ARCHER 3D

3D Time Reprocessing report

Carried out by: **Compagnie Générale de Géophysique**

For: ***BHP PETROLEUM PTY. LTD***

Area: ***VIC/P45***

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CAUTION

This data/map does not use GDA94 – coordinates shown may be more than 200 metres different to those now commonly in use

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1 Introduction

1.1 Scope of report

This report describes the 3D time reprocessing of seismic data by COMPAGNIE GENERALE DE GEOPHYSIQUE (CGG) for the period between May 24th 2001 and February 28th 2002.

The processing agreement is referenced by CGG project number 501P1BO.

The input data for this project was Vintage GF88B-3D.

1.2 Layout of report

The report is divided into sections detailing data acquisition, data processing, conclusions and annexes.

1.3 Processing Logistics

Processing was carried out at CGG's data processing centres in PERTH (AUSTRALIA). Project management, velocity analysis and parameter testing was co-ordinated from PERTH. All client interactions were performed in PERTH.

Processing was carried out according to a sequence framework provided by BHP Petroleum PTY LTD. The BHP Petroleum PTY LTD gave authorisation for all processing steps and parameters used.

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2 Data acquisition

- The following text is a summary of information provided from the data acquisition report. The seismic data were acquitted with the following parameters:

Survey	:	GF88B-3D
Location	:	Vic/P45, Offshore Gippsland Basin, Victoria
Survey carried out by	:	
Vessel	:	
Date	:	
Number of traces per shotpoint	:	240
Stacking fold	:	60 (acquisition)
Type of operation	:	Single vessel operation
Type of energy source	:	Airguns
Shotpoint interval	:	25 meters
Volume source	:	2180 cubic inches
Air pressure	:	1800 psi
Sources depth	:	6 meters
Cable length	:	3000 meters
Number of groups	:	240
Group interval	:	12.5 meters
Cable depth	:	10 meters
Centre of energy source to centre of near group	:	103 meters
Type Instruments	:	FCS III
Tape format	:	SEG-D, 9-track
Filters:		
▪ Low cut	:	8 Hz, 18 dB/Oct
▪ High cut	:	180 Hz, 72 dB/Oct
Record length	:	6.0 seconds
Sample interval	:	2 milliseconds
Gun delay	:	-51.2 milliseconds
Primary positioning system	:	
Secondary positioning system	:	

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3 Processing sequences

- The 3D seismic data were processed with the following parameters:

Processing length	: 6.0 seconds
Processing sample rate	: 4 milliseconds
Nominal stacking fold	: 60
Datum plane	: Mean sea level

3.1 Final 3D Time Reprocessing sequence - flow chart

- **1. Pre -stack processing**
  - Transcription from SEGD to CGG format.
  - Trace labelling and Geometry updating
  - Anti Alias Filter using Butterworth Filter
  - Resample 2ms to 4ms
  - Remove Gun delay
  - Amplitude Recovery
  - Automatic Trace Editing: Statistical trace editing of noisy and bad traces
  - Normal move out using regional BHP Velocities filed
  - Shot domain FK velocity filtering
  - Trace Adjacent Summation
  - Remove Normal move out
  - 1st Velocity Analysis every 1 Km grid

- **2. Intermediate Pre-stack processing**
  - Normal move out using 1st velocity field
  - Trace interpolation in CDP domain
  - Remove Normal move out
  - Normal move out using selected percentage of 1st velocity field
  - Radon multiple Attenuation
  - Original trace selection from interpolated traces
  - Remove Normal move out
  - Shot Average Wavelet Shaping Decon with removable 1000 ms AGC
  - Amplitude Vs Offset correction
  - Harmonize fold coverage and missing trace
  - Crossline interpolation

- **3. Migration**
  - Kirchhoff PSTM:
    - PSTM velocity Analysis 1Km grid
    - Full PSTM
  - High Density Velocity Analysis 25m grid

- **4. Stack**
  - Offset Square root Scaling

- Inner and Outer Trace Mute
- Stack (Full, Near and Far)
- Gun and Cable statics correction
- Amplitude Adjustment
- Zero phasing to mach Archer 3D well

♦ **5. Post Processing**
- Spectral Balancing using BHP methodology

3.2 Pre-stack processing

3.2.1 Reformatting and Navigation Merge

The first step was to transfer the data into CGG's internal format, labeling and editing being carried out according to field documents (observer logs), and updating the processing data base.

The CGG header derived from SEG-D seismic data external header information such file numbering, the range of traces, the date and time. Base on the external header information, a seismic data and navigation data is merged together to produce subline numbering, the theoretical offset and trace coordinates (assuming a zero drift of the cables).

