Physics*, Vol. 56, No. 6, 1972, p. 2678-84. [Study of melting lines and triple points involving the metastable phase ice IV produced by using nucleators for both H<sub>2</sub>O and D<sub>2</sub>O. Isotope effect on transitions.]
- FLETCHER, N. H. Structural aspects of the ice-water system. *Reports on Progress in Physics*, Vol. 34, No. 10, 1971 [pub. 1972], p. 913-94. [Review including structure of ice in all its phases.]
- GANGWANI, G. S., and others. Steady-state neutron spectra in ice in the temperature range 268 to 4° K, by G. S. Gangwani, S. P. Tewari and L. S. Kothari. *Nuclear Science and Engineering*, Vol. 47, No. 1, 1972, p. 153-56. [Theoretical study of neutron cooling by ice.]
- GAVRILLO, V. P., and others. Vnytrenneye treniye v polikristallicheskom l'de v diapazone chastot 5-400 gts. [Internal friction in polycrystalline ice in the 5-400 Hz frequency range]. [By] V. P. Gavriilo, A. V. Gusev, V. N. Mal'kov, A. P. Polyakov. *Izvestiya Akademii Nauk SSSR. Fizika Zemli*, 1971, No. 6, p. 82-85. [Measurement of dependence on frequency, duration and amplitude of applied stress field at -7° C.]
- GOKHALE, N. R., and SPENGLER, J. D. Freezing of freely suspended, supercooled water drops by contact nucleation. *Journal of Applied Meteorology*, Vol. 11, No. 1, 1972, p. 157-60. [Observations in wind tunnel using ice crystals, AgI, soil, sand and clay as nucleators.]
- GOLD, L. W. The process of failure in columnar-grained ice. *Dissertation Abstracts International*, B, Vol. 31, No. 10, 1971, p. 6031-B. [Study of the stress, strain, temperature and time dependence of crack formation in columnar-grained ice. Abstract of Ph.D. thesis, McGill University, 1970. Microfilm available from National Library of Canada, Ottawa.]
- HARDIN, A. H. The vibrations of ice I and some clathrate-hydrates below 200° K. *Dissertation Abstracts International*, B, Vol. 31, No. 12, 1971, p. 7504-B-05-B. [Infra-red spectroscopic studies from 4.2 to 200 K in vitreous, cubic and hexagonal ice and clathrate hydrates. Abstract of Ph.D. thesis, University of British Columbia, 1970. Microfilm available from National Library of Canada, Ottawa.]
- JANZOW, E. F. An experimental study of salt entrainment in ice crystallized from brine. *Dissertation Abstracts International*, B, Vol. 32, No. 2, 1971, p. 979-B. [Observations of processes occurring when ice crystallizes on a pellet immersed in flowing brine. Abstract of Ph.D. thesis, University of Illinois at Urbana-Champaign, 1970. University Microfilms order no. 71-14806.]
- JENEVEAU, A., and SIXOU, P. Dipolar relaxation at low temperature of ice single crystal. *Solid State Communications*, Vol. 10, No. 2, 1972, p. 191-94. [Observation of depolarization thermocurrents of ice single crystals show two peaks attributed to Bjerrum defects and ionic states.]
- JONES, D. R. H., and CHADWICK, G. A. Experimental measurement of solid-liquid interfacial energies: the ice-water-sodium chloride system. *Journal of Crystal Growth*, Vol. 11, No. 3, 1971, p. 260-64. [Change in interfacial energy with NaCl concentration.]
- KROH, J., and STRADOWSKI, C. Radiolysis of alkaline ice containing additives. *Radiochemical and Radioanalytical Letters*, Vol. 9, No. 3, 1972, p. 169-77. [Measurement of concentration of stabilized electrons at 77 K in irradiated glassy ices.]
- KVAJČIĆ, G., and others. Instability of a smooth-planar solid-liquid interface on an ice crystal growing from a melt, by G. Kvačić and E. R. Pounder and V. Brajović. *Canadian Journal of Physics*, Vol. 49, No. 21, 1971, p. 2636-45. [Morphology observed as function of freezing rate and initial NaCl concentration. Instability not accounted for by current theories.]
- LAMB, D. Growth rates and habits of ice crystals grown from the vapor phase. *Dissertation Abstracts International*, B, Vol. 32, No. 1, 1971, p. 480-B. [Measurement of linear growth rates on prism and basal faces of ice and their interpretation. Abstract of Ph.D. thesis, University of Washington, 1970. University Microfilms order No. 71-16969.]
- LAMB, D., and HOBBS, P. V. Growth rates and habits of ice crystals grown from the vapor phase. *Journal of the*



- Atmospheric Sciences*, Vol. 28, No. 8, 1971, p. 1506–09. [Measurements of linear growth rates of basal and prism faces of ice used to calculate temperature variation of habit.]
- LAMB, D., and SCOTT, W. D. Linear growth rates of ice crystals grown from the vapor phase. *Journal of Crystal Growth*, Vol. 12, No. 1, 1972, p. 21–31. [Measurements of rates for basal and prism faces of ice as function of temperature, excess vapour pressure and air partial pressure.]
- LEBEDEV, D. P., and SAMSONOV, V. V. Skachki temperatur i mekhanizm vneshnego teplo- i massoobmena nad pronitsayemoy poverkhnost'yu pri sublimatsii l'da-vody v vakuum [Temperature discontinuities and mechanism of external heat and mass transfer over a permeable surface during ice-water sublimation *in vacuo*]. *Inzhenerno-Fizicheskii Zhurnal*, Tom 21, No. 2, 1971, p. 283–89 [Experimental study and explanation of mechanism. English summary, p. 289.]
- LEBEDEV, D. P., and ZHUKOV, V. N. Vliyaniye sodержaniya i konsentratsii v vodnykh rastvorakh nekotorykh ionov na mekhanizm sublimatsii l'da [The effect of content and concentration of some ions in aqueous solutions on the mechanism of sublimation of ice]. *Inzhenerno-Fizicheskii Zhurnal*, Tom 21, No. 4, 1971, p. 639–45. [Effect of pH and of various salts dissolved in mother liquid on the way in which sublimation of the resulting ice proceeds. English summary, p. 645.]
- MAENO, N. Dielectric properties of KCl ice. *Journal of Applied Physics*, Vol. 43, No. 2, 1972, p. 312–16. [Measurements above and below the eutectic temperature.]
- MILOŠEVIĆ-KVAJIĆ, M., and others. Angular correlation of annihilation photons in frozen aqueous solutions, [by] M. Milošević-Kvajić, O. Mogensen, G. Kvajić and M. Eldrup. *Journal of Chemical Physics*, Vol. 56, No. 6, 1972, p. 2567–71. [Only halide-containing impurities changed the form of the curves.]
- NILSSON, G. Localized excess electrons in water and ice. An ice cavity model for the localized electron and the microscopic relaxation time. *Journal of Chemical Physics*, Vol. 56, No. 7, 1972, p. 3427–34. [Theoretical model of structure of solvated electron.]
- NILSSON, G., and others. Transient electrons in pulse-irradiated crystalline water and deuterium oxide ice, by G. Nilsson, H. Christensen, P. Pagsberg and S. O. Nielson. *Journal of Physical Chemistry*, Vol. 76, No. 7, 1972, p. 1000–08. [Observation of optical absorption spectrum after electron irradiation of H<sub>2</sub>O and D<sub>2</sub>O ice. Interpretation of kinetics of transient electron decay.]
- OFFENBACHER, E. L., and ROSELMAN, I. C. Hardness anisotropy of single crystals of ice Ih. *Nature, Physical Science*, Vol. 234, No. 49, 1971, p. 112–13. [Letter. Anisotropy of Knoop hardness on prismatic planes of ice crystals. Results interpreted in terms of non-basal slip.]
- OHNO, K., and others. Resolution enhanced ESR spectra of the trapped electrons in an alkaline ice [by] K. Ohno, I. Takemura and J. Sohma. *Journal of Chemical Physics*, Vol. 56, No. 3, 1972, p. 1202–06. [Study of hyperfine coupling constant and paramagnetic relaxation of trapped electrons.]
- OLANDER, D. S., and RICE, S. A. Preparation of amorphous solid water. *Proceedings of the National Academy of Sciences of the U.S.A.*, Vol. 69, No. 1, 1972, p. 98–100. [Method of producing samples of amorphous ice completely free of any crystallinity.]
- PERRY, J. W., and STRAITON, A. W. Dielectric constant of ice at 35.3 and 94.5 GHz. *Journal of Applied Physics*, Vol. 43, No. 2, 1972, p. 731–33. [Measurements.]
- PLOOSTER, M. N. On freezing of supercooled droplets shattered by shock waves. *Journal of Applied Meteorology*, Vol. 11, No. 1, 1972, p. 161–65. [Experiments show probability of ice crystal formation is very small.]
- PRASK, H. J., and others. Ice I—lattice dynamics and incoherent neutron scattering, [by] H. J. Prask, S. F. Trevino, J. D. Gault, and K. W. Logan. *Journal of Chemical Physics*, Vol. 56, No. 7, 1972, p. 3217–25. [Incoherent neutron inelastic scattering data presented and compared with theory based on ice Ic model with ordered hydrogens.]
- PUPEZIN, J., and others. The vapor pressure isotope effect in aqueous systems. I. H<sub>2</sub>O-D<sub>2</sub>O (–64° to 100°) and H<sub>2</sub><sup>16</sup>O-H<sub>2</sub><sup>18</sup>O (–17° to 16°): ice and liquid. II. Alkali metal chloride solution in H<sub>2</sub>O and D<sub>2</sub>O (–5° to 100°), by J. Pupezin, G. Jakli, G. Jancso and W. A. Van Hook. *Journal of Physical Chemistry*, Vol. 76, No. 5, 1972, p. 743–62. [Data for ice extending to predicted triple points and ice-liquid fractionation factors.]
- ROSE, D. N. The Hall effect in ice. *Dissertation Abstracts International*, B, Vol. 32, No. 3, 1971, p. 1794-B. [Measurements of Hall mobility in HF-doped ice give results similar to protonic drift mobility. Abstract of Ph.D. thesis, Texas A and M University, 1971. University Microfilms order no. 71-24706.]
- SEBAN, R. A. A comment on the periodic freezing and melting of water. *International Journal of Heat and Mass Transfer*, Vol. 14, No. 11, 1971, p. 1862–64. [Demonstrates that a simpler theory is adequate to explain experimental results as well as theory of G. S. H. Lock and others, *ibid.*, Vol. 12, No. 11, 1969, p. 1343–52.]
- SEIDENSTICKER, R. G. Partitioning of HCl in the water-ice system. *Journal of Chemical Physics*, Vol. 56, No. 6, 1972, p. 2853–57. [Partition coefficient is concentration-dependent. This is attributed to electrical point defects generated in ice by dissolved HCl.]
- SOLDANO, B. A., and WARD, W. T. The utility of ice cubes as an absorbent for gaseous fission products. *Nuclear Technology*, Vol. 12, No. 4, 1971, p. 363–66. [Ice cubes made from a base-borate solution of Na<sub>2</sub>S<sub>2</sub>O<sub>6</sub>, removed I<sub>2</sub> but not CH<sub>3</sub>I from air stream.]
- VON HIPPEL, A. R. Molecular understanding of electrochemical processes by ice research. *Journal of the Electrochemical Society*, Vol. 119, No. 2, 1972, p. 45C–54C. [Popular survey of recent work in ice physics.]
- VONNEGUT, B., and CHESSIN, H. Ice nucleation by coprecipitated silver iodide and silver bromide. *Science*, Vol. 174, No. 4012, 1971, p. 945–46. [Improvement of ability of AgI to nucleate freezing of supercooled water if 30% of I are replaced by Br.]
- WILLIAMS, P. M. Comment on the existence of a measured discontinuity in the thermal-neutron diffusion coefficient across the ice-water phase transition. *Nuclear Science and Engineering*, Vol. 47, No. 3, 1972, p. 389. [Questions the conclusion of G. N. Salaita and A. Robeson, *ibid.*, Vol. 46, No. 2, 1971, p. 214–22, that such a discontinuity exists. Cf. P. M. Williams and F. J. Munno, *ibid.*, Vol. 43, No. 1, 1970, p. 120–22.]
- WOOD, G. R. Kinetics of ice nucleation from water and electrolyte solutions. *Dissertation Abstracts International*, B,



- Vol. 31, No. 6, 1970, p. 3318-B. [Observations of frequency of solidification of droplets. Abstract of Ph.D. thesis, Case Western Reserve University, 1969. University Microfilms order no. 70-26011.]
- YEN, Y. C., and TIEN, C. Heat transfer at a melting flat surface under conditions of forced convection and laminar boundary layer. *International Journal of Heat and Mass Transfer*, Vol. 14, No. 11, 1971, p. 1875-76. [Draws attention to similarity between earlier theory of authors and theory published by F. N. Pozvonkov and others, *ibid.*, Vol. 13, No. 6, 1970, p. 957-62.]

