Seismic Data Processing Report

Carried out by: **CGG**

For: ***BG- QGC***

Area: ***SURAT BASIN***

Survey: ***BELLEVUE 2012 /PINELANDS 2012/ JEN & ARGYLE 2012 /SPOFFORTH 2012***

Method: ***2D Land Reprocessing***

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C O N T E N T S

Introduction

1.1 Scope of report

This report describes the seismic data processing of 4 2D surveys from the Surat Basin consisting of 42 2D lines which included 14 Bellevue, 10 Pineland, 4 Jen & Argyle lines and 14 Spofforth lines totaling 516 line km. The final datum of all the surveys is 244m above mean sea level.
A list of the lines are given in the appendix.

1.2 Location

The four 2012 2D surveys covered in this report are located in Surat Basin as shown in the figure a.

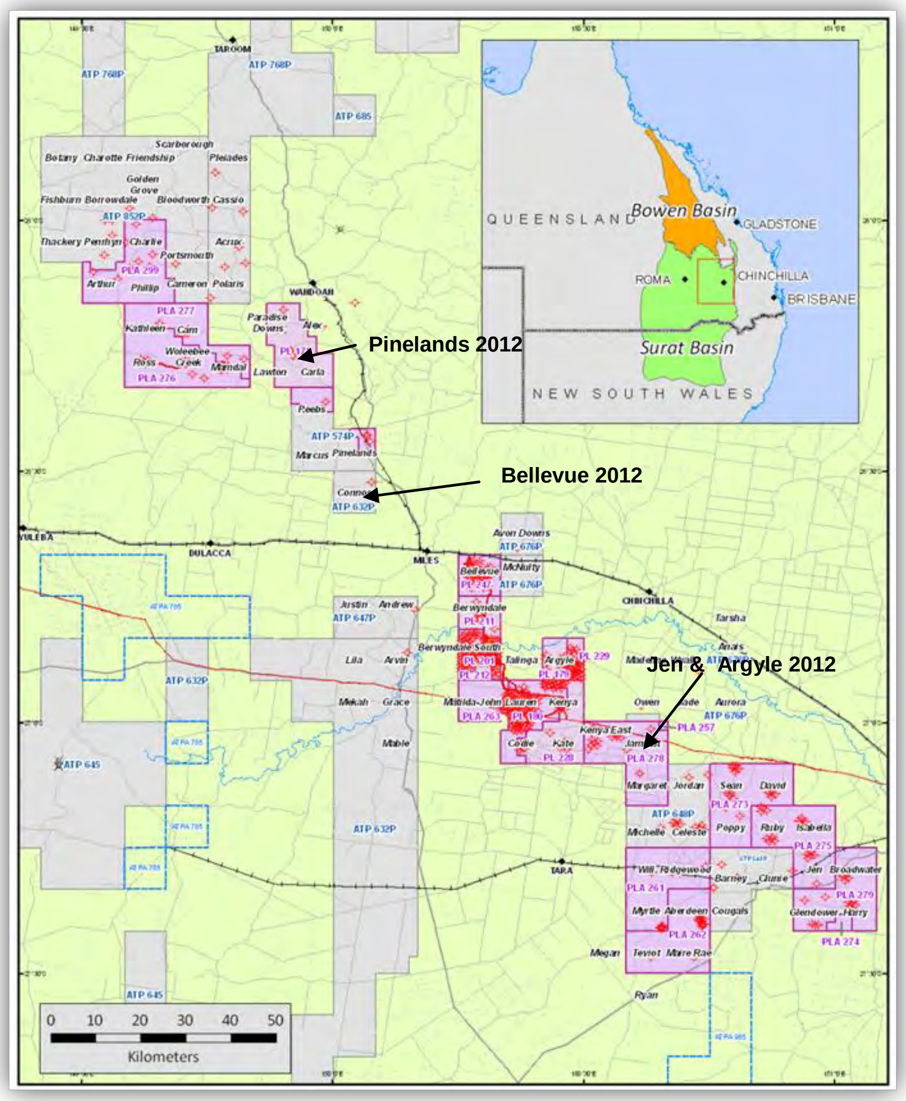

Figure a: Surat Basin

1.3 Scope of work

42 2D lines totaling 516 Line km were processed through a PreSTM sequence. A list of the lines are given in the Appendix 8.

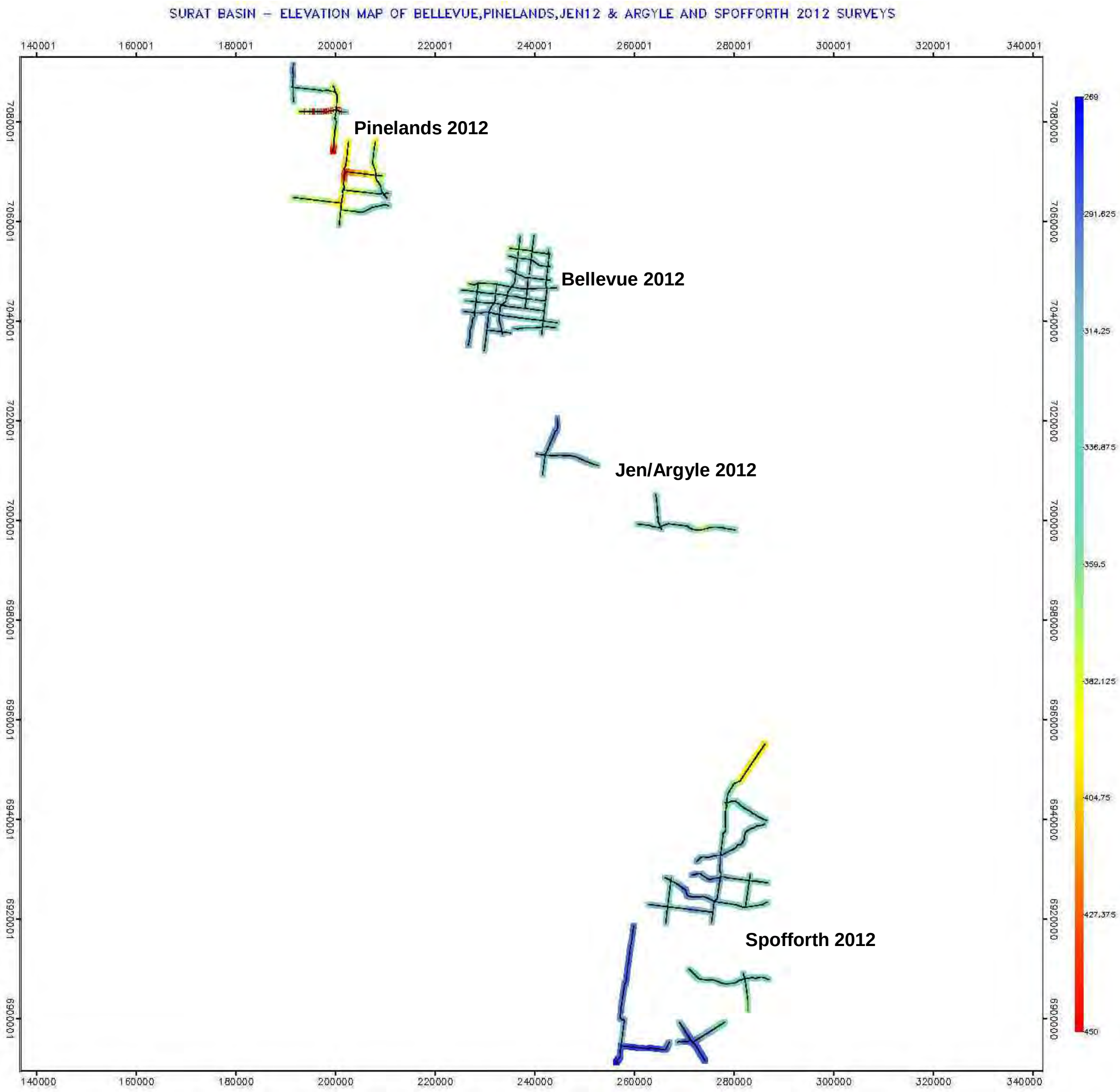

Figure b: Bellevue/Pinelands/Jen12 & Argyle/Spofforth 2D location & elevation map

1.4 Geology

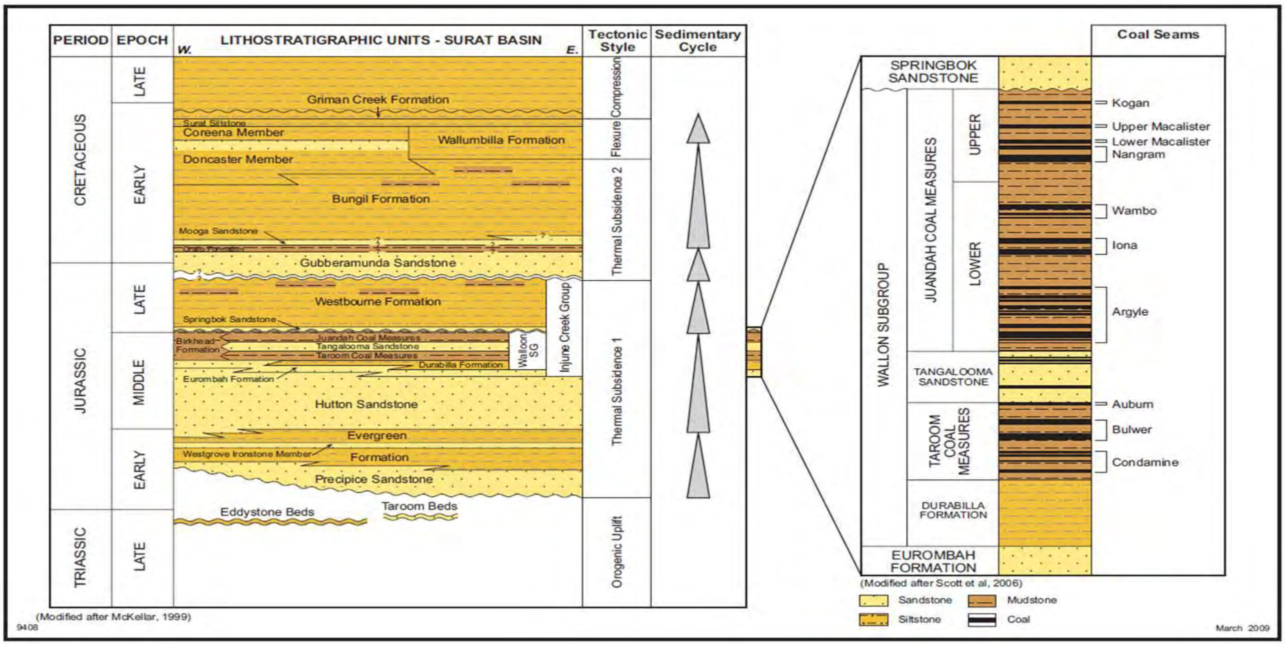

Figure c: showing the stratigarphic succession of Surat basin

1.5 Purpose and objectives of processing

To obtain pre-stack migrated sections of the data with improved imaging of shallow coal objectives.

1.6 Processing logistics

Test results and intermediate products were made available to BG via ftp in Geocluster and Segy format.

1 Data acquisition

2.1 Acquisition parameters

General Parameters	Bellevue & Pinelands 2012 survey
Acquisition contractor	GEOKINETICS
Original client	QGC -BG
Date acquired	October 2012
No. 2D lines	24
Line km	271 Line km
No. channels per shot record	700
Nominal stacking fold	350
Recording array	Asymmetrical Split spread,
Nominal offset range	3000– 1 – x – 1 – 1000 m
Correlated record length	4 secs
Recorded sample interval	2 ms
Source interval	10m
Receiver interval	10m
Bin size	5m
VP and Receiver numbering	Increment 1

Source Parameters	
Source type I	Vibroseis
Vibrator type	Input/Output Inc. AHV-IV (60,400 lb.)
Number of Vibrators	1
Sweep frequency	6-80 Hz
Sweep type	Linear
Sweep length	10 secs
Number of sweeps per VP	1
Front & Back – end tapers	300 msec/ 200msec
Source type 2	OnSeis
Onseis model	Dual OnSeis IHI IC-70, Synchronizer
No of OnSeis Units per vehicle	2
No of OnSeis vehicles per group	2
Pops per SP	2
Source array type	Inline
Inline spacing/Array length	6.8m(between source centers)/ 7.9m
Control Electronics	SGD-SP with Seismic Source TDMA
Receiver Parameters	
Receiver station interval	10m
Type of receivers	IO SM-24 land geophones w/spike, 10 Hz +/- 2 %
Receiver array	1 string of 6 elements wired in series
Instrumentation	
Recorder	Sercel SN428 XL
Filters	Hi cut 200 Hz Low cut out
Data Format	SEG-D, 8058
General Parameters	**Jen & Argyle 2012 survey**
Acquisition contractor	GEOKINETICS
Original client	QGC -BG
Date acquired	October 2012
No. 2D lines	4
Line km	50 Line km
No. channels per shot record	300
Nominal stacking fold	150
Recording array	Split spread,
Nominal offset range	1500– 1 – x – 1 – 1500 m
Correlated record length	4 secs
Recorded sample interval	2 ms
Source interval	10m
Receiver interval	10m
Bin size	5m
VP and Receiver numbering	Increment 1
Source Parameters	
Source type	Vibroseis
Vibrator type	Input/Output Inc. AHV-IV (60,400 lb.)
Number of Vibrators	1
Sweep frequency	6-80 Hz
Sweep type	Linear
Sweep length	10 secs
Number of sweeps per VP	1
Front & Back – end tapers	300 msec/ 200msec
Receiver Parameters	
Receiver station interval	10m

Type of receivers	IO SM-24 land geophones w/spike, 10 Hz +/- 2 %
Receiver array	1 string of 6 elements wired in series
Instrumentation	
Recorder	Sercel SN428 XL
Filters	Hi cut 200 Hz Low cut out
Data format	SEG-D, 8058
General Parameters	**Spofforth 2012 survey**
Acquisition contractor	GEOKINETICS
Original client	QGC -BG
Date acquired	December 2012 – January 2013
No. 2D lines	14
Line km	195 Line km
No. channels per shot record	402
Nominal stacking fold	201
Recording array	Asymmetrical Split spread,
Nominal offset range	2500– 1 – x – 1 – 1000 m
Correlated record length	4 secs
Recorded sample interval	2 ms
Source interval	15m
Receiver interval	15m
Bin size	7.5m
VP and Receiver numbering	Increment 1
Source Parameters	
Source type I	Vibroseis
Vibrator type	Input/Output Inc. AHV-IV (60,400 lb.)
Number of Vibrators	1
Sweep frequency	6-80 Hz
Sweep type	Linear
Sweep length	10 secs
Number of sweeps per VP	1
Front & Back – end tapers	300 msec/ 200msec
Source type 2	OnSeis
Onseis model	Dual OnSeis IHI IC-70, Synchronizer
No of OnSeis Units per vehicle	2
No of OnSeis vehicles per group	2
Pops per SP	2
Source array type	Inline
Inline spacing/Array length	6.8m(between source centers)/ 7.9m
Control Electronics	SGD-SP with Seismic Source TDMA
Receiver Parameters	
Receiver station interval	10m
Type of receivers	IO SM-24 land geophones w/spike, 10 Hz +/- 2 %
Receiver array	1 string of 6 elements wired in series
Instrumentation	
Recorder	Sercel SN428 XL
Filters	Hi cut 200 Hz Low cut out
Data Format	SEG-D, 8058

3 Processing Sequence

3.1 Final processing sequence

1. Pre-STM Processing Sequence - Bellevue 2012

- Reformat
  - Reformat from SEGY into Geocluster format.
  - Navigation merge and trace header update.
  - Geometry QC.
- Pre-processing
  - Crooked line binning.
  - Gain recovery using Spherical Divergence Correction (TV^2 gain curve).
  - Global amplitude scalar corrections per source type.
  - Vibroseis: minimum phase filter (Sweep dependent).
  - Automatic statistical editing of noisy traces (selected notch filter) in shot domain.
  - Automatic statistical editing of noisy traces (SPASM despike) in shot domain.
    → QC stack using elevation statics and field crew velocity
  - First break picking
    → QC Shot point gathers overlay with first break picks
- Denoise
  - Frequency dependent RNA (SPARC despike) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Frequency dependent RNA (SPARC despike) in receiver domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Adaptive groundroll attenuation (AGORA) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Adaptive groundroll attenuation (AGORA) in receiver domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Frequency dependent RNA (FDNAT) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
- Statics
  - Pseudo 3D refraction statics modelling (using GEOSTAR) to 244m datum.
    → QC stack using pseudo 3D refraction statics
  - Statics correction to floating datum plane.
  - Velocity analysis every 1000m using refraction statics –V1 velocity
    → QC stack using refraction statics and V1 vels.
  - Q phase only (Q80 @ 0ms, Q80@ 4000ms)
  - Surface consistent Deconvolution
    (Spike deconvolution, Operator length 200ms, window 200ms -2500ms)
  - Surface consistent residual statics, window 200ms -2500ms.
    → QC stack of residual statics.
- Amplitude adjustment
  - Surface consistent amplitude correction, window 200ms -2500ms (Source, Receiver and offset terms applied)
    → QC stack of SCAC 1st PASS
  - Velocity analysis every 1000m using pseudo 3D refraction statics – V2 velocity

→ QC stack using V2 vels.

- Surface consistent residual statics, window 200m -2500ms.
  → QC stack of residual statics.
- Frequency dependent RNA (SPARC despike) in CDP domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Frequency dependent RNA (SPARC despike) in offset domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Second pass of Surface consistent amplitude correction, window 200ms-2500ms (Only Source and Receiver terms applied)
  → QC stack of SCAC 2ND PASS

♦ Regularization

- 2D regularization (REG2D) and missing trace regularization
  → QC stack of regularization
- Hi resolution radon demultiple, (DTCUT 150ms, application time 700ms)
  → QC stack of radon demultiple

♦ PreSTM Migration

- Migration velocity analysis
  → QC stack with migration velocity
- Kirchhoff migration using smoothed migration velocities,
  (Dip 10^0 @ 0ms, 30^0 @ 400ms, 40^0 @ 2000ms and 50^0 @ 4000ms)
  → QC stack of raw migration
- Residual move out correction (HDPIC)
  → QC stack of residual moveout correction
- Residual demultiple attenuation (DTCUT 200ms, application time 700ms)
  → QC stack of residual demultiple attenuation
- Dip dependence coherency dip filtering
- Q amplitude only (Q100 @ 0ms, Q120@ 1000ms, Q160@ 1500ms,Q800@ 4000ms)
- Pre-stack AGC (Gate 400ms @ Time 0ms – 400ms followed by Gate 1000ms)
- Raw and AGC PSTM stack using inner and final outer XT stacking mute

♦ Post stack

- Post stack random noise attenuation (3 trace filter)
- Post –stack whitening
  (20Hz-72HZ@0ms,20Hz-72HZ@400ms,12Hz-70HZ@700ms,10Hz-50HZ@1200ms, 10Hz-40HZ @1700ms, 8Hz-40HZ @2100ms and 6Hz-30HZ @ 4000ms)
- Post stack time variant filter
  (Butterworth 8,24,72,144 @ time 0ms -4000ms,

2. Pre-STM Processing Sequence - Pinelands 2012

♦ Reformat

- Reformat from SEGY into Geocluster format.
- Navigation merge and trace header update.
- Geometry QC.

♦ Pre-processing

- Crooked line binning.
- Gain recovery using Spherical Divergence Correction (TV^2 gain curve).
- Global amplitude scalar corrections per source type.

- Vibroseis: minimum phase filter (Sweep dependent).
- Automatic statistical editing of noisy traces (selected notch filter) in shot domain.
- Automatic statistical editing of noisy traces (SPASM despike) in shot domain.
  → QC stack using elevation statics and field crew velocity
- First break picking
  → QC Shot point gathers overlay with first break picks

♦ Denoise

- Frequency dependent RNA (SPARC despike) in shot domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Frequency dependent RNA (SPARC despike) in receiver domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Adaptive groundroll attenuation (AGORA) in shot domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Adaptive groundroll attenuation (AGORA) in receiver domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Frequency dependent RNA (FDNAT) in shot domain, 1 pass.
  → QC stack using elevation statics and raw velocity

♦ Statics

- Pseudo 3D refraction statics modelling (using GEOSTAR) to 244m datum.
  → QC stack using pseudo 3D refraction statics
- Statics correction to floating datum plane.
- Velocity analysis every 1000m using refraction statics –V1 velocity
  → QC stack using refraction statics and V1 vels.
- Q phase only (Q80 @ 0ms, Q80@ 4000ms)
- Surface consistent Deconvolution
  (Spike deconvolution, Operator length 200ms, window 200ms -2000ms)
- Surface consistent residual statics, window 200ms -2000ms.
  → QC stack of residual statics.

♦ Amplitude adjustment

- Surface consistent amplitude correction, window 200ms -2000ms (Source, Receiver and offset terms applied)
  → QC stack of SCAC 1st PASS
- Velocity analysis every 1000m using pseudo 3D refraction statics – V2 velocity
  → QC stack using V2 vels.
- Surface consistent residual statics, window 200m -2000ms.
  → QC stack of residual statics.
- Frequency dependent RNA (SPARC despike) in CDP domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Frequency dependent RNA (SPARC despike) in offset domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Second pass of Surface consistent amplitude correction, window 400ms-3400ms (Only Source and Receiver terms applied)
  → QC stack of SCAC 2ND PASS

♦ Regularization

- 2D regularization (REG2D) and missing trace regularization
  → QC stack of regularization
- Hi resolution radon demultiple, (DTCUT 150ms, application time 700ms)

→ QC stack of radon demultiple

- PreSTM Migration
  - Migration velocity analysis
    → QC stack with migration velocity
  - Kirchhoff migration using smoothed migration velocities,
    (Dip 20^0 @ 100ms, 50^0 @ 400ms, 50^0 @ 1000ms and 50^0 @ 4000ms)
    → QC stack of raw migration
  - Residual move out correction (HDPIC)
    → QC stack of residual moveout correction
  - Residual demultiple attenuation (DTCUT 200ms, application time 700ms)
    → QC stack of residual demultiple attenuation
  - Dip dependence coherency dip filtering
  - Q amplitude only (Q100 @ 0ms, Q120@ 1000ms, Q160@ 1500ms,Q800@ 4000ms)
  - Pre-stack AGC (Gate 400ms @ Time 0ms – 400ms followed by Gate 1000ms)
  - Raw and AGC PSTM stack using inner and final outer XT stacking mute
- Post stack
  - Post stack random noise attenuation (3 trace filter)
  - Post –stack whitening
    (15Hz-80HZ @ 0ms, 15Hz-80HZ @ 300ms, 12Hz-80HZ @ 650ms, 12Hz-70HZ @ 800ms,12Hz-40HZ @ 1200ms and 10Hz-30HZ @ 4000ms)
  - Post stack time variant filter
    (Butterworth 15,24,80,144 @ time 0ms -4000ms,
    12,34,80 , 72@ time 500ms-1100ms
    12,24,60 , 48@ time 1200-1700ms.
    8,24,30, 48@ time 1900-T4000)

3. Pre-STM Processing Sequence - Jen & Argyle 2012

- Reformat
  - Reformat from SEGY into Geocluster format.
  - Navigation merge and trace header update.
  - Geometry QC.
- Pre-processing
  - Crooked line binning.
  - Gain recovery using Spherical Divergence Correction (TV^2 gain curve).
  - Global amplitude scalar corrections per source type.
  - Vibroseis: minimum phase filter (Sweep dependent).
  - Automatic statistical editing of noisy traces (selected notch filter) in shot domain.
  - Automatic statistical editing of noisy traces (SPASM despike) in shot domain.
    → QC stack using elevation statics and field crew velocity
  - First break picking
    → QC Shot point gathers overlay with first break picks
- Denoise
  - Frequency dependent RNA (SPARC despike) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Frequency dependent RNA (SPARC despike) in receiver domain, 1 pass.
    → QC stack using elevation statics and raw velocity

- Adaptive groundroll attenuation (AGORA) in shot domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Adaptive groundroll attenuation (AGORA) in receiver domain, 1 pass.
  → QC stack using elevation statics and raw velocity
- Frequency dependent RNA (FDNAT) in shot domain, 1 pass.
  → QC stack using elevation statics and raw velocity

♦ Statics

- Pseudo 3D refraction statics modelling (using GEOSTAR) to 244m datum.
  → QC stack using pseudo 3D refraction statics
- Statics correction to floating datum plane.
- Velocity analysis every 1000m using refraction statics –V1 velocity
  → QC stack using refraction statics and V1 vels.
- Q phase only (Q80 @ 0ms, Q80@ 4000ms)
- Surface consistent Deconvolution
  (Spike deconvolution, Operator length 200ms, window 200ms -2000ms)
- Surface consistent residual statics, window 200ms -2000ms.
  → QC stack of residual statics.