The following QCs were carried out:

- Control of parity errors on records causing a loss of trace.
- Control of the continuity of shotpoint numbering and geophone numbering.
- Identification of spike.
- Control of the amplitude of the swell noise for each trace of four shots for each sailed line.

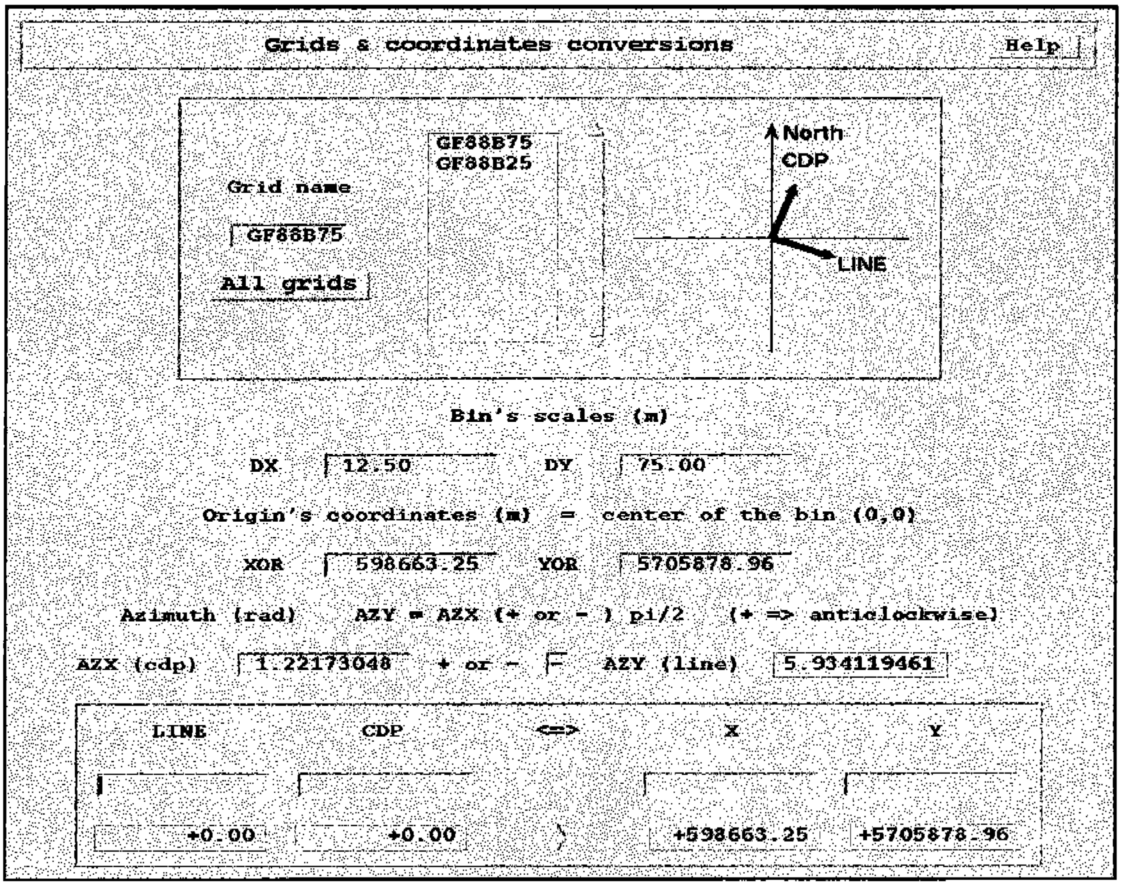

Figure 1. Grid and Coordinates Conversion Diagrams

3.2.2 Amplitude Recovery

The loss of amplitude as a function of time is a result of several factors such as geometrical spreading of the wave front, absorption of the signal and conversion into S-waves.

Compensation is necessary to see the deeper data and to balance the primaries relatively to the multiples.

The gain recovery were done as a function of TxV^2 and as a function of T only, where V is a regional velocity function.

3.2.3 Statistical data editing

A Various statistical measures is used to detect and remove different types of seismic noise. A complete gather is read and divided into small window. For each window from each trace various statistics are computed to detect if noise is present. The statistics for each window are compared with average model statistics computed from nearby traces and nearby windows. Windows whose statistics lie outside the range of the model statistics are edited, by either scaling or by interpolation across anomalous samples.

3.2.4 FK Velocity Filtering

F-K Velocity Filter tests were performed on common shot gathers NMO corrected using BHP velocity supplied. First, the data is transform into FK domain, and then the tests were performs by selected velocities of dipping noise. The results are verified on shot gather and stack displays.