## LAND ICE. GLACIERS. ICE SHELVES

- AIGINA, N. P., and RYUMIN, A. K. Fototeodolitnaya geomorfologicheskaya s"yemka konechno-morennogo kompleksa Zeravshanskogo lednika [Photo-theodolite survey of the end moraine of Zeravshan glacier]. *Vestnik Leningradskogo Universiteta. Seriya Geologii i Geografii*, 1971, No. 12, p. 116-23. [Glacier survey, 1968. English abstract, p. 123.]
- AMBACH, W., and others. Bestimmung von Firnrücklagen am Eisschild Jungfrauoch durch Messung der Gesamt-Betaaktivität von Firnproben, von W. Ambach, H. Eisner, R. Haefeli and M. Zobl. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 57-63. [Net accumulation of the period 1963-68 was determined by measurements of the gross  $\beta$ -activity of firn samples from the Jungfrauoch; results are discussed.]
- AMBACH, W., and others. Zum Abbau radioaktiver Spaltprodukte im Firn eines Alpen-gletschers, [von] W. Ambach, H. Eisner, F. Prantl, M. Url. *Archiv für Meteorologie, Geophysik und Bioklimatologie*, Ser. A, Vol. 20, No. 3, 1971, p. 277-88. [Investigations of vertical distribution of total  $\beta$ -activity in firn-snow layers in the accumulation area of the Kesselwandferner show that a high concentration of radioactive deposits on summer ablation horizons occurs due to melting of snow, with Cs<sup>137</sup> predominating as it is adsorbed onto dust layers.]
- BARKOV, N. I. Predvaritel'nyye rezul'taty bureniya lednikovogo pokrova na stantsii Vostok [Preliminary results of ice sheet drilling at "Vostok" station]. *Informatsionnyy Byulleten' Sovetskoy Antarkticheskoy Ekspeditsii*, No. 80, 1970, p. 24-29. [Boring reached 503 m, August 1970.]
- BEHRENS, H., and others. Study of the discharge of alpine glaciers by means of environmental isotopes and dye tracers, by H. Behrens, H. Bergmann, H. Moser, W. Rauert, W. Stüchler and W. Ambach, H. Eisner, K. Pessl. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 79-102. [Applies tracer methods to total run-off measurements and natural isotope content of the water for determining the characteristics of the run-off system of the melt water, differentiating between snow and ice melt water and surface and subglacial water.]
- CHINN, T. J., and BELLAMY, R. J. *Annual hydrological research report no. 1 for Ivory Glacier representative basin for the glacial hydrological region for the period ended 31 December 1969*. Wellington, N.Z., Ministry of Works, Water and Soil Division, 1970. [iv], 12 p.+ corrigenda slip. [Describes work to date.]
- CHIZHOV, O. P., and BAZHEVA, V. YA. Ostrova-ledyanyye shapki v Arktike i Antarktike [Islands with ice caps in the Arctic and Antarctic]. *Voprosy Geografii*, No. 84, 1970, p. 243-54. [Calculations of the mass budgets of the ice caps of these islands and indication of their usefulness as models of large ice sheets.]
- CHORLTON, J. C., and LISTER, H. Geographical control of glacier budget gradients in Norway. *Norsk Geografisk Tidsskrift*, Bd. 25, Ht. 3-4, 1971, p. 159-64. [Dependence of accumulation, ablation and specific net budget on altitude, distance from ocean and orientation.]
- DOWNIE, G. Glaciology. *British Schools Exploring Society. Report*, 1969-71, p. 112-27. [Report of the glaciology group of the 1970 expedition to Iceland on survey carried out on Klofajökull, outlet glacier of Eiríksjökull.]
- EISNER, H. Bestimmung der Firnrücklagenverteilung im Akkumulationsgebiet des Kesselwandferners (Ötztaler Alpen) durch Messung der Gesamt-Betaaktivität von Bohrproben. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 65-78. [Describes determination of the distribution of firn deposition in the accumulation area of the Kesselwandferner for the periods 1961-64 and 1964-68 by measurement of the gross  $\beta$ -activity.]
- EMMRICH, P. Über die Versetzung des Treibeises im Weststurm bei Südgrönland aus der Sicht des Satelliten. *Wetter und Leben*, Jahrg. 23, Ht. 11-12, 1971, p. 232-36. [Effect of westerly gales on movement of sea ice off south Greenland, illustrated by satellite pictures taken in 1968.]
- FÖHN, P. Methoden der Massenbilanzmessung bei grossen Schneehöhen, untersucht im Firngebiet des Grossen Aletschgletschers. *Beiträge zur Geologie der Schweiz. Hydrologie*, Nr. 20, 1971, 111 p. [Examines methods of investigating mass balance in regions where the snow accumulation is very high. Measurements on the Grosser Aletschgletscher enabled some conclusions to be made about the hydrological characteristics of this area.]
- GJESSING, Y. T. Mass transport of Jutulstraumen ice stream in Dronning Maud Land. *Norsk Polarinstitut. Årbok*, 1970 [pub. 1972], p. 227-32. [Maximum ice thickness and velocity were found to be 1 560 m and 390 m/year respectively; the mass transport was estimated at  $76 \times 10^8$  Mg/year.]
- GOVORUKHA, L. S. Sovremennoye sostoyaniye oledeniya Gor Byrranga [Present state of glaciation of Gory Byrranga]. *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, Tom 103, Vyp. 6, 1971, p. 510-16. [Describes glaciers in these mountains of the Taymyr peninsula.]
- HENOCH, W. E. S. Estimate of glaciers [sic] secular (1948-1966) volumetric change and its contribution to the discharge in the upper North Saskatchewan River basin. *Journal of Hydrology* (Amsterdam), Vol. 12, No. 2, 1971, p. 145-60. [Glacier volume loss during this period was  $1000 \times 10^6$  m<sup>3</sup>, which is approximately 4% of the total discharge of the entire river basin.]
- JOHNSON, S. J., and others. Oxygen isotope profiles through the Antarctic and Greenland ice sheets, [by] S. J. Johnson, W. Dansgaard, H. B. Clausen, C. C. Langway, Jr. *Nature*, Vol. 235, No. 5339, 1972, p. 429-34. [Discusses pole-to-pole correlations of the palaeoclimatic data obtained from ice cores, which remain, for the present, speculative owing to the complexity of the glaciological regime at "Byrd" station, Antarctica.]



- JOHNSON, P. G. Ice core moraine formation and degradation, Donjek Glacier, Yukon Territory, Canada. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 198-202. [Primarily composed of stagnant glacier ice. Cause of wide-spread occurrence and processes of degradation are discussed.]
- KINZL, H. Gletschermessungen mit der Kamera am Unteraargletscher (Schweiz). *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 219. [Brief description of Flotron's photographic measurements of the movement of Unteraargletscher.]
- KNIGHTON, A. D. Meandering habit of supraglacial streams. *Geological Society of America. Bulletin*, Vol. 83, No. 1, 1972, p. 201-04. [Suggests that there is a similarity in the form of meanders developed in alluvial valleys and on glacial ice, despite differences in environmental conditions.]
- KOHNEN, H. The relation between seismic firn structure, temperature and accumulation. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 141-51. [The firn structure revealed from seismic measurements is related to temperature and rate of accumulation; a method is outlined for determining the long-term accumulation rate from the temperature and the depths of the seismic horizon.]
- KOZARSKI, S., and SZUPRYCZYŃSKI, J. Ablation cones on Sidujökull, Iceland. *Norsk Geografisk Tidsskrift*, Bd. 25, Ht. 2, 1971, p. 109-19. [Observations of dirt cones on this outlet glacier of Vatnajökull.]
- LANG, H., and PATZELT, G. Die Volumenänderung des Hintereisferners (Ötztaler Alpen) im Vergleich zur Massenänderung im Zeitraum 1953-1964. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 39-55. [Good agreement was obtained between results for the change of volume of the Hintereisferner determined geodetically and for the sum of the yearly balances obtained glaciologically.]
- LANGWAY, C. C., jr. Stratigraphic analysis of a deep ice core from Greenland. *Geological Society of America. Special Paper* 125, 1970, ix, 186 p. [Account of deep rotary core drilling project which yielded a 411 m ice core. Data obtained permitted the direct estimate of annual accumulation layers from A.D. 934 to present day.]
- LÉVÊQUE, P. C. Evolution, de 1968 à 1970, des activités en tritium dans les eaux superficielles, depuis l'Autriche jusqu'au littoral d'Aquitaine. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences (Paris)*, Sér. D, Tom. 273, No. 1, 1971, p. 19-22. [Glacier ice and ground water samples studied for tritium content in 1968 and 1970.]
- LLIBOUTRY, L. A. The glacier theory. *Advances in Hydrosience*, Vol. 7, 1971, p. 81-167. [Review of glacier dynamics, bringing author's theory up-to-date.]
- LOOMIS, S. R. Morphology and ablation processes on glacier ice. *Proceedings of the Association of American Geographers*, Vol. 2, 1970, p. 88-92. [Study of ablation rates on medial moraine of Kaskawulsh Glacier is used in conjunction with ice flow data and an equilibrium hypothesis of mass movement in the debris mantle to explain the morphological form that the moraine assumes.]
- MAKSIMOV, YE. V., and MAKSIMOVA, N. N. Dendrokronologicheskiye aspekty vnutrivkovoy izmenchivosti gornyykh lednikov [Dendrochronological aspects of intrasecular fluctuations of glaciers]. *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, Tom 103, Vyp. 6, 1971, p. 517-30. [Glaciers in Tyan'-Shan' and Ural.]
- MARIÉTAN, I. La catastrophe du Giétroz en 1818. Note complémentaire du 24 octobre 1970. Un nouveau Longarone dans le val de Bagnes? *Bulletin de la Murithienne*, Fasc. 87, 1970, p. 12-19. [Describes catastrophic event of 1818 when the Glacier du Giétroz avalanched into the Bagnes valley, Switzerland, and discusses the possibility of a recurrence.]
- MEIER, M. F., and others. Ice and water balances at selected glaciers in the United States. Combined ice and water balances of Gulkana and Wolverine glaciers, Alaska, and South Cascade Glacier, Washington, 1965 and 1966 hydrologic years, by M. F. Meier, W. V. Tangborn, L. R. Mayo and A. [S.] Post. *U.S. Geological Survey. Professional Paper* 715-A, 1971, [iv], 23 p. [General description of glaciers and their settings, followed by details of results.]
- MEIER, S. Statistische Analyse der Oberflächenbewegung des Kongsvegen-Gletschers, Westspitzbergen. *Polarforschung*, Bd. 7, Jahrg. 41, Nr. 1-2, 1971, p. 130-41. [Study of the surface movement of this glacier.]
- OLSCHAK, B. C. Un nouveau membre de l'ONU: le Bhoutan, pays des glaciers inconnus. *Les Alpes. Revue du Club Alpin Suisse*, 47<sup>e</sup> An., 4<sup>e</sup> Trimestre, 1971, p. 211-17. [Informative general article on Bhutan, in the Himalaya, mentioning principal mountains and glaciers.]
- PASCHINGER, H. Die Pasterze in den Jahren 1958-1962. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 193-206. [Year-by-year detailed measurements on the Pasterze and neighbouring glaciers from 1958 to 1962.]
- PEDEN, I. C., and ROGERS, J. C. An experiment for determining the VLF permittivity of deep Antarctic ice. *IEEE Transactions on Geoscience Electronics*, Vol. GE-9, No. 4, 1971, p. 224-33. [Describes instruments and method, and presents results, which were in good agreement with those obtained in the laboratory.]
- POST, A. S., and MAYO, L. R. *Glacier dammed lakes and outburst floods in Alaska*. Washington, D.C., U.S. Geological Survey, 1971. 10 p. + 3 sheets. (Hydrologic Investigations Atlas HA-455.) [Two maps, scale 1 : 1 000 000, south-east and south Alaska, plus one sheet of photographs, of present glaciers, glacier-dammed lakes and glacier-clad volcanoes; describes recent history of several glacier-dammed lakes, and delineates areas where outburst flooding may be expected.]
- PRICE, R. J., and HOWARTH, P. J. The evolution of the drainage system (1904-1965) in front of Breidamerkjökull, Iceland. *Jökull*, Ár 20, 1970, p. 27-37. [Describes effect of nature of surface across which the glacier has been retreating on the sequence of drainage evolution, and discusses future developments and their practical significance.]
- RIST, S., and THORARINSSON, S. Annáll um jökulhlaup. *Jökull*, Ár 20, 1970, p. 88-89. [Local reports of jökulhlaups in Iceland.]
- ROBIN, G. DE Q. Polar ice sheets: a review. *Polar Record*, Vol. 16, No. 100, 1972, p. 5-22. [Intended for the layman with little background knowledge. Concludes that the dimensions and movements of these ice sheets are close to being in balance with their present climatic environment.]