♦ Amplitude adjustment

- Surface consistent amplitude correction, window 200ms -2000ms (Source, Receiver and offset terms applied)
  → QC stack of SCAC 1st PASS
- Velocity analysis every 1000m using pseudo 3D refraction statics – V2 velocity
  → QC stack using V2 vels.
- Surface consistent residual statics, window 200m -2000ms.
  → QC stack of residual statics.
- Frequency dependent RNA (SPARC despike) in CDP domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Frequency dependent RNA (SPARC despike) in offset domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Second pass of Surface consistent amplitude correction, window 200ms-2000ms (Only Source and Receiver terms applied)
  → QC stack of SCAC 2ND PASS

♦ Regularization

- 2D regularization (REG2D) and missing trace regularization
  → QC stack of regularization
- Hi resolution radon demultiple, (DTCUT 150ms, application time 700ms)
  → QC stack of radon demultiple

♦ PreSTM Migration

- Migration velocity analysis
  → QC stack with migration velocity
- Kirchhoff migration using smoothed migration velocities,
  (Dip 20^0 @ 100ms, 50^0 @ 400ms, 50^0 @ 1000ms and 50^0 @ 4000ms)
  → QC stack of raw migration
- Residual move out correction (HDPIC)
  → QC stack of residual moveout correction
- Residual demultiple attenuation (DTCUT 200ms, application time 700ms)
  → QC stack of residual demultiple attenuation
- Dip dependence coherency dip filtering

  - Q amplitude only (Q100 @ 0ms, Q120@ 1000ms, Q160@ 1500ms,Q800@ 4000ms)
  - Pre-stack AGC (Gate 400ms @ Time 0ms – 400ms followed by Gate 1000ms)
  - Raw and AGC PSTM stack using inner and final outer XT stacking mute
- ♦ Post stack
  - Post stack random noise attenuation (3 trace filter)
  - Post –stack whitening
    (20Hz-72HZ @ 0ms, 20Hz-72HZ @ 400ms, 12Hz-70HZ @ 700ms, 10Hz-50HZ @ 1200ms,10Hz-40HZ @ 1700ms,8Hz-40HZ @ 2100ms and 6Hz-30HZ @ 4000ms)
  - Post stack time variant filter
    Butterworth 8,24,70,144 @ time 0ms -4000ms,

4. Pre-STM Processing Sequence - Spofforth 2012

- ♦ Reformat
  - Reformat from SEGY into Geocluster format.
  - Navigation merge and trace header update.
  - Geometry QC.
- ♦ Pre-processing
  - Crooked line binning.
  - Gain recovery using Spherical Divergence Correction (TV^2 gain curve).
  - Global amplitude scalar corrections per source type.
  - Vibroseis: minimum phase filter (Sweep dependent).
  - Automatic statistical editing of noisy traces (selected notch filter) in shot domain.
  - Automatic statistical editing of noisy traces (SPASM despike) in shot domain.
    → QC stack using elevation statics and field crew velocity
  - First break picking
    → QC Shot point gathers overlay with first break picks
- ♦ Denoise
  - Frequency dependent RNA (SPARC despike) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Frequency dependent RNA (SPARC despike) in receiver domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Adaptive groundroll attenuation (AGORA) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Adaptive groundroll attenuation (AGORA) in receiver domain, 1 pass.
    → QC stack using elevation statics and raw velocity
  - Frequency dependent RNA (FDNAT) in shot domain, 1 pass.
    → QC stack using elevation statics and raw velocity
- ♦ Statics
  - Pseudo 3D refraction statics modelling (using GEOSTAR) to 244m datum.
    → QC stack using pseudo 3D refraction statics
  - Statics correction to floating datum plane.
  - Velocity analysis every 1000m using refraction statics –V1 velocity
    → QC stack using refraction statics and V1 vels.
  - Q phase only (Q80 @ 0ms, Q80@ 4000ms)
  - Surface consistent Deconvolution
    (Spike deconvolution, Operator length 200ms, window 200ms -2500ms)

- Surface consistent residual statics, window 350ms -2500ms.
  → QC stack of residual statics.

♦ Amplitude adjustment

- Surface consistent amplitude correction, window 200ms -2500ms (Source, Receiver and offset terms applied)
  → QC stack of SCAC 1st PASS
- Velocity analysis every 1000m using pseudo 3D refraction statics – V2 velocity
  → QC stack using V2 vels.
- Surface consistent residual statics, window 350m -2500ms.
  → QC stack of residual statics.
- Frequency dependent RNA (SPARC despike) in CDP domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Frequency dependent RNA (SPARC despike) in offset domain, 1 pass.
  → QC stack using refraction statics and V2 velocity
- Second pass of Surface consistent amplitude correction, window 200ms-2500ms (Only Source and Receiver terms applied)
  → QC stack of SCAC 2ND PASS

♦ Regularization

- 2D regularization (REG2D) and missing trace regularization
  → QC stack of regularization
- Hi resolution radon demultiple, (DTCUT 150ms, application time 700ms)
  → QC stack of radon demultiple

♦ PreSTM Migration

- Migration velocity analysis
  → QC stack with migration velocity
- Kirchhoff migration using smoothed migration velocities,
  (Dip 10^0 @ 0ms, 30^0 @ 400ms, 40^0 @ 2000ms and 50^0 @ 4000ms)
  → QC stack of raw migration
- Residual move out correction (HDPIC)
  → QC stack of residual moveout correction
- Residual demultiple attenuation (DTCUT 200ms, application time 700ms)
  → QC stack of residual demultiple attenuation
- Dip dependence coherency dip filtering
- Q amplitude only (Q100 @ 0ms, Q120@ 1000ms, Q160@ 1500ms,Q800@ 4000ms)
- Pre-stack AGC (Gate 400ms @ Time 0ms – 400ms followed by Gate 1000ms)
- Raw and AGC PSTM stack using inner and final outer XT stacking mute

♦ Post stack

- Post stack random noise attenuation (3 trace filter)
- Post –stack whitening
  (20Hz-72HZ@0ms, 20Hz-72HZ@400ms, 12Hz-70HZ@700ms, 10Hz-50Hz@1200ms, 10Hz-40Hz@1700ms, 8Hz-40Hz@2100ms, 6Hz-30Hz@4000ms)
  Post stack time variant filter
  (Butterworth 8,24,72,144 @ time 0ms -4000ms,

4 Processing and parameter testing

4.1 Testing strategy

Minimal testing was done for the processing of these four surveys. The processing sequence and parameters were generally similar to that used for previous Surat Basin surveys. The processing parameters for Bellevue, Jen12 & Arygle and Spofforth were similar to that used for Jen10 & Jen11 2D surveys. The parameters for the 2012 Pineland lines followed that used for the 2011 Ross & Pinelands survey.
Parameter verifications were done at some important steps and the lines used for this purpose were BEL12-007, PIN12-006 and SPO12-008 for Bellevue, Pinelands and Spofforth respectively.
Test results were primarily supplied direct to the thinanywhere setup for BG via ftp link. As thinanywhere setup supported Geocluster format, the data was supplied in Geocluster internal format. Powerpoint files containing technical notes were also produced which described the methodology of each test and the test results

4.2 Reformat

4.2.1 Reformat

The Bellevue,Pinelands,Jen12 & Argyle and Spofforth 2012 datasets was acquired by Geokinetics seismic crew 488. CGGVeritas received this dataset in SEGY format and then converted the data from SEGY to internal Geocluster format. Data received was cross-correlated. Processing sample rate was 2ms. Processing record length was 4 secs.

4.2.2 Navigation merge

All the data navigation merge was originally done by the seismic acquisition crew with zone 56 co-ordinates. Perth centre received SEGY data with navigation merge.
The final datum of all the four surveys survey is 244m above mean sea level.

4.2.3 Trace header update and geometry QC

Geometry QC is done on shotpoints by using Linear Moveout plots and plotting the first break times on the shotpoints. Trace headers were updated with the geometry and binning information. Shot to receiver offsets were now true offsets and took into consideration the crooked line geometry and actual shot and receiver locations.

4.2.4 2D Crooked line binning

All the 2D lines were processed as crooked lines. With crooked line processing a mean CMP line is steered through the densest concentration of midpoints. There are controls over the relative contributions of near and far offsets and on the amount of smoothing of the subsurface line. The CMP line is then divided into equally sized 5m bins for Bellevue, Pinelands, Jen12& Argyle and 7.5m bins for Spofforth. Binning results in individual midpoints being assigned to their nearest bins. Midpoints outside the specified maximum lateral distances from the bin centres can be dropped. Maximum lateral offset set for all datasets was 400m.

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4.3 Pre-processing

4.3.1 Gain recovery

The loss of amplitude as a function of time is a result of several factors such as geometrical spreading of the wavefront, absorption of the signal and conversion into S-waves.
Decision – A TV^2 spherical divergence correction was applied to the data.

4.3.2 Global amplitude scalar

A coefficient was calculated for each line separately to bring the average amplitude to the same level for all the lines. The coefficient was calculated by using the entire dataset for each line and normalizing the RMS amplitude values to a specified level for each line. After calculation the scalar was multiplied to each sample of the dataset.

4.3.3 Minimum phase conversion

One of the requirements for Wiener-Levinson deconvolution is for the input data to be minimum phase. To convert our data to minimum phase we must first derive a phase-shift filter that will convert the Klauder wavelet into its minimum phase equivalent. The Klauder wavelet is the autocorrelation of the pilot sweep, the effective source pulse of the vibrator that was sent into the earth. The calculated phase-shift filter is then applied to the seismic data to convert it to minimum phase.
For all four surveys the minimum phase conversion operator was derived from the synthetic sweep calculated by MATCALC using the sweep recording parameters. Minimum phase operator was derived for this synthetic sweep.

4.4 Denoise

4.4.1 De-spiking

Automatic statistical trace editing is carried out to detect and remove spikes, high amplitude noise bursts and noisy traces. Spikes were replaced by interpolated data and noise bursts were scaled down to expected levels or edited based on a threshold value .Module SPASM were tested and used.
SPASM is a despike process removing high amplitude spikes. SPASM were used in the shot point domain. 50hz Notch filter was applied to attenuate the mono frequency noise generated by high voltage cables.
Some details of the testing can be found in the following technical notes:
TESTING\BELLEVUE_PINELANDS12\TN01_Bellevue_2D_Despike_test.ppt

4.4.2 Frequency dependent RNA

CGGVeritas module SPARC was used for this denoise. SPARC is a FX decon that removes impulsive noise that is considered to be random noise. Cascaded SPARC was used in both the shot and receiver domains, with each pass of the cascade targeting a different frequency range and time range.

4.4.3 Adaptive groundroll attenuation (AGORA)

Groundroll was the biggest challenge in the Bellevue & Spofforth datasets which was acquired with Vibroseis and Onseis records. Onseis records had more organized noise content. CGG module AGORA (adaptive ground roll attenuation) was used for the linear noise attenuation.AGORA is a data-driven approach performing a shot by shot adaptive ground roll attenuation in a two dimensional mode even with an irregular offset distribution.
Testing was carried out on lines BEL12-010 & PIN12-013.Additional testing was done on Line BEL12-007 which had OnSeis shots. The elevation static was applied prior to linear noise modeling and subtraction and removed afterwards.
Details of the above denoise testing can be found in the following technical notes:

TESTING\BELLEVUE_PINELANDS12\TN02_Bellevue_2D_LNA_test.ppt
TESTING\BELLEVUE_PINELANDS12\QC01_Bellevue_2D_BEL007_PIN006.ppt
TESTING\BELLEVUE_PINELANDS12\TN02_Bellevue_2D_VibOnsScale_BEL007_Agora_test.ppt

4.5 Statics

4.5.1 Elevation Statics

Brute stacks were created using elevation statics correction only.

4.5.2 First break picking

Automatic First break picking is done using CGG batch module FBPICK in shot point domain.
Automatic first break picks were QCed and edited with CGG interactive application GEOSTAR.
Another interactive application FBPICK was also used for the global QC of the first break picks.
For all the datasets, first breaks were picked for all traces in the shot records but only offsets in the range 400-1000m were used for the modeling and inversion to calculate the refraction statics.

4.5.3 Pseudo 3D Refraction statics modeling

The interactive application GEOSTAR was used for refraction static modeling. It involves both inputs of picked first break times from shot records and an initial near surface model.
GEOSTAR works in the following manner:

1. Define near surface control points at discrete locations. It defines weathering thickness and velocity in the initial model.
2. Build a smooth layered near surface model for the whole survey. This involves
   (a) defining the number of refractors in the model,
   (b) smoothing the weathering thickness and velocity.
3. Compute arrival times that would occur if this earth model was correct.
4. Perform iterative model updates (Layered Model Inversion) to minimize the errors between the actual and modeled arrival times. The computed arrival times from the model are compared to the actual picked times. The model is updated to minimize the error between the two.
5. Statics are then calculated for the optimized model using its velocities and refractor depths. A constant replacement velocity is usually used from base of refractor to processing datum.
6. If using a proper Uphole survey the statics can be calibrated to the Upholes. However on this survey no Uphole survey was acquired and hence no calibration was possible.

It is to be noted that the GEOSTAR software does not update the weathering velocity coming from the initial model, in its iterations, only the weathering depth is updated. If the first break arrivals show an increase in static compared to that predicted by the initial model then the iterated model will show an increase in weathering depth with the weathering velocity being left largely unaltered. The truth may be that the deduced weathering depths are actually shallower and weathering velocities slower than those predicted in the final model. The total static is however correct. It is directly related to the variable of weathering depth divided by weathering velocity.
1000 m/sec velocity was used for the weathering layer velocity. A replacement velocity of 2500m/sec was used to correct from the base of the weathering to a flat datum 244m. The seismic data was stacked using GEOSTAR refraction statics and compared to one using the elevation statics. GEOSTAR outputs two types of statics: the long wavelength component and the short wavelength residual component.
Pseudo 3D refraction statics was calculated using CGG tool GEOSTAR. An integrated 3D solution was obtained for Bellevue 2012 lines with an update of the previous Jen11/Argyle and Rockwood solution. Similarly an updated 3D solution was also obtained for the Pineland 2012 lines integrated with the existing Ross-Woleebee-Conloi-Wandoan model. The 4 lines from the Jen12/Argyle were integrated into the existing Jen11/Argyle model to obtain pseudo 3D statics. An independent solution was obtained for the Spofforth 2D lines and the Merinda re-processed lines. This was to ensure a tied static solution for these 2 surveys.

To calculate the 3D solution all first break picks for all lines were loaded as a pseudo 3D survey in GEOSTAR. Initial model was generated using the intersection point of each line as control points. Offset range 400m-1000m was used to iterate the initial model. Pseudo 3D statics was calculated from the iterated model. Datum plane 244 m and replacement velocity 2500 m/s was used to calculate the 3D statics. Pseudo 3D refraction statics gives better horizon mapping at the intersection points of different lines.

Details of the refraction statics modeling can be found in the following technical notes:
TESTING\BELLEVUE_PINELANDS12\TN03_BELLEVUE_2D_Pseudo3D_RefStatics_prod.ppt
TESTING\BELLEVUE_PINELANDS12\TN03_BELLEVUE_2D_Pseudo3D_RefStatics_pinelands.ppt
TESTING\SPOFFORTH12\TN01_SPOFFORTH_2D_Pseudo3D_RefStatics_prod.ppt

4.5.4 Static correction to Floating Datum Plane

The low frequency (regional) component of the statics was obtained by smoothing the statics. This is the regional Floating Datum Plane. Conventional wisdom is to have the statics smoothed over one cable length and this was done for all four surveys.

The high frequency (residual) component is the difference between the total refraction static and the low frequency component. It was applied at this stage and corrects the data to the Floating Datum Plane which is close to the ground surface. All further pre-stack processing is done using the Floating Datum Plane as t=0 reference.

QC stacks of Geostar refraction statics vs. elevation statics, together with Geostar near-surface model plots, control points and all necessary QC output from GEOSTAR were sent to BG for all lines by transfer to the thinanywhere platform.

4.5.5 Velocity analysis (1st Pass)

Velocity analysis was made every 1km using the pseudo 3D refraction statics. Reference velocities for all lines were provided by the acquisition crew. Each analysis location comprised of 35 CMPs stacked with 15 velocity functions about a central function. Optimum velocity functions were selected from mini-stacks comprised 35 CMPs stacked with the 15 velocity functions, NMO corrected gathers of the central CMP, and a contoured semblance display based on the power of stack.

CGG Interactive tool Pacesetter was used for velocity analysis. The .velcom files, references stacks, stack before and after velocity analysis and picked velocity files for all lines were sent via ftp to thinanywhere for QC.

4.6 Deconvolution

4.6.1 Inverse Q filtering (Phase only)

Inverse Q filtering is used to restore spectral balance in the wavelet and removes the non-stationary phase components from the seismic data that occur due to the effects of absorption and dispersion. Q80 @0ms and Q80@4000 for phase correction was applied before surface consistent deconvolution

4.6.2 Surface consistent deconvolution

Deconvolution is used to remove the filtering effects of the earth. In doing this it compresses the wavelet and increases the resolution of the data. It is also designed to remove reverberations and multiples in the data. In surface consistent deconvolution each trace is expressed as the combination of the convolution of the earth's reflectivity series with four filters characterized respectively by

- The shot point position
- The receiver position
- The CDP or geology
- The shooting distance

The same source filter is used for traces belonging to the same shot point and similarly one receiver filter is used for traces belonging to the same receiver position, etc. As it is generally desirable to retain the effects of the 'geology', we do not apply the CMP filter.
Minimal testing was done and previously applied parameters were used.
Decision: surface consistent deconvolution using Geocluster module DECSC with Spike operator, length 200ms and design window 200ms- 2000ms.
These parameters were used for all four surveys and provided the best results concerning horizon continuity, preservation of dips, frequency content and multiple attenuation.

4.6.3 Surface consistent residual statics (1st Pass)

After first pass velocity picking, residual static corrections are needed as primary refraction statics do not totally compensate for the high frequency effects of near-surface velocity variation. Surface consistent residual reflection statics correct for the high frequency statics component that is usually missing in the primary statics. They do not correct large static anomalies or long wavelength statics.
Automatic residual statics corrections involve two parts:

(a) Picking time values within an analysis window after primary static correction, NMO and mute.
(b) The time picks are then decomposed into the following components: structural terms, residual moveout terms, source location terms, and receiver location terms. Output is a statics file containing individual static shifts associated with each source and receiver location.

Surface consistent residual statics showed improvement in the continuity of the main horizons. Checks were made that they did not degrade the data in any places and that there were no cycle skips.
The time window used for residual statics was 200ms-2500ms.

4.7 Amplitude adjustment

4.7.1 Surface consistent amplitude correction 1st pass

Surface consistent gain corrections correct for high frequency spatial variations in trace amplitude that are due to surface coupling (both vibrator and geophone coupling) and to varying near-surface ground conditions.
Spatial amplitude variations have two components:

(a) A low frequency regional component caused by geology.
(b) A high frequency component due to variations in source and receiver coupling.

Correction for high frequency amplitude variations involves two phases:

(1) An offset term correcting for regional amplitude decay with increasing offset.
(2) A surface consistent term correcting for the high frequency component.

Surface consistent amplitude correction was computed and applied after surface consistent deconvolution and 1st pass surface consistent residual statics. The regional amplitude vs. offset gain curve obtained for Jen11 was also used for the four lines of Jen12/Argyle and after which amplitude corrections for source and receiver were calculated on each line using time window 200ms -2000ms.
For the other three surveys, the regional amplitude vs. offset curve was calculated using all lines simultaneously for each survey over a time window of 200ms-2500ms, and after that amplitude corrections for source and receiver were calculated on each line using time window 200ms -2500ms

4.7.2 Velocity analysis (2nd Pass)

2nd pass velocity analysis were done every 500m after 1st pass residual statics. Each analysis location comprised of 35 CMPs stacked with 11 velocity functions about a central function. Optimum velocity functions were selected from mini-stacks comprised 35 CMPs stacked with the 11 velocity functions, NMO corrected gathers of the central CMP, and a contoured semblance display based on the power of stack. The .velcom files, references stacks, stack before and after velocity analysis and picked velocity files for all lines were sent via ftp to thinanywhere for QC.

4.7.3 Surface consistent residual statics (2nd Pass)

2nd pass of residual statics was calculated after 2nd pass of velocity analysis. Time window 200ms - 2500ms was used to calculate the residual statics.

4.7.4 Frequency dependent RNA in CDP domain

Random noise attenuation (for noise bursts) was performed in CDP domain where alternate CDP gathers were flipped back-to-back. This allowed denoising of the near and far traces at the edges. 2 pass of SPARC and 1 pass FDNAT modules were used for it and the whole frequency range was targeted for RNA.

4.7.5 Frequency dependent RNA in offset domain

Random noise attenuation (also for noise bursts) was performed in offset domain by sorting the data in offset class. 1 pass of SPARC and 1 pass of FDNAT modules were used for it and the whole frequency range was targeted for RNA.

4.7.6 Surface consistent amplitude correction 2nd pass

2nd pass Surface consistent amplitude correction was applied after CDP and Offset domain denoise. Surface consistent amplitude correction were calculated on each lines using time window 200ms - 2500ms. Only source and receiver amplitude correction terms were applied.