The Selected parameter are: Band Pass mode, Starting time for filter calculation is water bottom reference, Taper is 400ms, attenuation parameter is 30dB, Zone velocity preserve is –3000 to 3000m/s, Zone Tapering is -200000m/s to -3000m/s and 3000m/s to 200000m/s.

3.2.5 Trace Adjacent Summation

Although not tested a method of increasing signal to noise ratio before stack is adjacent trace summation and was included as part of the pre-stack sequence

3.2.6 1st Velocity Analysis

1st Pass Velocity Analysis (V1): BHP provided reference function for 1st pass velocity analysis. The 1st pass velocities analysis were output in a grid of 1000m x 1000m and were picked using CGG's interactive velocity picking package, VELCOM. Velocity picking was done by CGG and quality controlled by BHP representative. The CDP-gathers, and stack sections corrected with the reference velocity function were displayed on paper plots

3.2.7 F-X Trace Interpolation

To sufficient model the multiples in the Radon transform it is required sufficient traces with regular offset sampling. Interpolation was carried out by the FXINT module. The program performing regular interpolation in the F-X domain (Frequency-X spatial). This interpolation generates a fixed number of traces between two consecutive input traces that are regularly distributed within the interval.
Input traces are CDP sorted with trace interval 50m. The implementation of F-X interpolation will provide traces with interval 25m and consequently double the fold.

3.2.8 Radon Multiple Attenuation

Multiple attenuation based on a velocities were performed using the CGG module MATRD. The tests were performed on 2D data. The QC is produced on both 2D-3D CMP gather and Stack displays. Input data are interpolated trace and NMO-corrected using selected percentages from 1st velocity field. A gather is modelled by a number of parabolas (including constant-time arrivals) with different weights plus the linear noise. The computation is based on data decomposition into user-defined parabolas. This computation is performed using least-square method in the frequency-space domain (f-x) for each frequency of the pass band defined. This consist in carrying out stacks according to the various parabolas (CCS - Constant Curvature Stack), then a spatial deconvolution of the obtained spectrum (DCCS - Deconvolved CCS). Events corresponding to parabolas with a curvature bigger than a given threshold (DTCUT) are considered as multiples. Events corresponding to parabolas smaller than this threshold is considered as primary events. The difference between data and the sum of primary and multiple events is considered as linear noise. The module subtracts from the input gather, the model of multiples or the model of multiples plus the linear noise. Specific parameter test is performed on Interleaved (Number of consecutive unit gather to built a pseudo-gather) and on overlapping consecutive elementary gathers building the pseudo-gather.

The parameter chosen was:
Application start time is 1.1 of Water Bottom Reference with length of tapering is 200 ms, Transform Range are DTMIN: –192ms to DTMAX: 2496ms with Parabola step (DDT) 16ms, Primary Model are DTMIN: –160ms to DTCUT: 112ms and time start are 300ms to 5000ms. Interleave 2, overlap 1