- ROWLINSON, J. S. The theory of glaciers. *Notes and Records of the Royal Society of London*, Vol. 26, No. 2, 1971, p. 189–204. [History of the controversy between Forbes and Tyndall.]
- RUTISHAUSER, H. Ein Versuch der Korrelation von Zungenänderungen eines Einzelgletschers mit ortsfremden Temperaturmessungen (erläutert am Beispiel des Tschingelgletschers). *Mitteilungen der Naturforschenden Gesellschaft in Bern*, Neue Folge, Bd. 28, 1971, p. 3–15. [Correlation between variations in the tongue of a single glacier and temperature measurements in other locations, using Tschingelgletscher as an example.]
- SHABANOV, P. F., and others. Opredeleniye zhidkogo stoka s firnovoogo polya lednika [Determination of volume of run-off from the firn area of a glacier]. [By] P. F. Shabanov, K. G. Makarevich, Ye. N. Vilesov. *Geofizicheskii Byulleten'*, No. 24, 1971, p. 29–39. [Results of observations on Tsentral'nyy Tuysuksuyskiy glacier in Zailiyskiy Alatau, Kazakhstan. English summary, p. 38–39.]
- SIGBJARNARSON, G. On the recession of Vatnajökull. *Jökull*, ÁR 20, 1970, p. 50–61. [Discusses shrinkage of Vatnajökull in the light of measurements made of the recession of Breidamerkurjökull in relation to run-off.]
- SIGURDSSON, S. P. Gravity survey on western Vatnajökull. *Jökull*, ÁR 20, 1970, p. 38–44. [Results from this and other work are used to obtain estimates of ice thickness on Tungnárjökull and in the Grimsvötn caldera.]
- SKODA, G. Die Bestimmung des Massenhaushaltes temperierter Gletscher aus Radiosondenmessungen. *Polarforschung*, Bd. 7, Jahrg. 41, Nr. 1–2, 1971, p. 153–64. [Presents a method for the calculation of an annual index number which correlates well with specific mass balances measured on alpine glaciers during the last 18 years.]
- SLATT, R. M. Sedimentological and geochemical aspects of sediment and water from ten Alaskan valley glaciers. *Dissertation Abstracts International*, B, Vol. 31, No. 12, 1971, p. 7375-B. [Discusses characteristics of superglacial sediments, suspended stream sediments, and melt water from glaciers eroding 5 different types of bedrock. Abstract of Ph.D. thesis, University of Alaska, 1970. University Microfilms order no. 71-15064.]
- SLUPETZKY, H. Ergebnisse von Gletschermessungen am Maurer- und Kleineiserkees (Stubachtal, Hohe Tauern) in den Jahren 1961–1970. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1–2, 1971, p. 207–11. [Measurements of fluctuations of Maurerkees and Kleineiserkees from 1961 to 1970.]
- SLUPETZKY, H., and others. Neue Gletscherkarten vom Stubacher Sonnblieckees (Hohe Tauern), von H. Slupetzky, W. Slupetzky und E. Kopecky. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1–2, 1971, p. 153–66. [Presents maps, 1 : 5 000 and 1 : 25 000, on which firn and ice are differentiated, and describes how they were prepared.]
- THEODÓRSSON, P. Rannsóknir á Barðarbungu 1969 og 1970. *Jökull*, ÁR 20, 1970, p. 1–14. [Deuterium and tritium in ice cores recovered from Barðarbunga, Vatnajökull, preparatory to drilling through ice cap in 1972 in order to obtain information about climatic changes in Iceland. English summary, p. 1.]
- USHAKOVA, L. A., and others. Geofizicheskiye opredeleniya moschnosti Lednika Malyy Azau [Geophysical determination of the depth of Zednik Malyy Azau]. [By] L. A. Ushakova, A. V. Bryukhanov, A. P. Tishchenko. *Vestnik Moskovskogo Universiteta*, 1971, Ser. 5, 26 God, No. 5, p. 99–101. [Depth of glacier on El'brus determined by gravimetry and seismic sounding. English abstract, p. 101.]
- VARNAKOVA, G. M., and ROTAYEVA, O. V. Basseyn r. Surkhob mezhd u ust'yami rek Obikhingou i Muksu [Basin of the river Surkhob between the mouths of the rivers Obikhingou and Muksu]. *Katalog lednikov SSSR [Catalogue of glaciers of the U.S.S.R.]*, Tom 14, Vyp. 3, Chast' 6. Leningrad, Gidrometeorologicheskoye Izdatel'stvo, 1971. [89] p. [Part of the I.H.D. catalogue of glaciers of the U.S.S.R. giving details of what is known of the glaciers in this part of Central Asia. The Tom and Vyp. numbers correspond with those of *Resursy poverkhnostnykh vod SSSR [Surface water resources of the U.S.S.R.]*]
- VIVIAN, R. Fiches des glaciers français. Les grandes groupes glaciaires. Les glaciers des Grandes-Rousses. *Revue de Géographie Alpine*, Tom. 59, Fasc. 3, 1971, p. 429–32. [Summary of knowledge of this group of French glaciers.]
- VIVIAN, R., and GONNET, R. Fiche des glaciers français. Les glaciers de Séguret. *Revue de Géographie Alpine*, Tom. 60, Fasc. 1, 1972, p. 159–63. [Summary of knowledge of this group of French glaciers.]
- VIVIAN, R., and SEYFERTH, R. Fiche des glaciers français. Les glaciers des Aiguilles d'Arves. *Revue de Géographie Alpine*, Tom. 60, Fasc. 2, 1972, p. 415–18. [Summary of knowledge of this group of French glaciers.]
- VUADENS, L. Grotte sous-glaciaire Gorner-Grenz. *Stalactite*, An. 20, No. 1, 1970, p. 30–34. [Describes exploration of passages and caves beneath the Gornergletscher and Grenzgletscher, near Zermatt.]
- WAKONIGG, H. Der Gletscher im Eiskar (Karnische Alpen) im Sommer 1971. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1–2, 1971, p. 213–14. [Observations on Eiskargletscher, Austria.]
- WAKONIGG, H. Gletscherverhalten und Witterung. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1–2, 1971, p. 103–23. [Study of relationship between glaciers and climate, with reference to mass-balance studies in the eastern Alps.]
- WEERTMAN, J. General theory of water flow at the base of a glacier or ice sheet. *Reviews of Geophysics and Space Physics*, Vol. 10, No. 1, 1972, p. 287–333. [Theory is reviewed and extended with reference to Röthlisberger and Nye channels.]
- WEERTMAN, J. Velocity at which liquid-filled cracks move in the Earth's crust or in glaciers. *Journal of Geophysical Research*, Vol. 76, No. 35, 1971, p. 8544–53. [Concludes that such cracks will move at non-uniform velocities that are small compared with the Rayleigh-wave velocity.]
- WEISS, H. V., and others. Mercury in a Greenland ice sheet: evidence of recent input by man, [by] H. V. Weiss, M. Koide, E. D. Goldberg. *Science*, Vol. 174, No. 4010, 1971, p. 692–94. [Discusses implications of increased mercury content in ice over the past several decades.]
- WHALLEY, W. B. Observations of the drainage of an ice-dammed lake—Strupvatnet, Troms, Norway. *Norsk Geografisk Tidsskrift*, Bd. 25, Ht. 3–4, 1971, p. 165–74. [Discusses mechanism of drainage, including observations and measurements during a jökullhlaup.]



YOUNG, J. A. T. Ice margins of the 19th and 20th centuries in the Venedigergruppe, Hohe Tauern, Austria. *Arctic and Alpine Research*, Vol. 4, No. 1, 1972, p. 73-83. [A pattern of deglaciation is reconstructed from early descriptions of glaciers and their forelands in this area, and from maps, surveys, climbing records, and field investigation. The findings are discussed.]

## ICEBERGS. SEA, RIVER AND LAKE ICE

- ASHTON, G. D. The formation of ice ripples on the underside of river ice covers. *Dissertation Abstracts International*, B, Vol. 32, No. 5, 1971, p. 2762-B. [Field observations are interpreted in the light of analytical and laboratory results. Abstract of Ph.D. thesis, University of Iowa, 1971. University Microfilms order no. 71-30392.]
- BANKE, E. G., and SMITH, S. D. Wind stress over ice and over water in the Beaufort Sea. *Journal of Geophysical Research*, Vol. 76, No. 30, 1971, p. 7368-74. [The wind-drag coefficient over ice for stable conditions was  $C_{10} = 0.0026$ , and over water for unstable conditions  $C_{10} = 0.0014$ .]
- BASHARINOV, A. E., and others. Features of microwave passive remote sensing, [by] A. E. Basharinov, A. S. Gurvitch and S. T. Igorov. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 119-23. [Mentions detection of the boundary of floating ice and estimation of the per cent coverage of sea ice cover, and investigations on Antarctic glaciers.]
- BLACHE, A., jr., and others. Remote sensing of the Arctic ice environment, [by] A. Blache, Jr., C. A. Bay, R. Bradie. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 523-61. [Discusses side-looking radar analysis, multi-sensor correlation analysis, spectrum analysis of sea ice, and future plans.]
- BIGGS, A. W. Ground-wave propagation over Arctic sea ice. *IEEE Transactions on Geoscience Electronics*, Vol. GE-9, No. 1, 1971, p. 51-56. [Amplitude and phase variations occurring as drop-off or recovery effects at the ice-sea water boundaries provide a technique for sea ice mapping and an explanation for anomalous radio reception.]
- BRODIE, J. W., and DAWSON, E. W. Antarctic icebergs near New Zealand. *New Zealand Journal of Marine and Freshwater Research*, Vol. 5, No. 1, 1971, p. 80-85. [Records of icebergs are noted and their implications on the interpretation of ice-rafterd sediments are discussed.]
- BUYNITSKIY, V. KH., and DMITRASH, ZH. A. O novom metode opredeleniya tolshchiny Antarkticheskikh aysbergov [New method of determining thickness of Antarctic icebergs]. *Vestnik Leningradskogo Universiteta. Seriya Geologii i Geografii*, 1971, No. 18, p. 127-32. [Icebergs measured near Mirny.]
- CAMPBELL, W. J. The remote sensing needs of Arctic geophysics. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 2, 1971, p. 937-40. [Application of remote sensing to Arctic glaciology, in particular to sea ice problems.]
- [CANADA: DAMAGE CAUSED BY FLOATING ICE.] Review of current ice technology and evaluation of research priorities. Prepared by H. G. Acres Limited for Ice and Snow Research Committee. *Canada. Dept. of the Environment. Inland Waters Branch, Report Series*, No. 17, 1971, xiv, 299 p. [Comprehensive review of ice technology in relation to studies of inland waters in Canada.]
- CHIKOVSKIY, S. S., and KORNILOV, N. A. O prochnosti morskogo l'da v zalive Alasheyeva v 1968 g. [Strength of sea ice in Alasheyev Bight in 1968]. *Informatsionnyy Byulleten' Sovetskoy Antarkticheskoy Ekspeditsii*, No. 80, 1970, p. 51-53.
- CLARK, D. L. Arctic Ocean ice cover and its late Cenozoic history. *Geological Society of America. Bulletin*, Vol. 82, No. 12, 1971, p. 3313-24. [Suggests that freezing probably occurred in response to the movement of the northern continents during this period.]
- COLLINSON, J. D. Some effects of ice on a river bed. *Journal of Sedimentary Petrology*, Vol. 41, No. 2, 1971, p. 557-64. [Describes the morphological activity of ice on the bed of the Tana river, Finnmark, Norway, during the spring flood.]
- DIONNE, J.-C. Polygonal patterns in muddy tidal flats. *Journal of Sedimentary Petrology*, Vol. 41, No. 3, 1971, p. 838-39. [Result of squeezing soft mud into the ice-foot tidal cracks under load pressure related to tidal movements.]
- DORT, W., jr. Shallow subsurface structures of east Antarctic ice shelves. *Nankyoku Shiryō: Antarctic Record*, No. 41, 1971, p. 67-80. [Observations of vertical sides of tabular icebergs made from shipboard suggest that exposed firn layers and melt-water tunnels record brief variations in the mean annual temperature and the annual net accumulation of snow for part of the coast during the past few decades.]
- FARHADIEH, R., and TANKIN, R. S. Interferometric study of freezing of sea water. *Journal of Geophysical Research*, Vol. 77, No. 9, 1972, p. 1647-57. [Observations on the convection pattern in sea water before and during freezing.]
- FERTUCK, L., and others. Computing salinity profiles in ice, [by] L. Fertuck, J. W. Spyker and W. H. W. Husband. *Canadian Journal of Physics*, Vol. 50, No. 3, 1972, p. 264-67. [Equation obtained for calculating ice salinity for temperature gradients up to  $1.3^{\circ}\text{C}/\text{cm}$ .]
- GLUSHKOV, V. M., and KOMAROV, V. B. Side-looking imaging radar system TOROS and its application to the study of ice conditions and geological explorations. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 317. [Possible to determine the degree of ice packing and its distribution, its age, the extension of ice fields and their forms, ice ridges, and the distribution of channels and free water.]