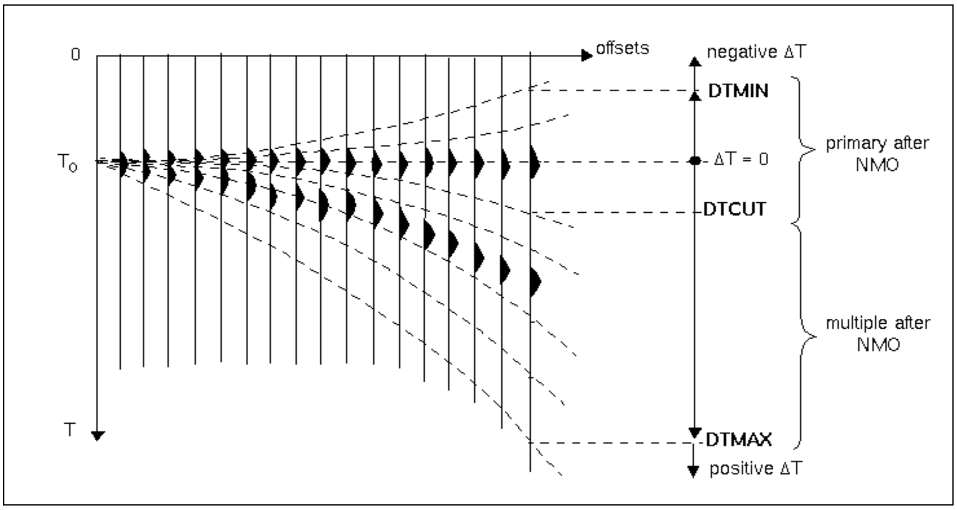
4.8 Regularization

4.8.1 2D regularization and trace interpolation

2D regularization and trace interpolation was done in offset classes. The data for Bellevue & Pinelands was divided in 350 offset classes in the interval of 10m. For Jen12/Argyle it was 150 offset classes in the interval of 10m and for Spofforth it was 201 offsets classes in the interval of 15m. Nominal fold after regularization was 350,150 and 201 for Bellevue/Pinelands, Jen12/Argyle and Spofforth respectively. CGG module REG2D was used for regularization. In REG2D input data are processed in spatial blocks of size NCX and merge into the output flow with taper TAPX. The spatial blocks size i.e. NCX =1000 and TAPX 20 was used for 2D regularization for all surveys.

4.8.2 Radon demultiple

Radon Demultiple typically removes multiples characterized as events with a slower velocity than the primary events. Testing comprises of identifying the ideal difference in move-out between multiples and primaries. The following diagram shows the typical parameters of the HR Radon transform.



The values of DTMIN & DTMAX define the parabolic transform range, and DT the increment between p-traces. Typically, these values are reduced to decrease the runtime of the production while ensuring no quality is lost. However, with technology available today, there is no need to make any compromise, and hence the best of these parameters are used. The DTCUT parameter defines the difference in moveout between multiple and primary once an NMO correction has been applied. For all surveys radon demultiple was applied from time 700ms with a taper of 200ms with DTCUT 150ms with DTMIN -100ms and DTMAX 4000ms.

4.9 Imaging

4.9.1 Migration velocity analysis

Migration velocity analysis was done on migrated gathers after radon demultiple.
For Jen12/Argyle the parameters were similar to Jen11/Argyle. The dips used were 10^0 @ 0ms, 30^0 @ 400ms, 40^0 @ 2000ms and 50^0 @ 4000ms dip and aperture 1500m was used for migration.
For the other three surveys the dips were the same with aperture of 2500m.
Migration velocity analysis was done at the CDP interval of 500m.
Resultant .velcom files and migrated QC stacks along with the picked velocities were forwarded to BG for QC.

4.9.2 Pre-PSTM

Migration velocities for each line were smoothed for Pre-PSTM. Time variant dips of 10^0 @ 0ms, 30^0 @ 400ms, 40^0 @ 2000ms and 50^0 @ 4000ms and aperture 2500m for all surveys except for Jen12/Argyle where the time variant dips were 10^0 @ 200ms, 50^0 @ 400ms, 50^0 @ 1000ms and 50^0 @ 4000ms and aperture 1500m.QC stacks after migration were sent to BG for every line.

4.9.3 Residual velocity analysis

After PSTM production the migration velocity field was removed and velocities were repicked in order to improve the stacking response. This was done by use of high density automatic bispectral velocity picking using the module HDPIC. This was done at an interval of 50m.
In HDPIC two orthogonal attributes are picked rather than the conventional 2^{nd} and 4^{th} order velocities. The attributes picked are the time delay between near and far offsets "dtn" and the intercept of the shifted hyperbola "Tau0". Simple algebra converts these to velocity (Vrms) and anellipticity (Eta) fields. These parameters are uncorrelated and can be subsequently filtered separately.
The pstm velocity field is the reference velocity. This reference velocity field along with user defined maximum and minimum values of velocity and anellipticity, are used to define the 2D picking corridor used by HDPIC. A 40^0 angle mute was applied for the picking.
Output of HDPIC are raw residual Vrms and Eta fields. These are subsequently filtered using geostatistical methods to define a smooth residual Vrms and Eta field and combined with the reference fields to output a new Vrms and Eta field for every CDP.

4.9.4 Radon demultiple

Residual multiple attenuation was done after high density velocity analysis. Radon Demultiple was applied from time 700 ms with a taper of 200ms with DTCUT 200ms.
QC stacks and gathers before and after residual demultiple were sent to BG.

4.9.5 Coherency Dip filter

Dip-dependent median filtering was performed to suppress random noise and increase trace-to-trace coherency as well as the unwanted migration swings. Geocluster module COH3D was used for this after sorting the data into offset planes. It estimates the local 2D dip at every sample point. A median filter is then applied along the dominant picked dip.
Parameters: 11 trace by 400ms search and filtering window.

4.9.6 Inverse Q filtering (Amplitude only)

Inverse Q filtering for amplitude only was applied after dip coherency filter.Q100 @0ms, Q120@1000ms,Q160 @1500ms and Q800 @4000ms was applied. Maximum gain limit specified was 10dB for this process.

4.9.7 Pre-stack automatic gain correction (AGC)

As deliverable one set of raw and final PSTM stacks was created with pre-stack AGC. Pre-stack AGC gates applied were 400ms @ time 0ms -400ms followed by 1000ms @ time 400ms-4000ms.

5.0 Stack

5.0.1 Stacking mute

For Bellevue & Spofforth various outer angle mutes (30^0,35^0,40^0,45^0,50^0) and the existing Jen XT mute were tested and it was decided to apply the XT mute as the outer stacking mute.
The outer XT mute was:

Time (ms)	Offset (m)
16	25
69	74
183	175
255	244
300	305
400	520
600	1020
800	1325
1000	1750
1200	2200
1500	3000

For Pinelands the same angle mutes and the existing Ross XT mute were tested and it was decided to apply the XT mute as the outer stacking mute.
The outer XT mute was:

Time (ms)	Offset (m)
5	15
79	65
148	225
623	965
936	1465
1497	2500
2058	3500
2619	4500

For Jen12/Argyle, the Jen XT mute was used as the outer stacking mute

The following inner mute was applied for all surveys.

Time (ms)	Offset (m)
10	5
100	25
200	60
342	171
508	211
658	251
1146	271
2188	331
4000	471

Details of the angle mute testing can be found in the following technical notes:
TESTING\BELLEVUE_PINELANDS12\TN04_BELLEVUE_2D_Mute_Tests.ppt
TESTING\BELLEVUE_PINELANDS12\TN04_PINELANDS_2D_Mute_Tests.ppt
TESTING\SPOFFORTH12\TN02_SPOFFORTH_2D_Mute_Tests.ppt

5.0.2 Stack

The data was stacked using 1/n stack compensation. Nominal fold was 150 for Jen12/Argyle 2D, 350 for Bellevue & Pinelands 2D and 201 for Spofforth 2D.

5.0.3 Static correction to final datum

Static correction to final datum was made by applying the regional CDP floating datum statics component. The final datum for all datasets is 244m flat datum with a replacement velocity of 2500m/s. To avoid losing data above datum a 200ms time shift was also applied. Output record length was 4200ms.

5.1 Poststack

5.1.1 Random Noise Attenuation

CGG module SPARN (projective filtering in FX domain) was applied for random noise attenuation. Different filters (3 trace, 5 trace and 7 trace) were tested for random noise attenuation. 3 traces filter was applied to attenuate the random noise attenuation poststack.

5.1.2 Post-stack whitening

Post stack Spectral balancing is done with CGG module TVDEF. TVDEF is a spectral balancing program i.e. it applies time variant amplitude deconvolution, equalization and filtering. The processing is performed in the spectral domain on time windows called “equalization window”. For every window, the deconvolved spectrum is equal to the spectrum of the window divided by the mean spectrum. This mean spectrum is equal to the square root of the energy spectrum smoothed by two successive current averages. The time-variant band pass whitening frequencies were:
Bellevue, Spfforth and Jen12/Argyle : whitening frequencies 20hz -72hz @0ms, 20hz -72hz @400ms, 12hz -70hz @700ms, 10hz -50hz @1200ms, 10hz -40hz @1700ms, 8hz -40hz @2100ms and 6hz-30Hz@4200ms
Pinelands : whitening frequencies 15hz -80hz @0ms, 15hz -80hz @300ms, 12hz -80hz @650ms, 12hz -70hz @800ms, 10hz -40hz @1200ms, and 10hz-30Hz@4200ms
Spofforth:

5.1.3 Time variant filter

The following TVF was applied for Bellevue 2012,Jen12/Argyle & Spofforth 2012:
Butterworth filter:
(8,24,72,144) @ 0ms-4200ms

The following TVF was applied for Pinelands 2012 :
Butterworth filter:
(15,24,80,144) @ 0ms-400ms
(12,24,80,72) @ 500ms-1100ms
(12,24,60,48) @ 1200ms-1700ms
(8,24,30,48) @ 1900ms-4200ms

5 Final Products

5.1 Archive SEGY Stacks and Gathers

The following deliverables were archived and sent to BG:

- CDP gathers after Radon demultiple (input to migration)
- CDP gathers after Post PSTM residual radon demultiple.
- Raw PSTM stack.
- Raw PSTM stack with pre-stack AGC.
- Final PSTM stack
- Final PSTM stack with pre-stack AGC
- Migration velocity at floating datum (ASCII,SEGY)
- Migration velocity at final datum (ASCII,SEGY)

6 Conclusions and Recommendation

Processing and testing of the Bellevue &, Pinelands 2012, Jen12/Argyle and Spofforth 2012 2D surveys followed the sequence specified in the processing contract. Good communication and co-operation between BG-QGC and CGG was achieved throughout.

7 Personnel

7.1 CGG Personnel

Project Leader – Munish Dohroo
Ganim Daif – Geophysicist
Team Leader – Raj Pillai

7.2 BG Personnel

Nick Benfield and Andrew Hall from BG QC supervised the processing of the four surveys.

8 Appendix

8.1 Bellevue/Pinelands 2012 2D line list

Bel12 Line	Min VP	Max VP	Min CDP	Max CDP	Line KM
001	1004	1538	2017	3088	5.34
003	1001	1583	2014	3181	5.80
004	1084	2466	2179	4941	13.82
005	1000	1584	2013	3180	5.84
006	1000	3099	2013	6209	20.99
007	1160	2938	2333	5888	17.77
008	1345	2326	2704	4664	9.80
009	1000	2136	2013	4283	11.36
010	999	2706	2012	5423	17.07

011	1071	2679	2154	5368	16.08
013	1032	2295	2077	4601	18.95
115	1002	1474	2016	2960	4.72
215	1000	1564	2013	3139	5.64
Origin Line 25	996	1511	1	1015	12.88
Pin12 Line	**Min VP**	**Max VP**	**Min CDP**	**Max CDP**	**Line KM**
002	1000	1598	2014	3199	8.97
005	1000	1947	100	1969	9.47
006	1001	2363	2013	4738	13.62
007	1000	1753	2012	3518	7.53
009	1000	1648	2013	3307	6.48
010	1001	2722	2013	5454	17.21
013	1000	1999	2013	4009	9.99
018	1001	2216	2014	4417	12.15
021	1001	1508	2013	3027	7.60
119	1001	1971	2013	3953	9.70

8.2 Jen & Argyle/Spofforth 2012 2D line list

Jen12 Line	Min VP	Max VP	Min CDP	Max CDP	Line KM
JEN12-003	1004	1538	2014	6077	20.32
JEN12-015	1001	1583	7832	9137	7.28
Arg12 Line	**Min VP**	**Max VP**	**Min CDP**	**Max CDP**	**Line KM**
ARG12-005	999	2111	2022	4379	11.12
ARG12-008	1945	3061	3809	6132	11.16
Spo12 Line	**Min VP**	**Max VP**	**Min CDP**	**Max CDP**	**Line KM**
SPO12-008	1000	1635	2013	3282	9.53
SPO12-002	1000	2917	2013	5846	28.76
SPO12-003	1000	2134	2013	4280	17.01
SPO12-004	1000	1627	2013	3266	9.41
SPO12-005	1012	2073	2037	4158	15.92
SPO12-006	1000	1626	2013	3264	9.39
SPO12-007	1000	2863	2013	3739	27.95
SPO12-008	1000	3636	2013	7284	39.54
SPO12-009	1000	2167	2013	4346	17.51
SPO12-010	1001	1497	2014	3006	7.44
SPO12-011	1828	2567	2014	3458	11.09
SPO12-013	1007	2519	2020	5050	22.68
SPO12-110	2388	2824	2824	4785	6.54
SPO12-111	1001	1723	2014	3458	10.83

Note that the Line km here is calculated from the distance between the first and last Shot station.

8.3 SEGY header byte positions

SEGY header byte positions of archived stacks

Description	Bytes
Volume marker number	1-4
Sequential trace count within a line	5- 8
CDP number	21-24
Bin fold	31-32
CMP x coordinate	181-184
CMP y coordinate	185-188
Source refraction static correction	99-100
Receiver refraction static correction	101-102
Total statics	103-104
Regional static correction	97-98
Shot elevation	45-48
Receiver elevation	41-44
Elevation scalar	69-70
Shot point number	197-200
Line number	17-20
Weathering Velocity	91-92

8.4 Sample SEGY EBCIDIC Header

8.4.1 SEGY Headers of Raw PSTM stack – Bellevue & Pinelands 2012

```
*******************************************************************************

                COMMENT
{#28#<14
  CLIENT      : QGC       SURVEY :SURAT-BOWEN BELLEVUE 2D PROCESSING
}
{#28#>13
  CLIENT      : QGC       SURVEY :SURAT-BOWEN PINELANDS 2D PROCESSING
}
  COMPANY: CGGVERITAS       DATE   : FEB 2013
  DATA :PSTM RAW STACK
  TRACE LENGTH: 4202 MS
  LINE NUMBER: #1<3#12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
  SPHERIOD:GRS80       PROJECTION:UTM-56    GEODETIC DATUM:GDA94
  FSP:#29# EASTING: #31# NORTHING: #32#
  LSP:#37# EASTING: #33# NORTHING: #34#
  FCDP:#35#  SP ON FCDP:#29#  LCDP:#36#  SP ON LCDP:#37#
  ACQUISITION PARAMETERS:
  FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:#21# ASYMM SPLIT
  FOLD:#20#  SOURCE:VIBROSEIS  SHOT INT:#19#M    RECEIVER INT:#19#M
  SEGY BYTE INFO:
  BYTES 189-192  = LINE NUMBER    BYTES 197-200  = SHOTPOINT NUMBER
  BYTES 021-024  = CMP NUMBER     BYTES 031-032  = STACKING FOLD
  BYTES 181-184  = BIN X          BYTES 185-188  = BIN Y
  BYTES 041-044  = RECEIVER ELEVATION(DM)
  BYTES 045-048  = SHOT ELEVATION(DM) BYTES 099-100  = SRC REF STATIC
  BYTES 101-102  = RCV REF STATIC BYTES 103-104  = TOTAL STATIC
  BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
  STATICS DATUM   = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
  BULK SHIFT = 200ms DOWNSHIFT
  PROCESSING PARAMETERS:
   1.REFORMAT TO CGG FORMAT           2.GEOMETRY MERGE WITH SEISMIC
   3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
   6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
```

7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
12.RESIDUAL STATICS 1 (W 200ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2500MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 17.RADON DEMULTIPLE (DTCUT 150 ms) 19.PSTM VEL ANALYSIS.
20.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
21.HIGH DENSITY VELOCITY ANALYSIS 22. RADON DEMULTIPLE (DTCUT 200ms)
23.TAU-P COHERENCY FILTER 24.INVERSE Q-FILTER (AMPLITUDE ONLY)
25.INNER AND EXTERNAL MUTES APPLICATION & STACK
26.REGIONAL STATIC APPLIED WITH 200MS DOWNSHIFT
ENDCOM
****

8.4.2 SEGY Headers of Final PSTM stack-Bellevue & Pinelands 2012

****
COMMENT
{#28#<14
CLIENT : QGC SURVEY :SURAT-BOWEN BELLEVUE 2D PROCESSING
}
{#28#>13
CLIENT : QGC SURVEY :SURAT-BOWEN PINELANDS 2D PROCESSING
}
COMPANY: CGGVERITAS DATE : FEB 2013
DATA :PSTM FINAL AGC STACK
TRACE LENGTH: 4202 MS
LINE NUMBER: #1<3#12-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
FSP:#29# EASTING: #31# NORTHING: #32#
LSP:#37# EASTING: #33# NORTHING: #34#
FCDP:#35# SP ON FCDP:#29# LCDP:#36# SP ON LCDP:#37#
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:#21# ASYMM SPLIT
FOLD:#20# SOURCE:VIBROSEIS SHOT INT:#19#M RECEIVER INT:#19#M
SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION(DM)
BYTES 045-048 = SHOT ELEVATION(DM) BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
BULK SHIFT = 200ms DOWNSHIFT
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
12.RESIDUAL STATICS 1 (W 200ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2500MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 17.RADON DEMULTIPLE (DTCUT 150 ms) 19.PSTM VEL ANALYSIS.
20.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
21.HIGH DENSITY VELOCITY ANALYSIS 22. RADON DEMULTIPLE (DTCUT 200ms)
23.TAU-P COHERENCY FILTER 24.INVERSE Q-FILTER (AMPLITUDE ONLY)
25.INNER AND EXTERNAL MUTES APPLICATION 26.PRE-STACK SCALING-1000MS & STACK
{#28#<14
27.RANDOM NOISE ATTENUTION 28.SPECTRAL WHITENING 29.BANDPASS FILTER (8-72HZ)
}
{#28#>13

```
  27.RANDOM NOISE ATTENUTION 28.SPECTRAL WHITENING 29.TIME VARIANT FILTER
}
   30.REGIONAL STATIC APPLIED WITH 200MS DOWNSHIFT
  ENDCOM
*********************************************************************************
```

8.4.3 SEGY Headers of CDP gathers (Input to PSTM) –Bellevue & Pinelands 2012

```
*********************************************************************************
                     COMMENT
{#28#<14
  CLIENT      : QGC        SURVEY :SURAT-BOWEN BELLEVUE 2D PROCESSING
}
{#28#>13
  CLIENT      : QGC        SURVEY :SURAT-BOWEN PINELANDS 2D PROCESSING
}
  COMPANY: CGGVERITAS        DATE   : APRIL 2013
  DATA : CDP GATHERS AFTER RADON DEMULTIPLE
  TRACE LENGTH: 4000 MS
  LINE NUMBER: #1<3#12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
  SPHERIOD:GRS80        PROJECTION:UTM-56    GEODETIC DATUM:GDA94
  ACQUISITION PARAMETERS:
  FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:#21# SYMM SPLIT
  FOLD:#20#  SOURCE:VIBROSEIS  SHOT INT:#19#M    RECEIVER INT:#19#M
  SEGY BYTE INFO:
  BYTES 189-192  = LINE NUMBER    BYTES 197-200  = SHOTPOINT NUMBER
  BYTES 021-024  = CMP NUMBER     BYTES 031-032  = STACKING FOLD
  BYTES 181-184  = BIN X          BYTES 185-188  = BIN Y
  BYTES 041-044  = RECEIVER ELEVATION
  BYTES 045-048  = SHOT ELEVATION BYTES 099-100  = SRC REF STATIC
  BYTES 101-102  = RCV REF STATIC BYTES 103-104  = TOTAL STATIC
  BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
  STATICS DATUM   = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
  PROCESSING PARAMETERS:
   1.REFORMAT TO CGG FORMAT           2.GEOMETRY MERGE WITH SEISMIC
   3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
   6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
   7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
   8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
  10.INVERSE Q-FILTER(PHASE ONLY)
  11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
  12.RESIDUAL STATICS 1 (W 200ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
  14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2500MS)
  16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
  18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
  20.OUTPUT CDP GATHERS WITHOUT NMO 21. DATA TO SEGY
  ENDCOM
*********************************************************************************
```

8.4.4 SEGY Headers of PSTM Gathers –Bellevue & Pinelands 2012

```
*********************************************************************************
                    COMMENT
{#28#<14
  CLIENT      : QGC        SURVEY :SURAT-BOWEN BELLEVUE 2D PROCESSING
}
{#28#>13
  CLIENT      : QGC        SURVEY :SURAT-BOWEN PINELANDS 2D PROCESSING
}
  COMPANY: CGGVERITAS        DATE   : APRIL 2013
  DATA : PSTM GATHERS
  TRACE LENGTH: 4000 MS
  LINE NUMBER: #1<3#12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
  SPHERIOD:GRS80        PROJECTION:UTM-56    GEODETIC DATUM:GDA94
  ACQUISITION PARAMETERS:
  FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:#21# SYMM SPLIT
  FOLD:#20#  SOURCE:VIBROSEIS  SHOT INT:#19#M    RECEIVER INT:#19#M
  SEGY BYTE INFO:
```

BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION
BYTES 045-048 = SHOT ELEVATION BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
12.RESIDUAL STATICS 1 (W 200ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2500MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
20.PSTM VEL ANALYSIS.
21.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
22.HIGH DENSITY VELOCITY ANALYSIS 23. RADON DEMULTIPLE (DTCUT 200ms)
24.TAU-P COHERENCY FILTER 25.INVERSE Q-FILTER (AMPLITUDE ONLY)
26.OUTPUT PSTM GATHERS WITH NMO 27. DATA TO SEGY
ENDCOM
****
****

8.4.5 SEGY Headers of Raw PSTM stack – Jen12/Argyle 2012

****
COMMENT
CLIENT : QGC SURVEY :SURAT-BOWEN JEN12 & ARGYLE 2D PROCESSING
COMPANY: CGGVERITAS DATE : FEB 2013
DATA :PSTM RAW STACK
TRACE LENGTH: 4202 MS
LINE NUMBER: #11#-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
FSP:#19# EASTING: #14# NORTHING: #15#
LSP:#20# EASTING: #17# NORTHING: #18#
FCDP:#13# SP ON FCDP:#19# LCDP:#16# SP ON LCDP:#20#
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:6 SECS CHANNELS:300 SYMM SPLIT
FOLD:150 SOURCE:VIBROSEIS SHOT INT:10M RECEIVER INT:10M
SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION(DM)
BYTES 045-048 = SHOT ELEVATION(DM) BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 3000 m/sec,
BULK SHIFT = 200ms DOWNSHIFT
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2000ms)
12.RESIDUAL STATICS 1 (W 200ms-2000ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2000MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms) 20.PSTM VEL ANALYSIS.

