280. SHORE, P.J., ARMSTRONG, R.L., Univ. British Columbia (Geological Sciences):
The establishment of a V-Pb zircon geochronology facility, 1977-79; M. Sc. thesis (Shore):

Specifically the project deals with zircon from the Coast Mountain area of British Columbia. The same techniques are applicable to V-Pb whole rock analysis. To date the mechanical separation equipment (disk mill, jaw crusher, Wilfley table) is in working order. The Franz magnetic separator has been rebuilt for more efficient operation.
A clean chemistry laboratory has been set up and stocked with the necessary equipment including laminar flow hoods. At present, in the process of cleaning the chemistry equipment and producing spikes.

281. STEINER, J., Univ. Alberta (Geology):
Rb/Sr dating of pre-Pleistocene tillites, 1977-.

To date by the Clauer-Rb/Sr method clay mineral separations (less than 2 microns) of the Precambrian tillites (glacigene diamictites) or supposed tillites of Canada; whole rock dates of shale and argillite or carbonates will also be obtained. 1) Tillite of Rapitan Group, Redstone River, Mackenzie Mountains, Northwest Territories; 2) tillite of Toby Formation, Purcell Mountains, British Columbia; 3) tillite of Conception Group, Eastern Avalon Peninsula, Newfoundland; 4) tillite of Chibougamau Group, Lac Waconichi, Quebec; 5) tillite of Hurwitz Group, Padlei map-area, Northwest Territories.
A three week field trip to the Backbone Ranges of the Mackenzie Mountains, Northwest Territories, yielded excellent and fresh shale samples of the tillite of the Rapitan Group and underlying formations (Shezal, Sayune and Coppercap formations) with very accurate stratigraphic and footage control. The samples obtained the previous year are from Keele Formation, which overlies the Rapitan tillite. It has been arranged with Shell Canada Ltd. to sample a continuously cored 5000 ft. bore which was drilled to evaluate the interbedded iron ore horizons. The cores of numerous drill holes were still available in excellent condition and order at Little Dal Lake. The deepest drill holes (Redstone River 7Y3) were sampled for Rb/Sr clay mineral dating.

282. TUREK, A., KROGH, T.E., SMITH, T.E., HUANG, C., Univ. Windsor (Geology):
Geochronology of Lake Superior region, Northwestern Ontario, 1977-.

The Gamitagama greenstone belt to the south of Wawa, Ontario, is related to the Abitibi and Wawa greenstone belts. The greenstones in the study area are intruded by various plutons: a gabbro complex trondhjemite and several granitic stocks and border with a migmatite terrain. Both Rb/Sr ages and U/Pb ages on zircons are being determined to establish in detail the stratigraphic relations of the intrusive plutons and the volcanic pile. So far 12 U/Pb zircon ages and 34 Rb/Sr whole rock ages reveal that all above rocks are Archean in age. Moreover, the various intrusive bodies are time distinct and therefore not genetically related as previously thought. Geochemical studies, major elements, trace elements and rare earths support these conclusions.

283. WANLESS, R.K., Geol. Surv. Can:
Geochronological research and control studies, 1973-.

See:
The age of the Roberts Arm Group, North-central Newfoundland;
Con. J. Earth Sci.,vol.16, no.3, pt. 1, p. 599-606, 1979.

284. WEBER, W., HUBREGTSE, J.J.M.W., SCOATES, R.F.J., Manitoba Geol. Serv. Br.:
Age of Pikwitonei granulites and their relation to Superior Province greenstone belts, the Thompson nickel belt and the Churchill Province, 1976-81.

See:
Archean and Proterozoic metamorphism in the Northwestern Superior Province and along the Churchill-Superior boundary, Manitoba;
Geol. Surv. Can., Paper 79-10, p. 5-16, 1978.

285. FENTON, S.L.A., WHITE, O.L., Univ. Waterloo (Computing Centre), Ontario Geol. Surv.:
Geological and geotechnical data base for Northern Ontario urban area, 1977-80.

See:

A geological and geotechnical data base for urban development. Geoscience Information Society (in press).

286. MISSAN, H.S., ANDREWS, K., MCARTHUR, G., Newfoundland Dep. Mines Energy (Mineral Develop. Div.):
Mineral Occurrence Data System: Establishment of a computer processable file on the mineral deposits of the province, 1978-81.

Data on 4,000-4,500 mineral occurrences.

287. NOVA SCOTIA DEP. MINES, ST. FRANCIS XAVIER (COMPUTER):
Geological-geochemical surveys - Sub-project 4.9: Computer terminal studies, 1978-79.

287A. SMITH, D.G.W., GOLD, C.M., Univ. Alberta (Geology):
EDATA 2 - A FORTRAN IV computer program for processing wavelength and/or energy dispersive electron microprobe analysis, 1978-80.

Based on the FORTRAN IV program EDATA, a new computer program "EDATA 2" has been developed. The program is capable of processing for fully quantitative results electron microprobe data acquired by either energy or wavelength dispersive techniques or a mixture of both. It can handle any element up to Z=92 (uranium) and incorporates advanced corrections for background, overlap, escape peak and matrix effects as well as permitting the detection of, and correction for detector-window contamination, energy mis-calibration, etc. At the present time, the program runs on a mainframe computer (AMDAHL 470) but it is hoped to be able to install it on a mini-computer (PDP 11/04) using floppy discs and overlaying techniques. Testing and debugging of the program will continue for some while.

288. STANGL, C.A., PORUKS, M., HAMILTON, W.N., Alberta Research Council (Geology Div.):
Canadian index data has been merged with that of the Canadian Society of Petroleum Geologists and put up on the University of Alberta computer to run as a separate data base for Alberta, publicly available on line as a subfile of the SPIRES system. This allows as much greater east and flexibility of access than was primarily possible, will simplify procedures for our continuing data input to CIGD, and will enable ARC to function more effectively as a regional referal center. Current indexing plans call for the data base to be "all-inclusive" for the province by 1982.

289. AGTERBERG, F.P., Geol. Surv. Can.:
Probability models for estimating mineral potential, 1969-.

290. AGTERBERG, F.P., Geol. Surv. Can.:
Mineral and energy resource evaluation: Probabilistic methods, 1976-.

291. FABBRI, A.G., Geol. Surv. Can.:
Quantification of geological variables and geomathematical estimation of mineral potential for selected areas in Canada, 1972-.

See:
Picture processing of geological images; Geol. Surv. Can.,Paper 78-1B, p. 169-174, 1978.

Implementation of an interactive system for computer processing of geological images; Geol. Surv. Can., Paper 78-1C, p. 123, 124, 1978.

292. MAY, R.W., SCHWARTZ, F.W., JONES, B., Univ. Alberta (Geology):
Application of statistical methods to the analyses of geological data, 1976-.

The statistical analysis of groundwater chemistry project is complet. This ongoing study is being currently concentrated into aspects of the study of stochastic properties of sedimentary sequences.

293. UMAR, P.A., Ontario Geol. Surv.:
Quantitative analysis of mineralization in northeast Ontario, 1978-.

See:
Ontario Geol. Surv., Misc. Paper 82, p. 230-233, 1978.

Multivariate statistical techniques of correlation, factor and discrimanant analyses are being applied in formulating quantitative relationships between known mineral deposits/reported occurrences, and their associated geological characteristics in a section of northeast Ontario (Timmins-Kirkland Lake region) for developing exploration guidelines and to support regional evaluation and planning. The preliminary report has been submitted and is under study. Similar studies will be undertaken for other selected sections of Northern Ontario.

294. BOURQUE, M.A., FORD, D.C., McMaster Univ. (Geography):
Karst development in Ordovician carbonates, Western Platform of Newfoundland, 1976-78 (completed); M. Sc. thesis (Bourque).

The rugged carbonate rock topography between Goose Arm and Bonne Bay Big Pond displays karst sinkholes and groundwater systems. Sinkholes are large and greatly ice modified. Karst groundwater systems display much derangement by glacial infilling, and there is evidence of 'sub-cutaneous karst drainage' consequent upon an early post-glacial phase of permafrost growth. Spatial and temporal patterns of carbonate solution are remarkably uniform. A 'holding tank' model is developed to explain this characteristic.

295. BOYD, G.L., HARAS, W.S., Fisheries-Environment Canada (CCIW):
Arc slumps at Port Dover and Port Alma, Ontario, 1976-81.

The recent arc slump of an 80-foot high bluff near Port Dover on Lake Erie has since been protected at the toe and dewatered at the top, providing an ideal opportunity to study the temporal effects of the protection and the overall stabilization of the bluff. Groundwater seepage acts as a lubricant between the base clay deposits and sandy overburden. Monitoring of this area was started and will continue annually in conjunction with the Hydraulics Research Division, providing useful data in a determination of slope stabilities. Similary, a recent arc slump near Port Alma is being monitored to show the time cycle of these massive bluff failures.

296. BOYD, G.L., ZEMAN, A.J., Fisheries-Environment Canada (CCIW):
Scarborough Bluffs volumetric erosion rates, 1977-79.

Not all of the erodible Great Lakes' shoreline can be measured using the same technique; therefore a new methodology is being developed for highly dynamic large bluffs such as are found in the Scarborough and Port Burwell areas. A test area was selected at Scarborough's Bluffers Park offshore landfill site, and 1:2,400-scale, 2-metre contour interval maps were produced from air photos for seven years, from 1947 to 1977. At present, a digitizing and computer package is being developed to calculate volumetric erosional losses from these bluffs for the different time intervals to assess the variation in rates of change.

297. BRYAN, R.B., Univ. Toronto (Scarborough College-Geography):
Interaction of intense rainfall and sheetwash in the entrainment of soil particles, 1975-79.

See:
The influence of slope angle on soil entrainment by sheetwash and rainsplash; Earth Surface Proc., vol. 4, pt. 1, 1979.

Involves repeated testing of variety of soils in a laboratory flume to determine critical threshold velocities for entrainment initiation with and without added rainfall. Sheetflow of sub 1.5 mm depth and rainfall intensities to 100 mm/be used.

298. BRYAN, R.B., HODGES, W.K., YAIR, A., Univ. Toronto (Scarborough College-Geography):
Examination of the relative importance of surface and subsurface erosion in the Alberta badlands, 1976-; Ph.D. thesis (Hodges).

Involves experimental examination of surface and subsurface erosion under simulated rainfall. Runoff plots on a variety of slopes of varied lithology, with particular attention to threshold rainfall quantities necessary to initiate surface and subsurface flow, flow discharge and velocity and sediment discharges.

299. BRYAN, R.B., LUK, S., Univ. Toronto (Scarborough College, Erindale College-Geography):
Study of factors generating variability of rainsplash and sheetwash from homogeneous soils under controlled conditions, 1978-79.

In simulated rainfall erosion experiments it was found that where all major contributory factors are kept constant soil loss by rainsplash and sheetwash still varies greatly. An attempt to assign the source of this variability by very detailed analysis of microtopographic variation and extremely close control of rainfall properties.

300. BRYAN, R.B., MORGAN, C., Univ. Toronto (Scarborough College-Geography):
Development of indices of soil erodibility based on strength parameters, 1978-79; Ph.D. thesis (Morgan).

Involves attempts to adapt soil strength measurements to the prediction of soil erodibility. Objective is to develop indices of soil erodibility which are more appropriate for use with coherent soils than the numerous indices developed by agricultural engineers which are based primarily on partial size and aggregate stability. Experiments involved field and laboratory testing of soils using simulated rainfall.

301. BRYAN, R.B., PRICE, A.G., Univ. Toronto (Scarborough College-Geography):
Hillslope processes contributing to the recession of the Scarborough Bluffs, Ontario, 1976-79 (completed).

Involves classification and analysis of hillslope processes active over the 9 mile length of the high Scarborough Bluffs, with particular emphasis on variations in character and rate of action of processes in response to variations in bluff stratigraphy, and to variations in pipeflow contributions to bluff face.

302. DESMARAIS, G., DUBOIS, J.M.M., Univ. Sherbrooke (Géographie):
Géomorphologie quaternaire du bassin de la rivière Matamek, Côte-Nord du Saint-Laurent, 1975-79; thèse de maîtrise (Desmarais).

La rédaction de la thèse sera terminée en mai 1979.

303. DUBOIS, J.M.M., Univ. Sherbrooke (Géographie):
Bibliographie sur les caractéristiques physiques des Cantons de l'Est, Québec, 1971-.

Quatre rapports totalisant plus de 3,000 références ont été publiés à date pour couvrir tout le domaine physique des Cantons de l'Est. Les références sont regroupées par thèmes. L'acquisition de données est continuelle.

304. DUBOIS, J.M.M., Univ. Sherbrooke (Géographie):
Télédétection et cartographie des fronts glaciaires sur la Côte-Nord du Saint-Laurent entre le lac Saint-Jean et le Labrador, 1978-80.

Premier essai de corrélation des systèmes morainiques et des positions frontales de la glace au Québec-Labrador à partir d'évidences géomorphologiques obtenues par photo-interprétation. Une deuxième étape pourra comprendre des levés de terrain.

305. EWERS, R.O., FORD, D.C., McMaster Univ. (Geography):
Genesis of limestone cavern systems in the dimensions of length and breadth, 1974-79; Ph.D. thesis (Ewers).

See:
A model for the development of broad scale networks of groundwater flow in steeply dipping carbonate aquifers;
Trans. British Cave Research Assoc., vol. 5, no. 2, p. 121-125, 1978.

See:
The development of limestone cave systems in the dimensions of length and depth;
Can. J. Earth Sci., vol. 15, no. 11 p. 1783-1798, 1978.

Laboratory analogue experiments, computer simulations and field evidence from the mid-western United States, western Canada and central Europe support a comprehensive model for the development of the network of solution tubes which are responsible for high volume flow in carbonate aquifers. The model proposes that broad scale networks (networks draining more than 100km^2) are established by the integration of smaller networks which propagate from discrete input sources as distributary systems. Within the framework of regional hydraulic gradient established by geologic structure, topography and lithology the integration process proceeds headward in a stepwise fashion from the resurgence point. The direction and rate of growth of the smaller elements is determined by lithologic anisotropies and the geometry of the input and resurgence array. These factors together with regional boundary conditions determine the pattern of the larger networks.

306. FORD, D.C., MARGO, S., McMaster Univ. (Geography):
Genesis of Canadian Hole and the Friar's Hole System, Pocahontas County, West Virginia, U.S.A., 1978-81; M.Sc. thesis (Margo).

A study of the morphogenesis of a very extensive, complex and multiphase cavern system underlying the palaeovalley of Spring Creek, to test a general theory of cavern genesis.

307. FORD, D.C., WEIRICH, F.A., CROSBIE, M.L., McMaster Univ. (Geography): Geomorphology of the South Nahanni River-Ram Plateau region, Mackenzie Mountains, with particular reference to glacial and proglacial deposits, 1973-78; M. Sc. theses (Weirich, Crosbie). (completed)

Weirich has shown that in the central part of South Nahanni Park (South Nahanni and Flat River valleys) glaciolacustrine deposition up to 2000 feet a.s.l. must be attributed to two separate depositional events with an intervening phase of erosion to approximately modern local base level, not to a single depositional event as first proposed by Ford (1976).

Crosbie has studied deposits of the Ram Plateau and environs (Ram River basin) which lies astride the path of any South Nahanni proglacial lake draingage flowing northwards. The simplified sequence is 1) First Canyon Glaciation (Ford 1976); 2) considerable erosion; 3) glacial lake impounding to 2400 feet a.s.l. by Laurentide ice, drainage diverted north; 4) considerable erosion; 5) glacial lake impounding to 1800 feet a.s.l. with a recessional stand at 1500 feet (Laurentide ice); 6) considerable erosion; and 7) glacial lake impounding to 900-1000 feet a.s.l. by Laurentide ice (probably the Late Wisconsinan).

