GEOPHYSICAL TRANSACTIONS 1991
Vol. 37. No. 1. pp. 57–73

# LITHOPROBE, VANCOUVER ISLAND INTERVAL VELOCITY CASE STUDY

István KÉSMÁRKY[*] and Zoltán HAJNAL[**]

A seismic interval velocity study was carried out in the central part of Vancouver Island Line No.1 of the LITHOPROBE project. Independently of other methods, we concentrated on a more accurate estimation of the 'high velocity region', which is probably the most interesting part of the subduction zone.

The main point of our effort was to carry out a series of high precision stacking velocity analyses along the line (including several neighbouring CDPs, similarly to applying 'vertical stacking' prior to velocity analysis), by taking into consideration the dips and curvatures observable on the time section. The interval velocity calculations were based on a 2-D model containing plane and curved dipping interfaces.

Besides interval velocity calculation, the reliability (standard deviation) of the estimates was also strictly controlled. Taking into account the arrival time uncertainties of the individual traces (standard deviation of the remaining trim statics, not decomposable into shot and receiver components), the reliability of the estimated parameters could be calculated via the error propagation law. This theoretical model showed that in spite of the relatively small normal moveouts, the interval velocities could be estimated with appropriate accuracy if 50–150 neighbouring CDPs were considered simultaneously.

The model studies carried out parallely with the data processing clearly showed the practical limits of the accuracy of the interpretation and the achievable lateral resolution.

**Keywords: velocity, case studies, LITHOPROBE**

---

[*] Geophysical Exploration Co., 1065 Budapest, Gorkij fasor 42, Hungary

[**] University of Saskatchewan, Dept. of Geological Sci, Saskatoon SK, Canada S7N OWO

Manuscript received: 11 October, 1990

## 1. Introduction

LITHOPROBE, a multidisciplinary earth science research program, is investigating fundamental questions concerning the structure of the lithosphere in Canada [CLOWES et al. 1984]. A part of the program was the Vancouver Island Seismic Project conducted in 1980 to study the subducting oceanic plate and the overriding continental America plate. The principal refraction and reflection lines were shot perpendicular to the continental margin *(Fig. 1)*.

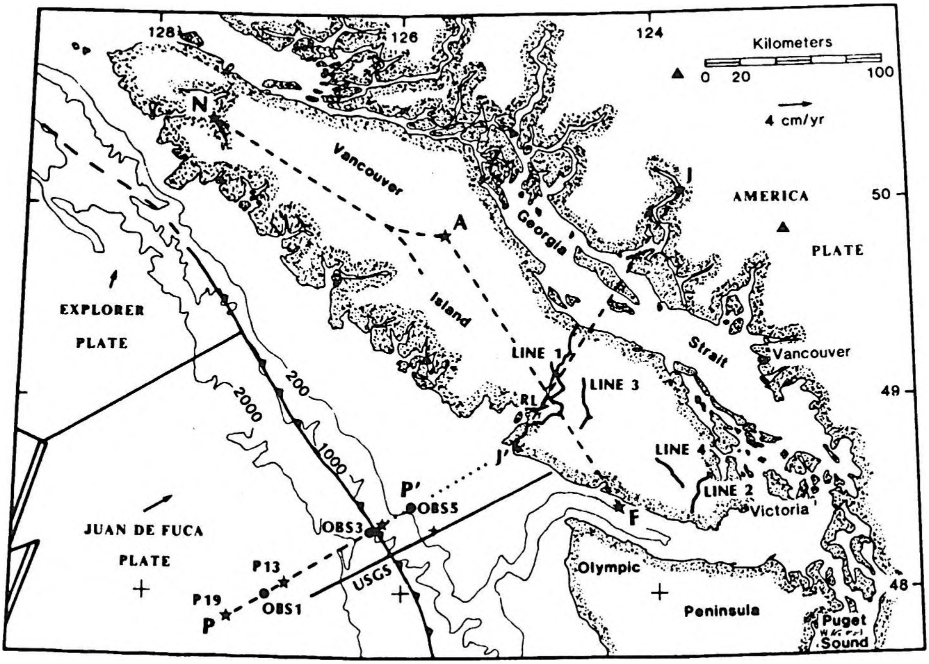


*Fig. 1.* Map of offshore-onshore study area, with the major survey lines. N-A-F, 'USGS' and P-P'-J'-J are refraction lines (ocean bottom seismographs were applied in the P–J' interval). Lines 1-4 are onshore reflection seismic lines [CLOWES et al. 1984]

*1. ábra.* A tengeri és szárazföldi kutatási terület térképe a fontosabb vonalakkal. Az N-A-F, USGS és a P-P'- J'-J vonalakon refrakciós mérések történtek (a P–J' szakaszon óceánfenékre helyezett szeizmográfokkal). Az 1-4 vonalakon szárazföldi mérések történtek [CLOWES et al. 1984]

*Рис. 1.* Карта наземных и морских исследований с основными профилями. По профилям N-A-F, USGS и P-P' - J'-J были выполнены измерения МПВ (на отрезке профиля P-J' - с сейсмоприемниками на дне океана). По профилям 1- 4 выполнены наземные измерения [CLOWES et al. 1984]