21.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
22.HIGH DENSITY VELOCITY ANALYSIS 23. RADON DEMULTIPLE (DTCUT 200ms)
24.TAU-P COHERENCY FILTER 25.INVERSE Q-FILTER (AMPLITUDE ONLY)
26.INNER AND EXTERNAL MUTES APPLICATION & STACK
27.REGIONAL STATIC APPLIED WITH 200MS DOWNSHIFT
ENDCOM
****

8.4.6 SEGY Headers of Final PSTM stack-Jen12/Argyle 2012

****
COMMENT
CLIENT : QGC SURVEY :SURAT-BOWEN JEN12 & ARGYLE 2D PROCESSING
COMPANY: CGGVERITAS DATE : FEB 2013
DATA :PSTM FINAL AGC STACK
TRACE LENGTH: 4202 MS
LINE NUMBER: #11#-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
FSP:#19# EASTING: #14# NORTHING: #15#
LSP:#20# EASTING: #17# NORTHING: #18#
FCDP:#13# SP ON FCDP:#19# LCDP:#16# SP ON LCDP:#20#
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:6 SECS CHANNELS:300 SYMM SPLIT
FOLD:150 SOURCE:VIBROSEIS SHOT INT:10M RECEIVER INT:10M
SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION(DM)
BYTES 045-048 = SHOT ELEVATION(DM) BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 211-212=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 3000 m/sec,
BULK SHIFT = 200ms DOWNSHIFT
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2000ms)
12.RESIDUAL STATICS 1 (W 200ms-2000ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2000MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 17.RADON DEMULTIPLE (DTCUT 150 ms) 19.PSTM VEL ANALYSIS.
20.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
21.HIGH DENSITY VELOCITY ANALYSIS 22. RADON DEMULTIPLE (DTCUT 200ms)
23.TAU-P COHERENCY FILTER 24.INVERSE Q-FILTER (AMPLITUDE ONLY)
25.INNER AND EXTERNAL MUTES APPLICATION
26.PRE-STACK SCALING - 1000MS GATES & STACK 27.RANDOM NOISE ATTENUTION
27.SPECTRAL WHITENING 28.BANDPASS FILTER(8-72HZ)30.RG STATIC(200MS DOWNSHIFT)
ENDCOM
****

8.4.7 SEGY Headers of CDP gathers (Input to PSTM) –Jen12/Argyle 2012

****
COMMENT
CLIENT : QGC SURVEY :SURAT-BOWEN JEN12 & ARGYLE 2D PROCESSING
COMPANY: CGGVERITAS DATE : APRIL 2013
DATA : CDP GATHERS AFTER RADON DEMULTIPLE
TRACE LENGTH: 4000 MS
LINE NUMBER: #11#-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:4 SECS CHANNELS:300 SYMM SPLIT
FOLD:150 SOURCE:VIBROSEIS SHOT INT:10M RECEIVER INT:10M

SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION(DM)
BYTES 045-048 = SHOT ELEVATION(DM) BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2000ms)
12.RESIDUAL STATICS 1 (W 200ms-2000ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2000MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
20.OUTPUT CDP GATHERS WITHOUT NMO 21. DATA TO SEGY
ENDCOM
****

8.4.8 SEGY Headers of PSTM Gathers –Jen12/Argyle 2012

****
COMMENT
CLIENT : QGC SURVEY :SURAT-BOWEN JEN12 & ARGYLE 2D PROCESSING
COMPANY: CGGVERITAS DATE : APRIL 2013
DATA : PSTM GATHERS
TRACE LENGTH: 4000 MS
LINE NUMBER: #11#-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:4 SECS CHANNELS:300 SYMM SPLIT
FOLD:150 SOURCE:VIBROSEIS SHOT INT:10M RECEIVER INT:10M
SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION(DM)
BYTES 045-048 = SHOT ELEVATION(DM) BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2000ms)
12.RESIDUAL STATICS 1 (W 200ms-2000ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 200MS-2000MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
20.PSTM VEL ANALYSIS.
21.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 3000m)
22.HIGH DENSITY VELOCITY ANALYSIS 23. RADON DEMULTIPLE (DTCUT 200ms)
24.TAU-P COHERENCY FILTER 25.INVERSE Q-FILTER (AMPLITUDE ONLY)
26.OUTPUT PSTM GATHERS WITH NMO 27. DATA TO SEGY
ENDCOM
****
****