- JOHNSON, J. D., and FARMER, L. D. Determination of sea ice drift using side-looking airborne radar. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 3, 1971, p. 2155-68. [Single ice floes, as well as ice masses, were identified and tracked in the North West Passage. Water currents have a marked effect on ice drift in this area.]
- KLIMOVICH, V. M. O reprezentativnosti izmereniy tolshchiny l'da na gidrometeorologicheskikh stantsiyakh [Representativeness of measurements of ice thickness at hydrological and meteorological stations]. *Meteorologiya i Gidrologiya*, 1971, No. 5, p. 97-100. [Measurements of sea ice thickness at Arctic stations, 1966-69.]
- KUDRYAVTSEV, N. F. Nekotoryye osobennosti narastaniya priipaynykh l'dov v nachal'nyy period ledoobrazovaniya v prolyve Dreyka [Features of the growth of fast ice in early stages of ice formation in Drake Passage]. *Problemy Arktiki i Antarktiki*, Vyp. 38, 1971, p. 92-97. [Observations made at "Bellingshausen", 1969.]
- LAPPO, S. D. Prirodnyye ledovyye rayony okrainnykh Arkticheskikh morey [Natural ice regions in the seas bordering the Arctic Ocean]. *Voprosy Geografii*, No. 84, 1970, p. 233-42. [Sea ice conditions along the northern coast of Eurasia.]
- LARROWE, B. T., and others. Lake ice surveillance via airborne radar: some experimental results, [by] B. T. Larrowe, R. B. Innes, R. A. Rendleman, L. J. Porcello. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 1, 1971, p. 511-21. [Fine-resolution radar images of Great Lakes ice were obtained to determine their use for ice type classification. This temperate zone fresh-water ice differed from the Arctic sea ice observed earlier.]
- LEONT'YEVA, A. V. Fotomontazh ledovoy obstanovki vokrug Antarktity [Photo mosaic of ice conditions around Antarctica]. *Antarktika. Doklady Komissii*, 1968, [pub.] 1971, p. 138-39. [Mosaic of satellite photographs from "Kosmos-226" in November 1968.]
- LEWIS, J. W., and EDWARDS, R. Y., jr. Methods for predicting icebreaking and ice resistance characteristics of icebreakers. *Transactions. Society of Naval Architects and Marine Engineers*, Vol. 78, 1970, [pub.] 1971, p. 213-49. [Discusses ship and ice parameters affecting the ice-breaking or ice-resistance characteristics of the ship. Discussion, p. 242-49.]
- LOEWE, F. Historical reference to ice islands. *Arctic*, Vol. 24, No. 4, 1971, p. 309. [Franz Boas' description of an iceberg in Cumberland Sound in October 1883 fits that of a typical ice island.]
- MCCLAINE, E. P. NOAA's oceanography studies under the earth resources survey program. (In *Third annual earth resources program review. Vol. 3. Hydrology and oceanography. Presented at the NASA Manned Spacecraft Center, Houston, Texas. December 1 to 3, 1970.* Houston, Texas, NASA Manned Spacecraft Center, [1971], p. 56-1-56-12.) [Mentions sea ice studies.]
- MILOSHEVICH, V. A. Raschet nastupleniya kromki ledyanogo pokrova v nizhnikh b'yefakh vodokhranilishch [Calculations of movement of edge of ice cover in tail waters of reservoirs]. *Meteorologiya i Gidrologiya*, 1971, No. 12, p. 59-64.
- NARUSE, R., and others. On the relation between sea ice growth and freezing index at Syowa station, Antarctica, [by] R. Naruse, T. Ishida, T. Endo and Y. Ageta. *Nankyoku Shiryo: Antarctic Record*, No. 41, 1971, p. 62-66. [Results discussed and various empirical formulae relating the thickness of sea ice to the freezing index are compared.]
- NAZAROV, V. S. Ledyanoy pokrov okeanov i napravlennost' klimaticheskikh protsessov zemli [Ice sheets of the oceans and trends of climatic processes of the earth]. *Voprosy Geografii*, No. 84, 1970, p. 224-32. [Seasonal variations of thickness and extent of ice in both hemispheres and their relation to climatic changes.]
- RABINOVITCH, YU. I., and others. The determination of the meteorological characteristics of the atmosphere and the Earth's surface from airborne measurements of passive microwave radiation, [by] Yu. I. Rabinovitch, G. G. Shchukin and V. V. Melentyev. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 3, 1971, p. 2281-94. [Results include detection of boundaries and per cent of sea ice coverage.]
- ROMANENKO, YU. M. Ploskiy elektroemkostnyy datchik dlya distantsionnogo issledovaniya zazhorov v tyazhelykh ledovykh usloviyakh [A plane electrical capacity sensor for remote study of ice jams in severe ice conditions]. *Meteorologiya i Gidrologiya*, 1971, No. 4, p. 99-105. [Diagram of construction.]
- ROMANOV, A. A. Izucheniye ledovykh usloviy plavaniya sovetских ekspeditsionnykh sudov v Antarktike [Study of ice conditions met with by Soviet research ships in the Antarctic]. *Informatsionnyy Byulleten' Sovetskoy Antarkticheskoy Ekspeditsii*, No. 80, 1970, p. 54-58. [Ice conditions between "Novolazarevskaya", "Molodezhnaya" and Mirny stations.]
- TRIQUET, C. Problème de glace en rivière. *Ressources: Bulletin de la Direction Générale des Eaux, Gouvernement du Québec*, Vol. 3, No. 2, 1972, p. 3-5. [Outlines the problem of ice formation and ice jams in rivers, with reference to the Rivière des Prairies, Quebec.]
- TSURIKOV, V. L. Morskoye l'dy [Sea ice]. *Itoги Nauki. Seriya Geofizika. Okeanologiya*, 1970, 1, [pub.] 1971, p. 89-107. [Methods of observation of sea ice, its seasonal distribution and its properties.]
- TSYKIN, YE. N. Preduprezhdeniye zatorov na rekakh pri pomoshchi oslableniya ili razrusheniya ledyanogo pokrova [Prevention of jams on rivers by weakening or destroying the ice cover]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya*, 1971, No. 5, p. 63-67.
- VINJE, T. E. Sea ice and drift speed observations in 1970. *Norsk Polarinstitutt. Årbok*, 1970 [pub. 1972], p. 256-63. [Series of maps showing area between Iceland and Novaya Zemlya, based mainly on pictures taken by American weather satellites.]
- WARNE, D. A., and RICHTER, J. Sedimentary petrography of till from a floating iceberg in Arthur Harbor, Antarctic Peninsula. *Revue de Géographie Physique et de Géologie Dynamique*, Vol. 12, Fasc. 5, 1970, p. 441-48. [Results of this analysis may aid understanding of the dynamics of glacial-marine sedimentation.]



- WELSH, J. P., and TUCKER, W. B. Sea ice laser statistics. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .*. Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 2, 1971, p. 1165-75. [Describes automatic ice type classification from laser profile data.]
- YAKOVLEV, G. N., ed. Fiziko-tekhnicheskoye issledovaniya l'da [Physical and technical studies of ice]. *Trudy Arkticheskogo i Antarkticheskogo Nauchno-Issledovatel'skogo Instituta*, Tom 300, 1971, 218 p. [Contains the following articles: I. S. Peschanskiy, "Sticheskiye davleniye morskogo l'da [Static pressure of sea ice]", p. 4-8; G. N. Yakovlev, "Metod predskazaniya prochnostnykh kharakteristik ledyanogo pokrova [Methods of predicting the stability characteristics of ice cover]", p. 9-20; Z. I. Shvayshteyn, "Eksperimental'nyye raboty v ledoisledovatel'skoy laboratorii [Experimental work in the ice research laboratory]", p. 21-31; V. V. Lavrov, "Masshtabnyy effekt kak otrazheniye mekhanizma razrusheniya l'da [Scale effect as a reflection of the mechanism of the destruction of ice]", p. 32-38; I. G. Petrov, "Opyt rayonirovaniya ledyanogo pokrova arkticheskikh morey po strukture [Test zoning of ice cover in the Arctic seas by structure]", p. 39-55; V. N. Smirnov, "Opredeleniye uprugikh kharakteristik nenarushennogo ledyanogo pokrova dinamicheskimi i sticheskim metodami [Determination of the elastic characteristics of undisturbed snow cover by dynamic and static methods]", p. 56-60; V. P. Afanas'yev and others, "Davleniye l'da na morskuyu otdel'no stoyashchiye opory [The compression of ice on isolated sea supports]", by V. P. Afanas'yev, Yu. V. Dolgopolov and Z. I. Shvayshteyn, p. 61-80; D. Ye. Kheysin, "Nekotoryye nestatsionarnyye zadachi dinamiki ledyanogo pokrova [Some changing problems of ice sheet dynamics]", p. 81-91; Yu. L. Nazintsev, "Staivaniye l'da v torosakh [Melting ice in a hummock]", p. 92-100; Yu. L. Nazintsev, "Izostatsicheskiye yavleniya na dreyfuyushchikh ledyanykh polyakh [Isostatic phenomenon on drifting polar ice]", p. 101-09; V. I. Fedotov, "Ledoisledovatel'skiye raboty na pripaynykh antarkticheskikh l'dakh [Research on Antarctic fast ice]", p. 110-20; A. M. Kozlovskiy, "Osobennosti formirovaniya i stroeniya pripaya na reyde Mirnogo i v zalive Alasheyeva [Peculiarity of forming and building of a land floe at Mirny and on Alasheyev Bight]", p. 121-27; V. I. Fedotov, "Radiatsionnoye razrusheniye pripaynykh antarkticheskikh l'dov [Radiation destruction of Antarctic land floes]", p. 128-36; S. S. Chikovskiy, "O pereoklazhdenii morskikh vod v prirodnykh i laboratornykh usloviyakh [On supercooling of sea waters in natural and laboratory conditions]", p. 137-52; G. N. Yakovlev, "Razrusheniye l'da reaktivnoy gazovoy struyey [The destruction of ice by reactive gas jets]", p. 153-67; Z. I. Shvayshteyn, "Rezaniye l'da nepreryvnymi struyami vysokogo davleniya [The cutting of ice by continuous high pressure jets]", p. 168-76; S. Ye. Nikolayev, "Opyt razrusheniya morskogo l'da napravlennym vzryvom [Test of the destruction of sea ice by directed explosion]", p. 177-95; N. V. Cherepanov and A. V. Kamyshnikova, "Razmery i forma kristallov konzheiyatsionnogo l'da [Dimensions and forms of congelation ice]", p. 196-204; A. N. Gollandtzeva and N. V. Glukhova, "Issledovaniye struktury morskogo l'da [Research on the structure of sea ice]", p. 205-09; N. A. Vitko, "Opyt rascheta prokhodimosti ledokolov v morskikh l'dakh [Test calculation of the navigability of ice-breakers in sea ice]", p. 210-12; V. N. Smirnov and Ye. M. Lin'kov, "Nablyudeniya za kolebaniyami morskogo ledyanogo pokrova s pomoshch'yu naklonomerov [Observations during the oscillations of sea ice cover by means of a tiltmeter]", p. 213-18.]
- ZAKHAROV, V. F. K obrazovaniyu vodnoy prosloyki v tolshche l'da epishel'fovykh ozer-lagun oazisa Shirmakhera [Formation of water layers in the ice of the lake-lagoons of Vassfjellet]. *Informatsionnyy Byulleten' Sovetskoy Antarkticheskoy Ekspeditsii*, No. 80, 1970, p. 48-50.
- ZHMURKO, V. YA. Radiolokatsionnyye nablyudeniye nad dreyfom markirovannykh l'dov [Radiolocation of marked ice drifts]. *Okeanologiya*, Tom 11, Vyp. 6, 1971, p. 1110-15. [Ship and shore observations of ice formation and decay in Tatarskiy Proliv.]

## GLACIAL GEOLOGY

- AALTO, K. R. Glacial marine sedimentation and stratigraphy of the Toby conglomerate (Upper Proterozoic), southeastern British Columbia, northwestern Idaho and northeastern Washington. *Dissertation Abstracts International*, B, Vol. 31, No. 9, 1971, p. 5423-B. [New interpretation of the genesis of this conglomerate. Abstract of Ph.D. thesis, University of Wisconsin, 1970. University Microfilms order no. 70-22034.]
- AARIO, R. Syndepositional deformation in the Kurkiselkä esker, Kiiminki, Finland. *Bulletin of the Geological Society of Finland*, No. 43, Pt. 2, 1971, p. 163-72. [Describes and discusses deformation structures in this esker.]
- ALLEN, J. R. L. A theoretical and experimental study of climbing-ripple cross-lamination, with a field application to the Uppsala esker. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 157-87.
- ANDREWS, J. T., and MILLER, G. H. Quaternary history of northern Cumberland Peninsula, Baffin Island, N. W. T., Canada. Part 4. Maps of the present glaciation limits and lowest equilibrium line altitude for north and south Baffin Island. *Arctic and Alpine Research*, Vol. 4, No. 1, 1972, p. 45-59. [Describes preparation of maps and discusses aspects related to the interpretation of data, comparing with results from other regions and analysing the Baffin Island situation.]
- ASEYEV, A. A. Osnovnyye zakonomernosti glyatsial'nogo lito- i morfogeneza v oblasti drevnego materikovogo oledeniya [Basic regularities of a glacial litho- and morphogenesis in areas of ancient continental glaciation]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya*, 1971, No. 5, p. 17-21. [Results based on Soviet research in Antarctica and north-west Europe.]
- BARR, W. Postglacial isostatic movement in northeastern Devon Island: a reappraisal. *Arctic*, Vol. 24, No. 4, 1971, p. 249-68. [Presents amended emergence and uplift curves for the Truclove Inlet area.]
- BARRY, R. G., and others. A discussion of atmospheric circulation during the last ice age, [by] R. G. Barry, J. D. Ives and J. T. Andrews. *Quaternary Research*, Vol. 1, No. 3, 1971, p. 415-18. [Discusses work of H. H. Lamb and A. Woodroffe, *ibid.*, Vol. 1, No. 1, 1970, p. 29-58.]