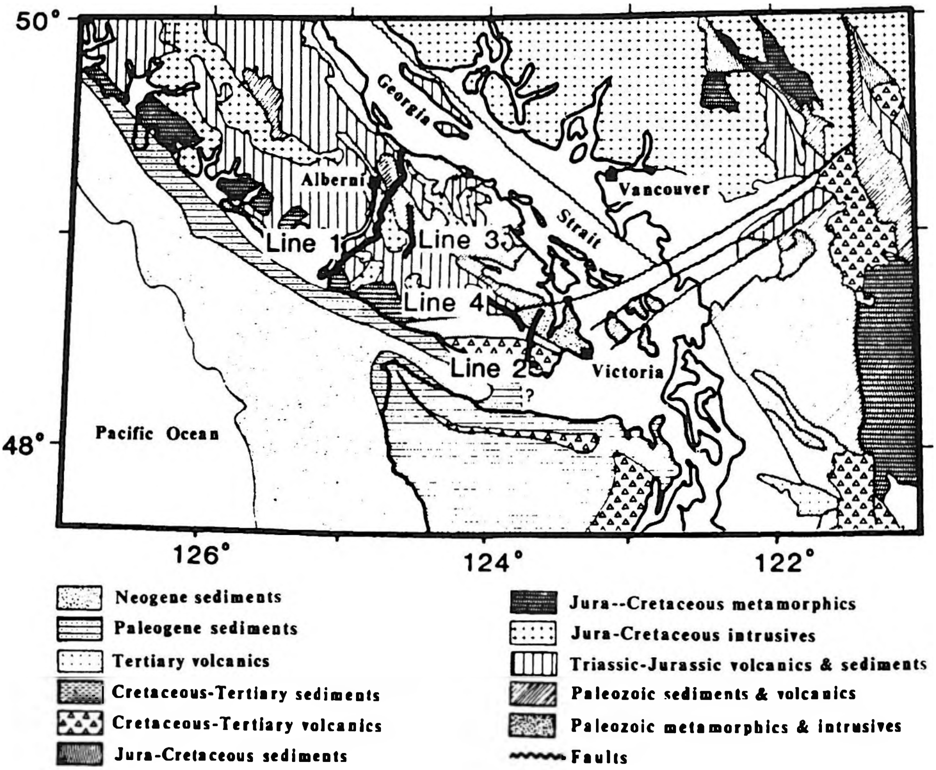


*Fig. 2.* Map of Vancouver Island survey area describing onshore reflection seismic lines 1-4 [CLOWES et al. 1984]

2. *ábra.* A kutatási terület Vancouver szigeti részének térképe az 1-4 szárazföldi vonalakkal [CLOWES et al. 1984]

*Рис. 2.* Карта участка исследований на о-ве Ванкувер с наземными профилями 1-4 [CLOWES et al. 1984]

To study the subduction zone, a special 30-fold VIBROSEIS* section was recorded along Line No. 1 across Vancouver Island using 10.8 km long spread lengths *(Fig. 2)*. Additional details of the survey procedures were described by CLOWES [1987].

---

* Trademark of Continental Oil Co.

A combined interpretation of the region using the described data and additional geophysical information was attempted by SPENCE et al. [1985]. A very high density and velocity (7.7 km/s) rock mass was placed above the subducting plate as a consequence of a gravity high and anomalous refraction arrival times observed along a segment of Vancouver Island (*Fig. 3*).

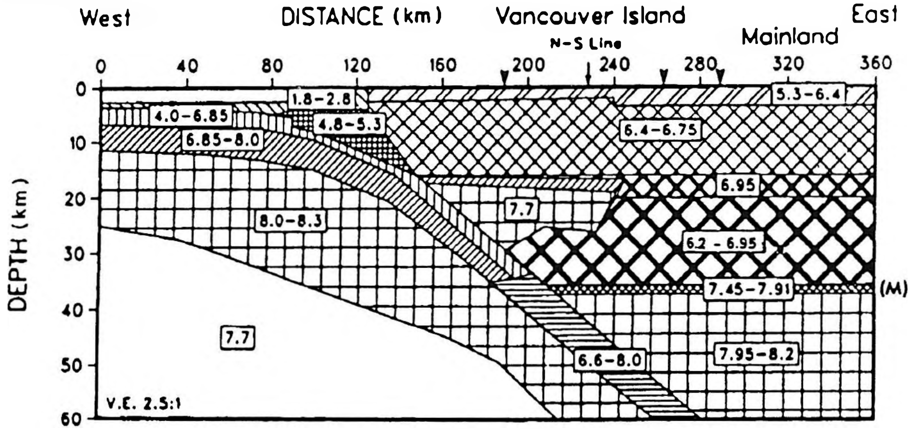


*Fig. 3.* Structural cross section and regional velocity segments according to SPENCE et al. [1985]

*3. ábra.* SPENCE és munkatársai által 1985-ben publikált szerkezeti szelvény a feltételezett intervallumsebességekkel

*Рис. 3.* Структурный разрез, опубликованный Спенсом с сотрудниками SPENCE et al. [1985] с предполагаемыми поинтервальными скоростями

The reflection portion of the data set became available to institutions for reprocessing and interpretation. At the seismic laboratories of the University of Saskatchewan, an interval velocity study was undertaken on a portion of this information covering the central segment of Line 1. This investigation concentrated on establishing a more accurate estimate of the acoustic properties of the high velocity region.