308. GANGLOFF, P.G., CLEMENT, P.C., de BOUTRAY, B., SAVOIE, L., PILON, D., JETE, H., Univ. Montreal (Géographie):
Morphosculpture des socles dans l'Ungava, Québec, 1978-82; thése de doctorat (Savoie, Pilon).

L'insertion des phénomines quaternaires(morphologies glaciaires et périglaciaires dans le cadre morphostructural.

309. GANGLOFF, P.G., GRAY, J.T., RICHARD, P.H.J., HETU, B., LABELLE, C., GAUTHIER, R., Univ. Montréal (Géographie):

Les séquences morphogénétiques tardiglaciaires et holocènes du Québec, 1978-82; thèse de doctorat (Hétu, Labelle), thèse de maîtrise (Gauthier).

Etablir la succession des séquences morphogénétiques post-wisconsiniennes au Québec, les causes des ruptures d'équilibre (oscillations climatiques, feux de forêts, etc.), l'âge, la fréquence et la périodicité éventuelle de ces ruptures. Des ruptures ont déjà été identifiées et datées, qui sont indépendantes du schéma classique de la géomorphologie climatique. La région de la Gaspésie est actuellement le lieux des recherches les plus intensives dans le cadre de ce projet.

310. GREENWOOD, B., BRYAN, R.B., PRICE, A.G., Univ. Toronto (Scarborough College-Geography):
Hydrodynamical, geotechnical and artificial controls on shoreline change in the Toronto waterfront: the assessment of a natural hazard, 1978-81.

To provide and integrated physical approach to the problem of shore erosion in the Toronto waterfront particularly in the area of the high bluffs.

311. GREENWOOD, B., MCGILLIVRAY, D.G., Univ. Toronto (Scarborough College-Geography):
Numerical modelling and environmental impact assessment in the Toronto waterfront area, 1976-80; Ph. D. thesis (McGillivray).

See:
A theoretical model of the littoral drift system in the Toronto waterfront area, Lake Ontario; J. Great Lakes Res., vol. 4, p. 84-102, 1978.

312. HARAS, W.S., BOYD, G.L., Fisheries-Environment Canada(CCIW):
Shore erosion monitoring programme, 1973-81.

To monitor erosion and accretion, both onshore and offshore, from Port Severn, Georgian Bay to Gananoque, Lake Ontario annually and after major storms. Sequential oblique colour slide and video photography available for area between 162 ground measurement sites, as a follow up programme to the Great Lakes Shore Damage Survey Technical report and Atlas. Analysis of erosion and accretion rates and factors for onshore bluffs and beaches as well as nearshore coastal zone.

313. HARAS, W.S., SHAW, J.R., Fisheries-Environment Canada (CCIW):
Point Pelee erosion study, 1974-81.

The concern about the preservation of a valuable natural resource such as Point Pelee is readily apparent, yet along with this concern is the need for raw materials such as aggregates dredged from submarine sand and gravel deposits. This could involve a conflict in resource management, therefore the question of how significant commercial dredging is as a process element in the local coastal dynamics needs to be resolved. To provide a basis for this assessment, offshore and onshore surveys, bottom sediment analyses, wind-wave analyses, and current measurements have been taken over the last four years to derive a sediment budget for the Point Pelee spit and shoal system.

314. HARAS, W.S., SHAW, J.R., Fisheries-Environment Canada (CCIW):
James Bay hydro development impacts, 1976-81.

To define rates of erosion in the estuaries of the La Grande and Eastmain Rivers in order to predict the magnitude of response to discharge modifications resulting from the James Bay hydroelectric power development. Current measurements, soil samples, sequential low-altitude oblique photography and annual onshore and offshore profiles for both estuaries are available.

315. HARAS, W.S., SHAW, J.R., Fisheries-Environment Canada (CCIW):
Hudson Bay Lowland baseline studies, 1976-81.

In support of the need for environmental baseline data in the Hudson Bay Lowlands, oblique low-level photography of the Albany River estuary and the shoreline between Fort Albany and Moosonee was undertaken. Also, shore profile stations were established at key locations to enable the measurement of shoreline dynamics. Future work will involve nearshore current measurements and locating additional shore profile stations in the Attawapiskat River estuary and Akimiski Strait.

316. JOHNSON, P.G., MAXWELL, M., KRISTJANSON, F., BIGRAS, S., KENT, T.D., Univ. Ottawa (Géographie):
Mass movement processes in alpine environments, 1977-79; M.A. (Maxwell, Kristjanson, Bigras, Kent).

See:
Rock glacier types and their drainage systems, Can. J. Earth Sci., vol. 15, no. 9, p. 1496-1507, 1978.

Project is developing into a study of hydrological regime of unconsolidated rock masses in Alpine areas together with the movement and dating studies. To determine structure of talus and the various rock glacier types, to determine mechanism, rates and date of movement of these forms.

317. MCCANN, S.B., McMaster Univ. (Geography):
Barrier Islands in the Southern Gulf of St. Lawrence, 1970-.

318. MCCANN, S.B., TUCKER, C.M., LECKIE, D.A., McMaster Univ. (Geography):
Quaternary stratigraphy and deglaciation of the Burin Peninsula, Newfoundland, 1976-79; Ph.D. thesis (Tucker), M.Sc. thesis (Leckie).

See:
Late Quaternary events, Burin Peninsula, Newfoundland and St. Pierre et Miquelon, France; Geol. Assoc. Can. Program with Abstracts, p. 507, 1978.

The project is nearing completion with Tucker's Ph.D. thesis ready for examination. The area of study was extended in 1978 to include the Hermitage Peninsula and mapping was completed by Leckie.

319. MILLER, T.E., FORD, D.C., McMaster Univ. (Geography):
Morphology and process of the Caves Branch karst terrain, Maya Mountains, Belize, 1976-79; Ph.D. thesis (Miller).

An integrated study of the surface and underground morphology of the deep doline (cockpit) karst surrounding the Caves Branch polje, and of lithologic and structural features guiding the karst genesis. A study of the modern hydrology and solution patterns during wet and dry seasons, and of soil CO_2 concentrations.

320. YAIR, A., BRYAN, R.B., LAVEE, H., ADAR, E., Univ. Toronto (Scarborough College-Geography), Hebrew Univ., Ben Gurion Univ.:
Study of spatially varied erosional response by homogeneous marls to intense rainfall, 1978-.

Simulated rainfall experiments using two different simulators were carried out on a variety of runoff plots. Experiments were designed to examine varying erosional responses related to aspect differences in homogeneous gypsiferous marls. Initial results show that under current climatic conditions virtually no erosional activity is taking place.

ELECTRICAL/METHODES ELECTRIQUES

321. DAVIS, J.L., Geol. Surv. Can.:
Measurement of dielectric properties of geologic materials in situ, 1975-.

322. DYCK, A.V., Geol. Surv. Can.:
Borehole geophysics (electrical and magnetic techniques), 1974-.

323. KATSUBE, T.J., Geol. Surv. Can.:
Electrical rock properties, 1963-.

324. PITCHER, D.H., BARLOW, R.B., Ontario Geol. Surv.:
James Bay Lowlands electromagnetic survey, 1978-79.

Tridem airborne electromagnetic system, which is presently mounted in a twin engined PBY Canso aircraft owned and operated by Kenting Earth Sciences Limited surveyed approximately 8000 line kilometres. The new Tridem system has a vertical coaxial coil configuration which measures in-phase and quatrature components at 500, 2000 and 8000 Hz.

The primary purpose of this survey was to map terrain conductivity and, in particular, to search for lignite. Physical property measurements show that electrical methods should detect differences in conductivity between conducting clay-lignite horizons from poorly conducting clay, soil, muskeg and gravel horizons. A previous Tridem test survey as well as d.c. resistivity soundings support this approach.

325. SCOTT, W.J., Geol. Surv. Can.:
Electrical mapping techniques , 1967-.

326. STRANGWAY, D.W., GUBINS, A., Univ. Toronto (Geology):
Electrical and magnetic signatures of paleoimpact structures - Williston Basin, 1976-79; M.A. Sc. thesis (Gubins).

An M.A. Sc. thesis on the magnetic and magnetotelluric signature of apparent paleoimpact structures in the Williston Basin has now been completed. Structures examined include the Viewfield and Dumas structure in Saskatchewan and the Hartney structure in Manitoba. Very weak, but local magnetic anomalies suggest the presence of reversely magnetized material in at least two of these structures. It is possible that heating remagnetized the sediments at the time of the impact.

The resistivity values of the shales overlying the structures are very low, so that it is not likely that we have been able to detect an electrical effect even at the lowest frequences of 10 hz. Nevertheless, the values of resistivity are extremely uniform from station to station so that small variations have been detected that may be of significance.

327. STRANGWAY, D.W., REDMAN, J.D., Univ. Toronto (Geology, Physics):
Magnetotelluric sounding over Proterozoic sediments, 1977-.

See:
Shallow crustal sounding in the Superior province by audiofrequency magnetotellurics; Can. J. Earth Sci., vol. 15, p. 1701-1711, 1978.

Studies of the electrical properties of Proterozoic sediments in the Blind River-Elliott Lake area, Ontario and in northern Saskatchewan show that in may places, these sediments have an extremely high resistivity. Resistivity values of 100,000 ohm meters or more are common and suggest that there is essentially, no water in the pore spaces and that the pore spaces must be closed, with little interconnection between them. Fractures associated with the diabase intrusions in the Elliott Lake region introduce local resistivity lows.

328. STRANGWAY, D.W., REDMAN, J.D., Univ. Toronto (Geology, Physics):
Instrumentation for tensor audiofrequency magnetotelluric sounding, 1977-; M.Sc. (Redman).

We have received a microprocessor system and the related prototyping devices for the construction of our new AMT tensor system. Design work has been completed and the preliminary system is now being assembled. The on site processing of individual transients and resolution into the tensor components is expected to increase the quality of our results quite considerably.

329. STRANGWAY, D.W., REDMAN, J.D., HOLLADAY, S., HORNE, C., Univ. Toronto (Geology, Physics):
Magnetotelluric sounding for water, permafrost and nuclear waste disposal site testing, 1977-.
See:
Permafrost mapping by audiofrequency magnetotellurics; Can. J. Earth Sci., vol. 15, p. 1539-1546, 1978.

See:
Electromagnetic sounding of permafrost NWT, Canada, in summer and winter; Proc. Third Internat. Permafrost Conf., p. 567-579, 1978.

We have continued our audiofrequency magnetotelluric studies over test sites for nuclear waste disposal. These studies are particularly useful to determine water content and to map fractures in high resistivity regions. In the Chalk River area we extended our earlier studies to a grid survey mapping out the location and orientation of a large number of water-filled fractures. These results show the region to be highly fractured. A study at the Whiteshell Nuclear Reactor Site, Pinawa, Manitoba was also conducted. A grid survey was also conducted in this clay covered region. Clay cover is highly conductive and makes sounding for detection of bedrock fractures difficult. We could only penetrate the cover at our lower frequencies of 100 hz. or so. This means of course that no conventional electrical or electromagnetic method will be capable of mapping the bedrock fractures uniquely. There is nevertheless a strong indication that there are no major conductive fractures in the bedrock in this region.

330. STRANGWAY, D.W., WONG, J., Univ. Toronto (Geology, Physics):
Induced polarization modelling and the determination of water content in various media, 1976-; Ph.D. thesis (Wong).

A portion of the work has been the development of an electrochemical model for the induced polarization effect. This model contains many parameters but it appears that one of the dominant ones is that of particle size which controls the frequency response and determines the peak relaxation frequency. It suggests that the spectral response of ore deposits is at least in part dependent on the habit of the mineral assemblage and that responses with no spectral peak represent a distribution of grain sizes.

Experimental studies are now being conducted to confirm the analytical calculations. Studies both analytical and field-based are being conducted to detect moisture content in the soil layers. Field data from permafrost regions and at a calibrated agricultural test site have been conducted.

EXPLORATION/PROSPECTION

331. ANNAN, A.P., Geol. Surv. Can.:
Radar sounding in geological environments, 1975-.

See:
Methodology for radar transillumination experiments; Geol. Surv. Can., Paper 78-1B, p. 107-110, 1978.

332. BECKER, A., BAZINET, R., Ecole Polytechnique (Génie Minéral):
Prospection géophysique en forage profond à l'aide des courants telluriques, 1977-79; thèse de doctorat (Bazinet).

L'objet du projet est la détection des gisements proches d'un sondage par la mesure de la distortion des courants telluriques dans le forage.

333. BOYLE, R.W., Geol. Surv. Can.:
Primary halos and metallogenic distribution of the elements, 1973-.

334. BURKE, K.B.S., Univ. New Brunswick (Geology):
Development of seismic reflection techniques for shallow investigations, 1974-79.

An electromagnetic vibrator, with a peak thrust of 196N, has been modified and adapted for field use. Field tests are now underway at various test sites in New Brunswick to evaluate the use of this energy ar part of a shallow seismic reflection exploration system.

335. CHARBONNEAU, B.W., Geol. Surv. Can.:
Evaluation of uranium reconnaissance data, 1976-.

336. DREVER, G., STOLZ, H., Saskatchewan Geol. Surv.:
Evaluation of the uranium potential of lake-covered areas, 1975-79.

See:
Sask. Geol. Surv., Summ. Investig., Misc. Rept. 78-10, p. 113-117, 1978.

To evaluate the radiometric method of uranium exploration using instrumentation reading directly on lake bottoms and in lake waters. The system uses four channels and continuous recording. Methods and instruments for following up anomalies recorded by the system have also been developed. A number of navigation systems have been experimented with; the most successful is the radio-location device used in 1978. In 1978, the evaluation trials were carried out at Stewart Island and Spring Point, Lake Athabasca.

337. ELLIS, R.M., JOSE, B.F., CHANDRA, B., Univ. British Columbia (Geophysics and Astronomy):
Feasibility of using the piezoelectric technique for detection and location of quartz veins in mine environments, 1978-79; M.Sc. thesis (Jose).

The piezoelectric effect is being investigated both in the laboratory and field environments. The laboratory system measures the relative piezoelectric effect between rock samples by a pulse technieque. The basic laboratory system is being adapted specifically for detection and location of quartz veins in mine environments. Initial field tests have been very encouraging with the observation of piezoelectric signals corresponding to both the compressional and shear arrival on the quartz veins. A filter system is now being developed to adequately discriminate against the electrical noise present in the mine environment.

338. FOLINSBEE, R.A., Geol. Surv. Can.:
East coast offshore surveys, 1973-.

339. Géophysique France-Québec Inc.,
Levé de geophysique marin partie sud du Lac Chibougamau, Québec, 1978-79.

340. GLACKMAYER, K.,Québec Min. Richesses Naturelles:
Géophysique au sol région de Abana, Québec, 1978-79.

341. GLACKMAYER, K., Québec Min. Richesses Naturelles:
Géophysique au sol Canton de Rasles, Québec, 1978-79.

342. GRASTY, R.L., Geol. Surv. Can.:
Gumma ray spectromety, 1972-.

343. KEATING, P., Québec Min. Richesses Naturelles:
Gravimétrie, Région du Lac Abitibi, Québec, 1978.

Amélioration de la connaissance géologique de la région, délimiter le batholite de Palmarole.