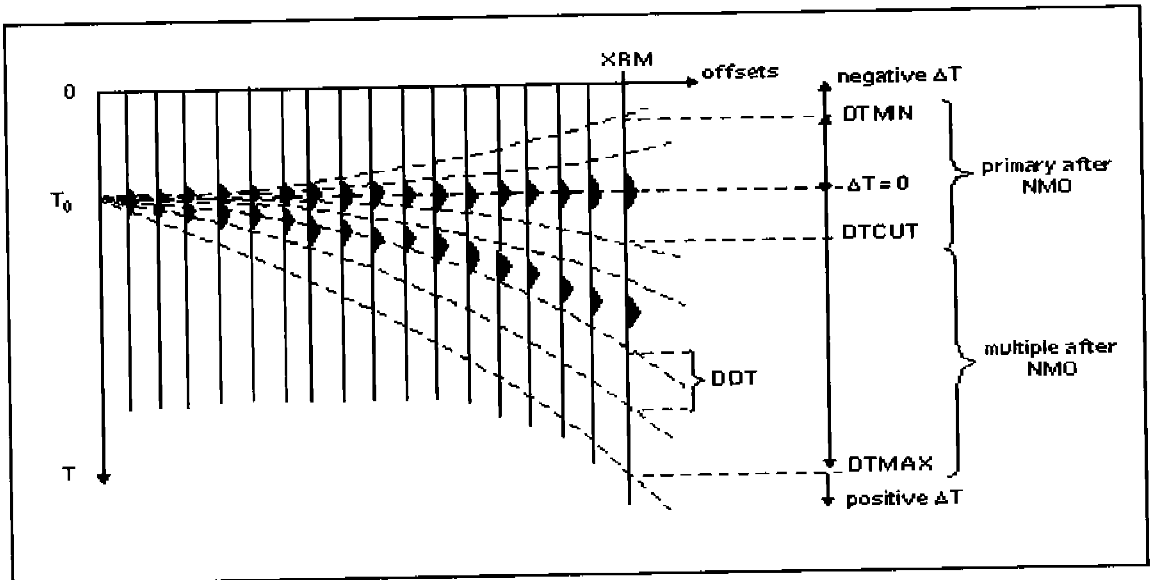

Figure 2. Hiperbolic Demultiple Diagrams

3.2.9 Shot Average Wavelet Shaping Decon

Shot Average Wavelet Shaping Decon is performed using CGG module DECBL. The program estimates the signal wavelet which is assumed to be minimum phase.

The module performs the following operations:
1) Multichannel spectral estimation: The windows are taken into account on single traces and computation average energy spectrum relative to these windows. The wavelet phase is calculated by a Hilbert transform of the amplitude spectrum logarithm. The windows selection is 300 MS to -3500 MS
2) Wavelet calculation: The phase spectrum was calculates by a Hilbert transform of the amplitude spectrum logarithm. The wavelet in the time domain is calculated by a reverse Fourier
3) Deconvolution operator calculation: A first operator is calculated to de-convolve the wavelet truncated to width estimate wavelet. A filter with a width given in data is calculated to reduce the noise amplified by the previous operator. This filter is merely the residual wavelet after deconvolution. The deconvolution operator applied to traces is the result of the convolution of the whitening operator and filter. The operator Length is defined 240 ms, and the number traces is used for operator calculation is 120

The Shot Average Wavelet Shaping Decon is associated with removable 1000 ms AGC.

3.2.10 Amplitude vs Offset Correction

Spatial amplitude variations caused by geology will most often consist of a low frequency component. However, it is often seen that this low frequency curve has a superimposed high frequency component. These frequencies may be due to several factors or combinations of these: acquisition footprints, special geological features above the time window where the amplitude is measured, etc. To correct for high frequency amplitude variations, a surface consistent amplitude correction is applied. It consists of an offset terms correcting for amplitude decay with increasing offsets. Surface consistent amplitude vs Offset correction is performed using CGG module AMPOF. This program is part of the processing sequence in 3D preserved amplitudes to compute the average curve of amplitude versus offset. The average amplitude of each input trace is computed by averaging the absolute values within a user-defined window.

3.2.11 Missing Trace Restoration

Missing trace restoration (MISTR) on a 3D regular grid were generated for the bin fold coverage regularisation. Missing trace restoration is recommended due to the fold coverage over the survey area is inherent cause of the acquisition. The MISTR approach will generate accurate seismic traces and headers by:

- Creation of missing traces in a 3D block
- Determination of a prediction operator from existing traces
- Calculation of missing traces from the existing traces and the prediction operator Amplitude adaptation

The regularisation of fold by interpolation prior to PSTM creates better amplitude preservation through the PSTM processing. Accurate source and receiver trace header words enable a more accurate Kirchhoff migration

3.2.12 Crossline F-X Trace Interpolation.

Crossline F-X trace interpolation was carried out by FXINT module. The program performing regular interpolation in the F-X domain (Frequency-X spatial). This interpolation generates a fixed number of traces between two consecutive input traces that are regularly distributed within the interval. Input traces are crossline sorted in offset domain. Crossline F-X interpolation will adjust the original bin size 12.5x75 m a square to bin size of 12.5x25 m a square. The data will become high density to improve migration

3.3 Pre-stack Time processing

3.3.1 Kirchhoff Migration

A Kirchhoff time migration for pre-stack 2D and 3D data is performed with a CGG module TIKIM. The Kirchhoff algorithm is a trace-by-trace migration, which treats each output sample as the apex of a diffraction curve. Input samples are summed along the diffraction curve, which is characterized by a locally defined RMS velocity. The reflector image is thus built by constructive interferences.

In TIKIM module, the algorithm dip limitation is set the maximum dip (in degrees) of the data to be preserved and the algorithm aperture is define the maximum spatial extension (in meter) on either side the migration operator of the trace. The dip limitation value is selected 50 degrees and the aperture for the migration in both inline and crossline was defined 4000 meter.

- **PSTM Velocity Analysis.**

TIKIM outputs a migrated image resulting from the stack of all the individual traces generated by the algorithm. For the purpose of velocity analysis, it is also possible to separately compute the images corresponding to different offset classes and different velocity model perturbations. The selected image can be dense or sparse in both CDP and line direction. The two volumes can be defined separately.