## 2. Theoretical background

The main point in establishing the reliability of the estimated velocities is quite simple. Assuming identical waveforms roughly positioned along a nearly hyperbolic reflection arrival time curve, the arrival times of these wavelets can be treated as random variables [AL-CHALABI 1974] due to the effect of noise and some deterministic but unknown effects. The zero offset arrival time $t_0$ and the stacking velocity $v_s$ can be estimated as the parameters of a hyperbola, fitted to these random arrival times by the least squares method. It is important to note that even the arsenal of the more advanced and more general information theory gives almost the same result as this simple heuristic least squares approach [KÉSMÁRKY 1985].

In the case of hyperbolic arrival times, this statistical model would provide absolutely correct results for noise free traces. In other words this would mean infinite resolving power and complete discrimination between any possible velocities. In practical cases however, the possible effects of the above mentioned 'noise' must be taken into consideration.

Using the data acquisition parameters (cable length, geophone and shot spacing, coverage number, etc.) and the standard deviation of the random arrival time shifts, the standard deviations of the resultant $t_0$ and $v_s$ parameters can be calculated via the error propagation law [HAJNAL and SERADA 1983 and KÉSMÁRKY 1985]. The results confirm the well known rule of thumb that, in general, the reliability of the stacking velocity quickly deteriorates for depths greater than the cable length. (The relevant formulae can be found in the above mentioned references.)

Neglecting the non-hyperbolic components of the reflection arrival times, the most straightforward way to improve the reliability of stacking velocities would be the application of longer and longer cables. The designer of the LITHOPROBE Vancouver Island survey [CLOWES 1987] employed a cable length (10.8 km) significantly longer than the usual lengths deployed in oil exploration. Once the data acquisition parameters had been fixed, the only way to further improve the reliability of the estimated velocities was to increase the signal to noise ratio by including numerous neighbouring CDPs into the computations or in other words to increase the quantity of input data considered. For example, a conventional velocity spectrum calculated from a single CDP set may show uninterpretable results. A commonly applied practice is the vertical stacking of a group of neighbouring CDP sets, prior to the velocity analysis, which means an averaging of data along the common offset profiles. This process profoundly influences the reliabilities of the estimates. The noise suppression ability of this method and the exact semblance is discussed in the Appendix. The more stable exact semblance function has been used in the following investigation. Of course, these methods need special care in the case of dipping reflections as will be discussed later.

After obtaining the estimates of the stacking velocity and its standard deviation, the interval velocities and their standard deviations could be calculated [KÉSMÁRKY 1985]. The estimated interval velocities are even more sensitive to the random time shifts. In the case of thin layers the interval velocity estimates become very unreliable and highly correlated. Fortunately the 'high velocity zone' to be examined has significant dimensions. It has roughly a 3000 ms interval in the time section between 4200 and 8800 ms.

Two cases for random time shifts have to be considered:

— The random time shifts have a 'static' nature or, in other words, for a given trace the random shifts are the same for each horizon. Because of these correlated shifts, the hyperbolae fitted to the different arrivals will have the same residual NMO values. This situation influences the estimated interval velocities in a special way: the interval velocity errors of all layers due to this uniform residual NMO will have the same sign. The magnitude of the interval velocity errors will increase with depth since this ambiguous residual NMO becomes larger and larger relative to the NMO itself. There will be a positive correlation between all estimated interval velocities.

— The case of totally random time shifts is more problematic and generally results in much larger interval velocity errors. In this case the random time shifts and the resultant residual NMOs are independent for each horizon. The residual NMO of a given horizon will influence only the two interval velocity estimates below and above the given interface, but a strong negative correlation will exist between them.

An analysis was carried out to find out which extreme case outlined previously is closer to the real situation. First, the trim statics of the upper and lower boundary of the 'high velocity region' were determined. The correlation between the trim statics of the two horizons was quite low, so the hypothesis of the random model was accepted. If these statics were decomposed into shot and receiver components separately, and the resultant components were subtracted from the original trim statics, the residual could be considered as representing the random time shift of the original reflection arrival model. The estimated standard deviation of the trim statics was 8-10 ms (rather high) for both the upper and lower boundaries. Using only a single 30-fold CDP set, the standard deviation of the interval velocity of the 'high velocity layer' is about 205 m/s standard deviation. The vertical stacking of more and more neighbouring CDP sets is equivalent with the existence of fewer and fewer random time shifts due to the effect of noise suppression. The deviation is inversely proportional to the square root of the number of neighbouring CDP-s involved in the vertical stacking. Consequently, the vertical stacking of 100 neighbouring CDP-s results in ten times smaller deviations. Smaller deviations mean better resolving power and more reliable discrimination between two different hypothetical interval velocities.

## 3. Data processing

Three zones of Line No. 1 were selected for velocity analysis, shotpoints 1323-1438, 1169-1263 and 835-901. These correspond to CDP intervals 50-250, 350-501 and 919-1040 with widths of 8955, 6750 and 3600 meters respectively *(Fig. 4)*.

The velocity analysis using the semblance function (Appendix) was carried out along the dipping horizons *D1* and *E1* of time section 1, interpreted as the top and bottom reflectors of the underplated 'high velocity' layer.