344. Les Relevés GéophysiquesInc., Québec Min.Richesses Naturelles:
Levé electromagnétique aérien, Région du lac Abitibi, Québec, 1978-79.

345. Les Relevés Géophysiques Inc., Québec Min. Richesses Naturelles:
Levés electromagnétiques aériens Région des Monts Alexandre et Région de Deville-Clapperton, Québec, 1978-79.

346. Les Relevés Géophysiques Inc., Québec Min. Richesses Naturelles:
Levé electromagnétique aérien Région de Dalquier, Québec, 1978-79.

347. Les Relevés Géophysiques Inc., Québec Min. Richesses Naturelles:
Levé gradiométrique Dôme de Lemieux, Québec, 1979.

Réondre à des questions d'ordre géologiques, structure, définition de contacts.

348. Les Relevés Géophysiques Inc., Québec Min. Richesses Naturelles:
Levé input, Région de Coigny-Chaste, Québec, 1978-79.

349. Les Relevés Géophysiques Inc., Québec Min. Richesses Naturelles:
Levé aétrien de type input Région de Waconichi, Québec, 1978-79.

350. SINHA, A.K., Geol Surv. Can.:
Applied EM problems, 1973-.

GEOMAGNETISM-PALEOMAGNETISM/GEOMAGNETISME-PALEOMAGNETISME

351. BOWER, M.E., Geol. Surv. Can.:
Ocean aeromagnetics, 1965-.

352. CHRISTIE, K.W., Geol. Surv. Can.:
Paleomagnetism and rock magnetism instrumentation and technological development, 1970-.

353. CHRISTIE, K.W., Geol. Surv. Can.:
Paleomagnetism of the Hopeland diabase dykes, Newfoundland, 1972-.

354. COOKE, H.B.S., HALL, J.M., Dalhousie Univ. (Geology):
A study of the paleomagnetism of sediments from two deep drill holes in the Hungarian Basin, 1976-79.

Through Dr. A. Ronai of the Hungarian Geological Institute we have been provided with 1m-spaced semi-oriented samples from two 1200m deep continuously cored drill holes located in the Hungarian Basin. The locations of the holes are to the south of the limits of glacial advance in central Europe. It seems that deposition in the area has been essentially continuous over the last 6-7my at average rates of 150 to 200m/my. These high sedimentation rates mean that we can look at the time variation of the geomagnetic field in much more detail than is possible using oceanic sediment cores. To date measurement of samples from both cores is almost complete. All major polarity epochs and events are clearly recognisable and the first result of detailed data analysis is that the field appears to be in an undecided polarity state for about 30% of the time.

355. CURRIE, R.G., Geol. Surv. Can.:
Geological and geophysical studies in the Beaufort Sea, 1971-.

356. FAHRIG, W.F., Geol. Surv. Can.:
Paleomagnetism of the dykes of west Greenland, 1972-.

357. FAHRIG, W.F., Geol. Surv. Can.:
Paleomagnetism of Proterozoic to Devonian strata across Boothia Arch, 1974-.

358. GRAVENOR, C.P., SYMONS, D.T.A., STUPAVSKY, M., Univ. Windsor (Geology):
Paleomagnetism of the Meadowcliffe Till, Toronto, Ontario, 1977-78.

The 12 m thick Meadowcliffe Till was sampled in 5 vertical profiles spread horizontally over 400 m in the Scarborough Bluffs near Toronto, Ontario. This paleomagnetic study of ~700 specimens yielded a normal segment in all 5 profiles and an excursive segment in 3 profiles. The normal zones give, in most cases, significantly different directions which suggests that they are not strictly coeval and that deposition rates in this till are highly variable from one point to the next. Overall, they give a virtual geomagnetic pole located at 273.1°W, 73.0°N (δp = 1.7°, δm = 2.6°). Similarly the 3 excursive zones do not have exactly coeval remanences. Assuming the remanence reflects a single excursion, then the pole appears to swing from mid-Africa to mid-South Pacific and then back to the Arctic pole. This polar sequence and the apparent paleofield intensities are notably similar to those found in aboriginal fireplaces at Lake Mungo, Australia. The Meadowcliffe Till is the first Ontario till to yield evidence of recording a geomagnetic field excursion(s). Accordingly its paleomagnetic age is set at 30,500 ± 1,500 yr B.P. which is within the 8,000 yr window permitted by the single radiocarbon dates from below and above the till

359. HALL, D.H., Univ. Manitoba (Earth Sciences):
Surface magnetization, English River batholithic belt, Ontario, 1976-80.

360. HALL, D.H., STEPHENSON, O.G., MILLAR, T., Univ. Manitoba (Earth Sciences):
Aeromagnetic interpretation Lynn Lake, Mantobia, 1977-79.

361. HALL, J.M., GRUVER, N., PLASSE, D., Dalhousie Univ. (Geology):
The structure and magnetization of oceanic crust, 1973-; M. Sc. thesis (Gruver), Ph.D. thesis(Plasse).

Since 1973 Hall has been actively involved in trying to find the nature and extent of the source layer for the linear magnetic anomaly patterns of the ocean basins. This has involved work from CSS HUDSON and DV GLOMAR CHALLENGER. To date it seems unlikely that, in the North Atlantic at least, the uppermost volcanic layer can provide a widespread source for the anomaly patterns. This follows from the frequency of reversals and tectonic disturbance of the layer, among other factors. We are now considering lower layer 2A and layer 3 of oceanic crust for the magnetic source. This involves the consideration of novel magnetization mechanisms.

An important offshoot of this work is a strong suggestion that uppermost oceanic layer 2 has experienced strong tectonic disturbance, with faulting and large rotations. The evidence for rotation is both from anomalous paleomagnetic directions and from the study of separation vesicles presently being carried out by Ms. Nancy Gruver.

362. LATHAM, A.E., SCHWARCZ, H.P., FORD, D.C., PEARCE, G.W., McMaster Univ. (Geology):
Studies of the palaeomagnetic records of calcite speleothems, 1977-81; Ph.D. thesis (Latham).

It has been established that many calcite stalagmites and flowstones carry a stable chemical remanent magnetism of measurable strength. The first 'reversed' specimen (pre-Brunhes Epoch) has been measured. Studies continue, with associated U-Series dating where possible.

363. LERBEKMO, J.F., Univ. Alberta (Geology):
Magnetostratigraphy of the late Cretaceous and Paleocene of Alberta, 1973-80.

Magnetostratigraphy in the Red Deer Valley section will be carried downward to the base of the Edmonton Group, along with the geochronology of the bentonites, in an attempt to produce a continental magnetostratigraphic type section for the Maestrichtian.

364. MCGLYN, J.C., Geol. Surv. Can.:
Palemagnetic study of Proterozoic red beds of the western Canadian Shield, 1968-.

365. OLSON, D.G., Geol. Surv. Can.:
High resolution aeromagnetics (experimental surveys), 1968-.

366. PEARCE, G.W., KARSON, J., STESKY, R.M., ROBIN, P.Y.F., Univ. Toronto (Geology):
Effect of high pressure on remanent magnetism, 1977-79.

A project which began last year concerning the effects of high pressure (to 2 GPa) on magnetic remanence, has progressed well. We started the study because these effects may well be important in regions of low geothermal gradients, or at localities where a magnetization is associated with a meteorite impact. Similarly in the Moon and Mercury, pressure may well set the limit to the thickness of coherently magnetized crust which can contribute to their global magnetic field. Several series of experiments were thus begun to determine the effects of hydrostatic pressure on the magnetic remanent moment in a variety of materials. In one series a sample is magnetized to saturation, the resultant saturation remanent moment (SRM) was measured, the sample was subjected to a specific pressure, the pressure was removed, and the remanent moment remeasured. The after-pressure magnetization was always less than the SRM and was a monotonically decreasing function of the pressure applied. For samples with only hematite present the decrease was very small (5%), whereas for those with magnetite the decrease after pressurization to 20 kbar varied from 20% to 50% of the SRM. Conclusions so far are that there is a simple relationship between coercivity and the extent of this pressure demagnetization and we postulate a relationship between coercivity and the level of magnetization a rock may acquire under pressure.

367. PEARCE, G.W., KOBLUK, D., JAMES, N.P., Univ. Toronto (Geology), Memorial Univ. (Geology):
Paleomagnetism of Paleozoic rocks of Eastern Canada, 1977-.

The project has changed course slightly due to the discovery of a good paleomagnetic record in the excellently preserved Lower Cambrian rocks of southern Labrador. These should provide a lower limite to results from Ordovician and later rocks from elsewhere in eastern Canada and cover a little-studied time range. The sequence consists of a 120 to 180 m thick sequence of flat-lying, undeformed sedimentary rocks of late Early Cambrian age exposed on the coast along the Straits of Belle Isle, and comprises 2 formations: 1) the Forteau Formation: 50 to 60 m of shale, siltstone, and sandstone containing archaeocyathid-bearing carbonates and reefs, 2) the underlying Bradore Formation: 65 to 120 m of minor conglomerate and arkosic sandstone. Paleomagnetic work has been completed on preliminary set of 8 samples from near the base and top of the Bradore sandstone, and the base and top of the lower Forteau beds. The NRM of most of the samples included steep inclination components probably due to the earth's recent magnetic field. Removal of this modern magnetization (AFD) using fields up to 1000 Oe, revealed a stable low inclination magnetization consistent in direction in the Bradore and Forteau samples. In some of the basal Bradore samples this component was reversed. The average direction of this magnetization is in very good agreement with results by Rao and Deutsch from the Bradore Formation in northern Newfoundland. The paleolatitude suggested for southern Labrador in upper Lower Cambrian is between 10^{o} and 20^{o} south latitude. We are now measuring an extensive collection from these formations that were collected this summer (1978).

368. SAWATZKY, P., Geol. Surv. Can.:
High resolution aeromagnetics (instrumentation development), 1977-.

369. SCHWARZ, E.J., Geol. Surv. Can.:
Paleomagnestism of the Circum-Ungava Belt, 1973-.

370. SEGUIN, M.K., DAIGLE, R., ST-HILAIRE, B., LAVOIE, P., Univ. Laval (Géologie et Minéralogie):
Paleomagnetism of Devonian intrusives from the Appalachians; Paleomagnetism of the ultramafic rocks from Abitibi, Québec, 1977-79.

In the Appalachians, the purpose of the actual paleomagnetic work under way is to provide a magnetostratigraphic framework. For this reason, well dated rock units ranging in age from Cambrian to Cretaceous age have been investigated. At this time, the study is mainly centered on Upper Devonian and one Cretaceous intrusives. In the Superior Province, the paleomagnetic study is related to the La Motte-Vassan ultramafic basin and the problems to be solved are of structural nature.

371. SEGUIN, M.K., TURCOTTE, V., DAIGLE, R., Québec Min. Richesses Naturelles, Univ. Laval (Géologie et Minéralogie):
Levés paléomagnétiques dans le sillon de La Motte-Vassan, Québec, 1978-.

Définition des zones synchrones par une coupe de l'anticlinal de La Motte-Vasson.

372. STRANGWAY, D.W., BAMBRICK, J., LETROS, S., Univ. Toronto (Geology): High resolution aeromagnetic data interpretations over Abitibi greenstones, 1978-; Ph.D. thesis(Bambrick), M.Sc. thesis(Letros).

A study of the high resolution aeromagnetic maps over the Blake River volcanics and volcanics in the Timmins area, Québec, has been initiated. Maps have been subjected to upward and downward continuation and equivalent susceptibility maps have been derived. These maps quite accurately locate boundaries inferred by mapping.

The measurement of the samples will provide a base level and a scale for these maps so that we can seek to examine deviations from the known properties. In some of the magneticallyquiet calc-alkalic volcanics we have been able to use residual maps to detect strong north-south trends not readily recognized in any other way.

We are also examining the effect of the Superior province granite-greenstone belt anomalies to see if these major features could be detected at satellite height and hence be detectable by the forthcoming Mag.Sat. to be lauched in the near future.

373. STRANGWAY, D.W., KWIECIEN, B., Univ. Toronto (Geology): Intercontinetal magnetic correlation, 1977-.

We have renewed our effort to compile aeromagnetic data from West Africa and eastern South America to see if the new data that has become available in the past few years can give us more information about detailed anomaly correlation. We also hope to use satellite data from the forthcoming Mag.Sat. for this purpose since we are searching for major differences in magnetic provinces.

374. STRANGWAY, D.W., LANOIX, M., SUGUIRA, N., Univ. Toronto (Geology): Magnetic fields when the solar system formed, 1976-; M.Sc. thesis (Lanoix).

See:
The primordial magnetic field preserved in chondrules of the Allende meteorite; GRL, vol. 5, p. 73-76, 1978.

The study of the magnetism preserved in the Allende meteorite has continued by an examination of individual chondrules retaining the mutual orientation during measurement. The directions of the soft components of magnetization are found to be directionally well grouped suggesting a thermal overprint perhaps acquired at the time of accretion of the meteorite or subsequently during low temperature metamorphism. The stable components however are found to be randomly oriented thus indicating that they became magnetized before the meteorite accreted. These chondrules are often strongly magnetic and preserve a magnetization acquired before the meteorite coooled. Paleointensity values of 10-15 oersteds seem to be present in these samples indicating directly the presence of large magnetic fields in the early solar system.

375. STRANGWAY, D.W., SUGIURA, N., Univ. Toronto (Geology):
Lunar sample paleointensity, 1969-.

See:
Heating experiments and paleointensity determinations; Proc. 9th Lunar Sci. Conf. 1978.

During this past year we have continued to work on methods for preventing changes to the magnetic minerals during heating. A set of experiments on lunar samples in a controlled fugacity system showed some improvement during heating, but we were unable to recover paleointensity values for four different samples. We have also used a sealed container with a titanium getter which has given even better results permitting us to heat to 600°C or more without changes to the samples. One sample of very young glass from Apollo 17 has been shown to have a paleointensity of 2500 oersteds. This is a large field for most current models of lunar magnetic history.

376. STRANGWAY, D.W., TASILLO, A.M., GEISSMAN, J., Univ. Toronto (Geology):
Magnetic properties of the Blake River volcanics, 1978-; M.Sc. thesis (Tasillo).

We have initiated a study of the magnetic properties of the Blake River volcanic group in northeastern Ontario. These volcanics are only slightly metamorphosed and seem to yield useful pole positions. A preliminary pole position shows that the direction of magnetization is almost exactly the same as that of the Matachewan dikes. Age dating by Krogh et al. has recently shown that this is in agreement with the age determinations. Even though the eruption time is short there are a number of reversals contained in the sequence. The calcalkaline volcanics are weakly magnetic, but they nevertheless yield useful and stable remanence values.

377. SYMONS, D.T.A., Univ. Windsor (Geology):
Paleomagnetism and boundary geotectonics of the Superior geologic Province, 1976-79.

See:
Separation of magnetic components from AF step demagnetization data by least squares computer methods; J. Geophys. Res., vol. 83, p. 4925-4931, 1978.

Huronian polar wander and paleomagnetism of the Thessalon volcanics; Can. J. Earth Sci., vol. 15, p. 1141-1150, 1978.

Paleomagnetism of the 1180 m.y. Umfraville Gabbro; ibid., p. 956-962, 1978.

Depth of erosion from remanent magnetism; EOS Trans., vol 59, p. 1037, 1978.

Paleogeothermometry of the Yakima flows, Washington; ibid.,p.267, 268, 1978.

Reliability of paleomagnetic APW paths for age dating; ibid., p. 1035, 1978.