- BERDOVSKAYA, G. N., and others. Palinologicheskaya kharakteristika riss-vyurmnskogo mezhdnednik'ya v priyeni-syskoy Sibiri [Palynological character of Riss-Würm interglacial in the Yenisey area of Siberia]. [By] G. N. Berdovskaya, V. A. Zubakov, G. M. Levkovskaya. *Vestnik Leningradskogo Universiteta. Seriya Geologii i Geografii*, 1971, No. 12, p. 105-15. [Dating of age of interglacial deposits by radiocarbon method, and determination of relative warmth of the period. English abstract, p. 115.]
- BLEUER, N. K. Glacial stratigraphy of south-central Wisconsin. *Dissertation Abstracts International*, B, Vol. 32, No. 2, 1971, p. 1019-B-20-B. [Seven stratigraphic units of Pleistocene age recognized, representing 5 distinct glacial episodes. Abstract of Ph.D. thesis, University of Wisconsin, 1971. University Microfilms order no. 71-16064.]
- BRADSHAW, P. M. D., and others. Exploration geochemistry. Part 6: areas of continental glaciation [sic], by P. M. D. Bradshaw, D. R. Clews, J. L. Walker. *Canadian Mining Journal*, Vol. 92, No. 12, 1971, p. 29-34, 38. [Deals with exploratory mining situations where soils and rocks have been moved or mixed by glacial events and where metals may be bonded to soils due to weathering conditions induced by past climatic and glacial conditions.]
- BROOK, D. Scree benches around ice-dammed lakes in South Georgia. *British Antarctic Survey Bulletin*, No. 26, 1971, p. 31-40. [Scree benches around two lakes dammed by Neumayer Glacier are described and compared. They may be raised beaches formed recently during periods of higher lake level when the glacier was thicker and more advanced.]
- BUDYKO, M. I., and VASISHCHEVA, M. A. Vliyanie astronomicheskikh faktorov na chetvertichnyye oledeneniya [Effect of astronomical factors on Quaternary glaciations]. *Meteorologiya i Gidrologiya*, 1971, No. 6, p. 37-47. [A numerical model is used to show that changes of the Earth's surface relative to the sun could be the cause of Quaternary glaciations.]
- CLAPPERTON, C. M. The evidence for a Cheviot ice cap. *Institute of British Geographers. Transactions*, No. 50, 1970, p. 115-27. [Study of geomorphological evidence for independent centre of glaciation in this part of southern Scotland.]
- CLAPPERTON, C. M. The pattern of deglaciation in part of north Northumberland. *Institute of British Geographers. Transactions*, No. 53, 1971, p. 67-78. [Interprets pattern of deglaciation in east Cheviot area as indicated by assemblage of landforms of melt-water erosion and deposition.]
- DANIYELYAN, SH. A. Ob erozionnoy, transportiruyushchey i rel'yefoobrazuyushchey roli lednikov [The role of glaciers in eroding, transporting and forming relief]. *Izvestiya Vsesoyuznogo Geograficheskogo Obshchestva*, Tom 103, Vyp. 6, 1971, p. 502-09.
- DUDZIAK, J. Studia nad kierunkami transgresji ladolodu Plejstocénskiego [Investigations of the directions of movement of the Pleistocene ice sheet]. *Prace Geologiczne*, No. 66, 1970, 85p. [Investigation based on presence of material, particularly large erratics found in Poland which were transported in the ice as part of its morainic load. English summary, p. 80-85.]
- EK, J. Investigation of the tills at Levcániemi. *Sveriges Geologiska Undersökning, Avhandlingar och Uppsatser*, Ser. C, Nr. 658, Årsbok 65, Nr. 4, 1971, p. 36-43. [Grain size determination, petrographic investigation and pollen analysis of samples taken from interglacial deposit in Swedish Lapland.]
- ERIKSSON, K. Inlandsisens avsmältning i området Vålådalen-Sällsjön i sydvästra Jämtland. *Sveriges Geologiska Undersökning, Avhandlingar och Uppsatser*, Ser. C, Nr. 660, Årsbok 65, Nr. 6, 1971, 117 p. [Presents and discusses results of an investigation into the deglaciation of a valley in central Sweden. English summary, p. 107-14.]
- EVERETT, K. R. Soils of the Meserve Glacier area, Wright Valley, south Victoria Land, Antarctica. *Soil Science*, Vol. 112, No. 6, 1971, p. 425-38. [Study of physical and chemical properties of moraines enables their ages to be established.]
- FLINN, D. The glacial till of Fair Isle, Shetland. *Geological Magazine*, Vol. 107, No. 3, 1970, p. 273-76. [Describes till and relates it to direction of movement of last glaciation.]
- FLIRI, F., and others. Weitere Untersuchungen zur Chronologie der alpinen Vereisung (Bändertön von Baumkirchen, Inntal, Nordtirol), von F. Fliri, H. Hilscher und V. Markgraf. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 5-24. [Results presented of further investigations into the chronology of the Würm glaciation of the Alps, mainly radiocarbon dating of banded silts and clays from the Inn valley, Austria.]
- FRANKE, H. W., and GEYH, M. A. Zur Chronologie der letzten Grossvereisung der Alpen. *Naturwissenschaften*, 58. Jahrg., Ht. 11, 1971, p. 563-64. [Comments on the chronology of events during the last ice age in the Alps.]
- GAUNT, G. D., and others. The late Weichselian sequence in the Vale of York, by G. D. Gaunt, R. A. Jarvis and B. Matthews. *Proceedings of the Yorkshire Geological Society*. Vol. 38, No. 2, 1971, p. 281-84. [Three recent radiocarbon dates used to provide outline chronology and correlation for sequence of late Weichselian and early Flandrian environments in this region of Yorkshire.]
- GAUNT, G. D., and others. Quaternary deposits at Oxbow opencast coal site in the Aire valley, Yorkshire, by G. D. Gaunt, G. R. Coope and J. W. Franks. *Proceedings of the Yorkshire Geological Society*, Vol. 38, No. 2, 1971, p. 175-200. [Silts, sands and gravels are described and interpreted.]
- GEYH, M. A. Middle and young Holocene sea-level changes as global contemporary events. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 4, No. 547, 1971, p. 679-92. [Discusses sea-level changes since 7 000 B.P.]
- GLÜCKERT, G. Bewegungen des Inlandeises im Lohja-Seebecken, Südfinland. *Bulletin of the Geological Society of Finland*, No. 43, Pt. 2, 1971, p. 173-84. [Measurements of glacial striae on polished bedrock outcrops indicate variations in the direction of the movement of the Fennoscandian ice sheet in the lake basin of Lohjanjarve south Finland.]
- GLÜCKERT, G. Drumlinlandschaft auf der Wasserscheide zwischen Piekämäki und Haukivuori in Mittelfinland. *Bulletin of the Geological Society of Finland*, No. 43, Pt. 2, 1971, p. 141-61. [Describes investigations of a large drumlin field in central Finland.]



- HOPPE, G. Nordvästeuropas inlandsisar under den sista istiden. *Svensk Naturvetenskap*, Årg. 24, 1971, p. 31-40. [Summarizes research into extent of Würm glaciation in Svalbard, Iceland and Shetland. English summary, p. 40.]
- HOWARTH, P. J. Investigation of two eskers at eastern Breidamerkurjökull, Iceland. *Arctic and Alpine Research*, Vol. 3, No. 4, 1971, p. 305-18. [Describes these eskers, and discusses and compares their probable modes of formation.]
- IMREH, L. *Comportement géochimique des sédiments glaciaires en fonction du socle précambrien sous-jacent: Geochemical behaviour of glacial drift in relation to underlying Precambrian formations*. Québec, Ministère des Richesses Naturelles du Québec, Direction Générale des Mines, Service des Gîtes Minéraux, 1971. [iv], 27p. (Étude Spéciale 11.) [Shows that, within an area of 80 km<sup>2</sup> made up of Pre-Cambrian formations of high geochemical contrasts, the microparagenesis of stream sediments of glacial origin does not reflect that contrast. In French and English.]
- IVES, J. D., and BURNS, H. W., jr. Thickness of the Wisconsin ice sheet in southeast Baffin Island, Arctic Canada. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 167-74. [Discusses possibility that many high coastal mountain summits and small lower areas remained ice-free during the last glacial maximum.]
- JAKSCH, K. Beobachtungen in den Gletschervorfeldern des Sólheima- und Síðujökull im Sommer 1970. *Jökull*, År 20, 1970, p. 45-49. [Attempts to date terminal moraines by means of lichen growth.]
- JEWTCHOWICZ, S. Współczesna strefa marginalna lodowca Skeidararjökull na Islandii [The present-day marginal zone of Skeidararjökull, Iceland]. *Acta Geographica Lodziensia*, 27, 1971, 52p. [Phenomena caused by deglaciation, the role of dead ice and melt water in the development of landforms, and the adjacent older moraines were investigated, enabling some conclusions to be made about the present-day deglaciation of this region. English summary, p. 44-52.]
- JOHN, B. S. Glaciation and the West Wales landscape. *Nature in Wales*, Vol. 12, No. 3, 1971, p. 138-55. [Effects of Pleistocene glaciation.]
- KEMPTON, J. P., and GROSS, D. L. Rate of advance of the Woodfordian (late Wisconsinan) glacial margin in Illinois: stratigraphic and radiocarbon evidence. *Geological Society of America. Bulletin*, Vol. 82, No. 11, 1971, p. 3245-50. [Net rate of advance calculated to be about 62 m per radiocarbon year.]
- KNUTSSON, G. Studies of ground-water flow in till soils. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 3, No. 546, 1971, p. 553-73. [Characteristic differences found in flow pattern, velocity of flow, storage, and yield of ground water between drumlin terrain and hummocky moraine.]
- KONOVALOV, G. V. *Glyatsio-geomorfologicheskaya kharakteristika zapadnoy chasti vostochnoy Antarktidi* [Glacio-geomorphological characteristics of the western part of eastern Antarctica]. Leningrad, Gidrometeorologicheskoye Izdatel'stvo, 1971. 124 p. [Soviet research in Dronning Maud Land and Enderby Land.]
- LAGERLUND, E. Some aspects on till stratigraphy in the light of lithostratigraphic studies in the Kullen peninsula in northwestern Scania. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 3, No. 546, 1971, p. 653-58. [From results, conclusions may be made about the direction and chronology of Quaternary glaciation in this area.]
- LAMARCHE, R. Y. Northward moving ice in the Thetford Mines area of southern Quebec. *American Journal of Science*, Vol. 271, No. 4, 1971, p. 383-88. [Discusses evidence based on crag-and-tail glacial striations and suggests this northward movement may have been a local late-glacial deviation from the general southwarp ice direction as the ice sheet thinned due to melting.]
- LAUGÉNIE, C. Elementos de la cronología glaciaria en los Andes Chilenos meridionales. *Cuadernos Geográficos del Sur*, Año 1, No. 1, 1971, p. 7-20. [Discusses Quaternary glaciation of the Chilean Andes.]
- LAZUKOV, G. I. O geneticheskoy i vozrastnoy traktovke otlozheniy Samarovskogo oledeniya zapadnoy Sibiri [Genetic and age interpretation of the deposits of the Samarovo glaciation of western Siberia]. *Vestnik Moskovskogo Universiteta*, Ser. 5, 26 God, No. 5, 1971, p. 47-55. [English abstract, p. 55.]
- LEAMY, M. L. New Zealand glacial chronology. *New Zealand Journal of Geology and Geophysics*, Vol. 14, No. 4, 1971, p. 911. [Recent pedological contributions to this subject.]
- LIESTOL, O. Submarine moraines off the west coast of Spitsbergen. *Norsk Polarinstittut. Årbok*, 1970 [pub. 1972], p. 165-68. [Discusses significance of these moraines, thought to date from Würm maximum.]
- LINDSTRÖM, E. Submoräna sediment och isrörelser i nordvästra Ångermanland. *Uppsala Universitet. Naturgeografiska Institutionen. Rapport* 10, 1971, [vi], 52 leaves. [Submoraine sediments from Ångermanland, Sweden, studied and related to previous glaciations.]
- LOEWE, F. Considerations on the origins of the Quaternary ice sheet of North America. *Arctic and Alpine Research*, Vol. 3, No. 4, 1971, p. 331-44. [Reviews and discusses evidence, which suggests that an initial cooling, greater than 6° C, or a decrease of 6° C with precipitation higher than present, would have been necessary.]
- LUNDQVIST, J. The interglacial deposit at the Leveäniemi mine, Svappavaara, Swedish Lapland. *Sveriges Geologiska Undersökning, Ahandlingar och Uppsatser*, Ser. C, Nr. 658, Årsbok 65, Nr. 4, 1971, p. 1-35. [Describes results and discusses implications of investigations of deposit of till-covered peat and sediments.]
- MARKOV, K. K. Problemy lednikovoy i chetvertichoy geologii v osveshchenii Richarda Fostera Flinta [Richard Foster Flint's interpretation of problems of glacial and Quaternary geology]. *Izvestiya Akademii Nauk SSSR. Seriya Geograficheskaya*, 1971, No. 5, p. 140-43. [Soviet appreciation of R. F. Flint and discussion of theories in his *Glacial and Quaternary geology*, New York, etc., John Wiley and Sons, Inc., [1971].]
- MICKELSON, D. M. Glacial geology of the Burroughs Glacier area, southeastern Alaska. *Ohio State University. Institute of Polar Studies. Report* No. 40, 1971, xiii, 149 p. [Detailed account of the numerous geomorphic features of this area of recent deglaciation.]
- MILLER, C. D. Quaternary glacial events in the northern Sawatch Range, Colorado. *Dissertation Abstracts International*, B, Vol. 32, No. 4, 1971, p. 2238-B. [Succession of Pleistocene glaciations identified, using information- and graph-theoretic methods to analyse moraine morphology and weathering characteristics. Abstract of Ph.D. thesis, University of Colorado, 1971. University Microfilms order no. 71-25856.]