The survey fold is high (86) in zone 1, due to the special acquisition process adopted at the west end of the line. The fold in the central and east zones reached the range of 30-40. The reprocessing of the data set was extended to the time section generation. The top and bottom horizons of the 'high velocity region' were carefully picked. The dips and parabolic curvatures of both horizons were compensated (flattened) by applying appropiate bulk static corrections to the unstacked traces. An iterative process was applied to make certain that each selected dip and curvature resulted in the largest semblance peak in the velocity spectra. Significant curvature was detected only at zone 3. This operation resulted in six separate 'super CDP gathers', one for the upper and one for the lower horizon of each zone for the semblance calculation. The six velocity

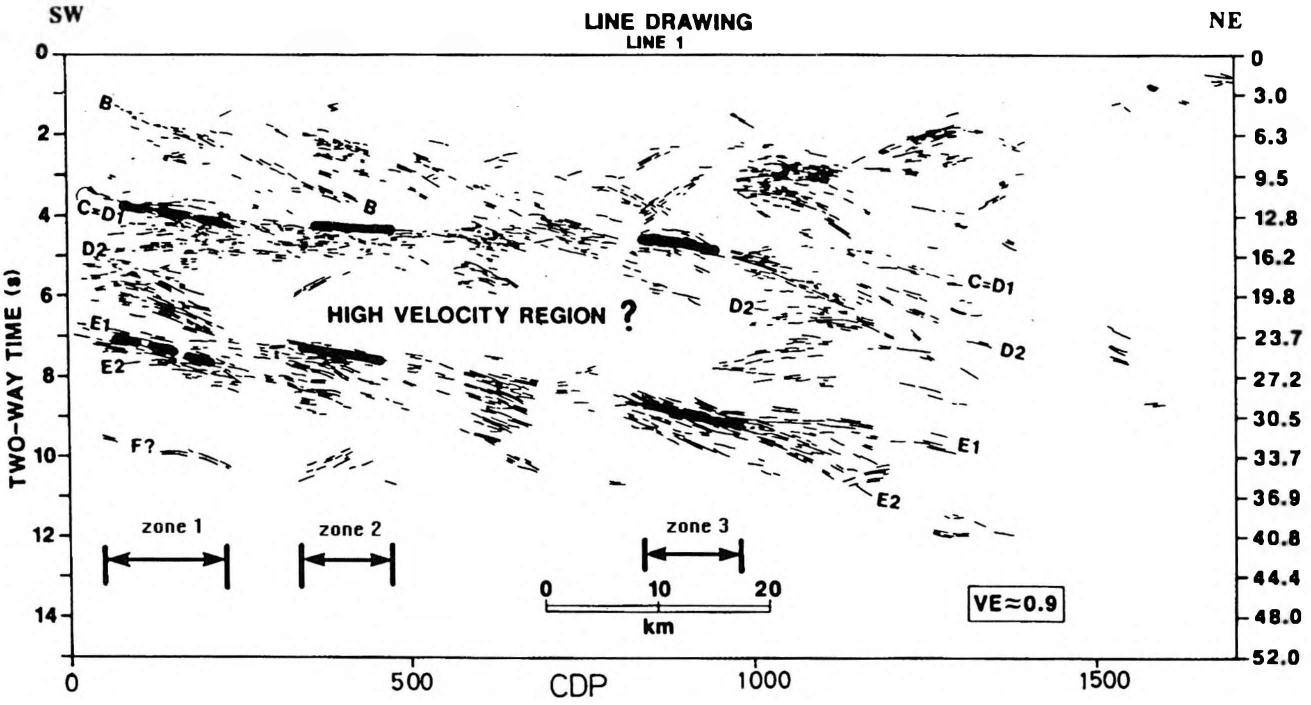


*Fig. 4.* Simplified time section of Line No.1 [CLOWES 1987]

*4. ábra.* Az 1-es szeizmikus időszelvény kiértékelhető horizontjainak egyszerűsített képe [CLOWES 1987]

*Рис. 4.* Упрощенный временный разрез по профилю 1 [CLOWES 1987] spectra computed from these super gathers were focused to the corresponding six reflection horizon segments.

This manipulation of data introduces errors since the reflection hyperbolae on the neighbouring CDP sets are not identical after compensating for the dip visible on the time section. An analysis examined the errors introduced by this form of data handling, which works similarly to the slant stack, applied to common offset gathers along a certain dip. A simple 2-D model consisting of homogeneous layers divided by dipping and bending interfaces was subjected to the same procedure. The results reveal that these systematic errors are much smaller than a quarter of the dominant wavelength. In this particular case the reflection hyperbolae on the neighbouring CDP profiles were fairly similar. The velocity spectra calculated for the upper and lower horizon of zone 2 and 3 are shown in *Figs. 5* and *6*, respectively.

The unique, well detectable peaks of the velocity spectra of zone 2 are quite convincing in Fig. 5. The velocity spectrum of the upper horizon of zone 3 (in the upper part of Fig. 6) contains a high velocity peak probably related to some uninterpretable interference, so a smaller, more reasonable local maximum has been picked. As zone 1 resulted in uninterpretable stacking velocities, probably due to the more complex subsurface conditions, it was discarded from the case study.