Examination of rock units in the 2.1Ga to 2.6Ga time frame adjacent to the boundary of the Superior Province with the Southern and Grenville Provinces; units involved include Nipissing diabase, Huronian Supergroup, several late Archean plutons, and Archean volcanics. Geotectonic and metamorphic effects on the original remanence of the rock are being examined.

378. SYMONS, D.T.A., STUPAVSKY, M., WALLEY, D., Univ. Windsor (Geology):
Component magnetization of iron formations and deposits, 1978-81; M.Sc. thesis (Walley).

Entails detailed magnetic analysis of iron ore deposits - the Sherman, Adams, Moose Mountain, and Griffiths - and their host rocks including vertical component magnetization, magnetic susceptibility, anisotropy of susceptibility, natural remanence and demagnetized remanence to permit a rational interpretation of existing air-borne and ground magnetic surveys and to study the ore genesis.

GEOTHERMAL/GEOTHERMIQUE

379. PALMER, J.H.L., SVEC, O.J., National Research Council (DBR):
Ground heat storage, 1978-.

To study the structural requirements and thermal efficiency aspects of in-ground heat storage schemes.
Instrumentation has been installed to monitor the thermal performance of 200,000 gallon in-ground storage reservoir at Aylmer, Ontario.
Design of a field test facility for in-ground storage systems and preparation for construction of four storage systems in proceeding with construction anticipated in 1979.
Computer programs have been developed to model steady-state and transient heat problems.

GRAVITY/GRAVITE

380. GUPTA, V.K., Ontario Geol Surv.:
Gravity studies in the Birch Lake, Uchi Lake and Red Lake areas, Dirtrict of Kenora (Patricia portion), Ontario, 1975-79.

See:
Bouguer gravity and generalized geological map-Red Lake area; Ontario Geol. Surv., Prel. Map P. no. 1248, 1978.

Gravity study of the Red Lake - Birch Lake area, District of Kenora, Ontario Geol. Surv., Misc.Paper

The area covered by this study includes the Red Lake and Birch-Uchi greenstone belts in northwestern Ontario. A variety of regional-residual separation techniques have been applied to the Bouguer map in order to isolate the long and short wavelength components of the Bouguer field. An optimum second derivative map has been computed to enchance anomalies originating from shallow sources. Quantitative two-dimensional model analysis of the residual gravity field has been carried out along 23 profiles covering most of the prominent negative and positive residual anomalies.

381. GUPTA, V.K., WADGE, D.R., Ontario Geol. Surv.:
A gravity study in the Temagami-Marten River area, Ontario, 1977-80.

The Bouguer gravity map of the Temagami-Marten River area will be release during 1979, at a scale of 1:100,000.

SEISMOLOGY AND PHYSICS OF INTERIOR/SISMOLOGIE ET PHYSIQUE DE L'INTERIEUR DE LA TERRE

382. ELLIS, R.M., CHANDRA, B., MELDRUM, R.M., ROGERS, G.C., Univ. British Columbia (Geophysics and Astronomy):
Seismicity in the Mica-Revelstoke reservoir region, 1972-83.

Seismicity in the McNaughton Lake (Mica Reservoir) region has continued to be monitored. Major changes in the telemetered system have been made with the expansion of the array to 8 elements, reconfiguration to also provide monitoring of the Revelstoke Reservoir, and transmission of the data to Vancouver by microwave link. At 2237 GMT on May 14, 1978, a magnitude 4.8 earthquake occurred near the northern end of McNaughton Lake. This is the largest earthquake since initiation of monitoring in 1972. Initial investigations suggest that it was not a reservoir induced earthquake. Preliminary interpretation of the focal mechanism indicate predominantly right-lateral strike-slip faulting along the strike of the mountains with a significant thrust component. A well-developed Lg phase was recorded to the south of the earthquake. The isoseismals are elongated in a north-south direction and intensity attenuation with distance to the south is similar to the relationship for eastern North America.

The data for the February 4, 1918 east-central British Columbia earthquake have been re-examined. Based on damage, felt reports, and the number of instrumental observations, this earthquake had been assigned a location near Revelstoke and a magnitude about 5. Analysis of instrumental records from SPO, SAS and OTT and examination of newspaper reports indicates the event has a magnitude ^{m}bLg of 5.6 to 6.1 and was located approximately 150 km north of Revelstoke.

383. ELLIS, R.M., CLOWES, R.M., Univ. British Columbia (Geophysics and Astronomy):
Seismic refraction across the southern Rocky Mountain Trench, 1977-79.

The observational program has been completed with the recording of 3 explosions from the Sullivan Mine and 1 from the Kaiser Resources operation. These data when combined with the earlier seismograms of Cumming et al. (1978), provide a 130 km. refraction profile containing 19 seismograms westward from Kaiser to Kootenay Lake and a 90 km reversed section containing 13 seismograms across the Rocky Mountain Trench from the Sullivan Mine eastward to the Kaiser Resources operation. In addition there are 2 seismograms recorded westward from Sullivan. Static corrections have been made and the digital record sections formed. Interpretation of the first arrival data indicates a 6.3 km/s refractor dipping westward at 2^{o} from a depth of about 1 km beneath the Kaiser shot point to 4 km at the Rocky Mountain Trench. At these depths, Bally et al. (1966) interpret their data to show a thrust dipping in excess of 15^{o} to the west at the Trench and flattening to about 7^{o} at a distance of 5 km to the east.

384. HAWORTH, R.T., Geol. Surv. Can.:
A geophysical investigation of the submarine extension of geological zonation of Newfoundland, 1979-.

385. HUNTER, J.A.M., Geol. Surv. Can.:
Hammer seismic surveys, Québec, New Brunswick and Ontario, 1968-.

386. HUNTER, J.A.M., Geol. Surv. Can.:
Seismic properties of earth materials in the permafrost environment, 1973-.
Offshore permafrost distribution in the Beaufort Sea as determined from temperature and seismic observations; Geol. Surv. Can., Paper 78-1C, p. 13-18, 1978.

387. KEEN, C.E., Geol. Surv. Can.:
Development of analytical and theoretical techniques for refraction seismology interpretations, 1977-.

See:
A study of the Reykjanes Ridge by surface waves using an earthquake-pair technique, Geol. Surv. Can., Paper 79-1A, p. 273-279, 1979.

388. OVERTON, A., Geol. Surv. Can.:
Seismic-Precambrian Shield, 1970-.

389. STESKY, R.M., Univ. Toronto (Erindale College- Earth Planetary Sci.):
Seismic and mechanical properties of simulated lunar and martian soils, 1976-79.

Measurements of compressional wave velocity and density of compacting powdered rock has been made in air and under high vacuum (to-6 torr). Both in air and under high vacuum, the wave velocity is a strong function of the applied stress, increasing from about 165 m/sec at 0.015 bars to about 620 m/sec at 5 Bars. Although the initial density of the powder ranged from 1.39 to 1.83 g/cc, the final density at 5 bars was nearly the same for all samples (1.921 ± 0.029 g/cc). These results and other considerations were used to test the two currently favoured models for the shallow regions of the moon's crust: a thick regolith or a thin regolith overlying a highly fractured rock. We concluded that neither model accounts for all the available geophysical data.

390. STESKY, R.M., ROBIN, P-Y.F., Univ. Toronto (Erindale College- Earth Planetary Sci.):
Elastic properties of drill-core samples collected by AECL/EMR as part of their study of the disposal of nuclear waste, 1979.

As part of the overall program to determine the physical properties of igneous rock bodies and to evaluate their potential as sites for the disposal of nuclear waste, we will measure the elastic properties under high pressure of selected drill-core samples from the Chalk River, Ontario and Pinawa, Manitoba test sites. These properties will include compressional and shear wave velocities up to 0.2 GPa (higher pressures for a few samples) and static compressibility to 0.2 GPa. These measurements are important for serveral reasons: for correlating rock

types with in situ seismic velocity measurements, for evaluating the bulk elastic properties of the rock bodies and their degree of heterogeneity, and for estimating the volume and geometry of microcracks in the rock, particularly at the depth from which the rocks were sampled.

391. SURYAM, J.V., Saskatchewan Geol. Surv.:
Seismic surveys in the Athasca Basin, Saskatchewan, 1976-.

More than300 line miles of refraction seismic survey was conducted in the Athabasca Basin in north Saskatchewan to define the topography of the Sub-Athabasca surface and to locate the edge of the Athabasca Basin. The economic consequences of the results of the survey are important for the exploration of uranium in the Athabasca basin since the major uranium ores discovered to date are found to occur close to the unconformity between the pre-Athabasca surface and the overlying Athabasca formation. The uranium mineralization in most of the cases is fault controlled. Hence the seimic results have practical application in defining the structure of the basement topography underneath the Athabasca basin, along with the fault patterns.

392. TIFFIN, D.L., Geol. Surv. Can.:
Geological and geophysical studies of the Pacific continental marign, 1971-.

OTHER/AUTRE

393. CARBONNEAU, C., Univ. Laval (Géologie et Minéralogie):
Géophysique et tectonique des lles-de-la-Madeleine, Québec, 1978-.

394. GODFREY, J.D., SPRENKE, K., LANGENBERG,C.W., Alberta Research Council (Geology Div.):
Geophysical aspects of Shield rocks in Alberta, 1960-80.

Physical parameters measured include: specific gravity of hand specimens and magnetic susceptibility of cores, powders and outcrop; to improve interpretation of aeromagnetic surveys in Shield terrains and to decipher tectonic history and three-dimensional geometry of major structural elements in the Shield of Alberta.

395. HALL, J.M., HELGASON, J., PETERSON, C., PLASSE, D., GRUVER, N., Dalhousie Univ. (Geology):
A 3km crustal section in eastern Iceland sampled by a 2km continuously cored drillhole plus conventional surface sampling methods, 1978-80, M.Sc. theses (Helgason, Peterson).

To sample to deeper levels in oceanic type crust than has been achieved so far by the drilling ship "Glomar Challenger". Glomar Challenger drilling has reached 600m, at which depth a few dykes have been identified among pillowed flows. The eastern Iceland Section begins about 500m below the postulated original lava surface and extends to an original crustal depth of about 3.5km. The deeper 2km of the section has been obtained by diamond drilling with continuous coring. Major results to date include: 1) sampling all alteration zones of the zeolite facies and into the epidote facies; 2)identification of a

complex geothermal system, presently active; 3) complete core description; 4) unit by unit sampling for geochemical, thin section, magnetic and other physical property purposes. Two reflection/ refraction seismic surveys carried out over the drill site (one U.S., one USSR), and 5) logging of the drill hole with a wide range of tools.

396. HALL, J.M., RYALL, P.J.C., Dalhousie Univ. (Geology):
The investigation of the oceanic rust by development of a deep water capability for the Bedford Institute electric bottom drill, 1978-81.

The Bedford Institute electric bottom drill is a successor to the hydrostatic drill used in the late 1960s and early 1970s. The electric drill has the advantages of being more easily controlled from a surface ship than was the hydrostatic drill. However, upto the present the electric drill was only designed for use in shelf water depths of a maximum of 500m or so.

We are working collaboratively with the Bedford Institute to extend the capability of this drill, in a series of stages, to deep ocean depths so that it may be used to sample oceanic crust. The advantage of the drill in ocean crust work will be in providing a dense network of shallow (upto 7m) drill stations to complement the widely spaced, deeper holes drilled by Glomar Challenger.

To allow extension of the drill to 1000m depth we shall be looking shortly for funds (about $100K) to assist with the costs of special cables and other equipment. A cruise to Mid Atlantic ridge to test the 1000m capability drill is planned for this summer, 1979.

397. KILLEEN, P.G., Geol. Surv. Can.:
Borehole geophysics (nuclear techniques), 1974-.

See:
Computer processing of gamma-ray logs; iteration and inverse filtering; Geol. Surv. Can.,Paper 78-1B, p. 83-88, 1978.

The relationship of uranium deposits to metamorphism and belts of radioelement enrichment; ibid, p. 163-168, 1978.

398. NOVA SCOTIA DEP. MINES, Terra Surv. Ltd.:
Geological - geochemical surveys - Sub-project 4.8: airborne geophysics, 1978-79.

399. SLAWSON, W.F., Univ. British Columbia (Geophysics and Astronomy):
Radon detection, 1977-.

Integrated counts of alpha particles have been collected from soil gas over two week intervals. The following features have been observed: 1) occasional large excursions (unexplained); 2) small variations which appear to correlate with Spring and Neap tides; and 3) a general increase in counts from late Fall to early Summer. As two detector sites are located at weather observatories an attempt is being made to determine the extent of meteorological factors on the emanation of radon.

400. STESKY, R.M., ROBIN, P-Y.F., Univ. Toronto (Erindale College-Earth Planetary Sci.):

Experimental and theoretical study of fractures in igneous rocks, 1978-81.

The choice of a suitable site for a repository for nuclear waste requires knowledge of the extent of fracturing at depth within the geological container. We are beginning a study of how fractures in various rocks close under pressure, and how these fractures may be detected by field electrical and seismic methods.

We will also examine, by numerical simulation, how the presence of pressure-dependent permeability affects the flow of water through a cratonic crust. The results from this work will be important for narrowing the choice of site from the approximately 1500 plutonic bodies identified in the Precambrian shield of Ontario to the smaller number for which the fractures are expected to be nearly closed at the depth of the proposed repository.

ENGINEERING GEOLOGY/GEOLOGIE DE L'INGENIEUR

401. CHAGNON, J.Y, GELINAS, P., COCKBURN, D., Univ. Laval (Géologie et Minéralogie):
Cartographie géotechnique de la Région de la ville de Québec, 1978-81; thèse de maîtrise (Cockburn).

Exécuter une cartographie détaillée du sous-sol dans la Région de Québec-Afin de faciliter la planification de l'aménagement du Territorie. La première phase est celle de la cevillette des données disponibles.Ce travail est an 3/4 réalisé - 10% du travail est exécuté.

402. COOPER, A.J., WHITE, O.L., Ontario Geol. Surv.:
Carbonate solution features in Ontario, 1978-.

To inventory all known carbonate solution features in Ontario with special emphasis on those posing engineering hazards.

403. DUGAL, J.J.B., Geol. Surv. Can.:
Drilling investigations of test sites and potential radioactive waste storage sites, 1977-.

404. EGGINTON, P.A., Geol. Surv. Can.:
Hydraulic, morphologic and morphometric studies of selected rivers along the Mackenzie Highway, 1975-.

405. GADD, N.R., Geol. Surv. Can.:
Geological variability of marine deposits Ottawa- St. Lawrence Lowland, 1974-.

406. GRICE, R.H., McGill Univ. (Geological Sciences):
Susceptibility of shales to weathering in controlled atmospheres, 1978-.

The rate of change of adsorption, alternately of water vapour and nitrogen or helium, will be measured in a BET type apparatus using a recording electro balance. New apparatus is being fabricated. To observe the weathering progress continually and more precisely than is possible by existing standard procedures.

407. HEGINBOTTOM, J.A., Geol. Surv. Can.:
Slope processes and cryogenic movements, Arctic Island, 1977-.

408. HUDEC, P.P., Univ. Windsor (Geology):
Effectof de-icing salts on expansion and durability of carbonate rock aggregates, 1977-80.

Involves determination of expansion coefficients in carbonate rocks in dry and in saturated states and their relationship to water absorpotion. The effect of de-icing salts (NaCl) on these expansion coefficients is also studied. The relationship of water adsorption to the durability and expansion coefficients is also determined.