8.4.9 SEGY Headers of Raw PSTM stack – Spofforth 2012

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*****************************************************************************
                    COMMENT
  CLIENT      : QGC        SURVEY :SURAT-BOWEN SPOFFORTH 2D PROCESSING
  COMPANY: CGGVERITAS       DATE   : MAR 2013
  DATA :PSTM RAW STACK
  TRACE LENGTH: 4202 MS
  LINE NUMBER: SPO12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
  SPHERIOD:GRS80       PROJECTION:UTM-56    GEODETIC DATUM:GDA94
  FSP:#25# EASTING: #27# NORTHING: #28#
  LSP:#26# EASTING: #29# NORTHING: #30#
  FCDP:#31#  SP ON FCDP:#25#  LCDP:#32#  SP ON LCDP:#26#
  ACQUISITION PARAMETERS:
  FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:402 ASYMM SPLIT
  FOLD:201  SOURCE:VIBROSEIS  SHOT INT:#18#M    RECEIVER INT:#18#M
  SEGY BYTE INFO:
  BYTES 189-192  = LINE NUMBER    BYTES 197-200  = SHOTPOINT NUMBER
  BYTES 021-024  = CMP NUMBER     BYTES 031-032  = STACKING FOLD
  BYTES 181-184  = BIN X          BYTES 185-188  = BIN Y
  BYTES 041-044  = RECEIVER ELEVATION(DM)
  BYTES 045-048  = SHOT ELEVATION(DM) BYTES 099-100  = SRC REF STATIC
  BYTES 101-102  = RCV REF STATIC BYTES 103-104  = TOTAL STATIC
  BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
  STATICS DATUM   = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
  BULK SHIFT = 200ms DOWNSHIFT
  PROCESSING PARAMETERS:
   1.REFORMAT TO CGG FORMAT           2.GEOMETRY MERGE WITH SEISMIC
   3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
   6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
   7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
   8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
  10.INVERSE Q-FILTER(PHASE ONLY)
  11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
  12.RESIDUAL STATICS 1 (W 350ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
  14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 350MS-2500MS)
  16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
  18.2D REGULARIZATION 17.RADON DEMULTIPLE (DTCUT 150 ms) 19.PSTM VEL ANALYSIS.
  20.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 2500m)
  21.HIGH DENSITY VELOCITY ANALYSIS 22. RADON DEMULTIPLE (DTCUT 200ms)
  23.TAU-P COHERENCY FILTER 24.INVERSE Q-FILTER (AMPLITUDE ONLY)
  25.INNER AND EXTERNAL MUTES APPLICATION  & STACK
  26.REGIONAL STATIC APPLIED WITH 200MS DOWNSHIFT
  ENDCOM
*****************************************************************************
```

8.4.10 SEGY Headers of Final PSTM stack-Spofforth 2012

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*****************************************************************************
                    COMMENT
  CLIENT      : QGC        SURVEY :SURAT-BOWEN SPOFFORTH 2D PROCESSING
  COMPANY: CGGVERITAS       DATE   : MAR 2013
  DATA :PSTM FINAL AGC STACK
  TRACE LENGTH: 4202 MS
  LINE NUMBER: SPO12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
  SPHERIOD:GRS80       PROJECTION:UTM-56    GEODETIC DATUM:GDA94