The interval velocity and depth calculations were based on a simple 2-D model containing dipping curved interfaces. The algorithm (recoursive stripping, using iterative calculation of the normal incidence path) is the generalized form of the well-known Dix's formula, described in KREY and HUBRAL [1980]. The curvatures are characterized by a single radius. The input features of the velocity spectra and the time section ($t_0$ and stacking velocity $v_s$, the dip and the parabolic term $p$ of the time horizon) and the interpretation results (estimated depth, spatial dip, interval velocity and radius of the reflector) are summarized in *Tables I* and *II*, for zones 2 and 3 respectively.

The $t_0$ and depth values are related to the center of the zone. The dips and curvatures show characteristic differences in the two zones considered.

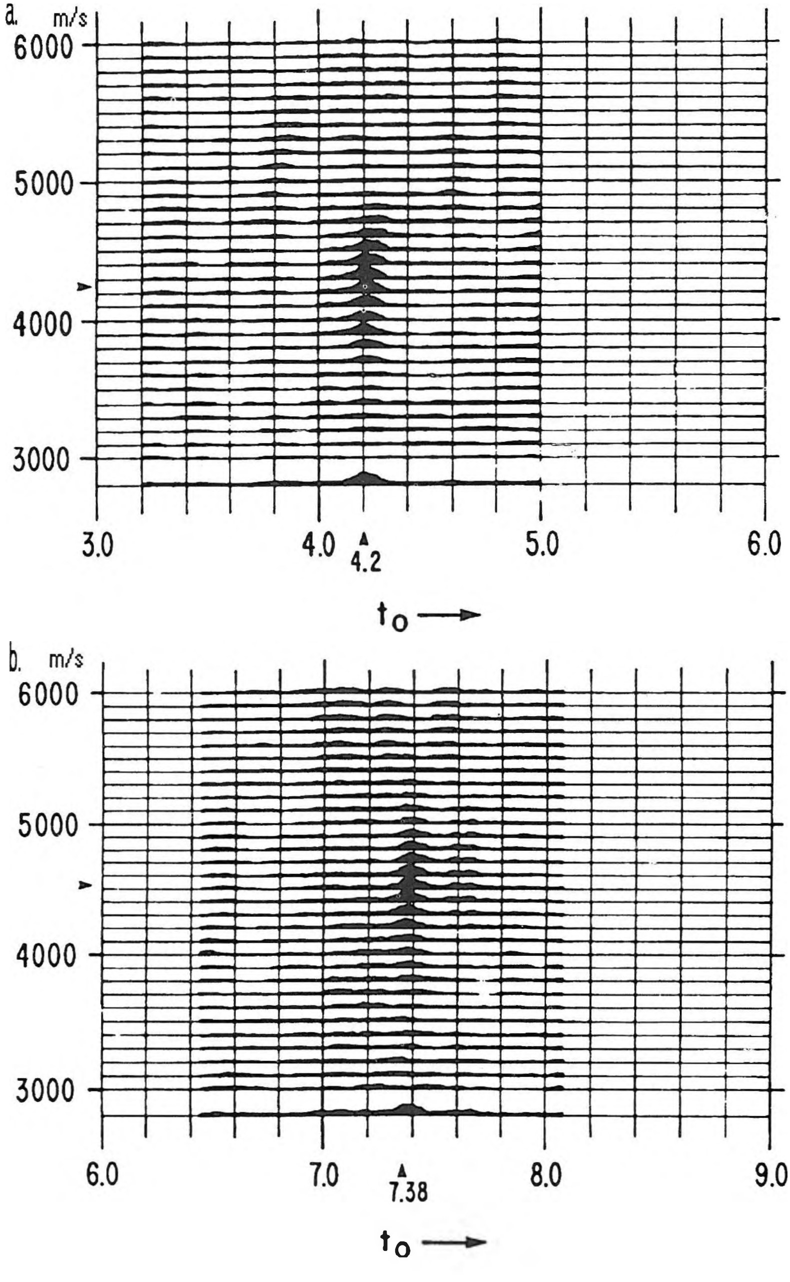
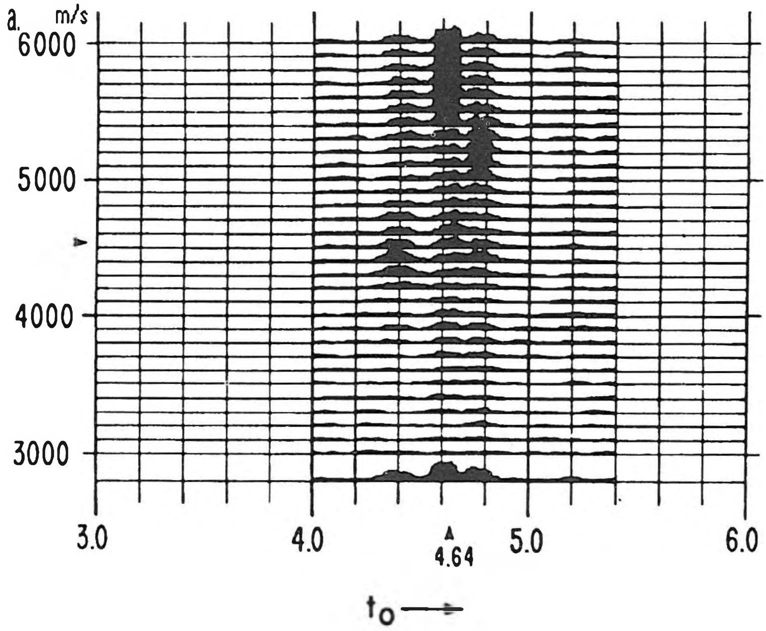