409. HUDEC, P.P., Univ. Windsor (Geology):
Development of new tests and specifications for concrete aggregate, 1978-79.

To develop new series of engineering tests that will better discriminate between good, marginal, and poor rock materials used as aggregates in concrete; to evaluate present tests, and compare the results between the new and old tests to the actual service record of the rock.

410. HUDEC, P.P., RUSSELL, D.J., Univ. Windsor (Geology):
Engineering properties of sedimentary rocks in southwestern Ontario, 1978-79.

To provide a start for engineering classification of carbonates currently used as sources of concrete aggregate in southwestern Ontario. This is a pilot project which may be expanded to cover other rock types. Parameters measured are: water absorption/adsorption, compressive and tensile strength, durability as measured by freeze-thaw and magnesium sulphate tests, thermal and isothermal (on wetting) expansion coefficients, chemical analysis (major oxide).

411. LAU, J.S.O., Geol. Surv. Can.:
Collection and analysis of borehole picture date in potential radioactive waste disposal sites, 1977-.

412. OWEN, E.B., Geol. Surv. Can.:
Engineering geology in Canada, 1975-.

413. RUSSELL, D.J., Univ. Windsor (Geology):
Effect of weathering on non-destructive test properties and clay mineralogy of argillaceous sediments, 1978-80.

To investigate the relationship between fabric anisotropy of clayey sediments, as expressed by directional variation in strength, and non-destructive test property anisotropy (velocity, resistivity, perhaps magnetic susceptibility). Weatherin profiles are to be sampled and the clay mineralogy and orientation of clay mineral grains to be observed and related to physical properties.

414. SOLES, J.A., MIRKOVICH, V.V., CANMET (EMR):
Nuclear waste repository: thermal and mechanical properties of Host rocks, 1976-80.

Petrography and thermal conductivity measurements on rocks from the site of an in-situ heater experiment have been carried out and reported to AECL. Further studies on other sites are in progress.

415. STANLEY, G.A., STEVENS, G.R., Acadia Univ. (Geology):
A study on the use and suitability of rock material in the Bay of Fundy area for rip-rap in construction of a tidal power barrier, 1978-79; M.Sc. thesis (Stanley).

Field work during the summer of 1978 resulted in sampling of forty locations around the Bay of Fundy from Digby through Parrsboro and Cape Chignecto (in Nova Scotia), to Wood Point, St. Martins and St. George (in New Brunswick). The rocks from these locations are being tested for suitability as armour protection of a tidal barrier. Tests include durability, point load strength, density and uniaxial compressive strength together with the dynamic determination of Young's modulus and Poissons ratio. Rip-rap sizes have been specified by design engineers and these were a major consideration in the site investigation programme. Therefore discontinuity surveys were taken at many locations, as well as photographic records. Work is continuing at present on the engineering classification of the rocks, by accepted standards, and a determination of the suitability of the rocks for a tidal barrier. Transport and economic factors are also being considered in a general way.

416. UFFEN, R.J., Queen's Univ. (Geology):
Radioactive waste management, 1976-.

See:
Science technology and natural resources commentary; Prcc. N.A.T.O. Sci. Committee, 20th Anniversary Conf., 1978.

417. WHITE, O.L., Ontario Geol. Surv.:
Residual stresses in rock at shallow depths, 1973-.

418. WHITE, O.L., LELIEVRE, B., Ontario Geol. Surv., Univ. Waterloo (Civil Engineering):
Lime stabilisation of Northern Ontario clays, 1975-79.

MUSKEG/MUSKEG

419. JARRETT, P.M., WATERS, G.F., Royal Military College (Civil Engineering):
Design and construction of pavements on organic soils; 1970-83; M. Sc. thesis (Waters).

Plate bearing tests using cyclic loading are being made on gravel fills both in large scale laboratory tests and in the field. The fills are constructed on organic soils and fabrics have been included to assess their use as separation membranes.

PERMAFROST/PERGELISOL

420. BAKER, T.H.W., National Research Council (DBR):
Strength and deformation of frozen and thawing soil, 1971-79.

See:
Effect of end conditions on the uniaxial compressive strength of frozen sand; Proc. Third Internat. Conf. Permafrost, vol. 1, p. 608-613, 1978.

Strain rate effect on the compressive strength of frozen sand; Proc. Internat. Symp. Ground Freezing, Bochum, Germany, 1978.

Measuring total volumetric strains during triaxial tests on frozen soils - Discussion; Can. Geotech. J., vol. 15, no. 4, p. 620-621, 1978.

The compliant platen is thought to be useful in testing brittle material and efforts are being made to check this with different materials. A series of tests on concrete specimens (76 mm diameter by 152 mm high) is planned. As more experience is attained with these platens both the design and testing technique will be refined.

A new triaxial cell has been designed and constructed, but is not operational at this time. This will allow use of the compliant platens during testing and reduce the possibility of leakage. The triaxial apparatus is now in a state where if coupled with a mini-computer it could be used for stress path testing. Triaxial testing with volume change measurements continue to a lower stress range.

Unconfined compression tests will soon commence on the frozen varved samples collected in Thompson, Manitoba, last winter. The tests will investigate the effect of varve orientation on the strength and deformation properties.

421. BROWN, R.J.E., National Research Council (DBR):
Permafrost distribution in Canada, 1953-.

See:
Influence of climate and terrain on ground temperatures in the continuous permafrost zone of northern Manitoba and Keewatin District, Canada; Proc. Third Internat. Conf. Permafrost, vol. 1, p. 15-21, 1978.

Plateau Mountain: A case study of apline permafrost in the Canadian Rocky Mountains; ibid, p. 385-391, 1978.

Permafrost ground temperatures and terrain studies, Northern Manitoba and Keewatin District, High Arctic. Alpine permafrost studies, Southern Alberta and British Columbia.

422. CHATWIN, S.C., RUTTER, N.W., Univ. Alberta (Geology):
Terrain characteristics and ground ice dynamics in a thermokarsted peatland, Fort Simpson, Northwest Territories, 1976-78; M. Sc. thesis (Chatwin).

423. GOODRICH, L.E., JOHNSTON, G.H., PENNER, E., National Reasearch Council (DBR):
Ground thermal regime, 1970-.

See:
Some results of a numerical study of ground thermal regimes; Proc. Third Internat. Conf. Permafrost, vol. 1, p. 29-34, 1978.

Work is in progress on field study of thermal effects of road embankment on permafrost, Mackenzie Highway, mile 419.5. Field measurements of soil thermal conductivity are being maintained at Ottawa, Thompson, Manitoba, and mile 419.5, Mackenzie Highway. A report will be prepared describing the instrumentation. a paper deling with the influence of snow covers on the ground thermal regime has been prepared for publication. Work has begun on a numerical model which will eventually be extended to model frost heaving.

424. JARRETT, P.M., RIDDOCH, R.G., Royal Military College (Civil Engineering):
Explosive excavation of frozen soils, 1977-83, M.Sc. thesis (Riddoch).

To develop design criteria for the explosive excavation of frozen soils. These criteria should relate the explosive type and the soil type and properties.

425. JOHNSTON, G.H., National Research Council (DBR):
Preparation of manual on permafrost engineering, field observations of performance of foundations of buildings, bridges, roads, airfields, etc., 1950-.

Observations of performance of bridge and building foundations and data collection for evaluating parameters for design of embankments and foundations of structures erected on permafrost were continued.

426. JOHNSTON, G.H., GOODRICH, L.E., National Research Council (DBR):
Insulated embankments on permafrost, 1972-80.

Observations continuing on performance of insulated and uninsulated test sections installed on the Mackenzie Highway south of Inuvik and south of Wrigley, Northwest Territories, and on Dempster Highway in northern Yukon, to evaluate the thermal behaviour and determine the parameters required for design.

427. PARAMESWARAN, V.R., National Research Council (DBR):
Model studies of behaviour of foundations in frozen ground. Micromechanics of flow of frozen soils, 1973-.

See:
Adfreeze strength of frozen and to model piles; Can. Geotech. J., vol. 15, no. 4, 1978.

The adfreeze strength and creep of piles in frozen soils, under constant rate of loading and under constant loads, are being investigated at temperatures varying between $-2^{\circ}C$ and $-10^{\circ}C$.

Unconfined uniaxial and confined triaxial compressive strength of frozen sand and soils at temperatures between $-2^{\circ}C$ and $-15^{\circ}C$ have also been carried out. At $-2^{\circ}C$, the compressive strength is decreased considerably due to the presence of unfrozen water in the soil.

The aim is to combine the results from the above two projects and obtain a criterion for calculating the bearing capacity of piles and other foundations in frozen soils.

ROCK MECHANICS/MECANIQUE DES ROCHES

428. CRUDEN, D.M., EVANS, S.G., TSE, R., Univ. Alberta (Civil Engineering, Geology):
Stability of natural slopes in rock, 1971-; Ph.D. thesis (Evans), M.Sc. thesis (Tse).

See:
Description and classification of geotechnical complexity; General Rep., Session 2, Internat. Symp. Geotechnics of structurally complex formations, Capri, Italy, September, 1977, 1978.

Simple graphical methods for estimating the confidence region around the orientation of the intersection of 2 planes: Can. J. Earth Sci., vol. 15, p. 1598-1604, 1978.

A computer based system for rock mass description. Proc. 3rd. Internat. Cong., Internat. Assoc. Engineering Geol., Spec. Session, vol. 4, p. 155-159, 1978.

Analyzinggeological field data for rock slope design; CIMM Bull., vol. 71, no. 793, p. 117-120, 1978.

The geology and mechanics of the Frank Slide; Developments in Geotechnical Engineering, 14A, Chp. 2, Elsevier, New York, 1978.

Detailed mapping of selected sites at which large downslope movements in rock are occurring or have occurred, has continued. Some laboratory work is planned to provide a theoretical basis for these studies.

429. EDEN, W.J., GRATTAN-BELLEW, P.E., PENNER, E., National Research Council (DBR):
Expansionof pyritic shale - Ottawa area, 1969-79.

To define conditions leading to swelling of pyritic shale in presence of sulfur bacteria; to study methods of prevention and control of welling at building sites.

430. EISBACHER, G.H., Geol. Surv. Can.:
Study of large landslides in the Western Cordillera, 1976-.

431. HUGHES, O.L., Geol. Surv. Can.:
Surficial geology and land classification, Mackenzie Valley Transportation Corridor, 1971-.

432. KENNEY, T.C., HORVATH, R.G., Univ. Toronto (Civil Engineering):
Load displacement behaviour of concrete piers socketed into rock, 1978-81; Ph.D. thesis (Horvath).

To study the load-displacement behaviour of concrete piers socketed into rock for the purposes of improving their design and construction and of developing more reliable means of predicting their behaviour. The study will have an analytical component and an experimental component based on both laboratory tests and full-scale field tests.

433. KURFURST, P.J., Geol. Surv. Can.:
Geotechnical study of rock heave, central Arctic Canada, 1977-.

434. LAJTAI, E.Z., Univ. New Brunswick (Geology):
Preferred fracture orientation in sandstones, 1978-79.

Most materials which have at one time during their history been subjected to stress, retain some of the stress in the form of residual stresses. Rocks are no exception. The usual consequence of residual stress is that the rock becomes anisotropic with respect to its apparent elastic modulus and to its fracture strength. Such anisotropy is detectible through stress-strain characteristics and wave velocity changes, and by point loading and time loading of oriented rock specimens. There is furthermore a relationship between the anisotropy of the rock and structures (e.g. fracture cleavage and joints) observed in the field. Investigations are now under way in the context of Carboniferous Appalachian history in New Brunswick.

435. LAROCQUE, G.E., GYENGE, M., GELLER, L., TERVO, R., CANMET (EMR):
Underground nuclear waste repository.

See:
Progress report on in situ heater experiment; EMR, CANMET Lab. Rep. MRP/MRL 78-37 (TR), 1978.

436. PALMER, J.H.L., National Research Council (DBR):
Field performance of tunnels under conditions of high in situ stress, 1976-.

This is a continuing project currently being conducted in cooperation with Mr. D. Belshaw of Morton & Partners, Toronto. Instrumentation of a tunnel is complete. The tunnel has been flooded and long-term monitoring of performance is continuing.

The project involving the measurement of in situ stress at Heart Lake Tunnel has been completed.

SOIL MECHANICS/MECANIQUE DES SOLS

437. BOZOZUK, M., EDEN, W.J., LAW, K.T., National Research Council (DBR):
Geotechnical properties - eastern marine clay, 1951-.

See:
Soil disturbance from pile driving in sensitive clay; Can. Geotech. J., vol. 15, no. 3, p. 346-361, 1978.

A limit equilibrium analysis of progressive failure in the stability of slopes; Can. Geotech. J., vol. 15, no. 1, p. 113-122, 1978.

Undrained strength anisotropy in embankment stability analysis; Can. Geotech. J., vol. 15, no. 2, p. 306-309, 1978.

Field studies of landslides in clay; settlement of buildings and fills on clays; skin friction on piles in clay. Laboratory studies on stress-deformation characteristics of clays.

438. DUSSEAULT, M.B., SCAFE, D.W., Alberta Research Council (Geology Div), Univ. Alberta (Engineering):
Geotechnology and clay mineralogy of the basal clays of the Mc M Formation, 1978-79.

The most noteworth findings are the low residual angles offailure of 4.5 to 7 degrees. These low angles are surprising because no discrete montmorillonite (an expansible clay mineral which is the usual cause of low failure angles) is observed in the clay mineral determinations. However, x-ray patterns seem to indicate that the expansible mineral vermiculite is interstratified with both kaolinite and chlorite. Specific surface measurement of 300 to 450 m^2/gm support the presence of this expansible mineral.

439. KENNEY, T.C., CURRAN, J., CONLIN, B., Univ. Toronto (Civil Engineering):
Densification of loose saturated sands by blasting (and other means of vibrating), 1978-80; M.A. Sc. (Conlin).

To determine means by which loose saturated sands and silts can be densified in situ. The project is related to stabilizing loose deposits of mine tailings. It has an analytical component and either a laboratory or field experimental component. There might also develop a study of means by which the looseness of materials can be reliably determined in situ.

440. KENNEY, T.C., FOLKES, D., Univ. Toronto (Civil Engineering):
Long-term pore-water pressure response of soft clays to loading, 1978-79; M.A. Sc. (Folkes).

To study the mechanisms by which pore-water pressures are generated in some soft clays under the action of unchanged applied loads. The mechanisms are basically the same as those causing "secondary consolidation". The goal is to find means of predicting the pore-water pressure behaviour of soft soild over the long term when volume changes (consolidation) occur.

441. KENNEY, T.C., LAU, K.C., Univ. Toronto (Civil Engineering):
Improvement of stability of clay slopes by use of deep horizontal drains, 1978-81; Ph.D. thesis (Lau).

To determine the effectiveness of deep horizontal drain holes to improve the stability of clay slopes. The programme has two parts: 1) an analytical study will be made to model the phenomena so that the most important factors can be recognized and a predictive approach can be developed; 2) the installation of drains in a slope and monitoring the influence of these drains on the amount and rate of ground-water pressure change.

442. PENNER, E., National Research Council (DBR):
Frost action in soils, 1953-.

See:
A soil frost susceptibility test for interpreting heaving rates; Proc. Third Internat. Conf. Permafrost, vol. 1, p. 721-727, 1978.

Effect of temperature and pressure on frost heaving; Proc. Internat. Symp. Ground Freezing, Bochum, Germany, 1978.

The dependence of frost heaving on load application - preliminary results; Proc. Internat. Sym. Frost Action in Soils, Lulea, Sweden.

