

## Geophysics Canada - An Informative Update

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### Article abstract

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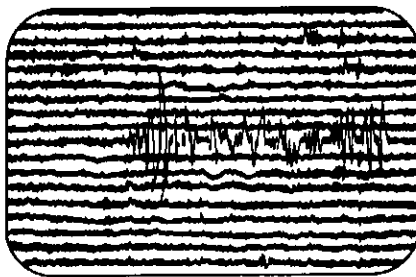
While the 1974 convention was ostensibly oriented toward technical content, the dominant overtones implicit in many of the papers were in fact political. This was of course predictable because of the uncertain future presently facing the resource industries (and consequently the geophysical industry) in Canada as a result of recent federal policy statements.

The 1974 convention attracted 750 registrants, a decrease of roughly eight per cent from the previous year. Papers at the conference were grouped under four general subdivisions: 1. data acquisition, 2. data processing, 3. interpretation, 4. general topics, with a considerable overlap between these classifications.

wanted to include field-oriented earth scientists and crystallographers who could provide critical tests of experiments already done or point out gaps in present knowledge that could be filled by experiments yet to be attempted. One session on the second day, chaired by Professor Gabrielle Donnay of McGill was a regular meeting of Krystallos, an informal association of crystallographers from the Montreal area.

This year's conference at McGill marks the end of eastward migration of conference sites; next year's conference will again be held at the University of Western Ontario. We trust that in the coming cycle, as in the past, the conference will continue to cultivate existing communication channels and to create new ones among earth scientists involved in mineralogy, petrology, and economic geology.

MS received, May 6, 1974.



## Geophysics Canada – An Informative Update

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### Summary

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### Data Acquisition

Papers in this category covered a rather diverse field of geophysical subjects ranging from seismic energy sources, through integrated field recording-processing modules, to the design of entire crews for Arctic marine and surface-ice operation. A number of the techniques represented field-tested applications of relatively recent vintage, a few concerned newer concepts presently in the testing stage and some covered somewhat more esoteric subjects.

The small crew concept in surface-ice Arctic operations was graphically demonstrated in a well-photographed and well-edited film entitled "Break-through". This crew design was pioneered by Phoenix Ventures, Limited, a Calgary-based seismic contractor. When originally announced a couple of years ago, the idea was received with scepticism by the more conservative element of the local geophysical fraternity. Problems of safety, logistics, and personnel maintenance appeared to be potential areas of difficulty, but the completion of three successful seasons with the small crew would indicate that it can handle Arctic-ice assignments as capably as its more cumbersome conventional counterparts.

Seismic energy sources were discussed in two presentations, one dealing with *Vibroseis*<sup>®</sup> recording and data processing parameters, and the other with the use of long vertical column-charges for under ice shooting. While neither of these topics really break any new ground, both papers were thorough in analysis and made their points clearly.

Interestingly, while the authors of the *Vibroseis*<sup>®</sup> study stressed the need for precise analysis of vibrator recording parameters tailored to each specific geographic area and its local surface conditions, the writer of another paper, presented later in the meeting and dealing with a similar subject, came to conclusions that were somewhat at variance. This author contends that, provided a wide sweep band is used and vibrator unit synchronization is maintained, recording parameters can be generalized and are less sensitive than commonly supposed to changes

in surface conditions and geographic area. The listener is presumed capable of judging from his own experience which viewpoint is more likely to be correct.

The operation of a novel sub-ice submarine-borne seismic system was demonstrated by a colour slide series in the third paper of the opening session. While the idea sounds pretty far out at first, the concept appears feasible and is probably closer to reality now than it was a few years ago when such a vessel was first tentatively proposed. Earlier attempts to interest the seismic industry in submarine transport never got much beyond the planning phase, but the current project discussed at the 1974 conference is now at the construction stage and is scheduled to carry on at least as far as deep water and under-ice testing.