  FSP:#25# EASTING: #27# NORTHING: #28#
  LSP:#26# EASTING: #29# NORTHING: #30#
  FCDP:#31#  SP ON FCDP:#25#  LCDP:#32#  SP ON LCDP:#26#
  ACQUISITION PARAMETERS:
  FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:402 ASYMM SPLIT
  FOLD:201  SOURCE:VIBROSEIS  SHOT INT:#18#M    RECEIVER INT:#18#M
  SEGY BYTE INFO:
  BYTES 189-192  = LINE NUMBER    BYTES 197-200  = SHOTPOINT NUMBER
  BYTES 021-024  = CMP NUMBER     BYTES 031-032  = STACKING FOLD
  BYTES 181-184  = BIN X          BYTES 185-188  = BIN Y
  BYTES 041-044  = RECEIVER ELEVATION(DM)
  BYTES 045-048  = SHOT ELEVATION(DM) BYTES 099-100  = SRC REF STATIC
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BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 209-210=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
BULK SHIFT = 200ms DOWNSHIFT
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
12.RESIDUAL STATICS 1 (W 350ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 350MS-2500MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 17.RADON DEMULTIPLE (DTCUT 150 ms) 19.PSTM VEL ANALYSIS.
20.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 2500m)
21.HIGH DENSITY VELOCITY ANALYSIS 22. RADON DEMULTIPLE (DTCUT 200ms)
23.TAU-P COHERENCY FILTER 24.INVERSE Q-FILTER (AMPLITUDE ONLY)
25.INNER AND EXTERNAL MUTES APPLICATION 26.PRE-STACK SCALING-1000MS & STACK
27.RANDOM NOISE ATTENUTION 28.SPECTRAL WHITENING 29.BANDPASS FILTER (8-72HZ)
30.REGIONAL STATIC APPLIED WITH 200MS DOWNSHIFT
ENDCOM
****

8.4.11 SEGY Headers of CDP gathers (Input to PSTM) –Spofforth 2012

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COMMENT
CLIENT : QGC SURVEY :SURAT-BOWEN SPOFFORTH 2D PROCESSING
COMPANY: CGGVERITAS DATE : APRIL 2013
DATA : CDP GATHERS AFTER RADON DEMULTIPLE
TRACE LENGTH: 4000 MS
LINE NUMBER: SPO12-#1>3# SAMPLE RATE : 2 MS FORMAT : SEGY FORMAT 32BIT
SPHERIOD:GRS80 PROJECTION:UTM-56 GEODETIC DATUM:GDA94
ACQUISITION PARAMETERS:
FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:402 ASYMM SPLIT
FOLD:201 SOURCE:VIBROSEIS SHOT INT:#18#M RECEIVER INT:#18#M
SEGY BYTE INFO:
BYTES 189-192 = LINE NUMBER BYTES 197-200 = SHOTPOINT NUMBER
BYTES 021-024 = CMP NUMBER BYTES 031-032 = STACKING FOLD
BYTES 181-184 = BIN X BYTES 185-188 = BIN Y
BYTES 041-044 = RECEIVER ELEVATION
BYTES 045-048 = SHOT ELEVATION BYTES 099-100 = SRC REF STATIC
BYTES 101-102 = RCV REF STATIC BYTES 103-104 = TOTAL STATIC
BYTES 205-206=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
STATICS DATUM = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
PROCESSING PARAMETERS:
1.REFORMAT TO CGG FORMAT 2.GEOMETRY MERGE WITH SEISMIC
3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
10.INVERSE Q-FILTER(PHASE ONLY)
11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
12.RESIDUAL STATICS 1 (W 350ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 350MS-2500MS)
16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
20.OUTPUT CDP GATHERS WITHOUT NMO 21. DATA TO SEGY
ENDCOM
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8.4.12 SEGY Headers of PSTM Gathers –Spofforth 2012