Laboratory frost heave studies designed to explore further the conditions leading to shut-off pressures showed that the influence of cold side temperature T and overburden pressure P on total heave rate $\frac{dh}{dt}$ could be expressed by the equation $\frac{dh_{Total}}{dt} = ae^{-b\,P/T}$. This relationship has been advanced in a recent paper as a basis for normalizing frost susceptibility tests carried out under different conditions of P and T.

SNOW AND ICE/NEIGE ET GLACE

443. FREDERKING, R.M.W., SINHA, N.K., NAKAWO, M., National Research Council (DBR):
Ice mechanics, 1960-.

See:
Observations of basal dislocations in ice by etching and replicating; J. Glaciology, vol. 21, no. 85, p. 385-396, 1978.

Short-term rheology of polycrystalline ice; ibid., p. 457-474, 1978.

The flexural behaviour of ice from in-situ cantilever beam tests; Proc. 4th Internat. Symp. Ice Problems, Lulea, Sweden, August 1978.

To investigate the structural, rheological and mechanical properties of river, lake and sea ice. To investigate ice forces on structures and the load bearing capacity of ice covers.

444. WOO, M.K., McMaster Univ. (Geography):
Snowmelt computation for a High Arctic basin, 1977-79.
Lake ice formation and breakup in the High Arctic, 1978-81.

See:
Analysis of error in the determination of snow storage for small High Arctic basins: J. Applied Meteorol, vol. 17, p. 1537-1541, 1978.

445. ALT, B., Polar Cont. Shelf Proj. (EMR):
Role of present synoptic conditions in paleoclimate change in the Queen Elizabeth Islands, 1979-80.

To determine synoptic conditions effecting anomalously warm and cold summers in Arctic Islands, and relate to climatic change in the Holocene.

446. DILABIO, R.N.W., Geol Surv. Can.:
Glacial sedimentation studies, District of Franklin, 1977-.

See:
Compositionalvariation of debris in glaciers, Bylot Island, District of Franklin; Geol. Surv. Can., Paper 77-1B, p. 91-94, 1978.

447. KOERNER, R., FISHER, D., Polar Cont. Shelf Proj. (EMR):
Climatic change in the High Arctic, 1971-.

To detect volcanic layers in ice cores and relate to $\delta^{18}O$ values to determine way tephra enters and exits stratasphere and its effect on world temperatures; to continue chemical analysis of cores and relate to climatic change.

448. RICE, R.J., RUTTER, N.W., Univ. Alberta (Geology):
Sedimentary processes of the Sunwapta River valley train, Alberta, 1977-79;

449. CHIN, V., WNAG, K.T., WALLERY, D., SIBUL, U., Ontario Ministry Environment (Water Resources Br.):
Water resources in the South Nation River basin, Ontario, 1975-79.

To carry out an inventory of water resources in the South Nation River basin, including a study of the quantity and quality of surface and groundwaters and their use.

450. GRAHAM, B.W., Fisheries-Environment Canada (Water Res. Br.):
Groundwater contamination by wastewater effluent and sludge, 1978-80.

To identify major problem areas in groundwater contaminations by the disposal of wastewater effluent and sludge on land; to develop and apply up-to-date geochemical techniques to evaluate the contamination of groundwater by wastewater effluent and sludges; and to plan co-ordinated (other Fed. Gov't. dept's, provincial govt's and universities) research programs to help solve these problems.

A literature review of research already done in the field; preliminary heavy metal analysis of samples taken October 1977 from multi-level piezometers at theTab er (spray irrigation) Alberta site; and planning of laboratory coumn experiments on cores from as yet to be specified sewage effluent and sludge disposal sites.

451. GILLAM, R.W., CHERRY, J.A., EGBOKA, B., Univ. Waterloo (Earth Sciences):
Field investigations of denitrification in groundwater, 1977-78; M.Sc. thesis (Egboka).

452. GILLAM, R.W., CHERRY, J.A., SHARMA, H., Univ. Waterloo (Earth Sciences):
Evaluation of a site for field studies of radium migration in unconsolidated geologic materials, 1978-79.

453. GILLAM, R.W., FRIND, E.O., LINDSAY, L.E., Univ. Waterloo (Earth Sciences):
Studies of engineered environments for radioactive waste storage, 1976-79; M.Sc. thesis (Lindsay).

454. GILLHAM, R.W., REYNOLDS, W.D., Univ. Waterloo (Earth Scineces):
Solute transport in aggregated media, 1977-80.

455. GRISAK, G.E., DAVISON, C.C., GRAHAM, B.W., BOTTOMLEY, D.J., PICKENS, J.F., JOHNSTON, L.M., Fisheries-Environment Canada (Water Res. Br.):
Hydrogeologic investigation-high-level radioactive waste repository, 1978-.

456. GRISAK, G.E., JACKSON, R.E., Fisheries-Environment Canada (Water Res. Br.):
An appraisal of the hydrogeological processes involved in shallow subsurface radioactive waste management in Canadian Terrain, 1975-78.

See:

Inland Waters Directorate, Water Res. Br. Scientific Ser. No. 84, 1978.

Groundwater geochemistry and radionuclide adsorption in a flurial and aquifer at the Chalk River nuclear laboratories; Inland Waters Directorate, Water Res. Br. Scientific Ser. No. 104, 1979.

457. GROVE, G.D., VAN EVERDINGEN, R.O., Fisheries-Environment Canada (Water Res. Br.):
Hydrogeology of bedrock aquifers along international boundary in southern prairies, 1977-.

Some collection and compilation of water analysis from drill stem tests from the Mississippian in Manitoba tended to collaborate the generalized hydrogeochemical patterns for formation water chemistry reported previously in the literature. However on a detailed basis many anomalous values indicate that considerable work is required in defining more accurately the geologic and hydrologic framework of the Mississippian and associated formations and in assessing the quality of the data which has been collected before any description of the hydrogeologic conditions can be made.

458. HORE, R.C., HUGHES, G., FUNK, G., GOFF, K., VIIRLAND, J., HOLLAND, C., MELLARY, A., SMALL, E., HILLIER, R., Ontario Ministry Environment (Water Resources Br.):
Groundwater quality protection, 1957-.

459. HORE, R.C., MCCLENAGHAN, W.A., YU, P., Ontario Ministry Environment (Water Resources Br.):
Water well management, 1947-.

460. HORE, R.C., SIBUL, U., VALLERY, D., GOFF, K., VIIRLAND, J., HOLLAND, C., SMALL, E., HILLIER, R., Ontario Ministry Environment (Water Resources Br.):
Groundwater interference investigation program, 1961-.

461. HORE, R.C., SIBUL, U., WANG, K.T., CHIN, V., ROY, A., Ontario Ministry Environment (Water Resources Br.):
Northern Ontario studies, 1966-79.

Surface-water quality in selected lakes in Northern Ontario will be published in 1979.

462. HORE, R.C., WILKINS, D., HUGHES, G., SIBUL, U., GOFF, K., SMALL, E., VIIRLAND, J., HOLLAND, C., MELLARY, A., HILLIER, R., Ontario Ministry Environment (Water Resources Br.):
Environmental assessment-groundwater, 1961-.

463. HUYCK, M.K., BOOCOCK, R., Gulf Canada (Geological Serv.):
Beaverhill Lake, west-central Alberta, 1978-79.

Fluid and pressure data acquired in recent years shed light on problems of reservoir and phase continuity, geologic environment and aquifer history in the Beaverhill Lake Formation of west-central Alberta.

464. HUYCK, M.K., ROBBINS, V.L., Gulf Canada (Geological Serv.):
Pressure studies of various formations in Alberta, 1977-.

465. JACKSON, R.E., INCH, K.J.. Fisheries-Environment Canada (Water Res. Br.):

Groundwater geochemistry and radionuclide adsorption in a fluvial sand aquifer at the Chalk River nuclear laboratories, 1975-80.

See:
Inland Waters Directorate, Water Res. Br. Scientific Ser. No. 104, 1979.

Oxidation-reduction sequences in groundwater flow systems; Can. J. Earth Sci., vol 16, p. 12-23, 1979.

In the mid 1950s two experimental disposals of liquid radioactive waste containing approximately 700 curies of ^{90}Sr and ^{137}Cs were made into shallow pits dug into the sandy ground of one of the disposal areas at the Chalk River Nuclear Laboratories, 200 km northwest of Ottawa. The disposal area is part of the recharge area of a shallow ground water flow system of approximately one kilometer length containing two aquifers - the middle and lower sand units. In the past twenty-five years the radioactive wastes have migrated into both aquifers and have chromatographically separated into ^{90}Sr and ^{137}Cs plumes.

Radioactively contaminated aquifer sediments were obtained from five to twelve meters depth using a cohesionless sediment sampler modified for the purpose. The aluminum core tubes were sectioned and the interstitial waters and the associated sediments were separated by centrifuge extraction and immiscible fluid displacement techniques. Intersitial waters were oxygenated and slightly acidic (pH $\sim$ 6). Most of the ^{90}Sr ($K_d \sim 10$) is exchangeably adsorbed, primarily to feldspars and layer silicates (e.g. mica and chlorite); the remainder is either specifically absorbed to Fe (III) (and perhaps Mn (IV)) oxyhydroxides or fixed to unknown sinks. Less than one-half of adsorbed ^{137}Cs is exchangeable with 0.5 M $CaCl_2$; the high levels of ^{137}Cs adsorption and fixation ($K_d \sim 10^2$) are believed to be due to its reaction with micaceous minerals. Complexation of ^{90}Sr and ^{137}Cs does not appear to be an important factor in affecting their transport or adsorption. In some parts of the aquifer the retardation of ^{90}Sr may be occurring due to the precipitation of $SrCo_3$. Since these sediments are the products of the weathering of granitic rocks, this information may be relevant to adsorption of radionuclides in fractured granite.

466. MUEHLENBACHS, K., SCHWARTZ, F.W., Univ. Alberta (Geology):
Isotope geochemistry of the Milk River aquifer, Alberta, 1977-81.

Analysis of stable isotope and major ion data for waters collected from the Milk River aquifer, located in southeastern Alberta, reveals a variety of striking patterns. Oxygen - 18 and deuterium concentrations for groundwater from the areas of recharge to the aquifer are isotopically unaltered meteorite waters. Proceeding downdip in the aquifer groundwaters become encriched by up to 70% and 12% with respect to deuterium and oxygen - 18 of waters from the recharge part of the aquifer. The major ion chemistry of aquifer waters also changes from the recharge areas northward. Generally, Na^+, Cl^-, F^- and HCO_3^- concentrations increase and SO_4^{2-} concentrations decrease to zero.

467. OSTRY, R.C., TURNER, M.E., Ontario Ministry Environment (Water Resources Br.).:
Groundwater probability mapping, 1966-.

Work progressing on R.M. Peel and Simcoe Counties.

468. PATTERSON, R.J., FRAPE, S.K. MCLEOD, R.A., LYON, K., DYKES, L.S., CREASY, D., Queen's Univ. (Geological Sciences):

Seepage in lakes and rivers; Vadose zone water quality, geochemical controls on the migration of radionuclides in the subsurface at Chalk River; reversibility of attenuation processes in unconsolidated materials, 1975-80; Ph.D. thesis (Frape, Creasy), M.Sc. thesis (McLeod, Lyon, Dykes).

See:
A coring and squeezing technique for the detailed study of subsurface water chemistry; Can. J. Earth Sci., vol. 15, no. 1, p. 162-169, 1978.

A new method for collecting water samples from beneath the ice; Limnol.and Oceanog., vol. 23, no. 5, p. 1029, 1978.

Projects involving seepage into lakes and the study of vadosezone water quality are nearing completion. The project at Chalk River, involving the subsurface migration of radionuclides will require one more field season in order to complete the collection of data. A study of the attenuation processes in unconsolidated materials began last year and is expected to continue for several years. Future research on this project will involve an assessment of the reversibility of the attenuation processes. New projects anticipated in the future will likely be in the field of radionuclide transport processes in the subsurface.

469. PICKENS, J.F., GRISAK, G.E., Fisheries-Environment Canada (Water Res. Br.):
Dispersion of solutes in groundwater flow systems, 1978-80.

See:
Field studies of dispersion in a shallow sandy aquifer; Proc. Invitational Well Testing Symp., Berkeley, California, 19-21 Oct. 1977, LBL-7027, p. 55-62, 1978.

Field determination of the physical contaminant transport parameters in a sandy aquifer; Proc. IAEA Advisory Group Meeting Use of Nuclear Techniques Water Pollution Studies, Cracow, Poland, 6-9 Dec.1976, 1979.

A multi-level device for groundwater sampling and piezometric monitoring; Groundwater, vol. 16, no. 5, p. 322-327, 1978.

To assess existing types of field dispersion tests and methods of data analysis to obtain values of dispersivity, and to determine the effect of heterogeneity on dispersion of solutes in granular geologic materials.

470. PRICE, A.G., HENDRIE, L.K., Univ. Toronto (Geography):
Snowmelt and runoff in a leafless deciduous forest, 1977-.

Data from the first field season show that melt in the forest is dominantly radiative, and that the energy balance of the snowpack can be approximated by global or net over the canopy, making the prediction of melt rates in the forest simple. In the second part of the project we are attempting to unravel the linkages between snowmelt inputs to the basin and streamflow out of it. The data show that infiltration into the soil is the main process of runoff production. The slow, long lag-time response expected from the pathway through the soil dominates the basin hydrograph, but there is another, rapid response element which is less easily explained. The diurnal meltwater wave will be observed at the surface of the snowpack, within the snowpack, at the ground surface, within the unsaturated zone, and within the unsaturated zone, and within the groundwater body. In addition, basin runoff will be measured. Water in the snow and in the unsaturated zone will be monitored continuously with tensiometers, and meltwater flux at the ground surface will be measured using two runoff polts, one with a lined base acting as a lysimeter, and intercepting all melt, and one unlined, intercepting only direct surface runoff. It is hoped that the outcome of the next field seasons will be a better understanding of the processes involved in the response of basin streamflow to snowmelt inputs, and eventually the development of a predictive model for basin conditions like those at Perch Lake.

471. ROBBINS, V.L., PETRACCA, A.N., Gulf Canada Resouces Inc. (Exploration):
Low pressure Bow Island sand, southwestern Alberta, 1978-79.

Sands in the lower portion of the Colorado Group, in central and east portions of NTS map area 82H, are at a nearly uniform pressure over a depth range exceeding 600 meters. The shallow occurrences may be deemed normal and the deeper occurrences are therefore subnormal.

472. RODRIGUEZ, E., FLIGG, K., Ontario Ministry Environment (Water Resources Br.):
Groundwater geophysics, 1965-.

To carry out geophysical surveys for groundwater studies relating to groundwater development and protection.

473. SCHNEIDER, A.T., MAATHUIS, H.M., KEWEN, T., Saskatchewan Research Council (Geology Div.):
Groundwater and Pleistocene geology investigation group, 1960-.

474. SIBUL, U., DICKIN, R., WALMSLEY, D., Ontario Ministry Environment (Water Resources Br.):
Groundwater resources in the Grand River Basin, Ontario, 1977-80.

475. SIBUL, U., SZUDY, R., Ontario Ministry Environment (Water Resources Br.):
Groundwater in the Niagara Escarpment development control area, 1978-79.

To carry out a study of groundwater resources in the Niagara Escarpment area in order to formulate land management guidelines to protect groundwater for local uses and for maintaining perennial flow in streams in the area.