- MÖRNER, N.-A. Relations between ocean, glacial, and crustal changes. *Geological Society of America. Bulletin*, Vol. 82, No. 3, 1971, p. 787-88. [The relations are presented schematically; it is concluded that studies of uplifted area may be the only means for separating isostatic and eustatic changes.]
- MULLEN, R. E., and others. Significance of atmospheric dust and ice rafting for Arctic Ocean sediment, [by] R. E. Mullen, D. A. Darby, D. L. Clark. *Geological Society of America. Bulletin*, Vol. 83, No. 1, 1972, p. 205-11. [10% or more of the sediment may be composed of atmospheric dust and 30% or more of ice-rafted debris.]
- MUTANEN, T. An example of the use of boulder counting in lithologic mapping. *Bulletin of the Geological Society of Finland*, No. 43, Pt. 2, 1971, p. 131-40. [Results of boulder counts are compared to the bedrock lithology, and their glacial geologic implications are discussed.]
- NELSON, R. S., jr. The glaciation of the headwaters area of Clear Creek, Bighorn Mountains, Wyoming. *Dissertation Abstracts International*, B, Vol. 31, No. 6, 1970, p. 3484-B-85-B. [Deposits of 6 episodes of glaciation, representing 3 major glacial stages, were mapped. Abstract of Ph.D. thesis, University of Iowa, 1970. University Microfilms order no. 70-23926.]
- NORRMAN, J. O. Skallhultsplatån, en supraakvatisk delatäta bildad innanför inlandsisens rand under isavsmältningen i Vätterbäckenet. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 1, No. 544, 1971, p. 215-24. [Suggests the Skallhult plateau was formed by subglacial flow which penetrated the ice surface during deglaciation and built up an outwash plain surrounded by ice.]
- OLAUSSON, E. Oceanographic aspects of the Pleistocene of Scandinavia. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 3, No. 546, 1971, p. 459-75. [Discusses extent of glaciations during the Quaternary in the light of deep-sea core stratigraphy.]
- PINET, P. R., and others. An upper Paleozoic tillite in the dry valleys, south Victoria Land, Antarctica, [by] P. R. Pinet, D. B. Matz and M. O. Hayes. *Journal of Sedimentary Petrology*, Vol. 41, No. 3, 1971, p. 835-38. [Because of its unstratified nature, poor sorting, large clasts and stratigraphic position identical to tillites in the south, a pebbly mudstone was interpreted as a glacial deposit.]
- POIZAT, M., and ROUSSET, C. La langue glaciaire würmienne de type "Cantal" de Saint-Chély-d'Aubrac: conséquences paléogéographiques de son existence. *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences (Paris)*, Sér. D, Tom. 274, No. 10, 1972, p. 1465-68. [Investigations into the glacial geology of this region of France enable some conclusions to be made about the Würm glaciation.]
- PORTER, S. C., and CARSON, R. J., III. Problems of interpreting radiocarbon dates from dead-ice terrain, with an example from the Puget lowland of Washington. *Quaternary Research*, Vol. 1, No. 3, 1971, p. 410-14. [Stresses the need for caution when estimating the time of glacial maximum and the beginning of ice recession from radiocarbon dates.]
- POWERS, W. E. Subdivisions of the Pleistocene ice age in New Zealand, and possible correlation with the glacial sequence in the United States. *Journal of Geology*, Vol. 78, No. 2, 1970, p. 221-29.
- RAMPTON, V. Late Pleistocene glaciations of the Snag-Klutlan area, Yukon Territory. *Arctic*, Vol. 24, No. 4, 1971, p. 277-300. [Extent, chronology, and climatic environment during early and late Wisconsin glaciations. Earlier glaciations also seem probable.]
- REPO, R., and TYNNI, R. Observations on the Quaternary geology of an area between the 2nd Salpausselkä and the ice-marginal formation of central Finland. *Bulletin of the Geological Society of Finland*, No. 43, Pt. 2, 1971, p. 185-202. [Deals especially with drumlins and their relation to glacial events.]
- RINGBERG, B. Glacialgeologi och isavsmältning i östra Blekinge. *Sveriges Geologiska Undersökning, Avhandlingar och Uppsatser*, Ser. C, Nr. 661, Årsbok 65, Nr. 7, 1971, 174 p. [Study of the deglaciation of eastern Blekinge, Sweden, with particular reference to glacial striae, glacio-fluvial deposits and glacial clay. English summary, p. 154-71.]
- ROSENGREEN, T. E. The glacial geology of Highland County, Ohio. *Dissertation Abstracts International*, B, Vol. 31, No. 9, 1971, p. 5428-B-29-B. [General description. Abstract of Ph.D. thesis, Ohio State University, 1970. University Microfilms order no. 71-7552.]
- RYDSTRÖM, S. The Varend district during the last glaciation. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 3, No. 546, 1971, p. 537-52. [Discusses origin of till-covered, deformed glacio-fluvial and ice lake sediments, as well as other features, occurring in this region of Sweden.]
- SCHENK, P. E. Possible late Ordovician glaciation of Nova Scotia. *Canadian Journal of Earth Sciences*, Vol. 9, No. 1, 1972, p. 95-107. [Geological evidence suggests Nova Scotia and south-eastern Canada are a remnant of north-western Africa, where late Ordovician glaciation is well established.]
- SCHOVE, D. J. Varve-teleconnections across the Baltic. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 214-34. [Statistical methods used to cross-date (teleconnect) varves in different scales.]
- SLATT, R. M. Texture of ice-cored deposits from ten Alaskan valley glaciers. *Journal of Sedimentary Petrology*, Vol. 41, No. 3, 1971, p. 828-34. [Textures of deposits from termini of Worthington, Matanuska, Castner, Fels, Gulkana, College, Rendu, Reid, Carroll and Norris glaciers, eroding 5 different types of bedrock, are described, and processes accounting for the textures are suggested.]
- STAHELI, A. C. Topographic criteria for recognition of a threshold of erosion by the Laurentide ice sheet. *Dissertation Abstracts International*, B, Vol. 32, No. 5, 1971, p. 2804-B. [Three zones in the Finger Lakes region (New York state) were distinguished and are described. Abstract of Ph.D. thesis, University of North Carolina at Chapel Hill, 1971. University Microfilms order no. 71-30602.]
- TELLER, J. T. Early Pleistocene glaciation and drainage in southwestern Ohio, southeastern Indiana, and northern Kentucky. *Dissertation Abstracts International*, B, Vol. 31, No. 9, 1971, p. 5429-B-30-B. [Sequence of events described and discussed. Abstract of Ph.D. thesis, University of Cincinnati, 1970. University Microfilms order no. 71-5471.]
- TREMBLAY, G. Glaciation et déglaciation dans la région Saguenay—Lac-Saint-Jean, Québec, Canada. 1ère partie: la glaciation. *Cahiers de Géographie de Québec*, 15<sup>e</sup> An., No. 36, 1971, p. 467-94. [Observations of land-forms and signs of glacial erosion indicate the direction of flow of the ice during the Wisconsin glacial period in this area.]



- WEBBER, G. E., and PEDEN, I. C. VLF ground-based measurements in Antarctica: their relationship to stratifications in the subsurface terrain. *Radio Science*, Vol. 5, No. 4, 1970, p. 655-62. [Data collected from the Byrd Glacier area enable some conclusions to be made about the nature of the ice and underlying earth.]
- WEDEL, P. O. The Gothenburg moraine. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 3, No. 546, 1971, p. 524-36. [Discusses the general features of this terminal moraine on the west coast of Sweden, its relation to topographical conditions, its stratification and age.]
- WILSON, L. Drainage density, length ratios, and lithology in a glaciated area of southern Connecticut. *Geological Society of America. Bulletin*, Vol. 82, No. 10, 1971, p. 2955-56. [Rock type is more important than influences of past glaciation and erosion cycles.]
- WRIGHT, H. E., jr. Retreat of the Laurentide ice sheet from 14,000 to 9000 years ago. *Quaternary Research*, Vol. 1, No. 3, 1971, p. 316-30. [Discusses evidence for 3 readvances of the ice subsequent to the maximum 18 000 years ago.]

## FROST ACTION ON ROCKS AND SOIL. FROZEN GROUND. PERMAFROST

- AGRELL, H. Periglacial ground in the Sommen-Åsunden area, southern Sweden. *Geologiska Föreningens i Stockholm Förhandlingar*, Vol. 93, Pt. 4, No. 547, 1971, p. 778-81. [Boulder depressions, sorted fields, stripes and nets observed.]
- ANDERSLAND, O. B. Mechanical properties of frozen soil. *Northern Engineer*, Vol. 3, No. 3, 1971, p. 3-6. [Discusses peak and creep strengths.]
- BARSCH, D. Rock glaciers and ice-cored moraines. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 203-06. [Suggests that these are analogous concepts.]
- BENOIT, G. R., and BORNSTEIN, J. Freezing and thawing effects on drainage. *Proceedings. Soil Science Society of America*, Vol. 34, No. 4, 1970, p. 551-57. [Interrelations between structure and texture, rate and extent of ice formation, and rate and magnitude of drainage studied in the laboratory.]
- BRYAN, R. B. The influence of frost action on soil-aggregate stability. *Institute of British Geographers. Transactions*, No. 54, 1971, p. 71-88. [Effects of slow or rapid freezing on air-dry or saturated soil samples discussed.]
- DIONNE, J.-C. Vertical packing of flat stones. *Canadian Journal of Earth Sciences*, Vol. 8, No. 12, 1971, p. 1585-91. [Suggests that unusual disposition of stones in many localities along the southern shores of the St. Lawrence estuary and Lac Saint-Jean, Quebec, is caused by wave action rather than periglacial processes.]
- FRIEDMAN, J. D., and others. Observations on Icelandic polygon surfaces and palsa areas. Photo interpretation and field studies, by J. D. Friedman, C. E. Johansson, N. Oskarsson, H. Svensson, S. Thorarinnsson and R. S. Williams, Jr. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 115-45. [Detailed discussion of results of observations.]
- GOLPARVAR, H. Soil-ice properties of frost-susceptible soils, made hydrophobic. *Dissertation Abstracts International*, B, Vol. 31, No. 3, 1970, p. 1260-B-61-B. [Observations on chemically waterproofed soils. Abstract of Ph.D. thesis, Michigan State University, 1969. University Microfilms order no. 70-15037.]
- GUTHER, H. H. Bentonite seals for piezometers in frozen soil. *Canadian Geotechnical Journal*, Vol. 9, No. 1, 1972, p. 115-16. [Seal of bentonite, water and methanol was suitable for sealing piezometers in frozen soil in order to observe the development of pore water pressures as the soil thaws.]
- HAMELIN, L.-E. Dans la plaine laurentienne, la glace du sol aurait-elle contribué au façonnement des glissements et autres formes de relief en creux? *Cahiers de Géographie de Québec*, 15<sup>e</sup> An., No. 36, 1971, p. 439-65. [Observations of landslides, ravines, depressions, string bogs, fossil ice wedges, etc., suggest the presence of discontinuous permafrost in this area during Holocene times.]
- HWANG, C. T., and others. A thermal analysis for structures on permafrost, [by] C. T. Hwang, D. W. Murray and E. W. Brooker. *Canadian Geotechnical Journal*, Vol. 9, No. 1, 1972, p. 33-46. [Presents a finite element formulation of the transient heat conduction problem for freezing and thawing soils in which latent heat is considered as a heat source in the energy balance equation.]
- KASIMOV, N. S. Relikty vechnoy merzloty v severnom Kazakhstane [Relics of permafrost in northern Kazakhstan]. *Vestnik Moskovskogo Universiteta*, Ser. 5, 26 God, No. 5, 1971, p. 118-20. [English abstract, p. 120.]
- KERFOOT, D. E. The geomorphology and permafrost conditions of Garry Island, N. W. T. *Dissertation Abstracts International*, B, Vol. 31, No. 11, 1971, p. 6685-B-86-B. [Abstract of Ph.D. thesis, University of British Columbia, 1970. Microfilm available from National Library of Canada, Ottawa.]
- KHOLMYANSKIY, M. A., and others. Klassifikatsiya, razmeshcheniye i elektricheskoye svoystvo mnogoletnemerzlykh gornykh porod na territorii Sovetskoy Arktiki [Classification, distribution and electrical properties of the frozen rocks in the Soviet Arctic region]. [By] M. A. Kholmyanskiy, S. M. Larin, I. V. Bel'govskaya. *Uchenyye Zapiski. Regional'naya Geologiya*, Vyp. 18, 1970, p. 5-14.
- KING, R. B. Periglacial activity in Scottish mountains. *Geographical Journal*, Vol. 138, Pt. 1, 1972, p. 126-27. [Letter, commenting on D. E. Sugden's paper on this subject (*ibid.*, Vol. 137, Pt. 3, 1971, p. 388-92), and reply by Sugden, *ibid.*, Vol. 138, Pt. 1, 1972, p. 127.]
- KULIK, V. Ya. Skhema kapillyarnykh kolonn dlya vpytyvaniya vody v merzlyy grunt [A scheme of capillary columns for water absorption into frozen ground]. *Meteorologiya i Gidrologiya*, 1971, No. 12, p. 71-78.
- LADANYI, B. An engineering theory of creep of frozen soils. *Canadian Geotechnical Journal*, Vol. 9, No. 1, 1972, p. 63-80. [Theory developed for dealing with the problem of the bearing capacity of buried footings and anchors.]
- LAGAREC, D. Paléformes de pergélisol dans la région de Québec (Canada). *Comptes Rendus Hebdomadaires des Séances de l'Académie des Sciences (Paris)*, Sér. D, Tom. 274, No. 7, 1972, p. 995-98. [Describes fossil polygons in Québec and attempts to date them.]