*Fig. 5.* Upper (a) and lower (b) spectra of zone 2

*5.ábra.* A 2. zóna felső (a) és alsó (b) horizontjára számított sebességspektrum

*Рис. 5.* Спектр скоростей для верхнего (a) и нижнего (b) горизонта зоны 2



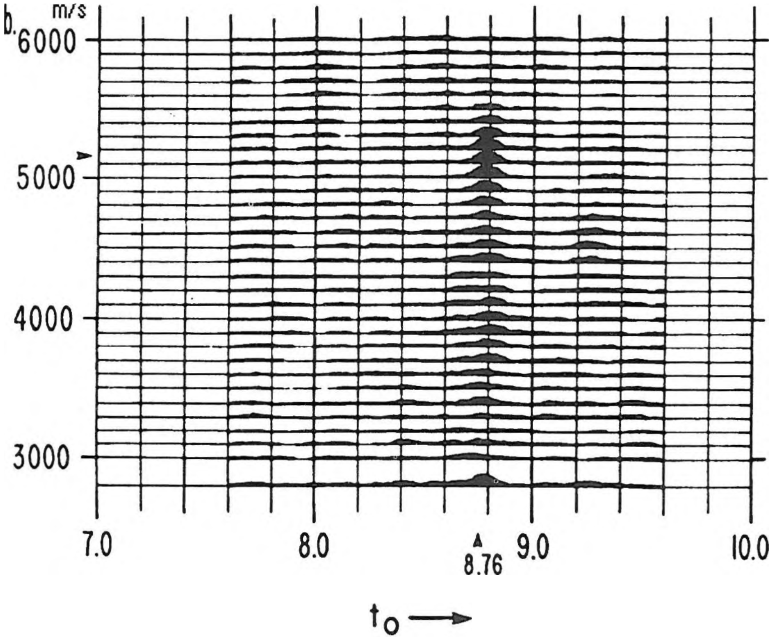


*Fig. 6.* Upper (a) and lower (b) spectra of zone 3
*6. ábra.* A 3. zóna felső (a) és alsó (b) horizontjára számított sebességspektrum
*Рис. 6.* Спектр скоростей для верхнего (а) и нижнего (b) горизонта зоны 3

| hor. | input | | | | output | | | |
|---|---|---|---|---|---|---|---|---|
| | $t_0$ | $v_s$ | $t_0$ dip | term $p$ | depth | $v_{int}$ | dip | curvature |
| | ms | m/s | ms/m | ms/km$^2$ | m | m/s | degree | 1/m |
| upper | 4200 | 4250 | 0.0044 | 0.000 | 8930 | 4895* | 0.5 | 0 |
| lower | 7380 | 4550 | 0.0313 | 0.000 | 16750 | | 4.3 | 0 |

*Neglecting the dip, the resultant interval velocity would be 4920 m/s.

*Table I.* Interpretation results for zone 2
*I. Táblázat.* A 2. zóna kiértékelési eredményei
*Табл. I.* Результаты интерпретации по зоне 2

| hor. | input | | | | output | | | |
|---|---|---|---|---|---|---|---|---|
| | $t_0$ ms | $v_s$ m/s | $t_0$ dip ms/m | term $p$ ms/km$^2$ | depth m | $v_{int}$ m/s | dip degree | curvature 1/m |
| upper | 4640 | 4550 | 0.0215 | 7.472 | 10600 | 4905** | 10 | 0.00024 |
| lower | 8760 | 5150 | 0.0639 | 1.851 | 21300 | | 23 | 0.00006 |

**Neglecting the curvature, the resultant interval velocity would be 5643 m/s. Neglecting both the dip and curvature, the resultant interval velocity would be 5750 m/s. So, the curvature really gives a significant effect (16-17%)!

*Table II.* Interpretation results for zone 3
*II. Táblázat.* A 3. zóna kiértékelési eredményei
*Табл. II.* Результаты интерпретации по зоне 3

## 4. Conclusions

The almost identical (~4900 m/s) interval velocities estimated from the reflection seismic data of zones 2 and 3 are much lower than those derived by CLOWES et al. [1984] (7700 m/s). Such a significant difference (2800 m/s) can reliably be detected since the moveout even at the lower horizon is not less than 200 ms and, in principle, the 1-2% relative accuracy of the interval velocity is attainable because of the extensive vertical stacking and the significant thickness of the layer considered. As the standard deviation of the interval velocity estimated by our statistical approach is only about 20 m/s because of the extensive vertical stacking in this particular case, the interval velocity calculated from the velocity spectrum is in considerable discordance with the prior postulation of a high velocity (7700 m/s) rock mass above the subducting slab. In other words, no reflection seismic evidence of such a high velocity formation at the previously defined depth was found.