476. SIBUL, U., VALLERY, D., Ontario Ministry Environment (Water Resources Br.): Flowing wells in Ontario, 1976-78.

477. SKLASH, M.G., WILSON, B.A., FARVOLDEN, R.N., Univ. Windsor (Geology): Environmental isotope and hydrometric investigation of the role of groundwater in storm runoff, 1974-80, M.A. Sc. (Wilson).

See:
Mechanisms of runoff generation and nitrate flux to streams during runoff events; A Pluarg Task Group C Study, Waterloo Res. Inst., 1978.

The results of storm and snowmelt runoff studies involving the combined use of environmental isotopes (O, D, T) as natural tracers, hydrometric monitoring, and computer simulations indicate that groundwater is often an active, responsive, and significant factor in the generation of high discharge events in streams. There also appears to be a good correlation between surface water quality and groundwater discharge during the high discharge events. Current research centres around the identification of the physical mechanism(s) responsible for the observed groundwater behaviour during runoff events, the implications of large groundwater components in surface water quality during high discharge events, and the effect of urbanization on the groundwater participation in high discharge events.

478. SMART, C.S., FORD, D.C., McMaster Univ. (Geography): Hydrology and hydrochemistry of the Mt. Castleguard Big Springs and adjoining portions of the Columbia Icefield, Banff National Park, Alberta, 1979-81; Ph. D. thesis (Smart).

A study of the temporal behaviour of the Big Springs believed to drain portions of the base of the Columbia Icefield to Castleguard River via inaccessible caverns in the Cathedral Formation (Cambrian), and of the spatial and temporal behaviour of comparative waters in the vicinity.

479. SMITH, J.L., Univ. British Columbia (Geological Sciences): Analysis of dispersion and mass transport in heterogeneous groundwater systems, 1978.

To investigate the phenomena of macroscopic dispersion in heterogeneous media. Predictive models of contaminant transport must be developed in light of the proposed storage of high and low level radioactive wastes in the subsurface environment. Macroscopic dispersion results from large-scale spatial variations in the hydraulic conductivity of the porous medium. A stochastic modeling technique, based on Monte Carlo simulation, is used to consider the transport of tracer particles through the porous medium. A stochastic model is used to generate realistic spatial variations in hydraulic conductivity. The analysis leads to a probabilistic interpretation of the dispersive character of the medium. In addition, a sensitivity analysis is carried out to relate the spatial structure of the hydraulic conductivity variations to the nature of the dispersion within that medium.

480. TERRY, R.D., MILLER, J., RADMAN, A., Ontario Ministry Environment (Water Resources Br.):

Groundwater data, 1979-.

A continuing program of monitoring groundwater levels throughout the Province of Ontario.

481. VALLERY, D., WANG, K.T., CHIN, V., SIBUL, U., Ontario Ministry Environment (Water Resources Br.):

Water resources in the Holland-Black River Basins, Ontario, 1977-80.

To carry out an inventory of water resources in the Holland-Black river basins, including a study of the quantity and quality of surface and groundwaters and their uses.

482. VAN EVERDINGEN , R.O., BANNER, J.A., Fisheries-Environment Canada (Water Res. Br.):

Northern groundwater and engineering problems (Northwest Territories), 1974-79.

Time-lapse photography has successfully recorded the growth of frost blisters, up to 4.5 m high, at Bear Rock, near Fort Norwan, Northwest Territories. Flooding and draining of two depressions in karst terrain north of Mahony Lake (96F) were also recorded by time-lapse photography.

483. VAN EVERDINGEN, R.O., Fisheries-Environment Canada (Water Res. Br.):

Northern groundwater and engineering problems (Yukon), 1978-.

Identification of areas where groundwater discharge and its interaction with engineering projects can be expected to produce engineering and/or environmental problems.

Field reconnaissance and colour airphotos taken in April 1978 have been used to identify a number of such areas along the Klondike, Dempster and Alska Highways for further detailed studies.

484. WANG, K.T., CHIN, V., VALLERY, D., SIBUL, U., Ontario Ministry Environment (Water Resources Br.):

Water resources in the Humber-Don River Basins, Ontario, 1979-82.

To carry out an inventory of water resources in the Humber-Don river basins, including a study of the quantity and quality of surface and groundwaters and their uses.

485. YAKUTCHIK, T.J., MCKENNA, P., ANDRIJIW, D., PAWLOWSKI, I., Ontario Ministry Environment (Water Resources Br.):

Groundwater development, 1957-.

486. CHASE, R.L., MURRAY, J., GRILL, E., BELAND, G., PRICE, M., COOK, R., HANSEN, K., Univ. British Columbia (Geological Sciences, Oceanography):
Ocean minerals, 1977-80; M.Sc. theses (Beland, Price, Cook, Hansen).

To seek hydrothermally generated deposits of metalliferous sediments on the seafloor at the crests of Juan de Fuca and Explores Ridges, Northeastern Pacific Ocean. Two cruises of 3 weeks in 1977 and 1978 have been made, 3 areas have been examined, 100 cores taken, 1000 chemical analysis for major and/or trace elements made. Tectomics of ridge crest also being examined.

487. COAKLEY, J.P., Fisheriers-Environment Canada (CCIW):
Study of littoral drift in suspension (S.O.L.I.D.S.), 1977-79.

See:
Sled system for profiling suspended littoral drift; Proc. 16th Int. Conf. Coastal Engin. Hamburg, August 28-Sept. 1, 1978.

A considerable proportion of the annual littoral transport along a shoreline is in the form of suspended material which has been lifted off the bed by wave action and then advected along by the net longshore current. We at CCIW have developed a unique methodology to measure directly in the field the transport rate of such suspended material at an experimental site at the western end of Lake Ontario. A specially designed sled is towed along a fixed cableway spanning the surf zone (where most longshore transport occurs), and is programmed to collect in a predetermined sequence, samples of the aqueous suspension and two-component flow velocities at three elevations above the bed, and at up to ten horizontal positions across the surf zone. The system operated successfully even in storm waves of up to 3m in height.

Twenty-eight profiles have been run to date, and the results are presently being analyzed. Preliminary calculations of supended sediment flux across the surf zone show a fairly regular pattern of horizontal variation, with a maximum value generally occurring in the vicinity of the breaker zone. Transport rates range as high as 440 m^3/hr for an intense storm.

488. CLOWES, R.M., AU, D., CHEUNG., H.P.Y., LEVY, S., WHITTALL, K., Univ. British Columbia (Geophysics and Astronomy):
Marine seismic crustal studies off the west coast of Canada, 1971-; Ph.D. thesis (Au), M.Sc. theses (Cheung, Levy).

A detailed interpretation of an 80 km refraction line recorded in 1976 on an array of 3 ocean bottom seismometers (OBS's) located west of the northern end of Explorer ridge and parallel to Revere-Dellwood fracture zone has been completed. The P- and S- wave velocity depth profiles show a general increase of velocity with depth and no distinct structural discontinuities. A normal oceanic crustal thickness of 6.5 km and an anomalously low Pn velocity of 7.3 km/s are inferred. This contrasts with the abnormally thick crust (~10km) for explorer plate on the opposite side of the ridge. Values of Poisson's ratios in the range 0.25 to 0.32 are determined for the crustal material.

Interpretation of an extensive set of marine seismic data obtained in 1977 is in progress. Three OBS's were deployed around the Nootka fault zone between Explorer and Juan de Fuca plates. Three explosion refraction profiles were shot through the array. To supplement the explosion data a 16ℓ airgun provided closely spaced shots at each OBS site. The combined data consist of about 1000 individual seismic traces. Record sections are being compiled.

Marine seismic records are often difficult to interpret because they are contaminated by signals from the bubble pulse. General linear and Backus-Gilbert inverse theory are being applied to determine the bubble pulse wavelet and "debubble" the marine records.

489. CLOWES, R.M., THORLEIFSON, A.J., LYNCH, S., Univ. British Columbia (Geophysics and Astronomy):
Interpretation of a marine deep seismic sounding survey in Winona Basin offthe west coast of Canada, 1975-79; M.Sc. theses (Thorliefson, Lynch).

See:
Geol. Surv. Can., Paper 78-1C, p. 29-34, 1978.

During 1975, three reversed deep seismic sounding profiles and additional subcritical incidence reflection profiles were recorded in Winona Basin, a deep water sedimentary basin west of northern Vancouver Island. Analyses of the reflection data indicate an upper sedimentary structure of three or four prominent horizons with interval velocities ranging from 1.6 to 3.8 km/s, and having a total depth extent of about 2 km in the central basin. This is underlain by a lower sedimentary structure with velocity of approximately 4.3 km/s and thickness of about 2 km. From the analysis of the refraction data, the average velocity of the subsediment crustal section is approximately 6.0 km/s and its thickness is about 10 km along the central basin. Significant lateral variations in crustal structure occur across the basin. The seismic results are consistent with a proposal of oblique subduction between the Explorer and American plates.

490. d'ANGLEJAN, B., McGill Univ. (Marine Sciences Centre):
Sedimentation studies in estuaries and coastal water, 1971-.

See:
Recent sediments of the St. Lawrence Middle Estuary: J. Sed. Pet., vol.83, no. 3, p. 951-964, 1978.

Work in 1978 at a better understanding of the transport of suspended sediments in the estuary. Detailed work was carried out in and around the turbid plume which advects the turbidity downstream over the South Channel. This included vertical profiling and horizontal sections of light attenuation and current meter profiling in the plume and along the front. Tidal and current observations as well as turbidity measurements were also obtained along the Baie Ste Anne - Rivière Ouelle subtidal platform to determine the intensification factors of the turbidity in this bay and the exchanges with the turbid plume in the South Channel. A sedimentological survey of the Bay Ste Anne and Rivière Ouelle estuary was completed. A sedimentological survey of Rupert Bay, south of James Bay was completed.

491. d'ANGLEJAN, B., SAVARD, J.P., McGill Univ. (Marine Sciences Centre): Studies in the benthic layer, 1977-81; Mc.Sc. thesis (Savard).

Instrumental development and preliminary trial and field studies were undertaken to moniter the resuspension, transport and composition of the suspended particulate matter in the epibenthic layer of the St. Lawrence estuary by means of simultaneous observations of turbidity and current velocities, as well as direct sampling of the suspended material.

492. GILBERT, R., THOMAS, G.J., Queen's Univ. (Geography): Oceanography and sedimentation in fiords and the nearshore zone, Cumberland Peninsula, Baffin Island, 1977-81; M.A. thesis (Thomas).

In 1977, studies began of fiord oceanography at Pangnutung, Northwest Territories. Rapid circulation of fiord water gives rise to rich benthic life which severely bioturbates sediments. In 1978, several fiords on the Davis Strait coast were examined briefly. In Maktok and Cornation Fiords the effect of biota is substantially less although the water is oxygen rich it all depths. Rates of sedimentation are estimated to be 1 to 3 cm/yr., significantly higher than at Pangnutung Fiord. We propose in 1979 to expand the study to other fiords around Cumberland Peninsula and to examine the mechanisms of tide flat formation at Pangnutung.

493. GREENWOOD, B., Univ. Toronto (Scarborough College-Geography): Hydrodyanmics monitoring system, 1978-80.

To establish an instrument array capable of monitoring and recording water motions in the zone of shoaling and breaking waves.

494. HESSE, R.F., VELDHUYZEN, H., McGill Univ. (Geological Sciences): Labrador Sea sediments, 1973-79; M. Sc. thesis (Veldhuyzen)

See:
Deposition of parallel laminated muds from the viscous sublayer of low-density turbidity currents: Am. Geol. Soc., Abstracts with Program, vol. 10, no. 7, p. 420, 1978.

Late Quaternary evolution of Karlsefini Trough, Labrador Shelf from high resolution seismic records; Geol. Assoc. Can., Ann. Mtg. Astracts with Program, 1979.

495. HOUGHTON, R.L., SULLIVAN, K.D., Univ. Alberta (Geology): Petrology, geochemistry, and origin of the linear volcanic chains of the western North Atlantic, 1974-79.

Detailed petrologic and geochemical data were collected for the lavas of the New England Seamounts (NES) and the Newfoundland Seamounts (NS) and presented in the thesis of Houghton (WHO-MIT) and Sullivan (Dalhousie), respectively. Application of combined petrologic, geochemical, and geophysical data indicates that the NES and NS represent Cretaceous volcanism along fractured zones in the seafloor, and not hot spot traces.

Further data has now been jointly collected for the rocks of the Fogo and Caryn-Muir (C-MS) seamount chains. Evaluation of this data is continuing and is expected to result in similar models for these chains. It is hoped that a combined picture for the evolution of the western North Atlantic will soon emerge.

A combination of petrologic and submersible dive data for these alkalic seamounts also suggests that most of the uplift of seamount edifaces may be due to sill intrusion within the structure and not the accumulation of piles of lava flows. Further evaluation of this data is expected to generate a detailed picture of the substructure of alkalic ocean islands.

496. LOGAN, A., Univ. New Brunswick, Saint John (Geology):
Ecology and systematics of reef-swelling brachiopods and other cryptic biota from caves and overhangs, Grand Cayman, B.W.I., 1975-79.

497. MACLEAN, B., Geol. Surv. Can.:
Eastern Baffin Island shelf bedrock and surficial geology mapping program, 1976-.

See:

Marine geological-geophysical investigations in 1977 of the Scott Inlet and Cape Dyer-Frobisher Bay areas of the Baffin Island and Continental shelf; Geol. Surv. Can., Paper 78-1B, p. 13-20, 1978.

498. MUEHLENBACHS, K., HOUGHTON, R.L., SCARFE, C.M., Univ. Alberta (Geology):
Isotopic and mineralogical study of the basaltic sea floor, 1976-82.

More than 150 basalts and separated mineral samples were analysed for $\delta^{18}O$ from Holes 417A, D and 418A. A simple model of the low temperature alteration of the oceanic crust can explain that data as well as $\delta^{18}O$ data from other DSDP and dredged basalts of known age. It is proposed that the new sea floor is open to cold sea water circulation, which weathers the basalts more or less uniformly to a depth of at least 600 meters. The massive circulation ceases after about 10 m.y. but that is sufficient time to have had the $\delta^{18}O$ of the rocks raised to about 7.5 $^{0}/_{00}$. Some low temperature alteration proceeds in the upper few hundred meters of the old oceanic crust but at a much slower rate and at a slightly warmer temperature causing some ^{18}O-gradients. In addition, there are highly transmissive units throughout the crust through which sea water can circulate for much longer times (25-50 m.y.).

499. NELSON, A.R., PIPER, D.J.W., COOKE, H.B.S., Dalhousie Univ. (Geology):
Chronology and paleoenvironments of Quaternary continental shelf sediments, eastern Baffin Island, 1978-79.

Studies are currently underway to 1) genetically relate nearshore glaciomarine litho and biofacies in 54 stratigraphic sections to contemporaneous shelf facies in available cores, and 2) intergrating the shelf and nearshore stratigraphies with the terrestrial glacial record along eastern Baffin Island. X-ray, grain size, clast lithology, detrital carbonate, and heavy mineral analysis of cores will answer questions on sediment genesis and provenance while foraminiferal studies will help in the recontruction of paleoenvironments. Amin acid analyses of foraminifera and shell fragments in the cores and ^{14}C dates on upper core sediments will provide time correlations with previously nearshore glaciomarine deposits. Paleomagnetic analysis of core samples may provide an additional basis for correlation.

500. ROBERTS, M., STEARN, C.W., McGill Univ. (Geological Sciences):
Role of boring endolithic algae in bioerosion of the Bellairs reef, Barbados, 1978-80; M. Sc. thesis (Roberts).