The PSTM velocity analysis was performs in a grid 1 Km 3D inline. The output are stacking gather were represent image from percentage of smoothed 1st velocity field was applied. The PSTM velocity analysis was picks using CGG's interactive velocity picking package, MVP. The percentage of the smoothed 1[st] velocity field ranges is 94% to 104%. The best migration image can be picked spatially and temporally, and then stored as a velocity library. The Output of velocity picked is named as PSTM velocity fields.

- **Full PSTM.**

The PSTM velocity fields were used to migrate the full volume of the seismic data set.

3.3.2 High Density Velocity Analysis

Dense Automatic Velocity Analysis (V3): Automatic raw velocity picks were done using the CGG Geovecteur modules **INVEL** on 25-m grid intervals. The INVEL module generates stacking-velocities from non-NMO corrected CDP gathers by a process of automatic velocity analysis and picking. Stacking velocities are generated by a velocity scan at each input CDP gather. The scan is centred on input control velocity field and is within limits set by the user-supplied search constraints. The derived velocities are saved into velocity libraries

3.4 STACK

3.4.1 Offset square Root Scaling

In order to rebalance the data with respect to a observed global amplitude versus offset decay, an offset scaling was derived by linear regression and applied to the data. The correction improved the structural image, and it enables a more direct comparison of near and far stack.

Offset (m)	100	3100
Time (ms)	0 - 6000	0 - 6000
Amplitude Gain Adjustment (dB)	1	5.5

3.4.2 Mutes

The Parameter of Archer 3D Mutes was defined:

Outer Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset	Time	Offset
4	4	290	162	300	786	872	1294	1650	1996	2800	2200	3100
150	4	290	162	300	786	932	1294	1650	1996	2800	2200	3100
350	250	290	360	300	753	950	1300	1700	2000	2550	2350	3100
450	350	290	460	300	753	950	1300	1650	2000	2550	2400	3100
750	650	290	760	300	1300	1550	2000	2550	2420	3100		

Inner Mutes

WT. BTM	Time	Offset	Time	Offset	Time	Offset	
4	1000	10	2000	300	5000	450	1294
150	1000	10	2000	300	5000	450	1294
350	1200	10	2100	300	5000	450	1300
450	1300	10	2200	300	5000	450	1300
750	1450	10	2300	300	5000	450	2000

3.4.3 Stack

- **Full offset Stack 3D volume**:

Full offset Stack 3D volume were performed using CGG module STAPA or (Preserved Amplitude Trace Stack). Input traces are NMO corrected using revised and edited PSTM velocity field and muted using inner and outer trace mute. In STAPA module, to keep stack is preserved, all valid traces are selected, and at a given time of the stack trace, its weighting coefficient is equal with its stack fold. The results are verified on both Subline and crossline displays.

- **Near offset Stack and Far offset Stack 3D volume**:

Near Offset stack and far offset Stack 3D volume were performed using CGG module STAPA with PS option (Partial Stack). The partial stack is generated for times within two percentages of the range lying in the interval between two mute functions. Input traces are NMO corrected using revised and edited PSTM velocity field and muted using inner and outer trace mute.

3.4.4 Residual Exponential Gain correction

Residual exponential gain correction was applied to balance the seismic data. Residual gain correction are defined:

Time (ms)	0	1000	2000	3000	6000
Amplitude Adjustment (dB)	0	3	6	9	9

3.4.5 Zero Phase

The Seismic data was zero-phased to mach with the Archer data well, The Zero phasing filter was derived using CGG module DECMC from seismic data across the Archer well. The program estimates the signal wavelet - assumed to be minimum phase - and calculates a deconvolution operator to convert the wavelet to a zero-phase wavelet. This deconvolution may concern the phase alone or both the amplitude and the phase. The deconvolution operator then is defined as Zero phase filter which is used to zero phase the seismic data set. The Zero phase filter was defined:

Sample Interval (SI): 4 ms
Shift of the operator 1st sample relative to the trace 1st sample: - 250 ms