Both observational [ODP Leg 110 Scientific Party 1978, PEARCE 1983] and seismic evidence [NELSON et al. 1985a and 1985b] attest that in zones of tectonic convergence, sedimentary strata may be subducted to crustal levels. At these depths, the acoustic properties of these rocks may be highly anomalous, and depend on local effects. Recent drilling investigations [STILLER 1990, KOZLOVSKY 1984] reveal that considerable porosity and fluid content can exist in greater than expected crustal depths. Thus zonal material heterogeneity, with properties comparable to the results of this investigation, can be expected to the considerable depth above the decollment zone of the subducting slab.

The geological ambiguity of this segment of the continental margin is further increased by the reinterpretation by DREW and CLOWES [1990] of the original data set. This new model subdivides the earlier anomalous zone into a four layer structure where two thin low velocity (6350 m/s) and two thick higher velocity layers (7100-7180 m/s) alternate with each other. The average compressional velocity of this complex crustal interval has been significantly reduced although it is still higher than portrayed by the reflection data alone.

The results of this investigation are further supported by the refraction data based model of FOWLER and PANDIT [1990]. This new crustal section explains the relevant refraction arrival time differences by introducing a simple anomalous segment in a portion of the subduction zone itself. The fitting of the existing gravity data to this most recent model of the plate convergence under Vancouver Island requires further investigation.

## Acknowledgement

The authors are grateful to Rick Ogloff for his valuable assistance in processing this complex data set.

## REFERENCES

AL-CHALABI M. 1974: An analysis of stacking, RMS, average and interval velocities over a horizontally layered ground. Geoph. Prospecting **22**, 3, pp. 458-475

CLOWES R. M., GREEN A. G., YORATH C. J., KANASEWITCH E. R., WEST G. F. and GARLAND G. D. 1984: LITHOPROBE — a National Program for studying the third dimension of geology. Journal of the Canadian Society of Exploration Geophysicists **20**, 1, pp. 23-39

CLOWES R. M. 1987: LITHOPROBE: Exploring the subduction zone of Western Canada. The Leading Edge **6**, 6, pp. 12-19

DREW J. J. and CLOWES R. M. 1990: A reinterpretation of the seismic structure across the active subduction zone of western Canada. G. S. C. Paper 89-13, pp. 115-133

FOWLER C. M. R., PANDIT B. I. 1990: Analysis of CCSS data set I: reflection-refraction data from Vancouver Island continental margin of western Canada. Ed: A. G. Green, Geological Survey of Canada Paper 89-13, pp. 79-91

HAJNAL Z., SERADA I. T. 1983: Maximum uncertainty of interval velocity estimates. Geophysics **50**, p.1790

KÉSMÁRKY I. 1985: High resolution interval velocities. Geophysical Transactions **31**, 1-5, pp. 265-266

KOZLOVSKY Y. A. 1984: The world's deepest well. Scientific American **251**, pp. 98-104

KREY T., HUBRAL P. 1980: Interval velocities from seismic reflection time measurements. (SEG publication)

NELSON K. D., ARNOW J. A., MCBRIDE J. H., WILLEMEN J. H., HUANG J., ZHENG L., OLIVER J. E., BROWN L. D. and KAUFMAN S. 1985a: New COCORP profiling in the southeastern United States. Part I: Late Paleozoic suture and Mesozoic rift basin. Geology **13**, pp. 714-718

NELSON K. D., MCBRIDE J. H., ARNOW J. A., OLIVER J. E., BROWN L. D. and KAUFMAN S. 1985b: New COCORP profiling in the southeastern United States. Part II: Brunswick and east coast magnetic anomalies, opening of the north-central Atlantic Ocean. Geology **13**, pp. 718-721

ODP Leg 110 Scientific Party 1987: Expulsion of fluids from depth along a subduction zone decollment horizon. Nature **326**, pp. 785-799

PEARCE J. A. 1983: Role of the sub-continental lithosphere in magma genesis of active continental margins. *in* C. J. Hawkesworth and M. J. Norry, eds.: Continental basalts and mantle xenoliths. Shiva, Nantwich pp. 230-249

SPENCE G. D., CLOWES R. M., ELLIS R. M. 1985: Seismic structure across the active subduction zone of Western Canada. Journal of Geophysical Research **90**, B8, pp. 6754-6772

STILLER M. 1990: 3-D Vertical incidence seismic reflection survey at the KTB location, Oberpfalz: Planning acquisition and preliminary results. Paper presented at the Fourth International Conference on Deep Seismic Reflection Profiling, Bayreuth, FRG, September 4-7.

## APPENDIX

### Noise suppression properties of the correct semblance and the semblance after vertical stacking in the common offset domain

The semblance function has the following, well-known form:

$$S = \frac{\sum_{i}^{I}\left(\sum_{j}^{J}\sum_{k}^{K}x_{ijk}\right)^{2}}{JK\sum_{i}^{I}\sum_{j}^{J}\sum_{k}^{K}x_{ijk}^{2}} \qquad \text{(A1)}$$

where $x_{ijk}$ represents a sample of a given seismic trace (after NMO correction), index $i$ runs from 1 to $I$ along a time window, offset index $j$ runs from 1 to the coverage number $J$, and CDP index $k$ runs from 1 to $K$. Our ultimate aim is to improve the resultant spectra by using a larger number of CDPs.