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                 COMMENT
 CLIENT      : QGC        SURVEY :SURAT-BOWEN SPOFFORTH 2D PROCESSING
 COMPANY: CGGVERITAS      DATE   : APRIL 2013
 DATA : PSTM GATHERS
 TRACE LENGTH: 4000 MS
 LINE NUMBER: SPO12-#1>3#  SAMPLE RATE : 2 MS  FORMAT : SEGY FORMAT 32BIT
 SPHERIOD:GRS80       PROJECTION:UTM-56    GEODETIC DATUM:GDA94
 ACQUISITION PARAMETERS:
 FORMAT:SEGY SWEEP FREQ:6-80 HZ SWEEP LENGTH:10 SECS CHANNELS:402 ASYMM SPLIT
 FOLD:201  SOURCE:VIBROSEIS  SHOT INT:#18#M    RECEIVER INT:#18#M
 SEGY BYTE INFO:
 BYTES 189-192  = LINE NUMBER    BYTES 197-200  = SHOTPOINT NUMBER
 BYTES 021-024  = CMP NUMBER     BYTES 031-032  = STACKING FOLD
 BYTES 181-184  = BIN X          BYTES 185-188  = BIN Y
 BYTES 041-044  = RECEIVER ELEVATION
 BYTES 045-048  = SHOT ELEVATION BYTES 099-100  = SRC REF STATIC
 BYTES 101-102  = RCV REF STATIC BYTES 103-104  = TOTAL STATIC
 BYTES 205-206=REGIONAL STATICS (TO SHIFT FROM DATUM TO FDP)
 STATICS DATUM   = 244m, REPLACEMENT VELOCITY = 2500 m/sec,
 PROCESSING PARAMETERS:
  1.REFORMAT TO CGG FORMAT          2.GEOMETRY MERGE WITH SEISMIC
  3.GAIN RECOVERY TV2 4.MINIMUM PHASE FILTER 5.SHOT DOMAIN DESPIKING
  6.STATISTICAL EDITING OF NOISY TRACES IN SHOT & RCV DOMAINS
  7.ADDAPTIVE GROUNDROLL AND LINEAR NOISE ATTENUATION
  8.PSEUDO 3D REFRACTION STATICS (DATUM 244 M) 9.VELOCITY ANALYSIS 1
 10.INVERSE Q-FILTER(PHASE ONLY)
 11.SURFACE CONSISTENT DECON (SPIKE,OP 200ms, W200ms-2500ms)
 12.RESIDUAL STATICS 1 (W 350ms-2500ms) 13. SURFACE CONSISTENT AMPL CORR 1
 14.VELOCITY ANALYSIS 2 15. RESIDUAL STATICS 2(W 350MS-2500MS)
 16.DENOISE CDP AND OFFSET DOMAIN 17. SURFACE CONSISTENT AMPL CORR 2
 18.2D REGULARIZATION 19.RADON DEMULTIPLE (DTCUT 150 ms)
 20.PSTM VEL ANALYSIS
 21.FINAL PSTM (DIP AT 100ms-20 deg.T400-T4000ms-50 deg.HALF APPERTURE 2500m)
 22.HIGH DENSITY VELOCITY ANALYSIS 23. RADON DEMULTIPLE (DTCUT 200ms)
 24.TAU-P COHERENCY FILTER 25.INVERSE Q-FILTER (AMPLITUDE ONLY)
 26.OUTPUT PSTM GATHERS WITH NMO 27. DATA TO SEGY
 ENDCOM
********************************************************************************
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8.5 List of Figures-BELLEVUE 2012

8.6 List of Figures-PINELANDS 2012

8.7 List of Figures-JEN/ARGYLE 2012

8.8 List of Figures-SPOFFORTH 2012

8.9 Sample Line stacks (Pre-STM sequence)- Bellevue 2012

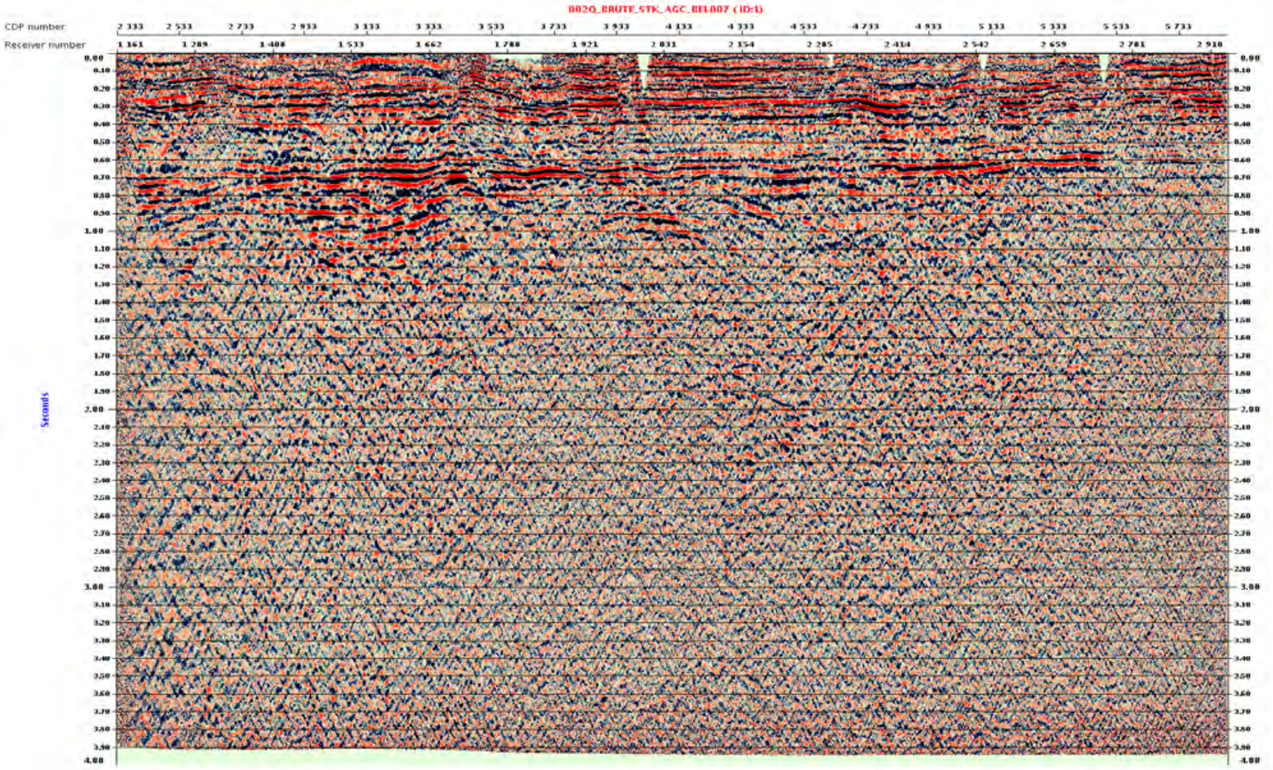

Fig 8.9.01 BEL12-007 Brute stack after geometry merge (pre-stack AGC applied)

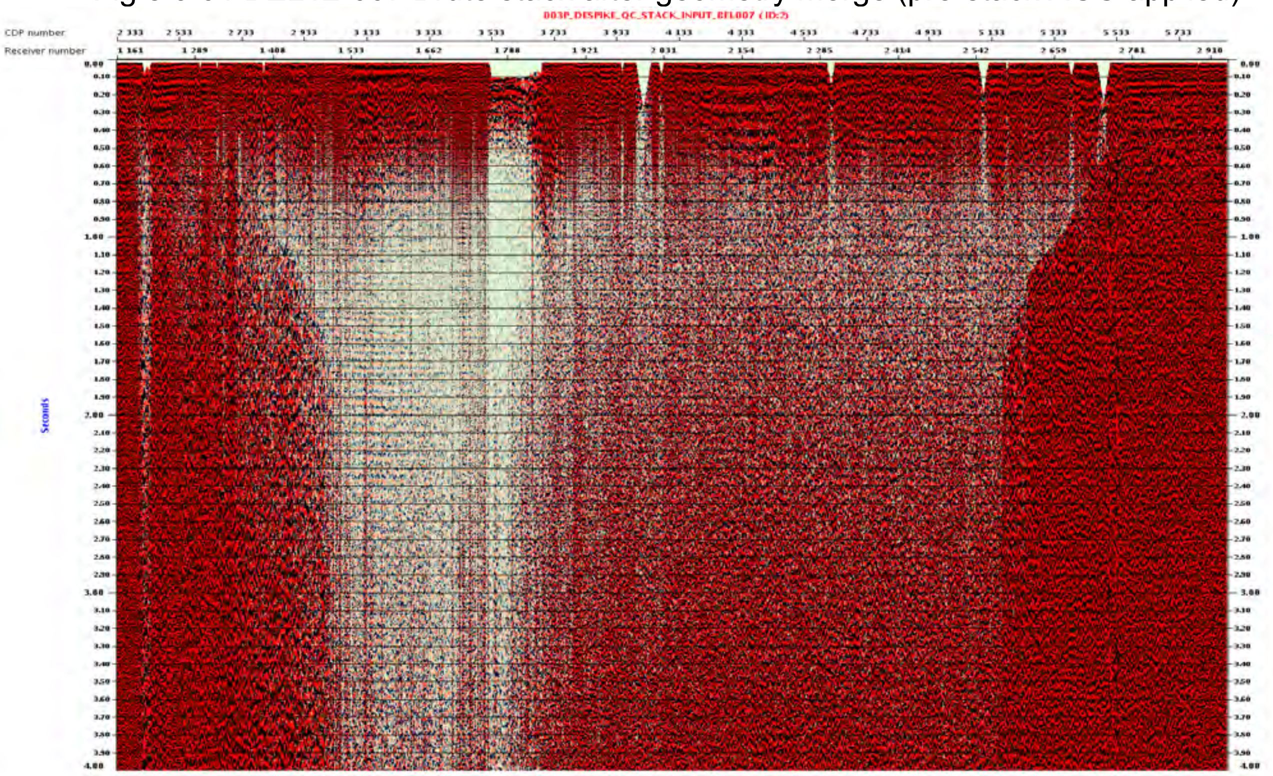

Fig 8.9.02 BEL12-007 stack before first pass of denoise

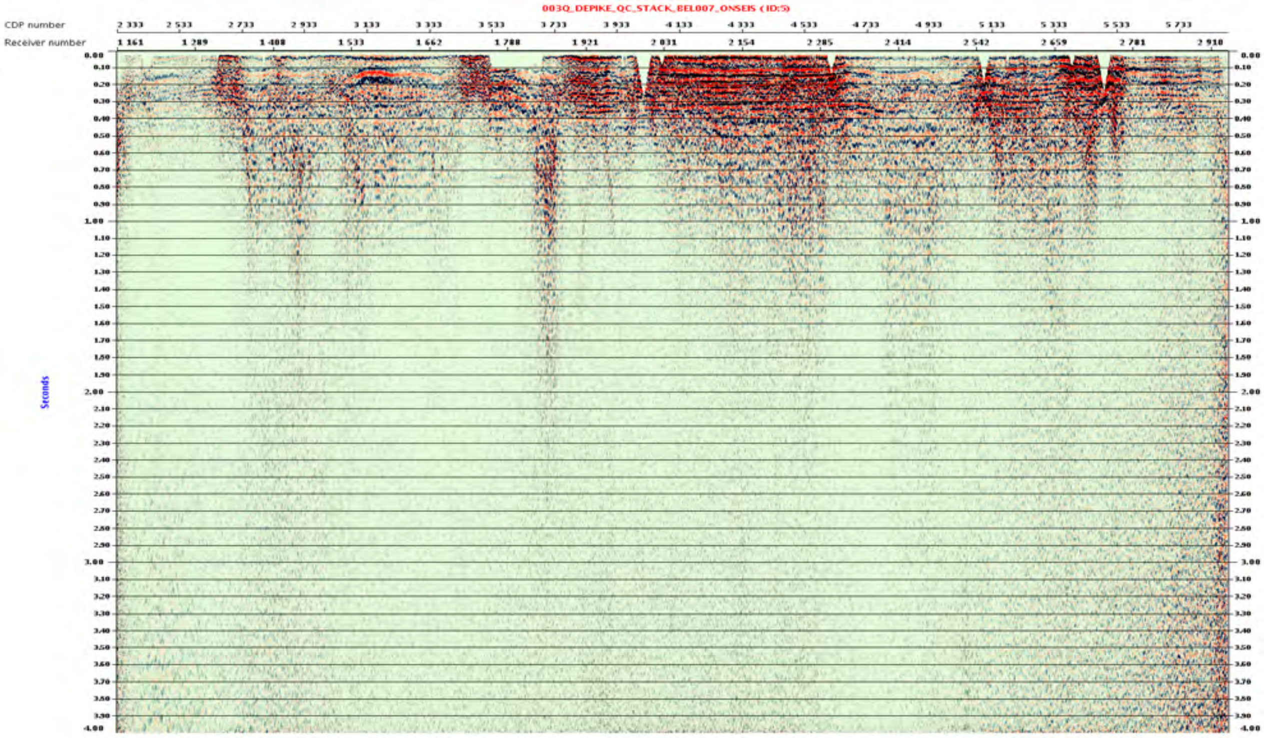

Fig 8.9.03 BEL12-007 stack after first pass of denoise

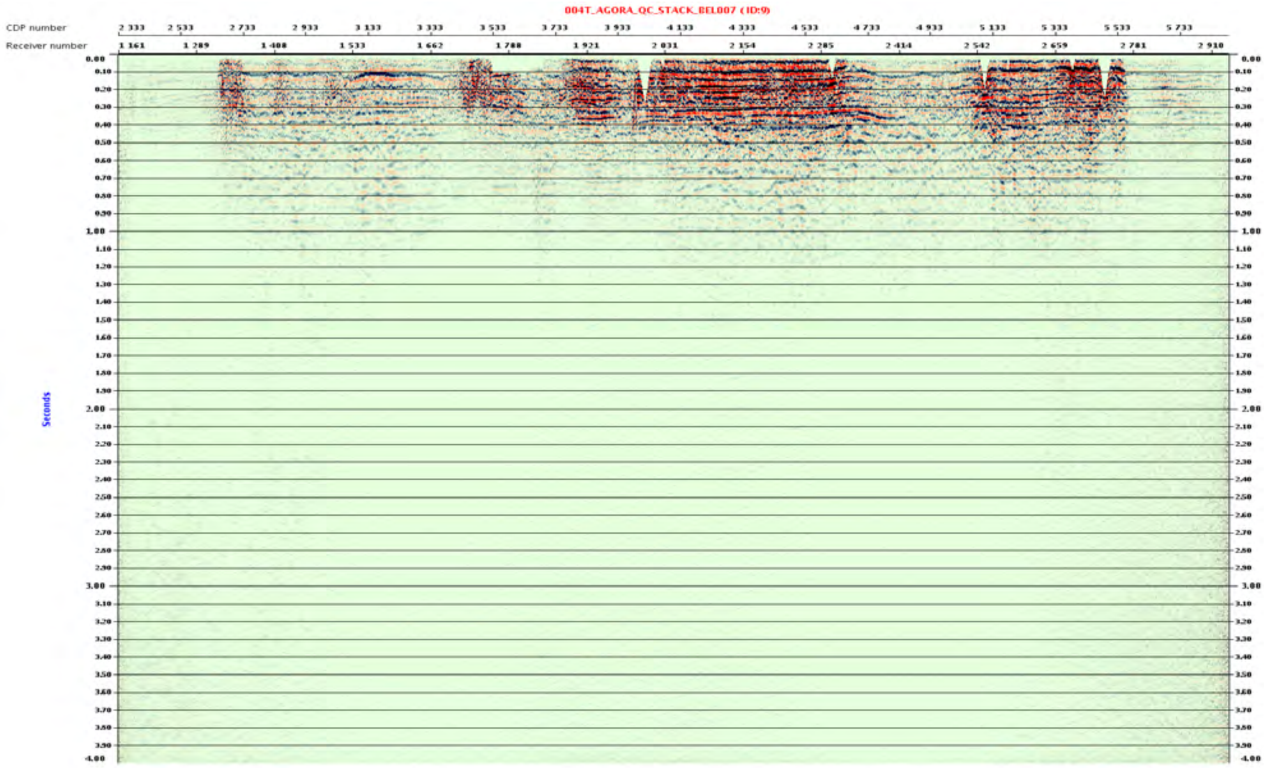

Fig 8.9.04 BEL12-007 stack after linear noise attenuation

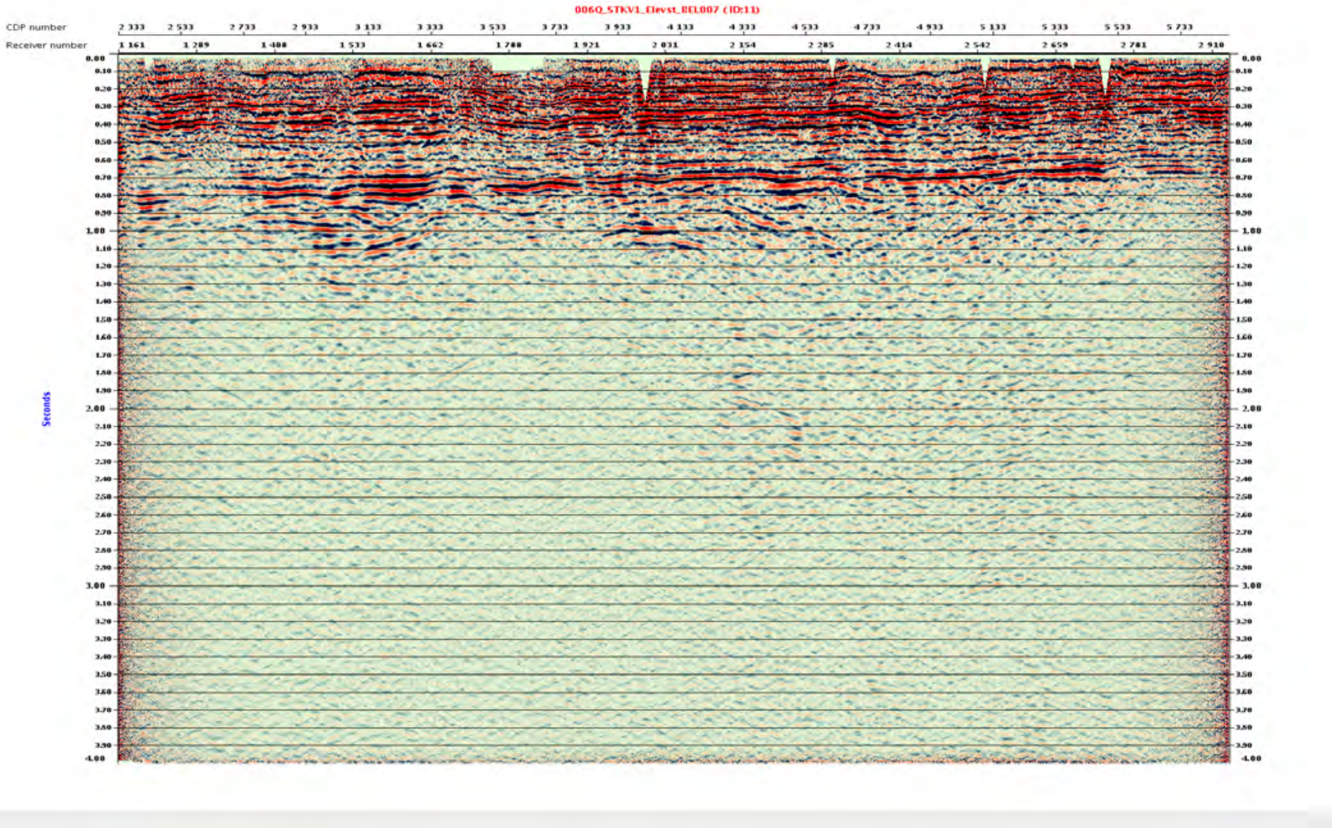

Fig 8.9.05 BEL12-007 stack with elevation statics (pre-stack AGC applied)

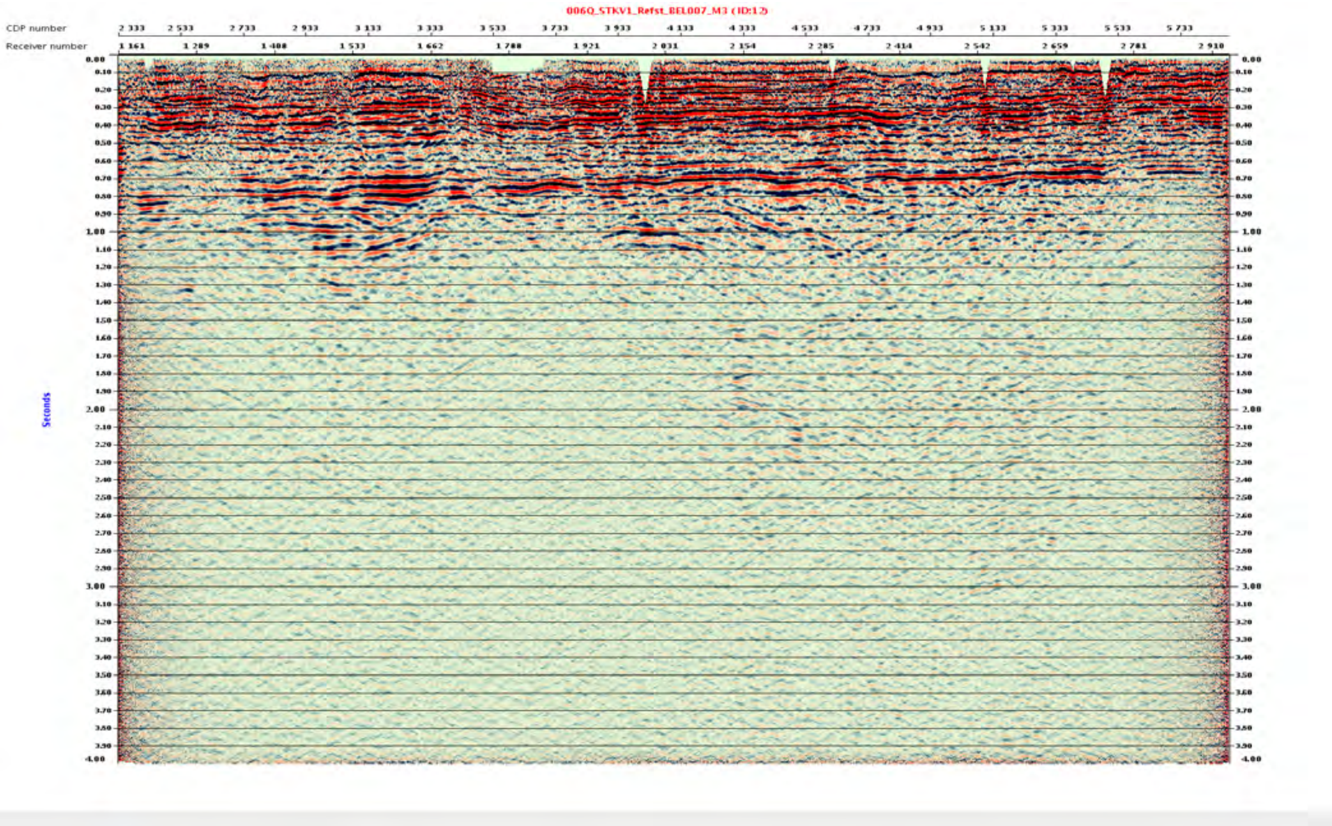