- McGINNIS, L. D., and JENSEN, T. E. Permafrost-hydrogeologic regimen in two ice-free valleys, Antarctica, from electrical depth sounding. *Quaternary Research*, Vol. 1, No. 3, 1971, p. 389-409. [This study was initiated by the problem of the origin of warm saline lake water in Wright and Taylor valleys and the possibility of a lake connection to unfrozen ground-water.]
- MEL'NIKOV, V. P., and others. O polarizuyemosti verkhnikh gorizontov tolshchi mnogoletnemerzlykh porod [Polarizability of upper horizons of persistently frozen rocks]. [By] V. P. Mel'nikov, A. M. Snegirev, L. L. Lyakhov. *Geologiya i Geofizika*, 1971, No. 7, p. 24-33.
- MORGAN, A. V. Polygonal patterned ground of late Weichselian age in the area north and west of Wolverhampton, England. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 146-56. [Air observation of ice wedge casts penetrating Irish Sea till in the Wolverhampton area reveals that they form part of a network of polygonal ground, probably formed before 12 500 B.P.]
- MORGENSTERN, N. R., and NIXON, J. F. One-dimensional consolidation of thawing soils. *Canadian Geotechnical Journal*, Vol. 8, No. 4, 1971, p. 558-65. [Examines settlement of a thawing soil, using the theories of heat conduction and of consolidation.]
- NAKANO, Y., and BROWN, J. Effect of a freezing zone of finite width on the thermal regime of soils. *Water Resources Research*, Vol. 7, No. 5, 1971, p. 1226-33. [Mathematical treatment of effect of freezing on granular soil with large pores so that all the water freezes and on soil with fine pores in which some water remains unfrozen.]
- NAKANO, Y., and BROWN, J. Mathematical modeling and validation of the thermal regimes in tundra soils, Barrow, Alaska. *Arctic and Alpine Research*, Vol. 4, No. 1, 1972, p. 19-38. [Accuracy of the mathematical model in simulating field observations was satisfactory.]
- O'BRIEN, R. Observations on pingos and permafrost hydrology in Schuchert Dal, N.E. Greenland. *Meddelelser om Grønland*, Bd. 195, Nr. 1, 1971, 20 p. [Detailed descriptions of the form, structure and some hydrological processes connected with these particular six pingos, which are of the open-system type related to the ascent of deep-seated waters, probably along faults.]
- ØSTREM, G. Rock glaciers and ice-cored moraines: a reply to D. Barsch. *Geografiska Annaler*, Vol. 53A, Nos. 3-4, 1971, p. 207-13. [Referring to paper by Barsch, *ibid.*, p. 203-06, the author maintains that it is necessary to differentiate between these two concepts.]
- OSTRYI, G. B., and SAKHIBGAREYEV, R. S. Ob odnoy vozmozhnoy prichine sokhraneniya moshchnykh tolshch merzlykh porod v neftegazonosnykh rayonakh zapadnoy Sibiri [A possible cause of the preservation of great thicknesses of frozen rocks in the oil and gas bearing regions of western Siberia]. *Geologiya i Geofizika*, 1971, No. 3, p. 60-62.
- OUTCALT, S. I. A study of needle ice events at Vancouver, Canada, 1961-1968. *Dissertation Abstracts International*, B, Vol. 31, No. 12, 1971, p. 7366-B. [General model of growth constructed, processes which combine to produce events characterized, and variations in ice needle morphology discussed. Abstract of Ph.D. thesis, University of British Columbia, 1970. Microfilm available from National Library of Canada, Ottawa.]
- PRICE, L. W. Up-heaved blocks: a curious feature of instability in the tundra. *Proceedings of the Association of American Geographers*, Vol. 2, 1970, p. 106-10. [Field observations suggest these features, occurring in unconsolidated material on well-vegetated slopes, result from several processes: diurnal freeze and thaw in spring, solifluction in summer and annual freeze in autumn. Size and shape are also important.]
- ROGOV, V. V. K metodike izucheniya mikrostroyeniya merzlykh gornykh porod [On methods of study of the microstructure of frozen rocks]. *Vestnik Moskovskogo Universiteta*, Ser. 5, 26 God, No. 4, 1971, p. 98-101. [Improvements to existing methods suggested.]
- SARTZ, R. S. Natural freezing and thawing in a silt and a sand. *Soil Science*, Vol. 109, No. 5, 1970, p. 319-23. [Frost penetrated faster and deeper and thawed sooner in sand; sand thawed at a nearly constant rate while silt thawed much more slowly during the last two weeks of thaw. Implications discussed.]
- SAVEL'YEV, B. A. *Fizika, khimiya i stroyeniye prirodnykh l'dov i merzlykh gornykh porod [Physics, chemistry and structure of natural ice and frozen rocks]*. Moscow, Izdatel'stvo Moskovskogo Universiteta, 1971. 507 p.
- SHEARER, J. M., and others. Submarine pingos in the Beaufort Sea, [by] J. M. Shearer, R. F. Macnab, B. R. Pelletier, T. B. Smith. *Science*, Vol. 174, No. 4011, 1971, p. 816-18. [Thought to have formed in the sea subsequent to oceanic transgression prior to 5 000 B.P.]
- SLUSARCHUK, W. A. An experimental study of dielectric constant and electrical conductance of some frost-prone soils. *Dissertation Abstracts International*, B, Vol. 32, No. 6, 1971, p. 3344-B-45-B. [Effects of temperature, water content, porosity, frequency, and soil type. Abstract of Ph.D. thesis, Rutgers University, State University of New Jersey, 1971. University Microfilms order no. 72-880.]
- SMALL, R. J., and others. The periglacial rock-stream at Clatford Bottom, Marlborough Downs, Wiltshire. *Proceedings of the Geologists' Association*, Vol. 81, No. 1, 1970, p. 87-98. [Valley contains numerous sarsens, transported by periglacial solifluction from a north-westerly direction.]
- SPARKS, B. W., and others. Presumed ground-ice depressions in East Anglia, by B. W. Sparks, R. B. G. Williams and F. G. Bell. *Proceedings of the Royal Society of London*, Ser. A, Vol. 327, No. 1570, 1972, p. 329-43. [Describes shallow depressions in western East Anglia on the chalk between the boulder clay and the Fens and attributes them to the late-glacial formation of ground ice and its subsequent thawing.]
- STÄBLEIN, G. Der polare Permafrost und die Auftauschicht in Svalbard. *Polarforschung*, Bd. 7, Jahrg. 41, Nr. 1-2, 1971, p. 112-20. [Correlation studied between the development of the thawing layer and frost patterns.]
- WHITE, S. E. Alpine subnival boulder pavements in Colorado Front Range. *Geological Society of America. Bulletin*, Vol. 83, No. 1, 1972, p. 195-200. [These features, occurring between 3230 and 3620 m altitude in rather precise conditions, have not been described before in this region. Their possible origin is discussed.]
- YEEND, W. E. Winter protalus mounds: Brooks Range, Alaska. *Arctic and Alpine Research*, Vol. 4, No. 1, 1972, p. 85-87. [Isolated piles of unsorted rock deposited on a gently sloping valley floor and away from the steep side slopes were probably transported along chutes developed in a snow or ice cover and deposited in depressions, holes, or at the margin of the snow or ice.]



YONG, R. N., and JANIGA, P. V. Field study of moisture movement and ground heave during freeze-up. *McGill University. Dept. of Civil Engineering and Applied Mechanics. Soil Mechanics Series*, No. 30, 1971, [ii], [63] leaves. [Examines ground heave and temperature profile, water and salt migration during and after the freeze-up period, rainfall, freezing index, etc.]

## METEOROLOGICAL AND CLIMATOLOGICAL GLACIOLOGY

- BOWLING, S. A. Radiative cooling rates in the presence of ice crystal aerosols. *Dissertation Abstracts International*, B, Vol. 31, No. 12, 1971, p. 7498-B. [Method of computing cooling rates in an ice fog. Abstract of Ph.D. thesis, University of Alaska, 1970. University Microfilms order no. 71-15060.]
- DOJCSAK, G. V. The ice cave of Dobsina, Czechoslovakia. *Canadian Geographical Journal*, Vol. 84, No. 1, 1972, p. 32-35. [Describes this cave containing permanent ice, and discusses the circumstances of its continued existence.]
- FUKUTA, N., and others. Experimental determination of ice nucleation by falling dry ice pellets, by N. Fukuta, W. A. Schmeling and L. F. Evans. *Journal of Applied Meteorology*, Vol. 10, No. 6, 1971, p. 1174-79. [Laboratory study simulating seeding of clouds.]
- GOW, A. J., and WILLIAMSON, T. Volcanic ash in the Antarctic ice sheet and its possible climatic implications. *Earth and Planetary Science Letters*, Vol. 13, No. 1, 1971, p. 210-18. [Suggested that the wide-spread eruption of volcanic ash in Antarctica 30 000 to 16 000 years ago may have triggered off world-wide cooling during this period.]
- HAMILTON, W. L., and SELIGA, T. A. Atmospheric turbidity and surface temperature on the polar ice sheets. *Nature*, Vol. 235, No. 5337, 1972, p. 320-22. [Evidence from "Camp Century" and "Byrd" ice cores indicates that millennial and longer variations in cloud-level temperature on the polar ice sheets have been caused by changing atmospheric turbidity over the past  $10^5$  years.]
- KENT, D., and others. Climate changes in the North Pacific using ice-rafted detritus as a climatic indicator, [by] D. Kent, N. D. Opdyke, M. Ewing. *Geological Society of America. Bulletin*, Vol. 82, No. 10, 1971, p. 2741-54. [A marked increase of ice-rafted material beginning at about 1.2 million years B.P. indicates a cooling in the North American cordillera and the Kamchatka peninsula. Subsequently, periods of even greater cooling occurred.]
- KRENKE, A. N. Klimaticheskiye usloviya suschestvovaniya lednikov i formirovaniye lednikovyykh klimatov [Climatic conditions required for the existence of glaciers and the formation of glacial climates]. *Itogi Nauki. Seriya Geofizika. Meteorologiya i Klimatologiya*, 1970, 1, [pub.] 1971, p. 168-207. [Examples from both the U.S.S.R. and the rest of the world.]
- LAMARCHE, V. C., jr., and FRITTS, H. C. Tree rings, glacial advance and climate in the Alps. *Zeitschrift für Gletscherkunde und Glazialgeologie*, Bd. 7, Ht. 1-2, 1971, p. 125-31. [Ring-width variations in Swiss stone pine (*Pinus cembra* L.) show a marked relationship with fluctuations of glaciers and with summer temperatures, and could assist in reconstructing the glacial and climatic history of the Alps for at least 1 000 years.]
- ORLOV, A. I. Ob ispol'zovanii dannykh izmereniy temperatury snega na glubine zatukhaniya godovykh kolebaniy v Antarktide dlya rascheta sredney mesyachnoy temperatury vozdukha [Use of data of snow temperatures at a depth lower than that of annual fluctuations in Antarctica for calculation of average monthly temperatures of the air]. *Antarktika. Doklady Komissii*, 1968, [pub.] 1971, p. 85-99.
- PENA, J. A., and HOSLER, C. L. Freezing of supercooled clouds induced by shock waves. *Journal of Applied Meteorology*, Vol. 10, No. 6, 1971, p. 1350-52. [Necessity of threshold pressure to cause nucleation.]
- PLOOSTER, M. N. Freezing of spongy ice spheres. *Journal of the Atmospheric Sciences*, Vol. 28, No. 7, 1971, p. 1299-301. [Theoretical calculation of radius of freezing interface and fraction of liquid frozen in a spongy hailstone as a function of time.]
- ROZENBERG, V. I., and VOROB'YEV, B. M. Rasseyaniye i oslableniye elektromagnitnykh voln dlinoy 3.2 cm neodnorodnym gradom [Scattering and attenuation of 3.2 cm microwaves by inhomogeneous hail particles]. *Izvestiya Akademii Nauk SSSR. Fizika Atmosfery i Okeana*, Tom 7, No. 6, 1971, p. 632-37. [These factors depend on the ratio of "dry" and "wet" hailstones in a given particle distribution, as well as the thickness of the water film on the hailstones and the density of the hail particles. English translation in *Bulletin of the Academy of Sciences of the U.S.S.R. Atmospheric and Oceanic Physics*, Vol. 7, No. 6, 1971, p. 422-25.]
- SCHUEPP, P. H. Experiments on the local convective mass transfer of smooth and rough hailstone models. *Journal of Applied Meteorology*, Vol. 10, No. 5, 1971, p. 1018-25. [Use of electrochemiluminescence to measure convective mass transfer in a model and comparison of results with wind-tunnel measurements of evaporation of naphthalene coated models.]
- SHAW, D. M., and DONN, W. L. A thermodynamic study of Arctic paleoclimatology. *Quaternary Research*, Vol. 1, No. 2, 1971, p. 175-87. [The thermodynamic model of J. Adem was applied to the determination of Arctic and hemispheric surface temperatures with both ice-covered and ice-free states of the Arctic Ocean.]

## SNOW

- BERGEN, J. D. The relation of snow transparency to density and air permeability in a natural snow cover. *Journal of Geophysical Research*, Vol. 76, No. 30, 1971, p. 7385-88. [Correlation suggested by the model of Dunkle and Bevans and the Carmen-Kozney relation seems in fair agreement with the measurements made and discussed.]
- BREU, K. Lawinenverbau im Kanton Schwyz. *Praktische Forstwirtschaft für die Schweiz*, 106. Jahrg., Nr. 6-7, 1970, p. 280-86. [Describes new additional construction of avalanche defences in this canton of Switzerland, and their maintenance.]