Recent developments in field recording and portable processing equipment were the subject of a further paper in the data acquisition series. This topic is of considerable interest to the working geophysicist, since such systems (along with the several mini-computers which have recently appeared) could possibly lead to a reversal of the current centralization of seismic processing and interpretation at large computer centres. We may again see the day when the seismic interpreter will travel with the field crew and work his data on a day to day basis.

The final paper of the session described a programme of deep seismic measurements for crustal studies off the Canadian west coast. The subject matter, admittedly academic, provided a welcome break from the overriding economic considerations which go hand in hand with most industrial geophysical applications.

### **Data Processing and Interpretation**

Many of the papers under these headings were concerned one way or another with the subject of "bright spot" interpretation, i.e., the direct detection of subsurface hydrocarbon deposits from seismic data. Specific topics covered case histories, seismic modelling, improved velocity and static programmes, etc.

While all papers were well presented and of excellent technical content, the highlight of the day was probably the display of an ingenious colour printing process for seismic sections, designed to emphasize high amplitude anomalies and abrupt changes in relative amplitude on individual reflections in the seismic section.

The process, while somewhat complicated in practice, is relatively simple in concept. Each sample amplitude corresponds to its unique equivalent in the colour spectrum, and the colour equivalent appears on the final section at every point where the specific sample amplitude occurred in the original seismic signal. Colour thresholds can be varied as desired, to bias the output in favour of the low or high ends of the colour spectrum. In addition to its obvious application to standard seismic time sections, the colour process can be superimposed on velocity scans, spectral analyses or any other related display usually done in only black and white. The colour printing does not contain any information that can't be obtained by other methods; it does however provide an outstanding means for graphic display of amplitude anomalies, whether generated by "bright spots" or other sources.

Seismic modelling of geological reservoirs provided the background for papers by three authors. While the examples shown differed widely from one to the other, the separate approaches to the basic problem showed in principle a general uniformity. The major differences appear to lie in the author's choice of a mathematical model to describe the inherent properties of porous reservoir rocks. One author had chosen Wyllie's simple time-average formula for computation, while another used the more flexible Brandt's equation. This is one area where professional opinions appear to be rather divergent at present, i.e., of the several mathematical models that have been proposed to describe the properties of reservoir rocks, which one may represent the closest approximation to reality? The question probably can't be answered conclusively at this time.

Exploration case histories made up the subject matter of three papers. While these were concerned with very specific topics, the discussion of astroblemes in the Williston Basin was of more than passing interest.

Astroblemes, or impact craters, constitute a phenomenon rarely met with in conventional petroleum seismology. Presumably they are the scars left from meteoritic impacts on the earth's surface in the geologic past, and while thirteen or more are known at the present time to exist in Canada, most of them occur in shield areas where the reflection seismograph is unlikely to penetrate. Not many geophysicists have encountered these features in their day to day work, and the description of their unusual seismic and gravity response should prove useful to interpreters.

Papers concerned with potential field measurements were in rather short supply. There were four, three of which were concerned with data analysis while the other was purely descriptive. Two of the papers were lumped with the General Topics category but should more properly have been included under the Interpretation subheading. The descriptive paper encompassed a brief review of the construction of the new Bouguer anomaly map of Canada, which supersedes the earlier version distributed by the Department of Energy, Mines, and Resources.

The other three papers were concerned with the analysis and interpretation of gravity and magnetic data. The subject matter in each case was relatively complex, and a bit difficult for a non-specialist to grasp completely in the short span of time during presentation. Preprints, had they been available prior to the start of the conference, would have been invaluable to the average registrant in gaining a more comprehensive understanding of the points each author wished to make.

### **General Topics**

This category was a sort of catch-all for papers that didn't fit conveniently into any of the preceding groups.

Two of the speakers were agents, in widely differing capacities, of the

Federal Government. The Naval representative, in his well-delivered talk, made a rather strong case for coordination for all marine traffic through a central agency, in this instance the Royal Canadian Naval offices. Coordination is necessary for reasons of safety, national defense and maintenance of a monitored flow of commercial shipping which includes seismic vessels. The speaker's points were generally well taken, and if audience reaction is any guide, most of the listeners were basically in accord with the Government position in these matters.