Sample	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.	Ampl.
1	14	-11	15	-12	16	-14	17	-15	18	-16
11	19	-18	21	-19	22	-20	23	-22	24	-23
21	25	-25	26	-26	28	-27	29	-29	30	-30
31	31	-31	32	-33	33	-34	34	-35	36	-37
41	37	-38	38	-39	39	-41	40	-42	41	-43
51	42	-45	44	-46	45	-48	46	-49	47	-50
61	48	-52	49	-53	50	-55	51	-56	53	-58
71	54	-59	55	-61	56	-62	57	-64	58	-65
81	59	-67	60	-68	61	-70	62	-72	63	-73
91	64	-75	65	-77	66	-78	67	-80	68	-82
101	69	-84	70	-86	71	-87	72	-89	73	-91
111	73	-94	74	-96	75	-98	76	-100	76	-102
121	77	-105	77	-107	78	-110	78	-112	79	-115
131	79	-118	79	-121	79	-124	79	-127	79	-130
141	79	-133	79	-137	79	-141	78	-144	77	-148
151	77	-153	75	-157	74	-162	73	-167	71	-172
161	69	-177	67	-183	64	-189	61	-195	58	-202
171	54	-209	50	-216	46	-224	41	-232	35	-240
181	29	-249	22	-259	15	-270	7	-281	-3	-294
191	-12	-307	-23	-322	-34	-338	-46	-355	-58	-373
201	-71	-395	-83	-419	-97	-445	-124	-537	-195	-575
221	-287	-551	-249	-423	-232	-406	-347	-431	-400	-331
231	-385	-266	-513	-337	-698	-336	-771	-250	-890	-280
241	-1148	-327	-1339	-220	-1474	-125	-1779	-130	-2190	-26
251	-2608	178	-3326	289	-4704	459	-7388	1047	-16232	4365
261	100000	-2668	12493	-1148	6725	-694	4608	-560	3406	-495
271	2742	-314	2376	-192	2011	-190	1715	-98	1599	43
281	1453	36	1211	7	1081	99	1019	129	837	54
291	671	94	655	204	599	198	459	208	439	356
301	479	442	402	481	310	439	257	432	220	425
311	191	419	167	413	144	406	124	398	106	390
321	90	382	74	373	60	364	48	356	36	347

331	25	338	16	329	8	321	0	313	-7	304
341	-12	296	-18	288	-23	280	-27	272	-31	264
351	-35	256	-38	249	-41	242	-43	235	-46	228
361	-48	221	-49	215	-51	208	-52	202	-53	196
371	-54	190	-55	185	-55	179	-56	174	-56	168
381	-56	163	-57	159	-57	154	-57	149	-56	145
391	-56	140	-56	136	-55	132	-55	128	-54	124
401	-54	120	-53	116	-52	113	-52	109	-51	106
411	-50	102	-49	99	-48	96	-47	93	-47	90
421	-46	87	-45	84	-44	81	-43	78	-41	76
431	-40	73	-39	70	-38	68	-37	65	-36	63
441	-35	61	-34	58	-33	56	-31	54	-30	52
451	-29	49	-28	47	-27	45	-26	43	-24	41
461	-23	39	-22	37	-21	35	-20	33	-18	32
471	-17	30	-16	28	-15	26	-14	24	-12	23
481	-11	21	-10	19	-9	18	-8	16	-6	14
491	-5	13	-4	11	-3	10	-2	8	-1	7
501	1	5	2	4	3	2	4	1	5	-1

3.5 POST PROCESSING

3.5.1 Spectral Balancing

In order to improve the resolution in the target, a spectral balancing was performed using BHP supplied filter. The filter were defined:

Filter 1.

Time (ms)	Band Pass Filter
0000 - 0800	04, 11, 19, 28
0804 - 2000	04, 10, 17, 25
2004 - 2800	04, 09, 15, 22
2804 - 3600	04, 08, 13, 19
3604 - 4400	04, 07, 11, 16
4404 - 5000	04, 06, 09, 13
5004 - 5800	04, 05, 07, 10

Filter 2.

Time (ms)	Band Pass Filter
0000 - 0800	11, 19, 28, 38
0804 - 2000	10, 17, 25, 34
2004 - 2800	09, 15, 22, 30
2804 - 3600	08, 13, 19, 26
3604 - 4400	07, 11, 16, 22
4404 - 5000	06, 09, 13, 18
5004 - 5800	05, 07, 10, 14

Filter 3.

Time (ms)	Band Pass Filter
0000 - 0800	19, 28, 38, 49
0804 - 2000	17, 25, 34, 44
2004 - 2800	15, 22, 30, 39
2804 - 3600	13, 19, 26, 34
3604 - 4400	11, 16, 22, 29
4404 - 5000	09, 13, 18, 24
5004 - 5800	07, 10, 14, 19

Filter 4.

Time (ms)	Band Pass Filter
0000 - 0800	28, 38, 49, 61
0804 - 2000	25, 34, 44, 55
2004 - 2800	22, 30, 39, 49
2804 - 3600	19, 26, 34, 43
3604 - 4400	16, 22, 29, 37
4404 - 5000	13, 18, 24, 31
5004 - 5800	10, 14, 19, 25

Filter 5.