- CARLSON, P. E. Measurement of snowfall by radar. *Dissertation Abstracts International*, B, Vol. 31, No. 10, 1971, p. 6181-B. [Abstract of Ph.D. thesis, McGill University, 1970. Microfilm available from National Library of Canada, Ottawa.]
- DEAL, L. J., and others. Environmental radiation surveys and snow mass predictions from aircraft, [by] L. J. Deal, J. F. Doyle, Z. G. Burson, A. E. Fritzsche. *Proceedings of the seventh International Symposium on Remote Sensing of Environment*. . . 1971 . . . Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 3, 1971, p. 2193-216. [Summarizes first major field tests using this system over snow courses in the U.S.A.]
- DUNNE, T., and BLACK, R. D. Runoff processes during snowmelt. *Water Resources Research*, Vol. 7, No. 5, 1971, p. 1160-72. [Factors affecting run-off in Vermont.]
- EGGLESTON, K. O. Hybrid computer simulation of the accumulation and melt processes in a snowpack. *Dissertation Abstracts International*, B, Vol. 32, No. 1, 1971, p. 277-B. [A snow simulation model was developed and tested satisfactorily. Abstract of Ph.D. thesis, Utah State University, 1970. University Microfilms order no. 71-19120.]
- FARNES, P. E. Mountain precipitation and hydrology from snow surveys. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 44-49. [Describes development of large-scale precipitation map for Montana. Relationship between run-off and precipitation was also established.]
- FEDERER, B. Der schwarze Schneefall vom 14. und 15. März 1970. *Winterbericht des Eidgenössischen Institutes für Schnee- und Lawinenforschung*, Nr. 34, 1971, p. 182-85. [Coarse particles in snow attributed to pollution from badly adjusted factory burners and sawmills.]
- FERLAND, M.-G. La neige au Québec; sa répartition. *Ressources: Bulletin de la Direction Générale des Eaux, Gouvernement du Québec*, Vol. 3, No. 2, 1972, p. 14-15. [Discusses distribution of annual snowfall in Quebec.]
- FOLLIOTT, P. F. Characterization of Arizona snowpack dynamics for prediction and management purposes. *Dissertation Abstracts International*, B, Vol. 31, No. 5, 1970, p. 2747-B-48-B. [Inventory-prediction equations describing snow-pack water content as functions of readily available or easily obtainable variables were developed for use in the ponderosa pine type. Abstract of Ph.D. thesis, University of Arizona, 1970. University Microfilms order no. 70-22324.]
- FOWLER, W. B., and BERNDT, H. W. Efficiency of foliage in horizontal interception. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 27-33. [Deals with formation and accumulation of rime and hoarfrost on test objects (cylinders of diameter 3-59 mm, fir and pine needles).]
- FROEHLICH, H. A. Forest snow accumulation factors in the Colorado Front Range. *Dissertation Abstracts International*, B, Vol. 31, No. 3, 1970, p. 1380-B. [The most important variable was the parameter expressing expanse of and distance from a source area of blowing snow. Abstract of Ph.D. thesis, Colorado State University, 1969. University Microfilms order no. 70-15174.]
- FRUTIGER, H. Der Lawinenzonenplan (LZP). *Schweizerische Zeitschrift für Forstwesen*, 121. Jahrg., Nr. 4, 1970, p. 246-76. [Describes official Swiss plan for recognition of areas in danger from avalanches and practical aspects of avalanche defence.]
- GEORGE, D. J. The snowstorms of 4 March 1970. *Weather*, Vol. 27, No. 3, 1972, p. 96-110. [30-45 cm of snow fell in 10 h in central and south-east England. Conditions leading to this situation are described.]
- GORNALL, J. C. Advanced techniques overcome severe environment encountered by mobile communications system. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 89-92. [Describes the installation of unattended automatic repeater stations in remote areas of British Columbia. Snow pack, temperature and precipitation measuring equipment may be installed in these.]
- HALVERSON, H. G. Seasonal snow surface energy balance at the Central Sierra Snow Laboratory. *Dissertation Abstracts International*, B, Vol. 31, No. 12, 1971, p. 7020-B. [Discusses investigations into the seasonal energy balance technique as a means for predicting the snow-pack water balance and, hence, run-off. Abstract of Ph.D. thesis, University of Arizona, 1971. University Microfilms order no. 71-15925.]
- HAMILTON, W. L., and MILLER, J. E. High lead concentrations in Columbus snow. *Ohio Journal of Science*, Vol. 71, No. 5, 1971, p. 313-16. [Snow samples collected over 52 km<sup>2</sup> in suburban Columbus, Ohio, January 1970, contained 0.05 to 1.09 p.p.m. of lead, the probable source being automobile exhaust.]
- HAUGEN, A. O., ed. *Proceedings of the snow and ice in relation to wildlife and recreation symposium, February 11-12, 1971, Memorial Union, Iowa State University, Ames, Iowa*, Iowa State University, Iowa Cooperative Wildlife Research Unit, 1971. iv, 280 p. [Includes the following papers: M. D. Dougal, "Snowmelt analysis in the mid-west and its role in water runoff and management", p. 68-85; W. O. Willis and H. J. Haas, "Snow and snowmelt management with level benches, small grain stubble and windbreaks", p. 86-95; B. W. Greb and A. L. Black, "Vegetative barriers and artificial fences for managing snow in the central and northern plains", p. 96-111; R. D. Tabler and K. L. Johnson, "Snow fences for watershed management", p. 116-21; H. W. Steinhoff, "Planning study of ecologic effects of artificially increased snow", p. 122-33; R. I. Perla, "Characteristics of slab avalanches", p. 163-83; P. E. Farnes, "Snowfall at potential ski areas from snow survey data", p. 184-92.]
- HEISLER, G. M. Application of micrometeorological methods for estimating snow interception loss from forests. *Dissertation Abstracts International*, B, Vol. 31, No. 9, 1971, p. 5098-B. [Attempt to avoid problems caused by wind transport of snow. Abstract of Ph.D. thesis, State University College of Forestry at Syracuse University, 1970. University Microfilms order no. 71-7761.]
- HIGUCHI, K., and IOZAWA, T. *Atlas of perennial snow patches in central Japan*. Nagoya, Nagoya University, Faculty of Science, Water Research Laboratory, 1971. 81 p. [Results from air photographs taken 1968, 1969 and 1970 are summarized; maps, photographs and tables show location, elevation, length, width and area of snow-patches.]
- HOGAN, A. W. Snowmelt delay by oversnow travel. *Water Resources Research*, Vol. 8, No. 1, 1972, p. 174-75. [Repeated compaction by snowmobile and refill by drifting result in increased water content and delayed melting.]



- IWAI, K. Note on snow crystals of spatial type. *Journal of the Meteorological Society of Japan*, Vol. 49, No. 6, 1971, p. 516–20. [Some examples of snow crystals of this type are described and their structures are discussed with reference to the formation of spatial dendrites and spatial plates.]
- JUSTO, J. E., and BOSWORTH, G. E. Fall velocity of snowflakes. *Journal of Applied Meteorology*, Vol. 10, No. 6, 1971, p. 1352–54. [Attempt to develop velocity expressions for dry snow-flakes as a function of diameter.]
- JUDY, C. H. Deuterium and snow hydrology. *Dissertation Abstracts International*, B, Vol. 31, No. 9, 1971, p. 5461-B. [Effects of snow metamorphism on deuterium content. Abstract of Ph.D. thesis, Colorado State University, 1970. University Microfilms order no. 71-5339.]
- KIKUCHI, K., and YANAI, K. Observation on the shapes of snow crystals in the neighbourhood of South Pole in the summer. *Nankyoku Shiryo: Antarctic Record*, No. 41, 1971, p. 34–41. [Single bullets, combinations of bullets, columns and side planes predominated, the type depending on locality and temperature.]
- LANSING, L. Thunder accompanying a snowstorm. *Weather*, Vol. 27, No. 1, 1972, p. 40. [Letter commenting on lake effect snow-storms of Lake Ontario, sometimes accompanied by thunder and hail.]
- LEAF, C. F., and HAEFFNER, A. D. A model for updating streamflow forecasts based on snow cover and a precipitation index. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 9–16. [Describes development of simple model giving satisfactory forecasts.]
- MCCLAINE, E. P. NOAA's hydrology studies under the earth resources survey program. (*In Third annual earth resources program review. Vol. 3. Hydrology and oceanography. Presented at the NASA Manned Spacecraft Center, Houston, Texas. December 1 to 3, 1970.* Houston, Texas, NASA Manned Spacecraft Center, [1971], p. 57–1–57–9.) [Mentions snow cover studies.]
- MCKAY, G. A., and FINDLAY, B. F. Variation of snow resources with climate and vegetation in Canada. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 17–26. [General survey.]
- MEIER, M. F., and EDGERTON, A. T. Emission characteristics of snow and ice in the microwave range. (*In Third annual earth resources program review. Vol. 3. Hydrology and oceanography. Presented at the NASA Manned Spacecraft Center, Houston, Texas. December 1 to 3, 1970.* Houston, Texas, NASA Manned Spacecraft Center, [1971], p. 51–1–51–14.) [Outlines recent studies, especially in separating the effects on microwave emission of the various snow characteristics.]
- MEIER, M. F., and EDGERTON, A. T. Microwave emission from snow—a progress report. *Proceedings of the seventh International Symposium on Remote Sensing of Environment . . . 1971 . . .* Ann Arbor, Willow Run Laboratories, Institute of Science and Technology, University of Michigan, Vol. 2, 1971, p. 1155–63. [Measurement of natural and artificial snow packs at various wave-lengths showed that brightness temperatures vary with snow depth, water equivalent, free water content, and with the character of the underlying material.]
- MEL'CHANOV, V. A. Snegozapasy v yelovykh lesakh srednego Urala [Snow reserves in fir forests in the central Ural]. *Meteorologiya i gidrologiya*, 1971, No. 11, p. 75–80. [Factors affecting melting of snow and consequent water supply.]
- MOLNAU, M. Comparison of runoff from a catchment snow pillow and a small forested watershed. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 39–43. [Analysis of run-off timing for two forested watersheds.]
- MUELLER, O. P. Soil temperature regimes in a forested area of the northern Rockies. *Soil Science*, Vol. 109, No. 1, 1970, p. 40–47. [Soil temperatures were closely related to air temperatures and snow cover; factors influencing these two controls are discussed.]
- NOGAMI, M. Sessen no teigi to sono ketteihō [The snow-line: its definition and determination (using Cordillera Real as an example)]. *Daiyonki Kenkyū: Quaternary Research*, Vol. 9, [No.] 1, 1970, p. 7–16. [Reviews various methods and derives equation for calculating the change of snow-line from the fluctuations of the ice tongue. English summary, p. 7.]
- PECK, E. L. Snow measurement predicament. *Water Resources Research*, Vol. 8, No. 1, 1972, p. 244–48. [Discusses limitations of present measuring systems and basic problems involved in obtaining more representative values.]
- PECK, E. L., and others. Evaluation of snow water equivalent by airborne measurement of passive terrestrial gamma radiation, [by] E. L. Peck and V. C. Bissell, E. B. Jones, D. L. Burge. *Water Resources Research*, Vol. 7, No. 5, 1971, p. 1151–59. [Describes method for determining the water equivalent of snow packs in large open non-mountainous areas, e.g., United States mid-west.]
- PERLA, R. I. The slab avalanche. *Alta Avalanche Study Center Report* No. 100, 1971, ix, 100 p. [Deals with observations and theory, and applies these to problems of control and the evaluation of instability.]
- PIPES, A. Prediction of seasonal snowmelt runoff in the Okanagan valley. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 98–105. [Describes difficulties of prediction in this valley, which has a semi-arid climate and floor of glacial till with a sandy surface, in British Columbia.]
- RECHARD, P. A., and LARSON, L. W. The use of snow fences for shielding precipitation gages. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 56–62. [Describes installation of fence-shield, and discusses resultant improved operation of gauges in windy areas.]
- REITER, R. Elektrische Ladungen während Schneefegen im Hochgebirge. *Pure and Applied Geophysics*, Vol. 83, 1970/VI, p. 142–57. [Study of atmospheric electrical phenomena occurring during drifting of snow along the slopes of the Wetterstein Gebirge, Austria.]
- SALM, B. On the rheological behavior of snow under high stresses. *Contributions from the Institute of Low Temperature Science*, Ser. A, No. 23, 1971, 43 p. [As the classical failure criteria applied to snow were not in accordance with experimental results, a fundamentally new criterion is suggested which shows better agreement with tests.]
- SCHMILINSKY, M. Description systématique des avalanches. *Les Alpes. Bulletin Mensuel du Club Alpin Suisse*, 1972, No. 1, p. 1–2. [Describes W. Flaig's classification of avalanches.]
- SWANSON, R. H., and STEVENSON, D. R. Managing snow accumulation and melt under leafless aspen to enhance



- watershed value. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 63-69. [Experiences in southern Alberta show that leafless aspen and willow stands have a marked effect on the retention of snow, even during chinook periods.]
- SWIFT, C. H., III. Radio-telemetry network used by the U.S. Geological Survey for reporting hydrologic data in western Washington. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 70-76. [Describes extent of present network, type and capability of equipment used for reporting and recording data, types of sensors used, and some practical problems.]
- TABLER, RONALD D. Design of a watershed snow fence system, and first-year snow accumulation. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 50-55. [Describes design, location and performance of this snow fence, intended to store snow, particularly in windswept areas, for management purposes.]
- TARBLE, RICHARD D., and BURNASH, R. J. C. Directions in water supply forecasting. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 93-97. [General discussion of trends in forecasting water supply from snow cover.]
- TINKER, J. Lead in Arctic snow. *New Scientist*, Vol. 52, No. 772, 1971, p. 49-51. [Reply to article by M. Williams, *ibid.*, Vol. 51, No. 768, 1971, p. 578-80, refuting his allegations about Bryce-Smith and Tinker's presentation of Murozumi and co-workers' data regarding lead levels in Greenland snow.]
- TOLLNER, H. Zum Problem Lawinenabgang und Lawinen-Vorhersage in Österreich. *Wetter und Leben*, Jahrg. 23, Ht. 11-12, 1971, p. 237-43. [Methods of predicting avalanches, particularly in Austria.]
- TUSHINSKIY, G. K., ed. *Karty lavinoopasnykh rayonov Sovetskogo Soyuza* [Maps of avalanche risk regions of the Soviet Union]. Moscow, Izdatel'stvo Moskovskogo Universiteta, 1971. 27 p., 4 maps. [Four maps of the U.S.S.R., relating relief, climate and distribution of avalanches, accompanied by explanatory booklet.]
- VANCE, H. M., and WHALEY, B. L. Snow frequency analysis for Oregon and Utah. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 34-38. [This information is valuable in newly developing areas where plans for snow management must be made.]
- VILLENEUVE, G.-O. Les chutes de neige à Québec. *Ressources: Bulletin de la Direction Générale des Eaux, Gouvernement du Québec*, Vol. 3, No. 2, 1972, p. 6-8. [Examines periodicity of snowfalls in Quebec, using data from 1901 to 1971.]
- WILLEN, D. W., and others. Simulation of daily snow water equivalent and melt, by D. W. Willen, C. A. Shumway and J. E. Reid. *Proceedings of the Western Snow Conference*, 39th annual meeting, 1971, p. 1-8. [Describes development of simulation model that predicts daily snow deposition, depletion, and net on-site delivery of snow melt water.]

## ERRATUM (Vol. 11, No. 62)

On p. 223 the third line of text should read:  
ties also occur in the medial moraines in the  
valley part of the glacier situated between the.