The other Government-sponsored paper was of a markedly different nature. It is probably inevitable that conflict will exist between people who want to cut down trees for seismic operations, lumbering, etc., and those who don't want them cut down for any reason at all. In essence the address consisted of outlining the proper channels to follow in complying with Government regulations for permission to operate seismic crews in Northern Canada. Specific forestry problems, e.g., recovery rate of forests after cutting in Northern Canada, were reviewed, the esthetics of seismic line cutting in treed areas were discussed and the author closed with a reminder that regulations are going to be more restrictive in the future than they are at the present time.

Corresponding problems from the working geophysicist's side of the fence, i.e., how to speed up the administration of Government paper work, processing of applications etc., were raised informally among the audience but were left unanswered.

### Conclusion

From a technical point of view, the 1974 CSEG convention was successful and did accomplish its objectives.

There are however a lot of grey clouds on the horizon. The question may be asked: What does the future hold for the geophysical industry in Canada? This question was very carefully skirted by everyone when it threatened to crop up in formal talks. It was never answered or even directly asked at any point in the convention, although it seemed to be uppermost

in the minds of the majority of delegates to judge by private conversations.

Can the Canadian geophysical profession survive in its present independent form, or is it destined to vanish as a distinct entity, and disappear into the Federal and Provincial civil services?

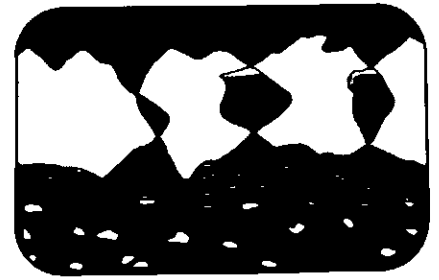
These questions touch on sensitive political ground, and it is difficult to be diplomatic in either asking or answering them. It is of interest to note that there will likely be a decline in geophysical activity in Canada during 1974 compared to 1973 levels. A number of erstwhile Canadian seismic crews are in the process of departing for greener pastures south of the border. Estimates have placed the number as high as 15 crews, about 20 per cent of the total usually employed during the peak winter season in Canada. As well, at least one major oil company has publicly announced the suspension of all Canadian geophysical operations into the indefinite future as a result of recent Government action.

Hopefully these are temporary phenomena which will pass with time, but the future of both resource industries and the geophysical profession in Canada is cloudy at the present. This state of uncertainty cannot endure for very long, if the professional health of the geophysical industry is to be maintained.

### Note

*Vibroseis* is a registered trade mark and service mark of Continental Oil Company.

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## L'action Géologique des Glaces Flottantes

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Le *glaciel*, science qui étudie tous les processus, formes et sédiments associés à l'action des glaces flottantes dans tous les milieux (marin, littoral, lacustre et fluvial), a reçu sa consécration officielle en avril dernier par la tenue, à Québec, du premier colloque international consacré à l'action géologique des glaces flottantes.

Vingt-sept communications furent présentées à ce colloque suivi par une centaine de scientifiques venus du Canada, des Etats-Unis et de l'Europe. De l'avis des spécialistes les plus autorisés dont le professeur Hans-Erich Reineck, de l'Institut de Géologie marine de Senckenberg (Allemagne de l'Ouest), ce colloque "open a new chapter in a geological text book" (Discours de clôture prononcé par le professeur H. E. Reineck au colloque sur l'action géologique des glaces flottantes). C'est dire toute l'importance de l'événement, qui représente une contribution majeure du Canada, en particulier du Québec, au progrès des sciences géologiques. Pourtant le sujet est loin d'être neuf, puisqu'au siècle dernier de nombreux géologues y ont consacré de belles pages dont Charles Lyell et J. Prestwick qui en parlent à diverses reprises dans leurs traités de géologie. Les circonstances, entre autre la longue querelle entre glacialistes et glaciellistes au siècle dernier, avait relayé dans l'ombre les