Time (ms)	Band Pass Filter
0000 - 0800	38, 49, 61, 74
0804 - 2000	34, 44, 55, 67
2004 - 2800	30, 39, 49, 60
2804 - 3600	26, 34, 43, 53
3604 - 4400	22, 29, 37, 46
4404 - 5000	18, 24, 31, 39
5004 - 5800	14, 19, 25, 32

Filter 6.

Time (ms)	Band Pass Filter
0000 - 0800	49, 61, 74, 88
0804 - 2000	44, 55, 67, 80
2004 - 2800	39, 49, 60, 72
2804 - 3600	34, 43, 53, 64
3604 - 4400	29, 37, 46, 56
4404 - 5000	24, 31, 39, 48
5004 - 5800	19, 25, 32, 40

Filter 7.

Time (ms)	Band Pass Filter
0000 - 0800	61, 74, 88, 103
0804 - 2000	55, 67, 80, 94
2004 - 2800	49, 60, 72, 85
2804 - 3600	43, 53, 64, 76
3604 - 4400	37, 46, 56, 67
4404 - 5000	31, 39, 48, 58
5004 - 5800	25, 32, 40, 49

3.6 Final product

3.6.1 SEG-Y:

- **Raw PSTM Stack**
  - Segy of 3D volume Raw Full Offset Stack (Zero phase)
  - Segy of 3D volume Raw Near Offset Stack (Zero phase)
  - Segy of 3D volume Raw Far Offset Stack (Zero phase)

- **Final PSTM Stack**
  - Segy of 3D volume Full Offset Stack (Spectral balancing)

- **PSTM Gather**

3.6.2 Velocity

- **Conventional Velocity fields**
  - 1st Pass Velocity fields (Western Format)
  - PSTM Velocity fields (Western Format)

- **High Density Velocity fields**
  - PSTM Velocity fields (Western Format)
  - PSDM Velocity fields (Western Format)

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4 Conclusion and Recommendation

4.1 Specifics Problems

Several specific problems were discovered early in the processing such as:
Missing observer reports
Difficulties to identify data vintages and 3D part of 2D lines.
Missing Field File, SP relationship
Not recorded Julian time and day.
Static shifts and parity errors due to 9 track transcription

4.2 Conclusion

Generally the data is acquired as multi 2D data with 75m trace spacing.
The lack of spatial sampling in cross line direction is the main concern for the final data quality.
Interpolation can handle the coherent and dipping energy, but not random noise. Consequently the interpolation from 75m to 25m is questionable. Amplitude and noise problems due to the old acquisition systems in another concern. Navigation is questionable from cross line QC

4.3 Recommendations for further works

AVO analysis could be investigated to take into account lateral velocity variations and complex ray path . Acquire new dataset is recommended

1 Introduction

2 Data acquisition

3 Processing sequence

4 Conclusion

5 Annexes

5 Annexes

5.1 CGG personnel

The following personnel were involved with the processing of the survey:

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5.2 Final Documents and Tapes

5.2.1 PSTM STACK

PROCESSING	Tape Number	Min Line	Max Line	Min CDP	Max CDP
Raw Full Stack PSTM	AR1001	297	500	190	1090
Raw Full Stack PSTM	AR1002	501	747	190	1090
Final Full Stack PSTM	AR1003	297	500	190	1090
Final Full Stack PSTM	AR1004	501	747	190	1090
Raw Near Stack PSTM	AR1005	297	500	190	1090
Raw Near Stack PSTM	AR1006	501	747	190	1090
Raw Far Stack PSTM	AR1009	297	500	190	1090
Raw Far Stack PSTM	AR1010	501	747	190	1090

5.2.2 PSTM GATHERS

PROCESSING	Tape Number	Min Line	Max Line	Min CDP	Max CDP
PSTM Gather	AR501	297	317	190	1090
PSTM Gather	AR502	318	338	190	1090
PSTM Gather	AR503	339	359	190	1090
PSTM Gather	AR504	360	380	190	1090
PSTM Gather	AR505	381	401	190	1090
PSTM Gather	AR506	402	422	190	1090
PSTM Gather	AR507	423	443	190	1090
PSTM Gather	AR508	444	464	190	1090
PSTM Gather	AR509	465	485	190	1090
PSTM Gather	AR510	486	506	190	1090
PSTM Gather	AR511	507	527	190	1090
PSTM Gather	AR512	528	548	190	1090
PSTM Gather	AR513	549	569	190	1090
PSTM Gather	AR514	570	590	190	1090
PSTM Gather	AR515	591	611	190	1090
PSTM Gather	AR516	612	632	190	1090
PSTM Gather	AR517	633	653	190	1090
PSTM Gather	AR518	654	674	190	1090
PSTM Gather	AR519	675	695	190	1090
PSTM Gather	AR520	696	716	190	1090
PSTM Gather	AR521	717	737	190	1090
PSTM Gather	AR522	738	747	190	1090