501. SCHAFER, C.T., Geol. Surv. Can.:
The Newfoundland continental slope at 49°N to 50°N: nature and magnitude of contemporary marine geologic processes, 1978.

502. UMPLEBY, D.C., Geol. Surv. Can.:
Regional subsurface geology, continental shelf and slope, offshore Labrador, Baffin Island and related areas, 1976-.

See:
Clay mineral analysis of Mesozoic-Cenozoic sequence, Labrador Shelf- a preliminary report; Geol. Surv. Can., Paper 78-1B, p. 111-114, 1978.

Multichannel reflection seismic survey in the Labrador Sea; Geol. Surv. Can., Paper 78-1C, p. 118, 1978.

COAL GEOLOGY/GEOLOGIE DU CHARBON

503. BOTHAM, J.C., GARDINER, W., JORGENSEN, J.C., LLOYD, T.A., MONTOGOMERY, W.J., CANMET (EMR):
Evaluation of Canadian coking coals.

504. BROUGHTON, P.L., Cambridge Univ. (Geology):
Coal seam genesis and sedimentology of the Paleocene Ravenscrag Formation of southern Saskatchewan, 1977-79; Ph. D. thesis.

To evaluate the coal seam genesis within the basin environments of the Paleocene Ravenscrag Formation of southern Saskatchewan and to determine the relationship of the coal seams to the local and regional sedimentological and structural framework.

505. BUSTIN, M., Geol. Surv. Can.:
Geology of mine sites, Alberta and British Columbia, 1978-.

To examine the stratigraphy, sedimentology and structure of the Jurassic and Lower Cretaceous coal measures of southwestern Alberta and southeastern British Columbia, and to evaluate the stuctural fabric of the coal measures, their petrography, and mechancial properties and the petrographic make up of the coal.

506. CAMERON, A.R., Geol. Surv. Can.:
Petrographic examination of coking coals from the Kootenay Formation, Alberta and British Columbia, 1961-.

507. CAMERON, A.R., Geol. Surv. Can.:
Petrographic analysis of Saskatchewan lignites, 1972-.

508. CAMERON, A.R., Geol. Surv. Can.:
Compositional charcteristics of coals from Hat Creek, British Columbia, 1977-.

509. CREANEY, S., Geol. Surv. Can.:
Optical properties of coals and dispersed organic materials, 1975-.

See:
Spore fluorescence coloration-a rapid microscopic method of maturation assessment; Geol. Surv. Can., Paper 78-1C, p. 101-103, 1978.

Organic material in the Tranquille beds of the (Tertiary) Kamloops volcanic group near Afton Mine, Kamloops, British Columbia; Geol. Surv. Can., Paper 79-1A, p. 381, 382, 1979.

510. GRAHAM, P.S.W., Geol. Surv. Can.:
Evaluation of coal deposits of western Canada, 1976-.

See:
Geology and coal resources of the Tertiary sediments, Quesnel-Prince George area, British Columbia; Geol. Surv. Can., Paper 78-1B, p. 59-64, 1978.

The Tranquille beds of the Kamloops Group: A Tertiary (Middle Eocene) coal-bearing sequence in the vicinity of Kamloops Lake, British Columbia; Geol. Surv. Can., Paper 79-1A, p. 357-360, 1979.

511. HACQUEBARD, P.A., Geol. Surv. Can.:
Rank and petrographic studies of coal and organic matter dispersed in sediments, 1968-.

See:
A geological appraisal of the coal resources of Nova Scotia; CIM Bull., vol. 72, no. 802, p. 76-87, 1979.

512. HACQUEBARD, P.A., Geol. Surv. Can.:
Microscopic study of pyrite in main seams of Sydney coalfields, Nova Scotia, 1975-.

513. HUGHES, J.D., Geol. Surv. Can.:
Resource evaluation of coal deposits of western and northern Canada, 1977-.

514. IRVINE, J.A., WHITAKER, S.H., BROUGHTON, P.L., Saskatchewan Geol. Surv.:
Coal Resources of southern Saskatchewan: A model for evaluation methodology, 1972-78.

Geology and coal resource evaluation (quantitative) for the Paleocene Ravenscrag Formation of southern Saskatchewan.

515. JONES, W., HILLS, L.V., Univ. Calgary (Kananaskis Environmental Centre):
Trace elements in some Alberta thermal coals, 1977-79; M.Sc. thesis (Jones).

Although there is an extensive literature on trace elements in coal on an international basis there is little information available for coals from western Canada. Therefore a project has been undertaken to examine trace elements in Upper Cretaceous coals from the Wabamun area of Alberta. Analysis will be conducted utilizing neutron Activiation techniques.

516. LONG, D.G.F., Geol. Surv. Can.:
Studies of coal deposits of western and northern Canada, 1977-.

See:
The Tranquille beds of the Kamloops Group: A Tertiary (Middle Eocene) coal-bearing sequence in the vicinity of Kamloops Lake,British Columbia; Geol. Surv. Can., Paper 79-1A, p. 357-360, 1979.

517. MARCHIONI, D.L., Geol. Surv. Can.:
Surface oxidation of variously ranked coals, 1977-.

518. MARCHIONI, D.L., Geol. Surv. Can.:
Mineral matter and trace element control of Canadian coals, Alberta, 1978-.

See:
The effect of vitrinite reflectance of elevated temperatures during sample preparation; Geol. Surv. Can., Paper 78-1C, p. 125, 126, 1978.

519. MCLEAN, J.R., Geol Surv. Can.:
Stratigraphy and sedimentology of Blairmore Group and equevalent strata in Alberta and northeastern British Columbia, 1976-.

520. MCLEAN, J.R., Geol. Surv. Can.:
Studies of coal-bearing Upper Cretaceous and Paleocene formations, central Alberta Foothills, 1977-.

521. NANDI, B.N., BELINKO, K., GAZLEY, A., CANMET (EMR):
Behaviour of different coal macerals during coal liquefaction, 1978.

To develop petrographic techniques to investigate the behaviour of different coal macerals during thermal and catalytic hydrogenolysis. This was accomplished by microscopically examining the residues from coal liquefaction experiments at various intermediate stages of the hydrogenolysis process.

522. NANDI, B.N., BELINKO, K., CIAVAGLIA, L.A., CANMET (EMR):
Alkane distribution of eastern and western Canadian coals, 1977-78.

See:
The effect of oxidation on the physical and chemical properties of coking coals; EMR, CANMENT Lab. Rep. ERL/ERP 78-44(R), 1978.

523. PEARSON, D.E., British Columbia Min. Mines Pet. Res. (Geological):
Coal in British Columbia, 1975-.

524. PEARSON, D.E., GRIEVE, D.A., British Columbia Min. Mines Pet. Res. (Geological):
Geology of East Kottenay coal fields, British Columbia, 1975-.

525. POTTER, W., SMITH, E., GILLIS, K., CALDER, J., Nova Scotia Dep. Mines:
Mineral evaluation survey-Sub-project 3.3: coal inventory, 1976-79.

The Coal Inventory staff have been assessing the various coal basins throughout Nova Scotia, primarily through drilling programs. The results of these programs are currently being compiled and it is hoped that several coal inventory/assessment reports will be available in the very near future. Areas examined include the Pictou, Springhill and Sydney coal basins.

526. RAHMANI, R.A., Alberta Research Council (Geology Div.):
Stratigraphy, sedimentology and coal resources of the Edmonton Group (Cretaceous-Tertiary) of the Alberta Plains, 1979-83.

Surface and subsurface investigations down to a depth of 400 m, to 1) estimate coal reserves of the Edmonton Group of the Alberta Plains, 2) surface to subsurface correlation of the major coal seams, and 3) study the sedimentology and origin of the coal and coal-bearing rocks, coal chemistry and petrology and their relationship to depositional environments. Resulting depositional models will be utilized to predict coal seam geometry in newly developed coal deposits. Data obtained from such investigations can be used directly to aid in solving various geotechnical and mining problems and in situ coal gasification. Future

research will involve: 1) studies similar to the above on other Mesozoic and Tertiary coal-bearing rocks of Alberta Plains and Foothills; 2) structural studies of coal and host rocks in areas of potential mining interest in the Foothills; 3) investigating deep coal in the Alberta Basin and correlation of Plains and Foothills coals; and 4) studying the application of various methods of coal exploration (Drilling, coring, geophysical logging, seismic, etc.).

526A. WILLIAMS, G.D., MURPHY, M.C., Univ. Alberta (Geology):
Deep coal deposits of the Western Canadian Plains, 1972-79.

Verification of the accuracy of a computer data base containing information from approximately 4500 petroleum boreholes has been completed, and mapping of coal penetrated by depth, thickness geologic formation and calculation and categorization of resource quantities is under way.

INDUSTRIAL MINERALS/SUBSTANCES MINERALES INDUSTRIELLES

527. BELL, K.E., DEAN, R.S., ZEMGALS, L.K., RILEY, G.W., CANMET (EMR):
Ceramic clays and shales of western Canada, 1973-79.

See:

Cursory Mineralogical Examination of Ceramic Clays and Shales of the Prairie Provinces; EMR, CANMET, Lab. Rep. MRP/MSL 78-169 (IR), 1978.

528. BERARD, J., BOILY, B., COTE, E., Ecole Polytechnique (Génie Minéral):
Etude des produits de réactions chimiques entre les agrègats de grès Potsdam et le ciment Portland, 1977-79; M.Sc. A (Boily), nouveau type de calcaire réactif dans les bétons, 1978-80; M.Sc.A (Côté).

Etude des minéraux de néoformation dans les bétons faits de grès réactifs aux alcalis du ciment, et détermination des horizons stratigraphiques réactifs dans les bétons.

529. BRINSMEAD, R.A., BARNETT, D.E., New Brunswick Dep. Nat. Res. (Mineral Resources Br.):
Granular aggregate resources, Charlo (210/16), Upsalquitch Forks (210/10) and part of Nepisiguit Lakes (210/7) map-areas, New Brunswick, 1978-79.

To provide information on the distribution, extent, thickness, and quality characteristics of granular aggregate deposits in the areas studies. The results will assist producers and consumers of granular aggregates in locating deposits suited to their requirements, and will provide basic data for land-use planning in the Restigouche Planning District, which encompasses the areas examined.

530. BUCHANAN, R.M., CANMET(EMR):
Evaluation of phosphate resources, 1978-79.

Compilation and evaluation of data on phosphate minerals in igneous and metamorphic rocks. Significant deposits will be sampled to provide material for beneficiation experiments.

531. CHRISTIE, R.L., Geol. Surv. Can.:
Geology of bedded phosphate deposits in Canada, 1976-.

532. DEAN, R.S., BUCHANAN, R.M., BELL, K.E., CANMET (EMR):
Anorthosite and argillaceous materials as resources of non-bauxitic alumina, 1975-.

Anorthosite as a resource of non-bauxitic alumina is being appraised by the compilation pertinent data and sampling of the most promising materials for laboratory testing of extraction methods. A survey of aluminous argillaceous materials is being made and mineralogical studies of materials associated with the Hat Creek coal deposit in British Columbia are in progress.

533. EDWARDS, W.A.D., Alberta Research Council (Geology Div.):
Sand and gravel resources of the Canmore Corridor, Alberta, 1978-79.

Fieldwork (including surficial mapping, seismic and resistivity testing, rotary drilling and bulk sampling) was donein August to October, 1976 and April 1978. Five types of gravel deposits (outwash (terrace and plain forms), ice-contact, fan and recent alluvial) were identified and delineated on 1:50,000 and 1:12,000 maps. The quality and quantities of the deposits were estimated. Report is written and edited; it is in final drafting.

534. EDWARDS, W.A.D., Alberta Research Council (Geology Div.):
Sand and gravel resources of the St. Paul-Bonnyville area, Alberta, 1977-79.

The report for this area is partially completed; sand and gravel data will be displayed on 1:50,000 maps; surficial geology at 1:125,000. The report includes a geological description of major aggregate deposits as well as estimates of their extent, quantity and quality.

535. EDWARDS, W.A.D., FOX, J.C., Alberta Research Council (Geology Div.):
Sand and gravel resources of the Cold Lake area, Alberta, 1978-79.

The suficial geology of the project area was initially evaluated by aerial photo interpretation. Field checking, at a reconnaissance level (scale of field mapping - 1:50,000), of the geological units delineated followed, with particular emphasis on sand and gravel deposits of various genesis. Selected sand and gravel deposits were further investigated with auger drilling, backhoe test pits and resistivity traverses (EM31).

536. FINAMORE, P., BARNETT, D.E., New Brunswick Dep. Nat. Res.(Mineral Resources Br.):
Granular aggregate resources of the Campbellton (210/9), Tetagouche Lakes (210/16) and Escuminac (21B/1) map-areas, New Brunswick, 1978-79.

Separate reports for the Campbellton and Tetagouche Lakes map-areas will be available on open file by April 1, 1979. A report for the eastern half of Restigouche County will also be prepared for the Restigouche Planning District, New Brunswick.

537. FOWLER, J.H., STEA, R., Nova Scotia Dep. Mines:
Mineral Evaluation survey - Sub-project 3.2: surfical mapping and sand and gravel, 1978-79.

Mapping and geochemical sampling of tills, compilation of information on ice movement directions (till fabric analysis, stone counts, mapping stoss and lee bedrock forms and striations), and detailed stratigraphical descriptions and sampling of major till sections, within lat. 44°15', 45°14'N, long. 63°31', 64°34'W including parts of Halifax, Lants Lunenbury and Kings counties. A report with maps at a scale of 1:100,00 is in progress.

538. HAMILTON, W.N., BAINEY, S.J., Alberta Research Council (Geology Div.):
Economic minerals map of Alberta, 1975-78.

All known deposits or occurrences have been compiled. Map editing is in progress. A system of coding and cross indexing to mineral deposit lists and information sources is in preparation.

539. HORA, Z.D., GARNETT, J.A., British Columbia Min. Mines Pet. Res. (Geological):
Granular resources inventory, Lower Mainland and Vancouver Island, British Cloumbia, 1978-79.

540. MACDONALD, D.E., Alberta Research Council (Geology Div.):
Marl study, Alberta, 1976-78 (completed).

541. MACDONALD, D.E., Alberta Research Council (Geology Div.):
Phosphate evaluation project, Alberta, 1978-81.

To evaluate the resource potential of phosphate rock in Alberta, primarily as an industrial mineral commodity and secondarily as a possible source of uranium. Phosphate occurs in a number of locations in the Foothills and Rocky Mountains and some private companies have done exploration in an attempt to evaluate these deposits. To date, however the overall knowledge concerning phosphate rock in Alberta is minimal.

542. MCLAWS, I.J., Alberta Research Council (Geology Div.):
Silica sand in the Fort McMurray area, Alberta, 1973-78 (completed).

Tailings sands, waste sand from the processing of the Athabasca Oil Sands, average 95 to 98 percent silica (SiO_2) in the raw bulk samples. These sands, together with other high quartz sands in the Fort McMurray area including McMurray Formation sands where the formation is not impregnated with bitumen, alluvial (bedrook channel) sands from the Clearwater River valley, and dune sands, were studied for their potential as a source of silica sand for glass manufacture and other uses.

The main contaminants of the tailings sands are the residual oil film, the "fines", the iron content, and mica. After beneficiation, the tailings sands analyzed 98 to 99 percent silica (SiO_2), with iron contents of 0.02 to 0.04 percent Fe_2O_3, well within range for high quality glass manufacture. Mica is present in minor amounts but may not have to be removed.