The following formula is generally used if vertical stacking is carried out in the 'common offset' domain prior to the calculation of the semblane:

$$S' = \frac{\sum_{i}^{I}\left(\sum_{j}^{J}\sum_{k}^{K}x_{ijk}\right)^{2}}{J\sum_{i}^{I}\sum_{j}^{J}\left(\sum_{k}^{K}x_{ijk}\right)^{2}} \qquad \text{(A2)}$$

Since the numerators are the same in both cases, it is enough to deal with the denominators to show the difference. The behaviour of the two functions is compared when the input traces $x_{ijk}$ contain only pure uncorrelated 'white' noise $n$ of zero mean with standard deviation $\sigma$:

$$x_{ijk} = n_{ijk} \qquad \text{(A3)}$$

The expected value of the denominator of eq. (A1) is:

$$E\,(\text{denominator of } S) = IJ^2K^2\sigma^2 \qquad \text{(A4)}$$

$$E\,(\text{denominator of } S') = IJ^2K\sigma^2 \qquad \text{(A5)}$$

In contrast with (A4), the expected value of the denominator of eq. (A2) is:

It could easily be demonstrated that in the case of pure signal $x_{ijk}=s_i$, the two functions $S$ and $S'$ have identical unit values. Since in the previous case of pure noise the denominator of $S$ is $K$ times larger than that of $S'$, it can be concluded, that the noise suppression characteristics of $S$ is more favourable than that of $S'$. Unfortunately, the calculation of $S$ needs significantly more computation time.

## LITHOPROBE, INTERVALLUM SEBESSÉG MEGHATÁROZÁSI ESETTANULMÁNY VANCOUVER SZIGETÉN

KÉSMÁRKY István és HAJNAL Zoltán

A LITHOPROBE projekt (kanadai multidiszciplináris litoszférakutatási program) keretében intervallumsebesség meghatározást végeztünk a Vancouver-szigeti 1-es számú szeizmikus vonal középső szakaszán. Elsődleges célunk a feltételezett "nagysebességű összlet" minél pontosabb, más módszerektől független megismerése volt, mely a szubdukciós zóna modelljének legérdekesebb, legvitatottabb része.

A feladatmegoldás lényege, hogy nagypontosságú szeizmikus sebességanalízisek sorozatát készítettük el a vonal mentén a vertikális stackinghez hasonlóan számos (a szokásosnál jóval több) szomszédos CDP csatorna csoport bevonásával, figyelembe véve az időszelvényen is látható horizontok görbületét és dőlését. Az intervallumsebesség becslést dőlt és görbült réteghatárokat tartalmazó kétdimenziós modell alapján végeztük.

Az intervallumsebesség számítása mellett a becslések megbízhatóságának (szórásának) meghatározását is elvégeztük. Az egyes csatornákon mért beérkezési idők hibáinak (a számított maradék statikus tolások geofonponti és robbantóponti komponensre nem bontható részének) szórásából, a hibaterjedési törvény alapján számítottuk a becsült intervallumsebességek szórását. Az elméleti modell alapján a viszonylag kis moveout-ok ellenére is megfelelő pontosság volt elérhető 100-150 szomszédos CDP figyelembe vétele esetén. Eredményeink nem támasztották alá a "nagysebességű összlet" létezését.

Az adatfeldolgozással párhuzamosan elvégzett modellezés világosan mutatta a kiértékelés pontosságának és az oldalirányú felbontás elvi határait.

# ОПРЕДЕЛНИЕ ПОИНТЕРВАЛБНЫХ СКОРОСТЕЙ НА О-ВЕ ВАНКУВЕР, ПРОЕКТ ЛИТОПРОБ

Иштван КЕШМАРКИ, Золтан ХАЙНАЛ

В рамках проекта ЛИТОПРОБ (канадская междисциплинарная программа по исследованию литосферы) были выполнены определения поинтервальных скоростей на среднем отрезке сесймического профиля 1 на о-ве Ванкувер. Первичная цель заключалась в как можно более точном, не зависимом от других методов, изучении предполагаемой "толщи высоких скоростей", представляющей наиболее интересную и наиболее спорную часть модели зоны субдукции.

Сущность решения задачи заключалась в том, что была выполнена серия высокоточных анализов сейсмических скоростей вдоль профиля, подобно стэкингу, с объединением многочисленных (намного больше обычного) соседних трасс CDP, учитывая кривизну и наклон горизонтов, наблюдаемых на временных разрезах. Оценка поинтервальных скоростей была проведена на основании двумерной модели с наклонными и искривленными горизонтами.

Помимо расчета поинтервальных скоростей была также выполнена оценка надежности (дисперсии) полученных данных. По разбросу ошибок вступлений по конкретным трассам (той части расчетных остаточных статических смещений, которые не могут быть разложены на компоненты при взрывпункте и сейсмоприемнике) на основании закона распространения ошибок были определены дисперсии полученных поинтервальных скоростей. На основании теоретической модели, несмотря на сравнительно малые значения moveout -ов при объединении 100-150 соседних CDP можно было достичь надлежащей точности. Полученными нами результатами не подтверждаетсь наличие "толщи высоких скоростей".

При моделировании, выполненном одновременно с обработкой данных, четко были выявлены принципиальные пределы точности интерпретации и латеральной разрешающей способности.