5.2.3 VELOCITY

PROCESSING	Format	Tape Number
1st Velocity Fields	Western	CD-01
Migration Velocity Fields	Western	CD-01
HD Velocity Fields (PSTM)	Western	CD-01
HD Velocity Fields (PSDM)	Western	CD-01

5.2.4 LINE LIST

Sail Line	First SP	Last SP
line_103	101	501
line_104	101	501
line_105	101	501
line_105A	101	359
line_106	101	501
line_107	101	501
line_108	101	501
line_109	101	501
line_110	101	501
line_111	101	501
line_112	101	501
line_113	101	502
line_114	101	501
line_115	102	501
line_116	101	501
line_117	101	501
line_117B	101	280
line_117C	280	517
line_118	101	503
line_119	101	501
line_120	101	502
line_121	101	500
line_122	470	877
line_122C	102	502
line_122D	161	384
line_123	101	501
line_124	101	502
line_125	101	468
line_125C	141	421
line_126	101	502
line_127	101	501
line_127A	101	503
line_128	101	501
line_129	101	502
line_130	101	501
line_131	101	503
line_132	101	502
line_133	101	502
line_134	101	501
line_135	101	501
line_136	486	893
line_137	101	493
line_138	101	501
line_139	101	504
line_140	101	491
line_141	101	502
line_142	101	501
line_143	291	690
line_143A	101	502
line_143B	101	255
line_144	101	501
line_144A	102	502
line_145	101	501
line_146	102	501
line_147	101	502
line_148	101	501
line_149	101	501
line_150	738	1146
line_150D	252	501

line_151	102	501
line_152	101	504
line_153	101	502
line_154	101	500
line_154A	101	300
line_155	101	502
line_156	101	502
line_157	101	503
line_158	102	505
line_159	101	504
line_160	101	394
line_161	101	501
line_162	101	503
line_163	101	502
line_163B	121	374
line_164	101	501
line_164A	101	503
line_164C	101	315
line_164D	201	502
line_165	101	503
line_166	101	503
line_167	101	503
line_168	102	502
line_169	101	503
line_171	296	704
line_172	101	501
line_173	101	501
line_173A	102	477
line_173B	101	501
line_174	101	502
line_175	101	503
line_176	101	499
line_177	101	501
line_177B	101	501
line_178	101	501
line_179	101	505
line_181	101	503
line_181A	221	506
line_182	101	503
line_183	101	502
line_184	101	509
line_185	101	502
line_186	101	502
line_186B	101	503
line_187	101	501
line_188	101	502
line_189	101	501
line_190	101	503
line_191	101	501
line_192	101	503
line_193	102	502
line_194	101	501
line_194B	101	501
line_195	101	502
line_196	101	501
line_197	101	501
line_197A	101	501
line_198	101	501
line_199	101	502
line_200	101	504
line_200A	101	502
line_201	101	501

line_202	101	501
line_203	101	502
line_204	101	510
line_204A	102	501
line_205	101	501
line_206	194	597
line_206E	141	471
line_207	101	502
line_208	101	502
line_208A	101	481
line_209	101	509
line_210	101	504
line_210A	101	482
line_211	101	503
line_212	101	503
line_213	101	501
line_214	102	509
line_214A	195	198
line_215	102	502
line_216	101	501
line_216A	181	393
line_217	101	501
line_218	101	503
line_219	101	510
line_220	101	504
line_221	101	461
line_222	101	504
line_223	101	506
line_223A	101	503
line_224	101	509
line_225	101	500
line_225A	101	504
line_226	101	507
line_227	101	501
line_228	101	507
line_228A	141	490
line_229	101	509
line_230	101	503
line_231	101	502
line_232	101	505
line_233	101	506
line_234	828	1237
line_234A	955	1154
line_235	101	500
line_235A	101	502
line_236	101	502
line_237	101	502
line_238	101	501
line_238A	102	505
line_239	101	511
line_240	101	502
line_241	101	501
line_241A	341	502
line_242	101	503
line_243	101	501
line_244	101	509
line_244A	101	501
line_245	101	510
line_246	101	509
line_247	101	504
line_247A	151	368
line_248	101	468