Fig 8.9.06 BEL12-007 stack with pseudo 3D refraction statics (pre-stack AGC applied)

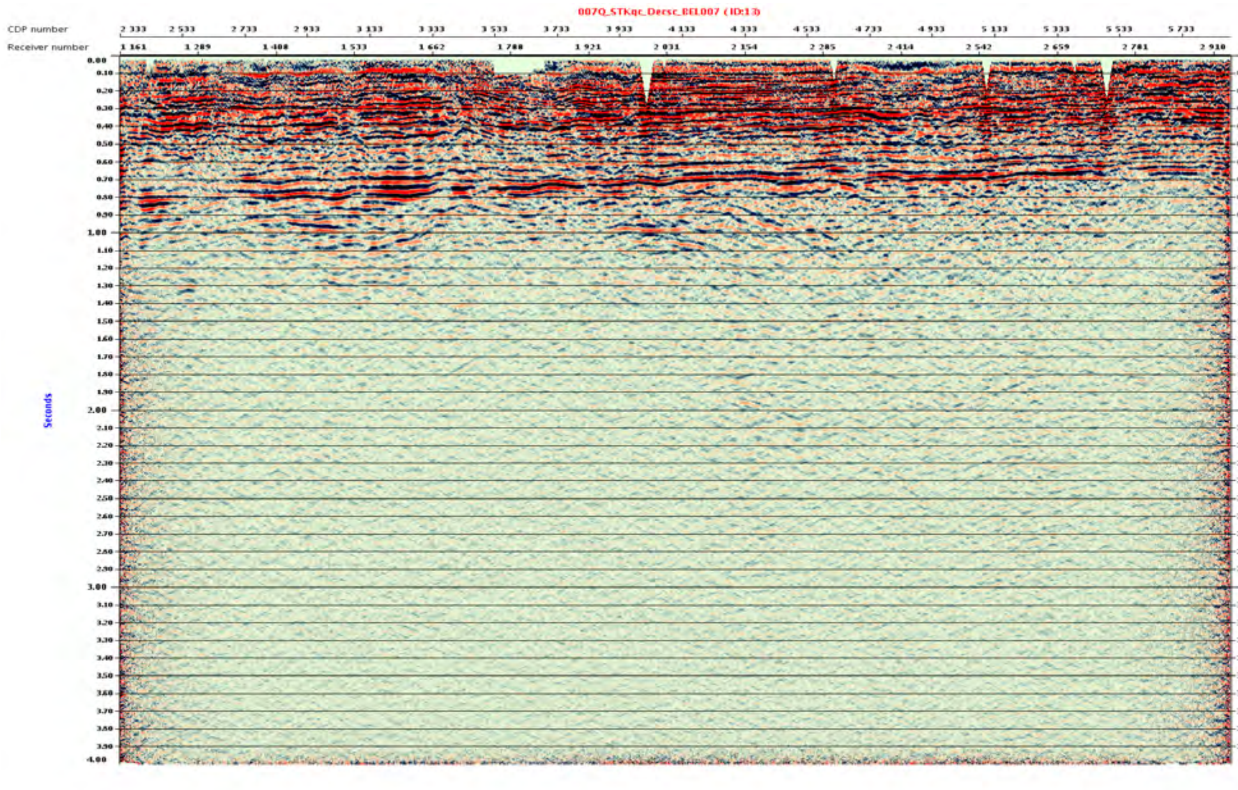

Fig 8.9.07 BEL12-007 stack after surface consistent deconvolution (pre-stack AGC applied)

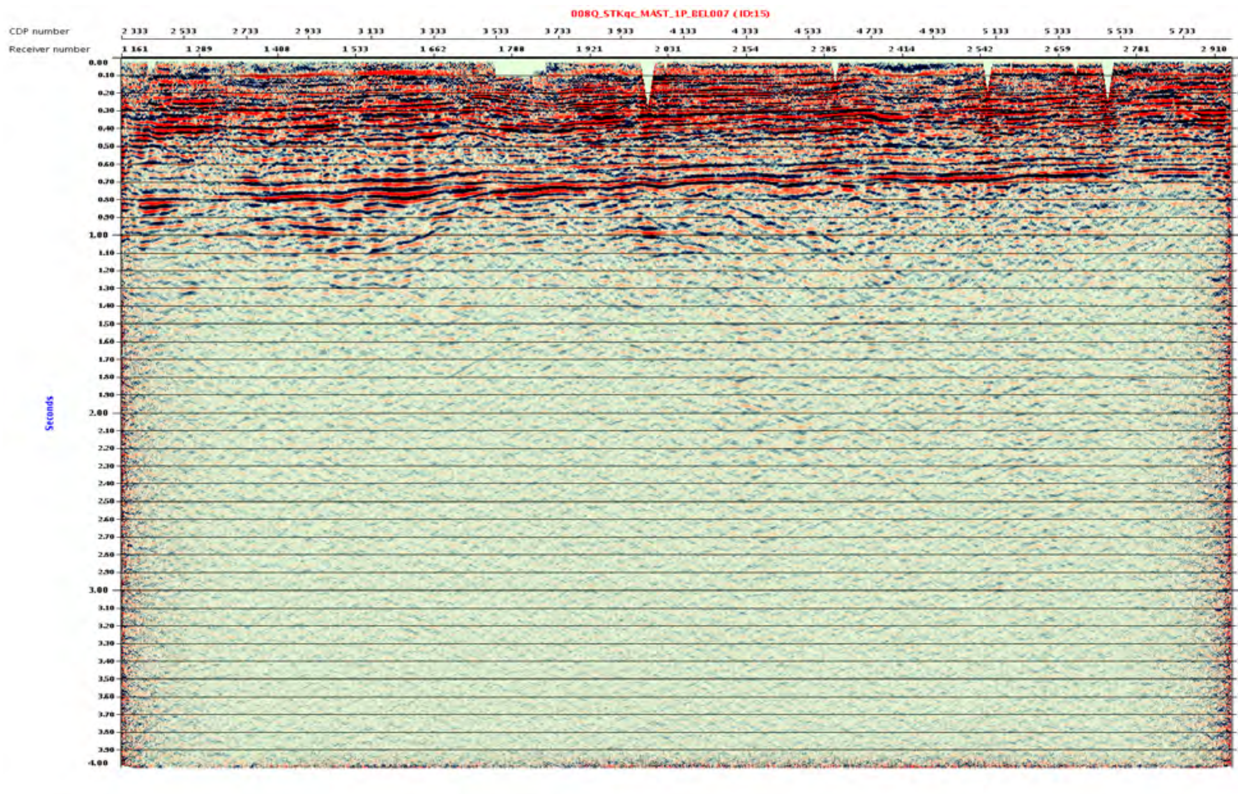

Fig 8.9.08 BEL12-007 stack after 1st pass residual statics (pre-stack AGC applied)

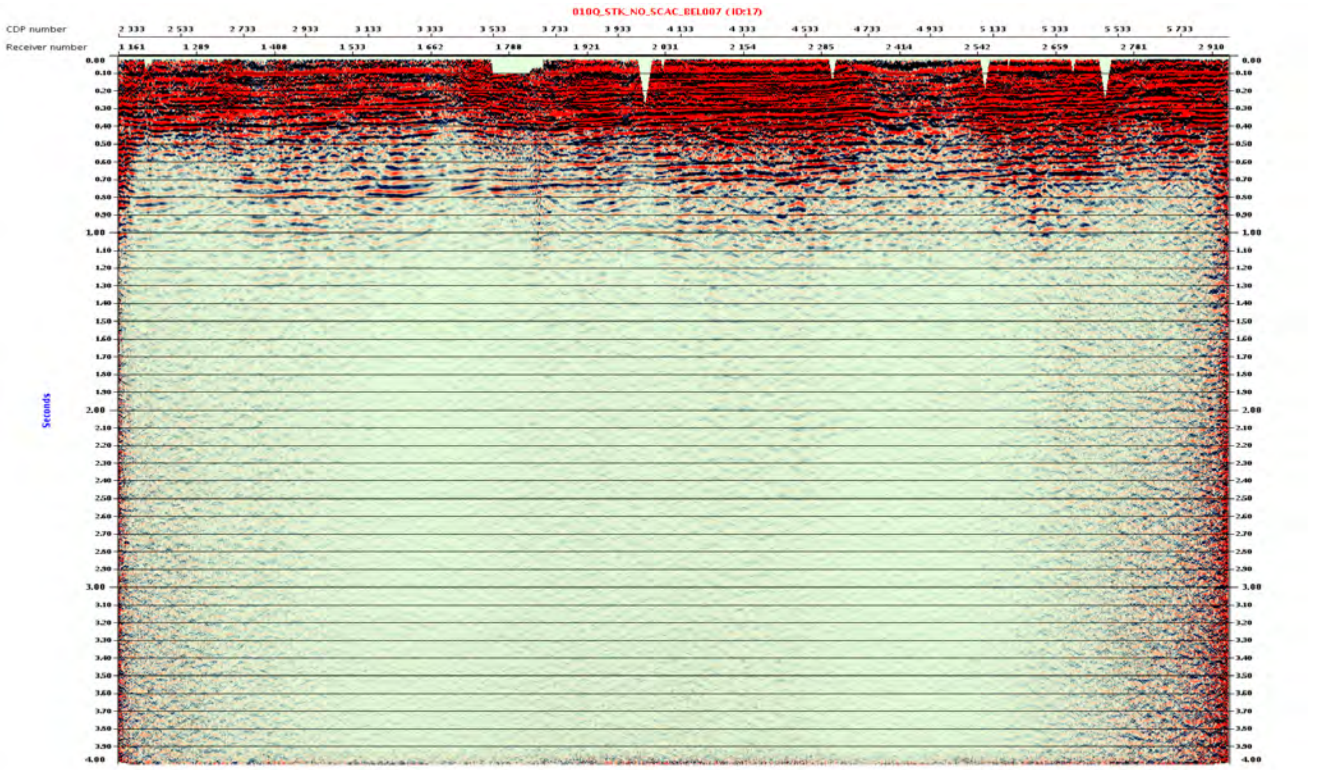

Fig 8.9.09 BEL12-007 stack before 1st pass surface consistent amplitude correction

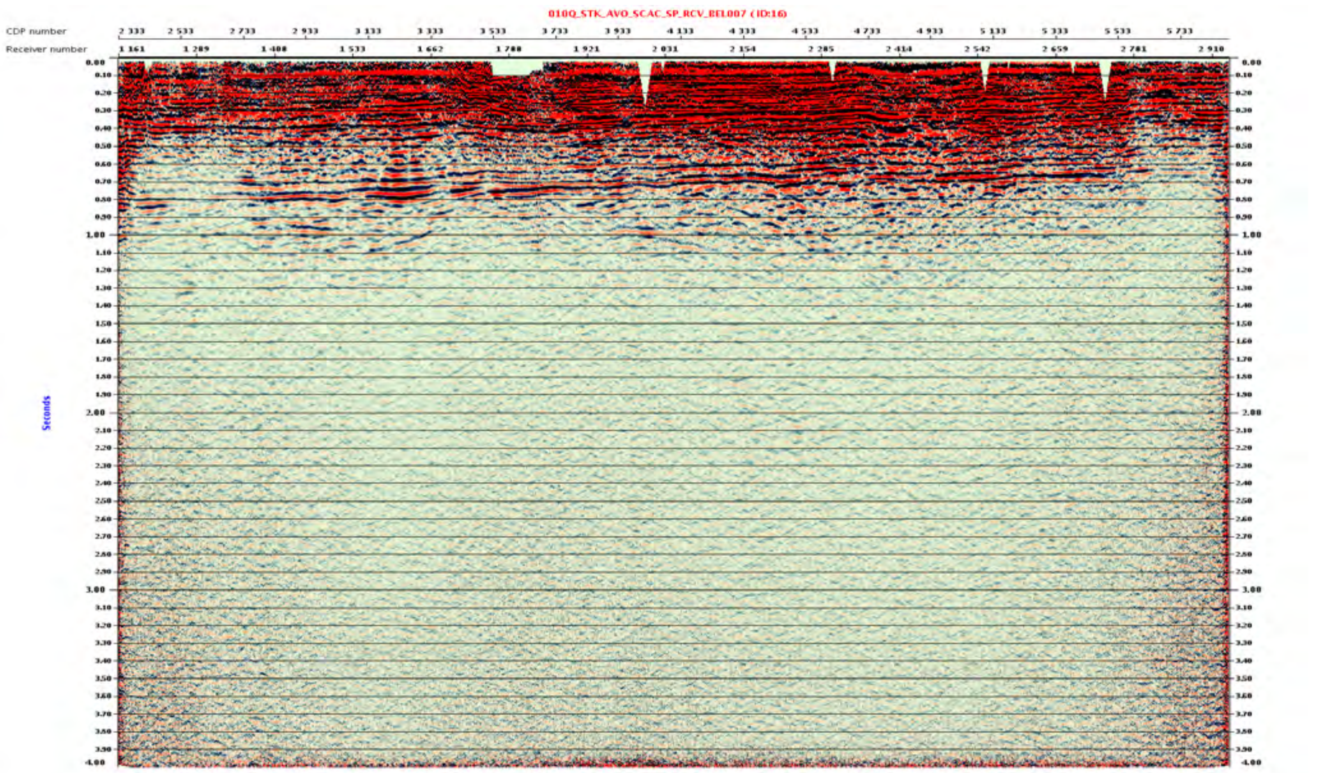

Fig 8.9.10 BEL12-007 stack after 1st pass surface consistent amplitude correction

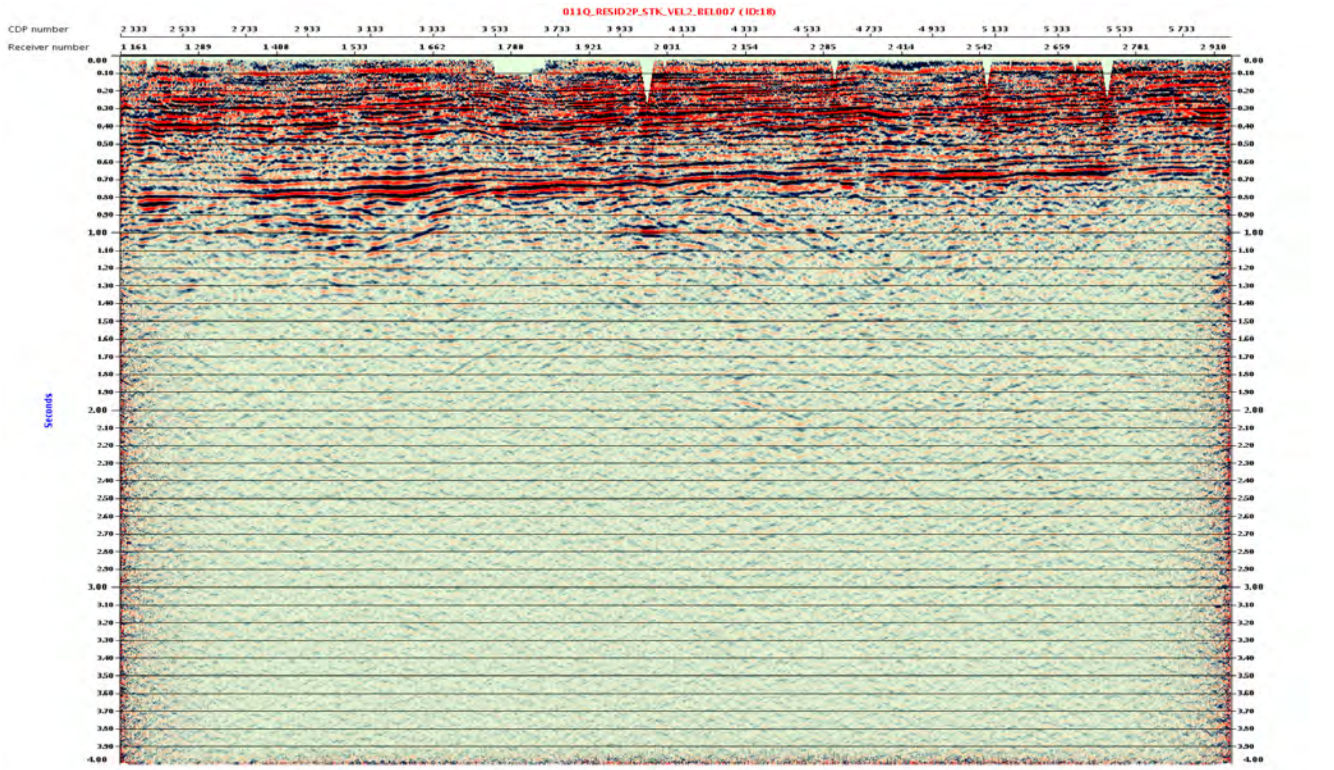

Fig 8.9.11 BEL12-007 stack after 2nd pass of residual statics (pre-stack AGC applied)

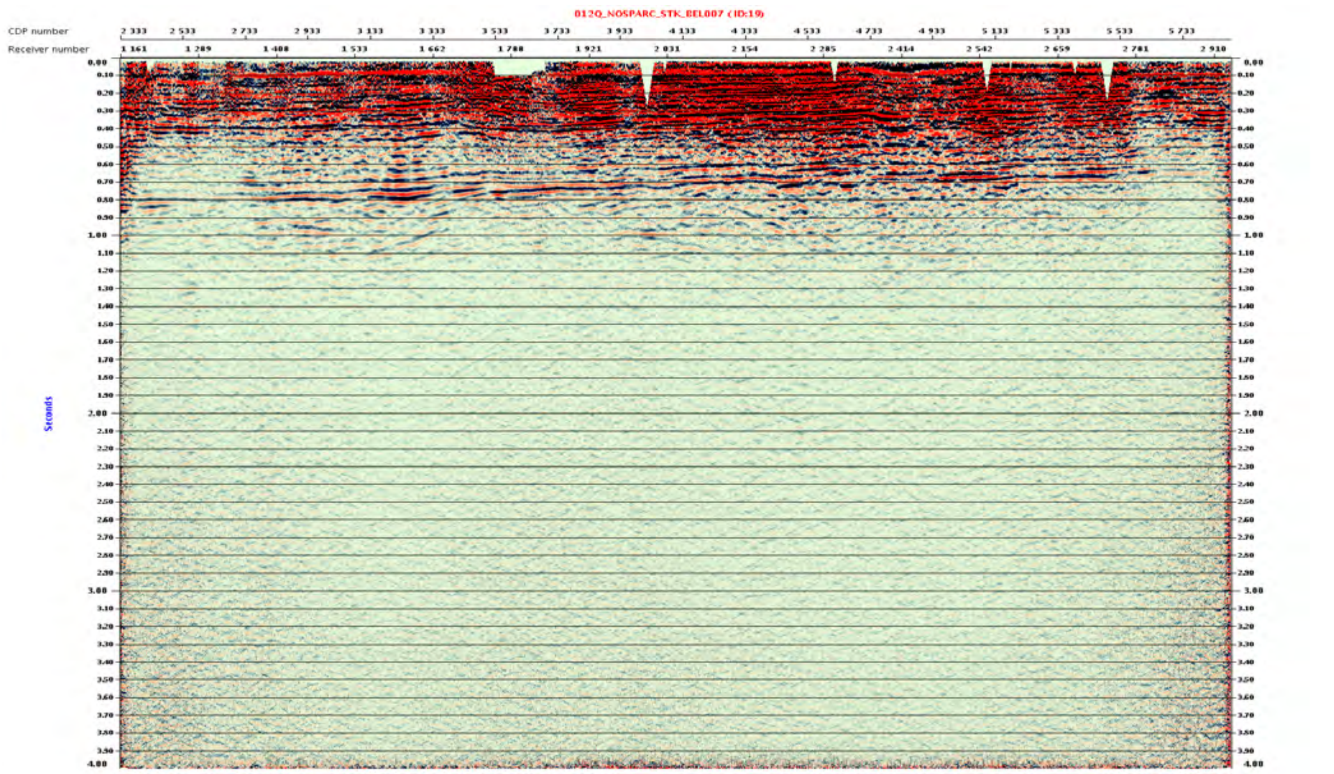

Fig 8.9.12 BEL12-007 stack before CDP-Offset domain denoise

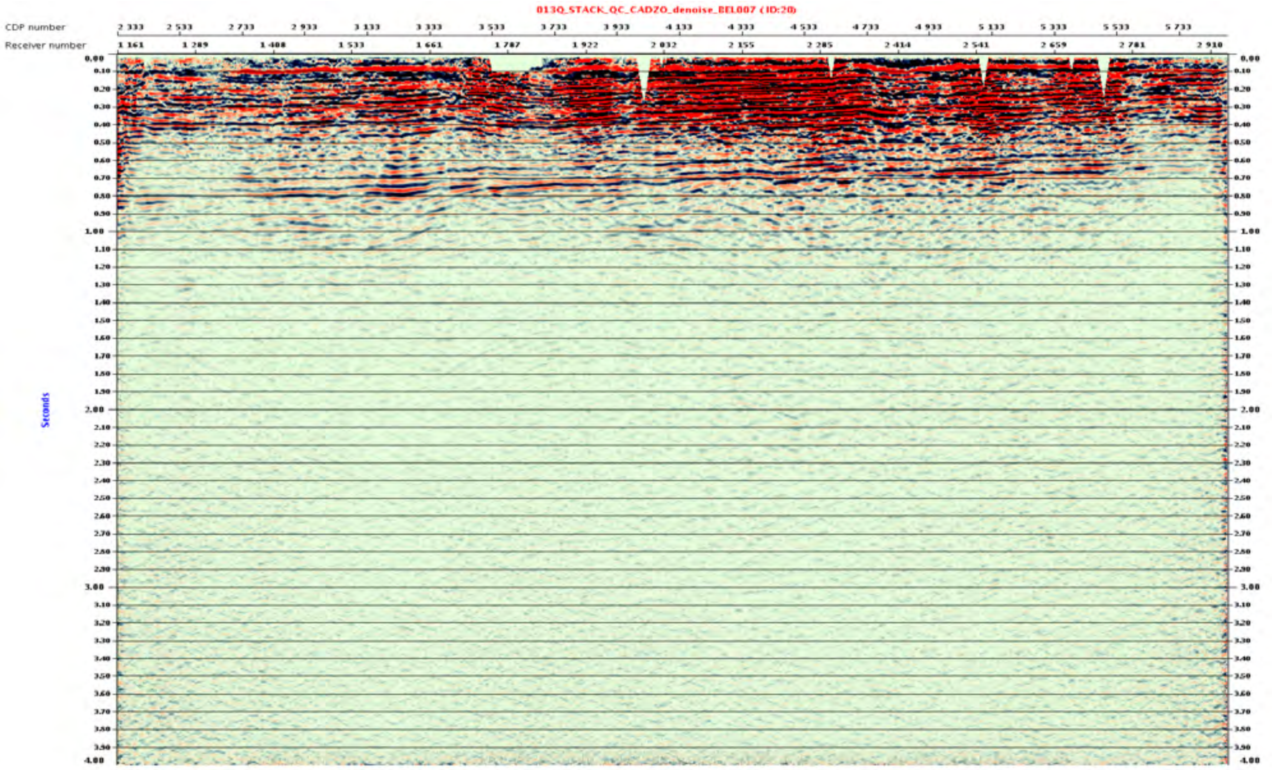

Fig 8.9.13 BEL12-007 stack after CDP-Offset domain denoise

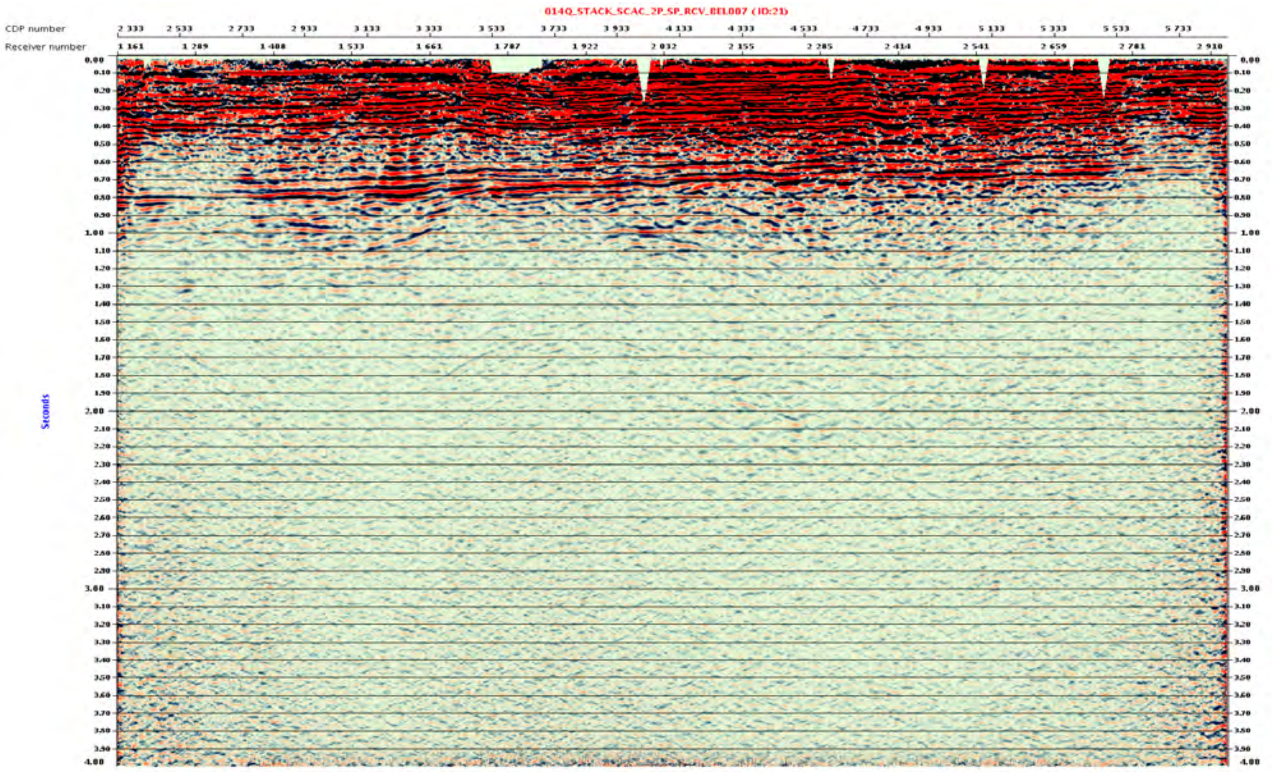

Fig 8.9.14 BEL12-007 stack after 2nd pass of surface consistent amplitude correction

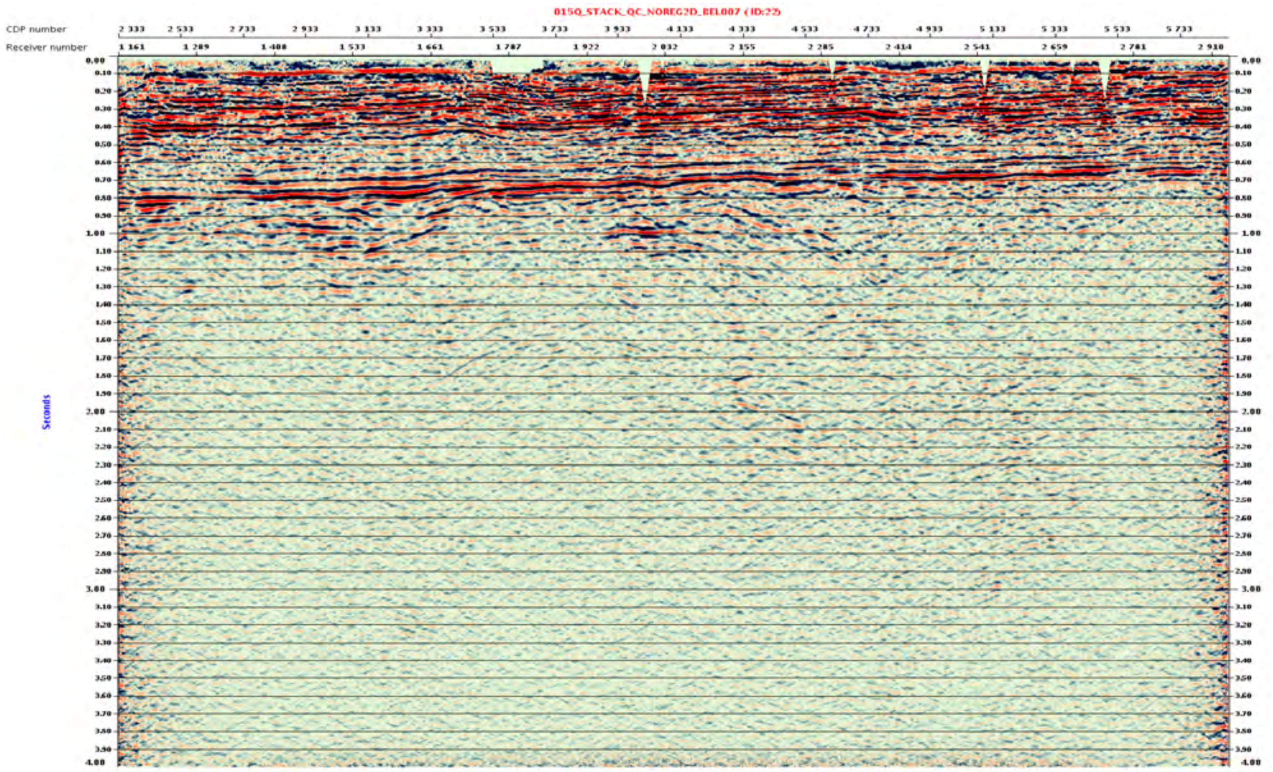

Fig 8.9.15 BEL12-007 stack before 2D Regularization(pre-stack AGC applied)

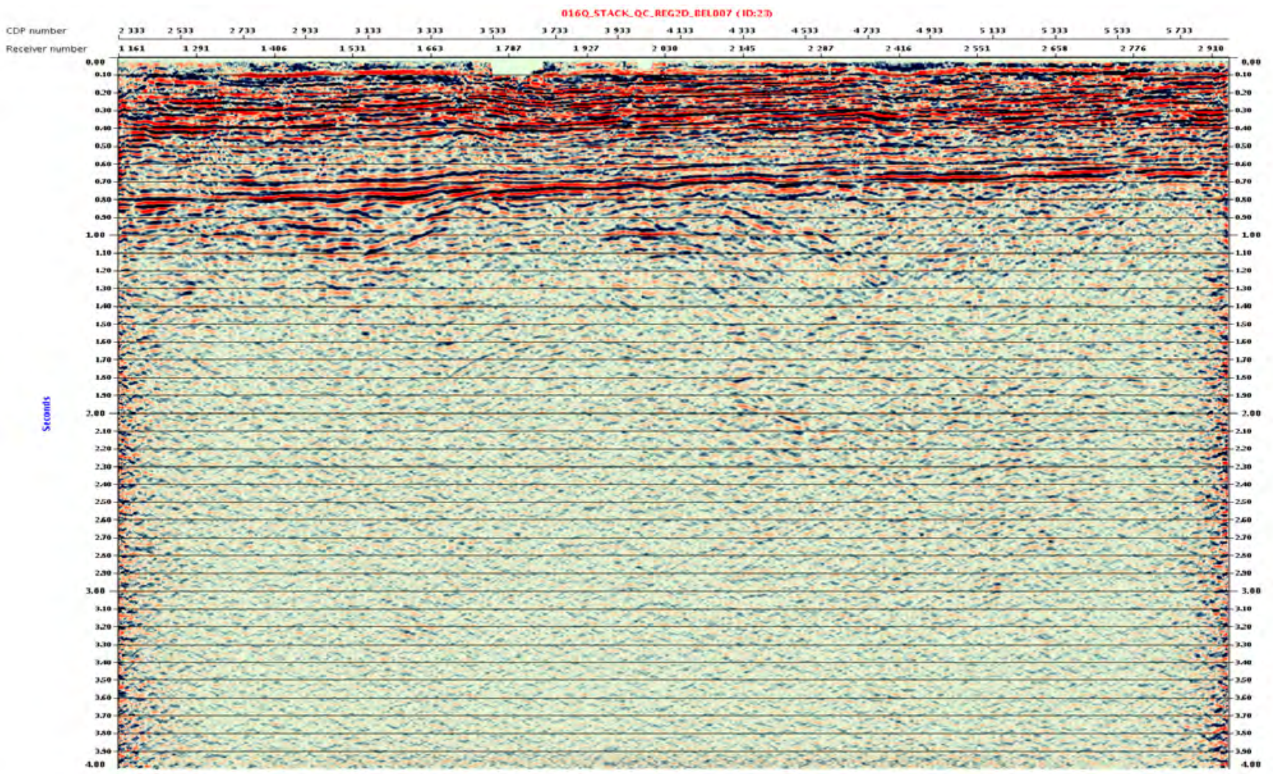

Fig 8.9.16 BEL12-007 stack after 2D Regularization(pre-stack AGC applied)

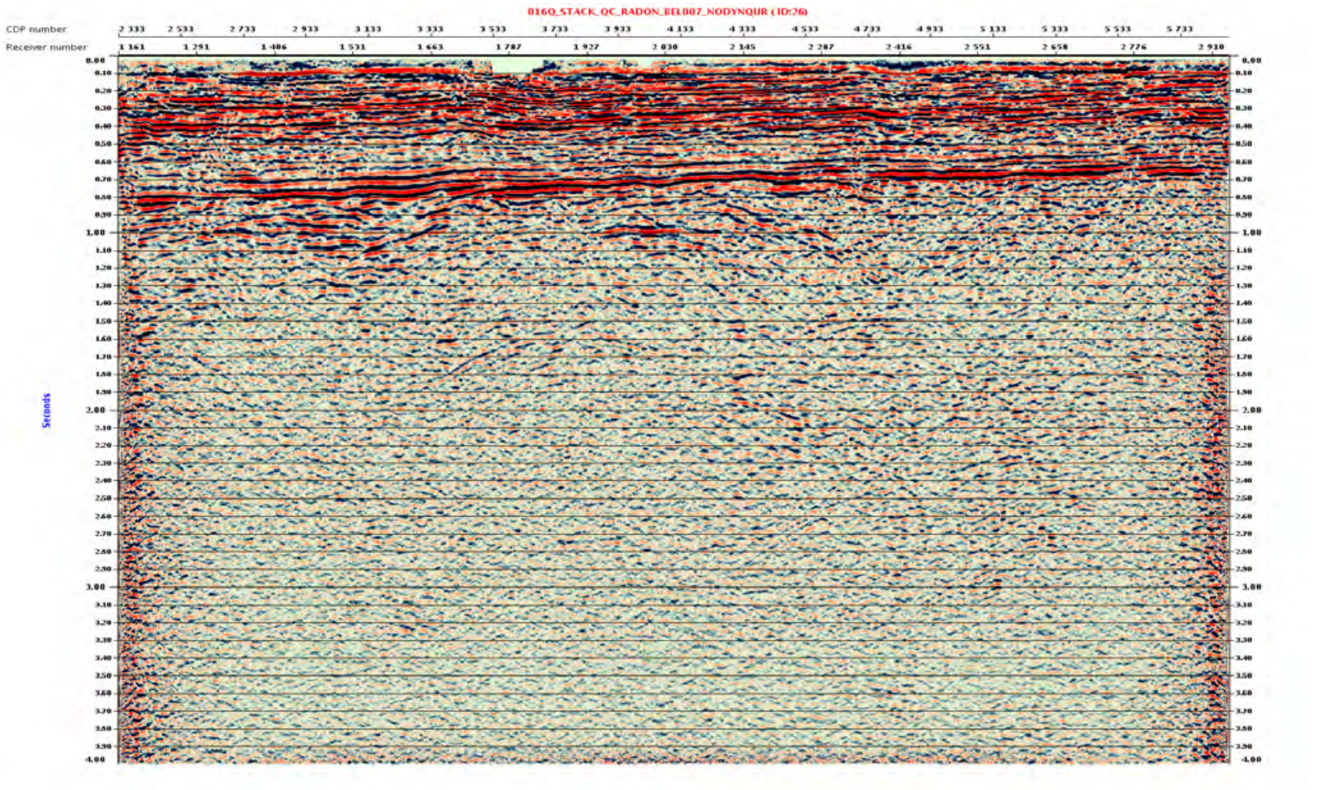

Fig 8.9.17 BEL12-007 stack after Radon demultiple(pre-stack AGC applied)

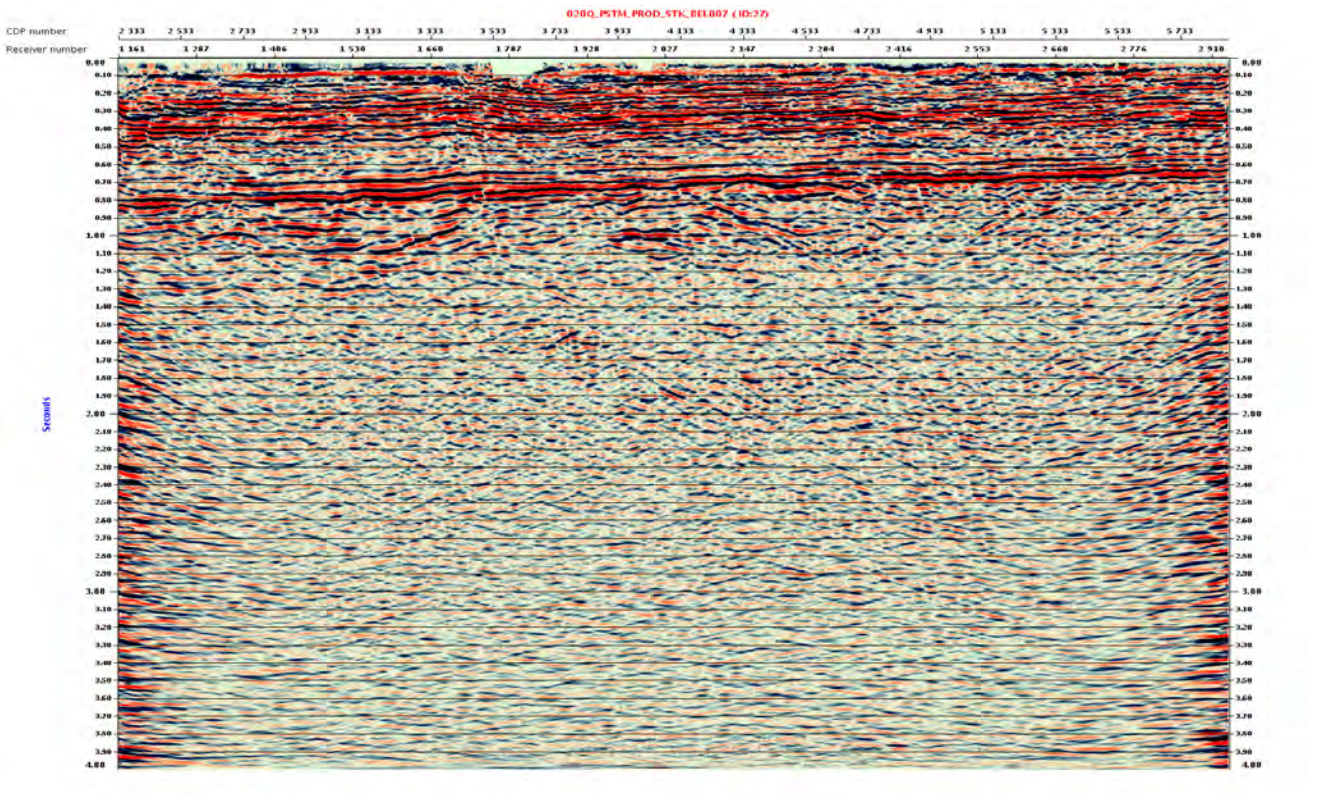

Fig 8.9.18 BEL12-007 PSTM after pre stack migration(pre-stack AGC applied)

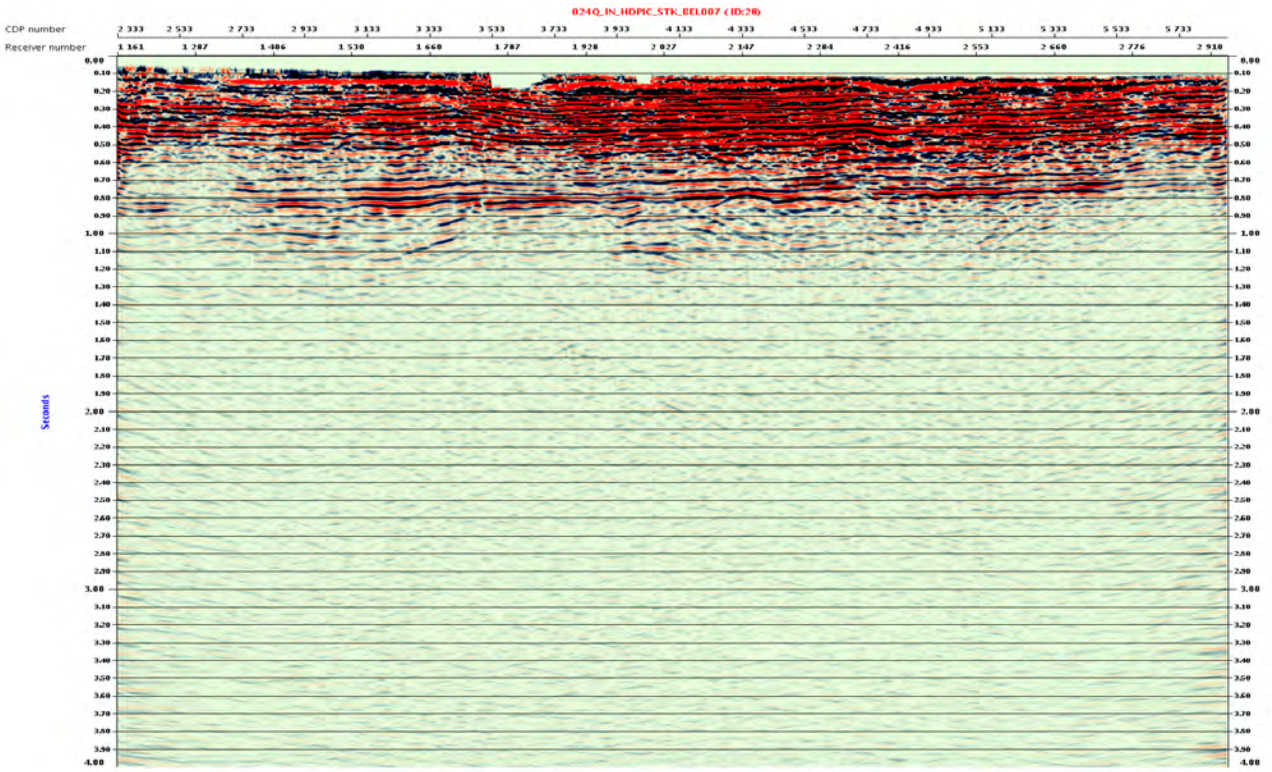

Fig 8.9.19 BEL12-007 PSTM stack before RMO velocity analysis

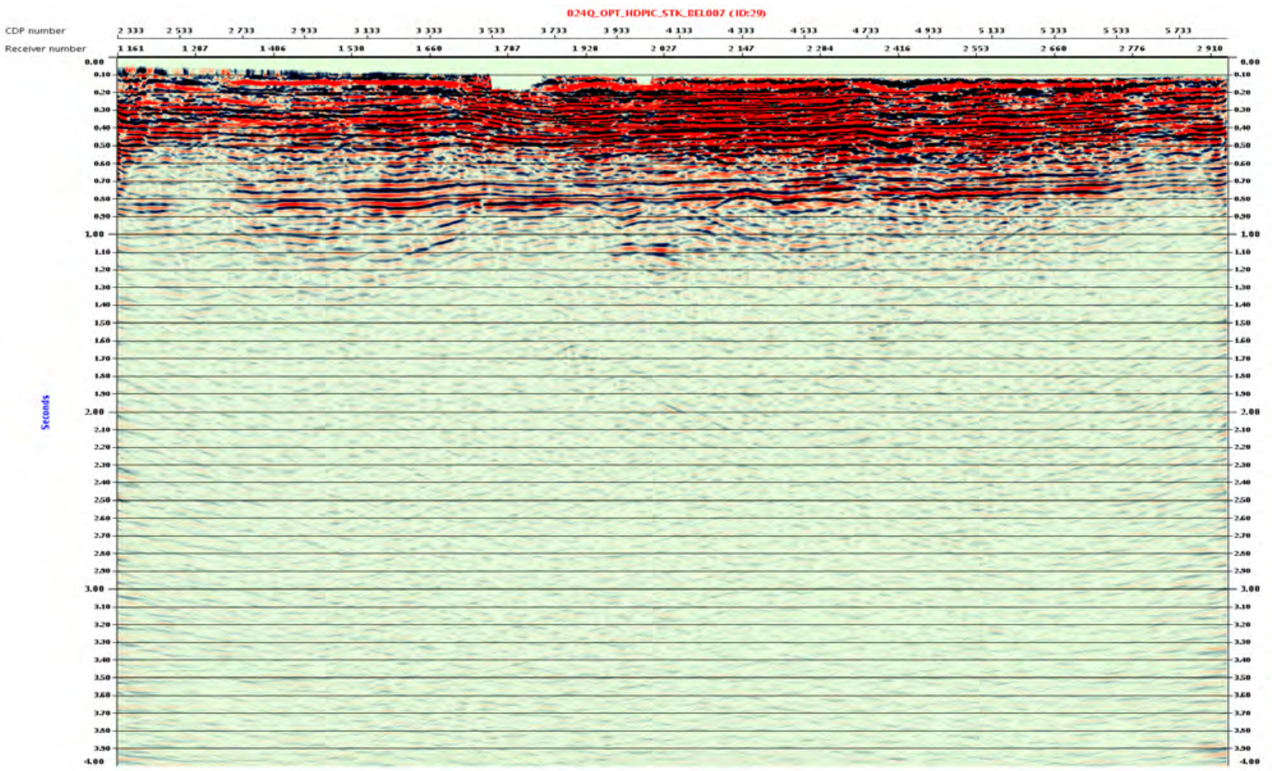

Fig 8.9.20 BEL12-007 PSTM stack after RMO velocity analysis

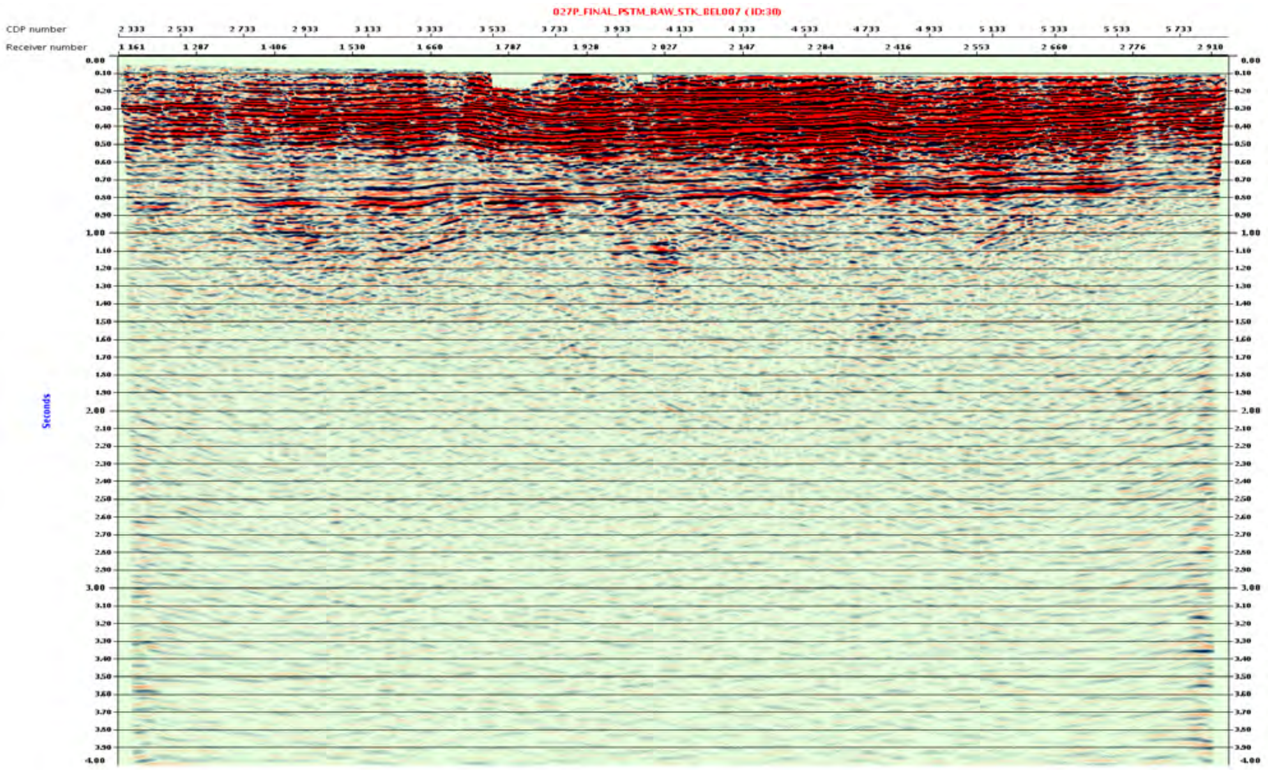

Fig 8.9.21 BEL12-007 Final PSTM stack

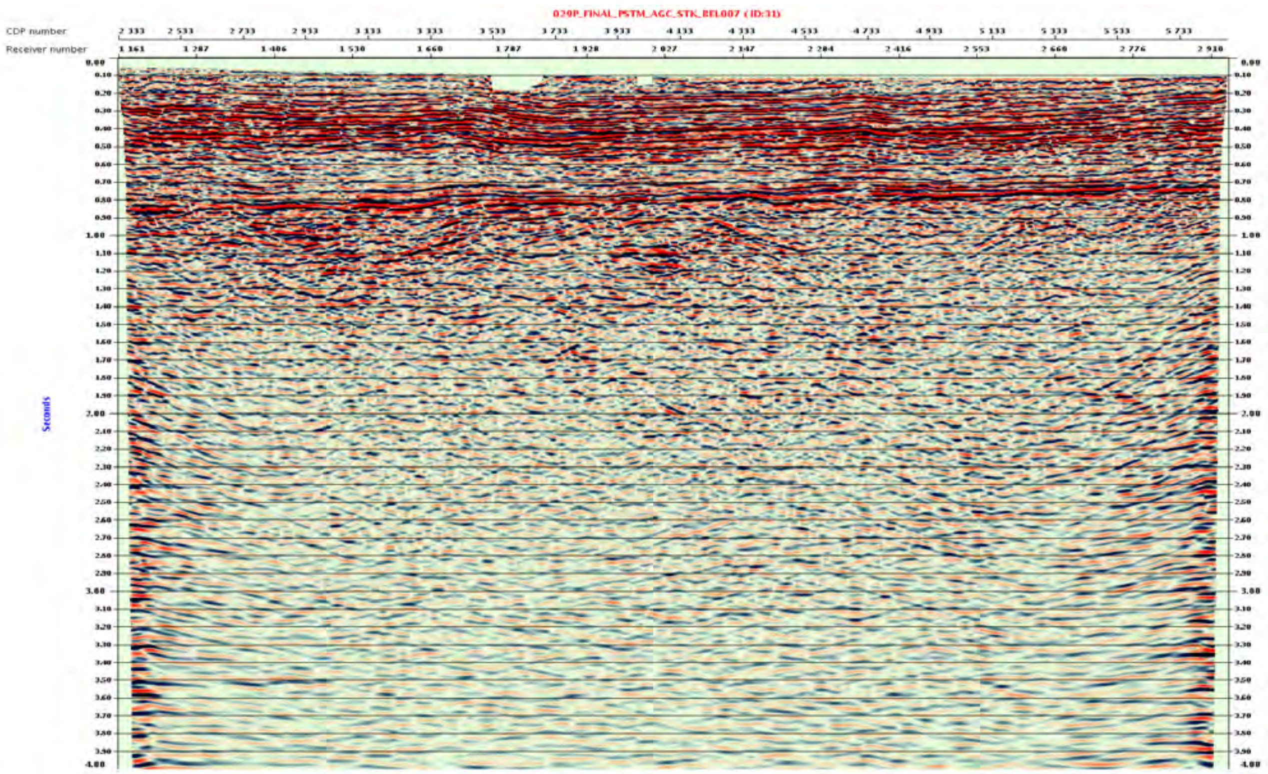

Fig 8.9.22 BEL12-007 Final PSTM stack with pre-stack AGC

8.10 Sample line stacks (Pre-STM sequence)- Pinelands 2012

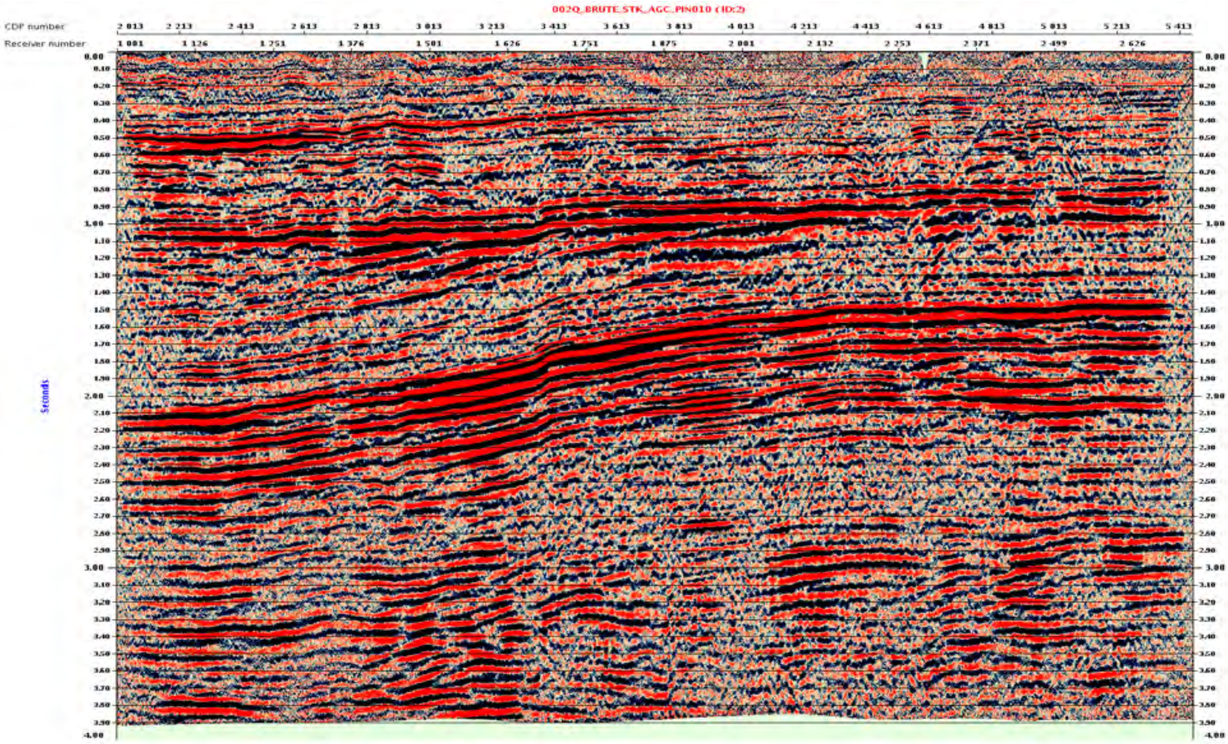

Fig 8.10.01 PIN12-010 Brute stack after geometry merge (pre-stack AGC applied)

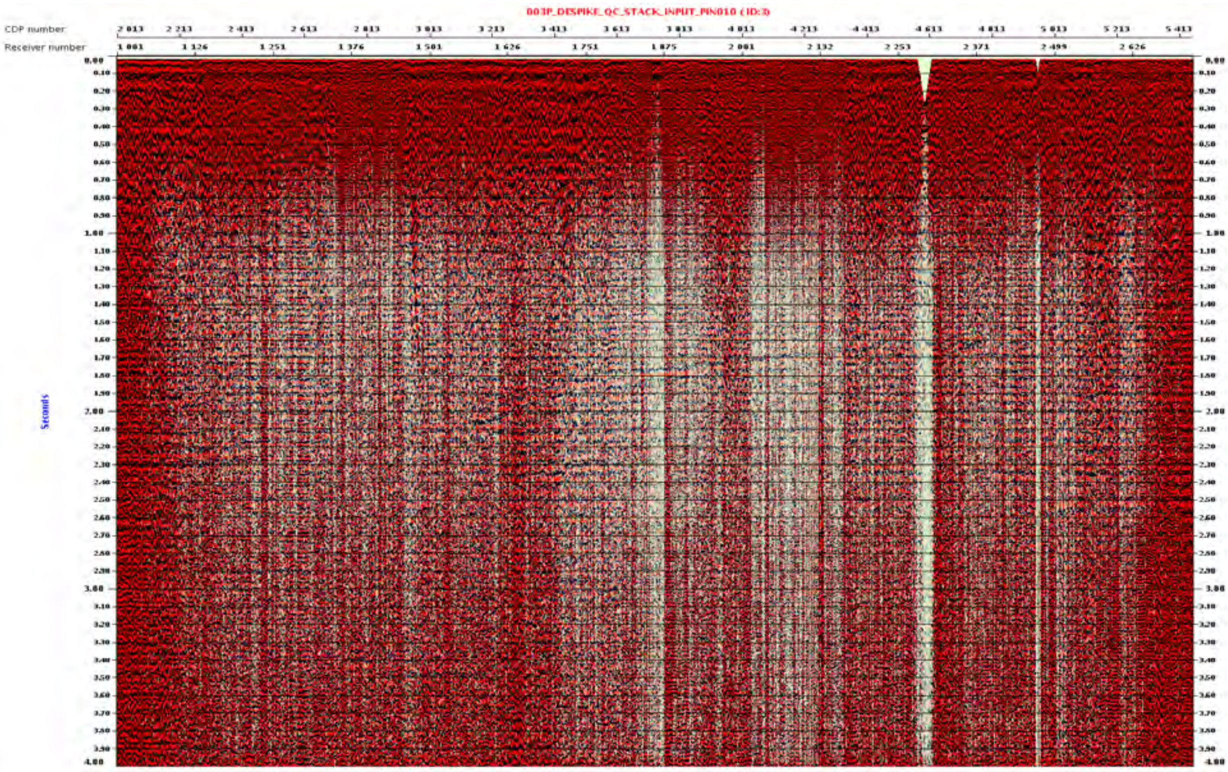

Fig 8.10.02 PIN12-010 stack before first pass of denoise

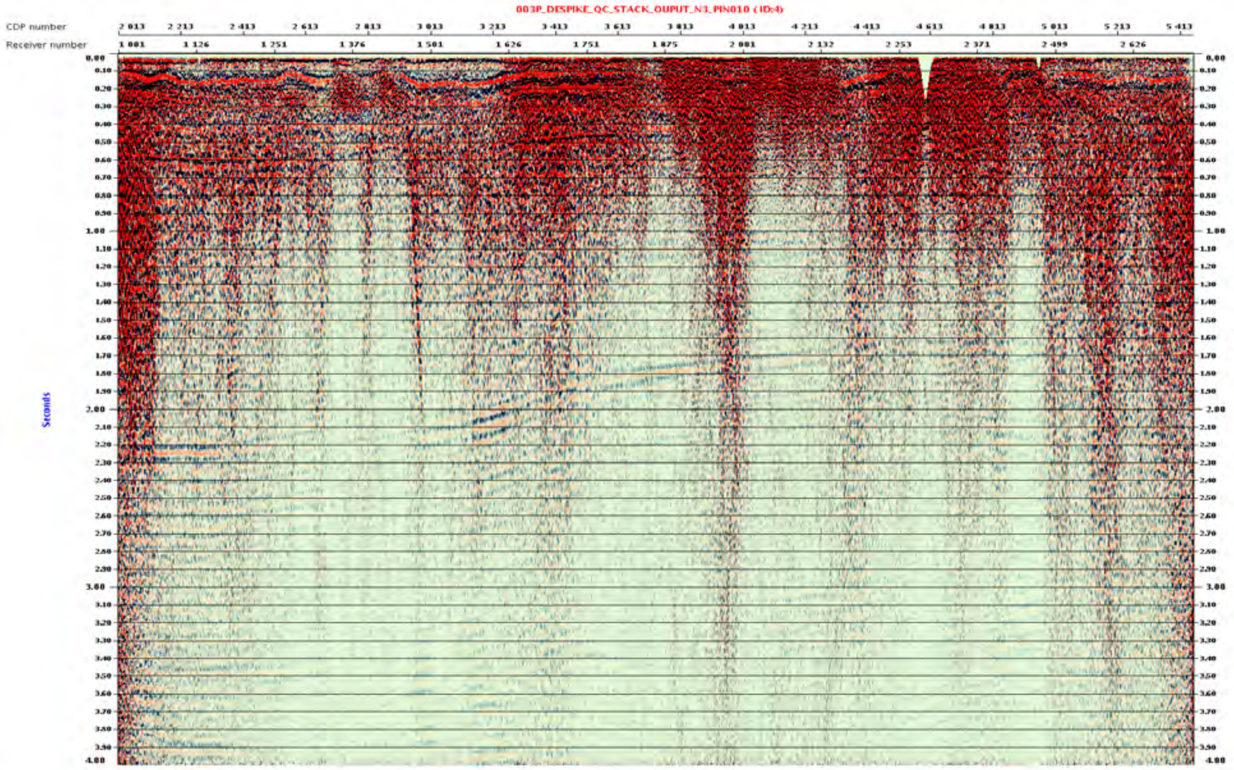

Fig 8.10.03 PIN12-010 stack after first pass of denoise

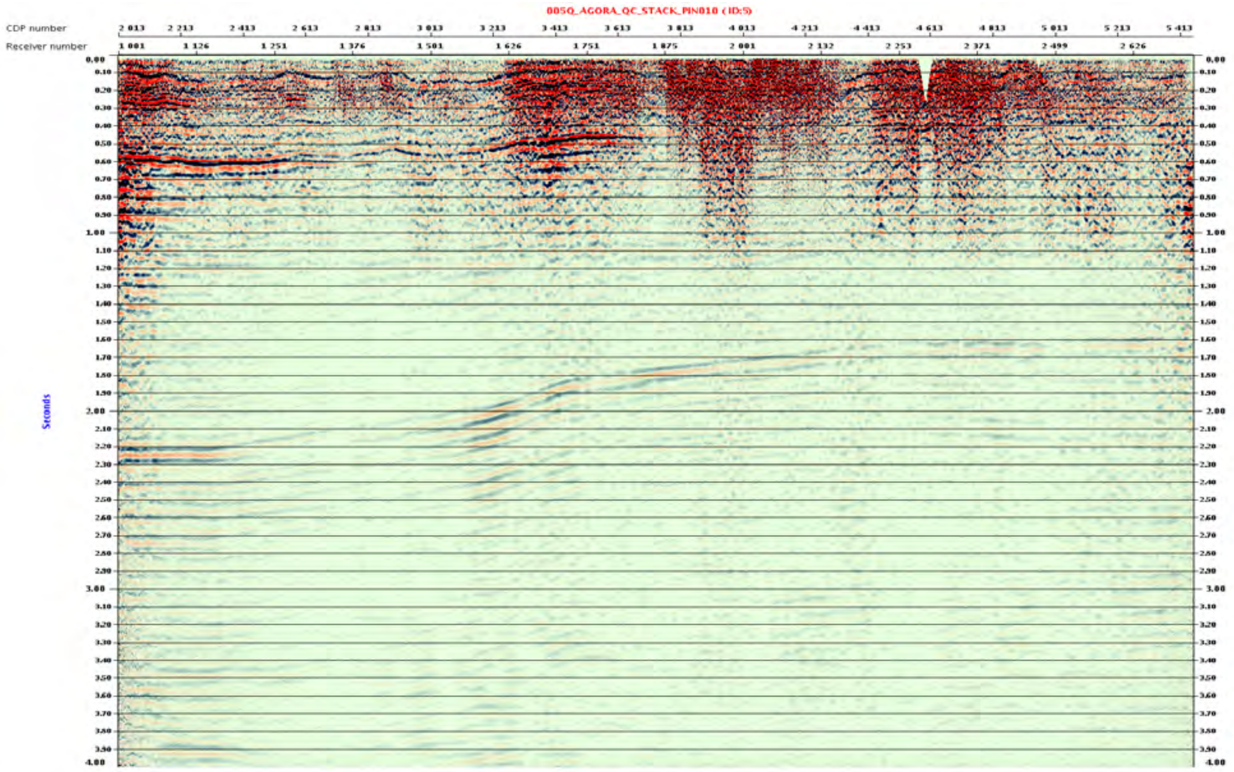

Fig 8.10.04 PIN12-010 stack after linear noise attenuation

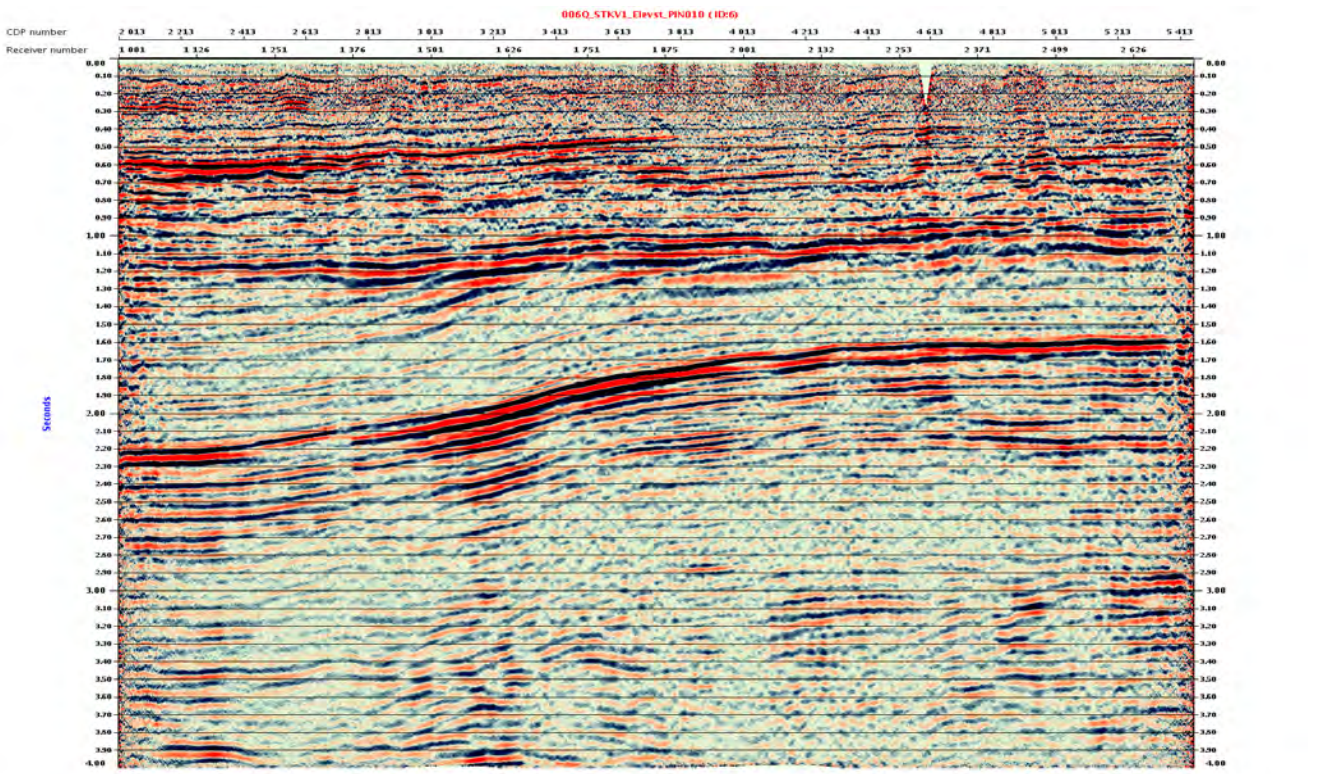

Fig 8.10.05 PIN12-010 stack with elevation statics (pre-stack AGC applied)

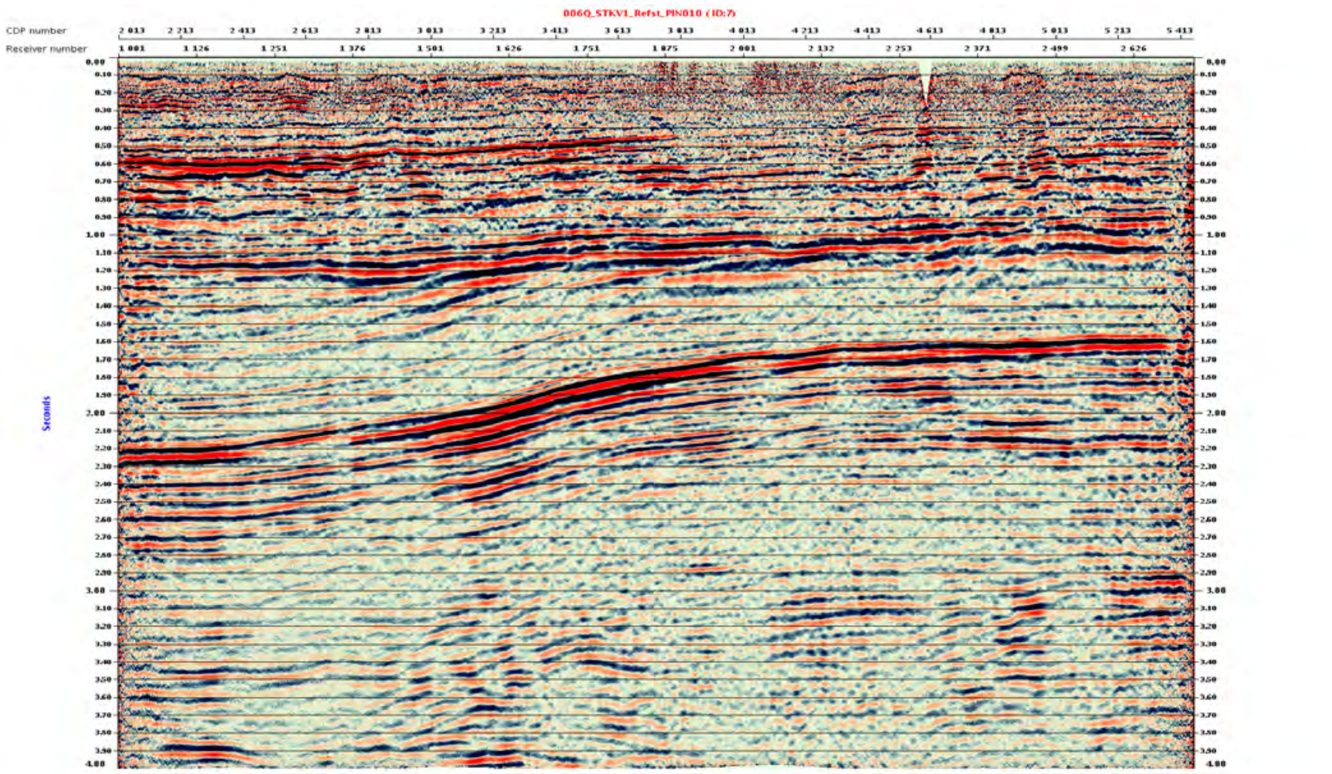

Fig 8.10.06 PIN12-010 stack with pseudo 3D refraction statics (pre-stack AGC applied)

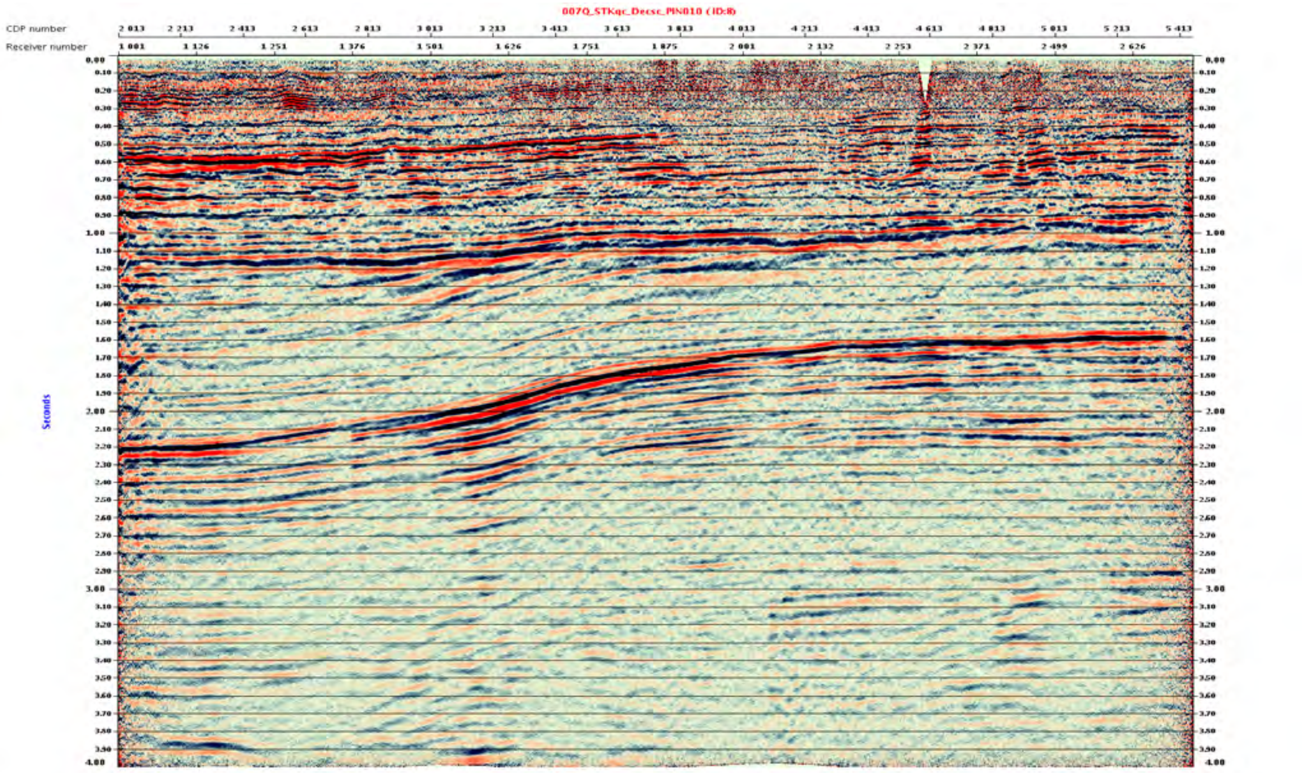

Fig 8.10.07 PIN12-010 stack after surface consistent deconvolution (pre-stack AGC applied)

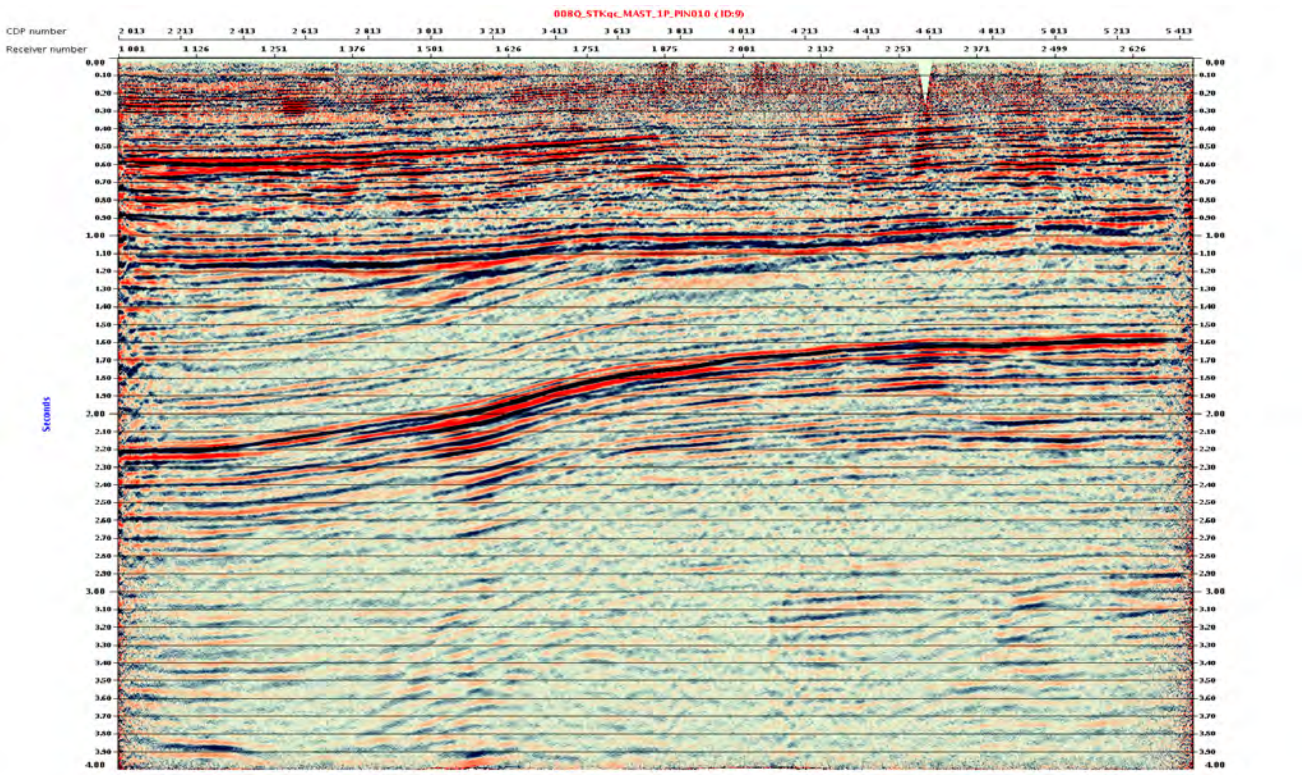

Fig 8.10.08 PIN12-010 stack after 1st pass residual statics (pre-stack AGC applied)

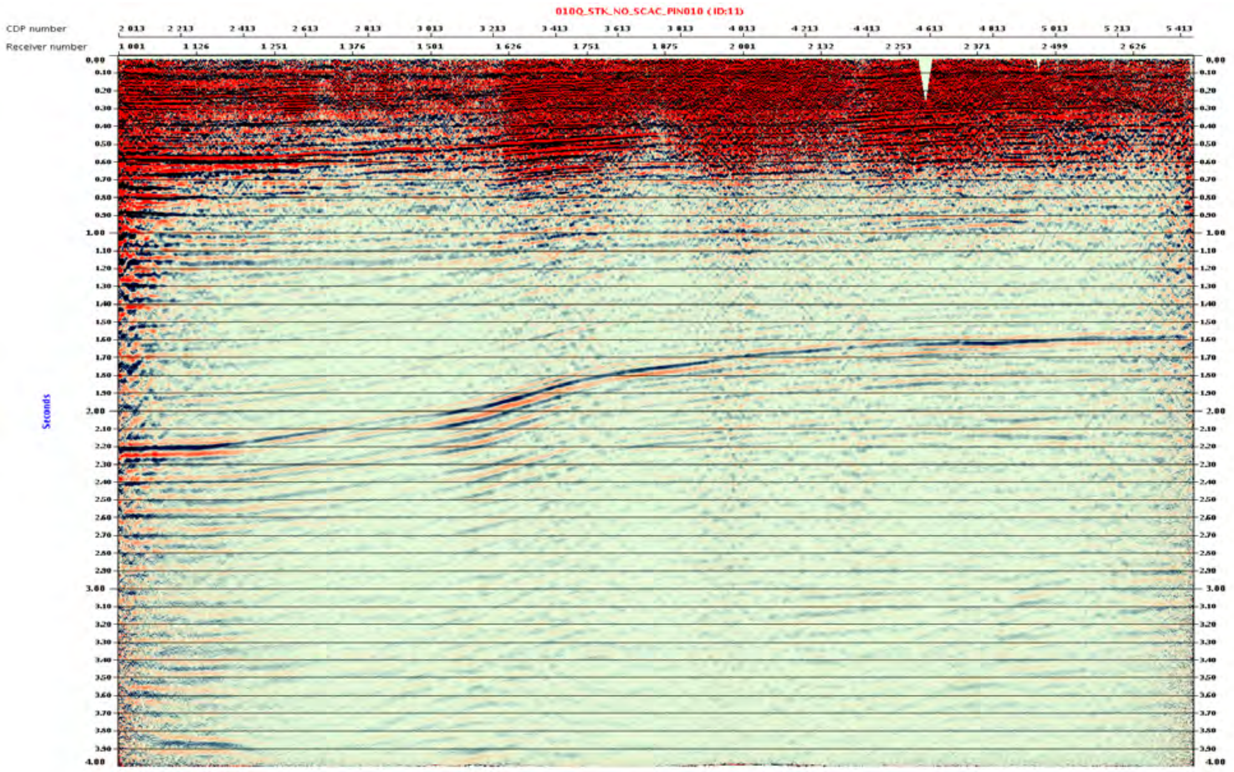

Fig 8.10.09 PIN12-010 stack before 1st pass surface consistent amplitude correction

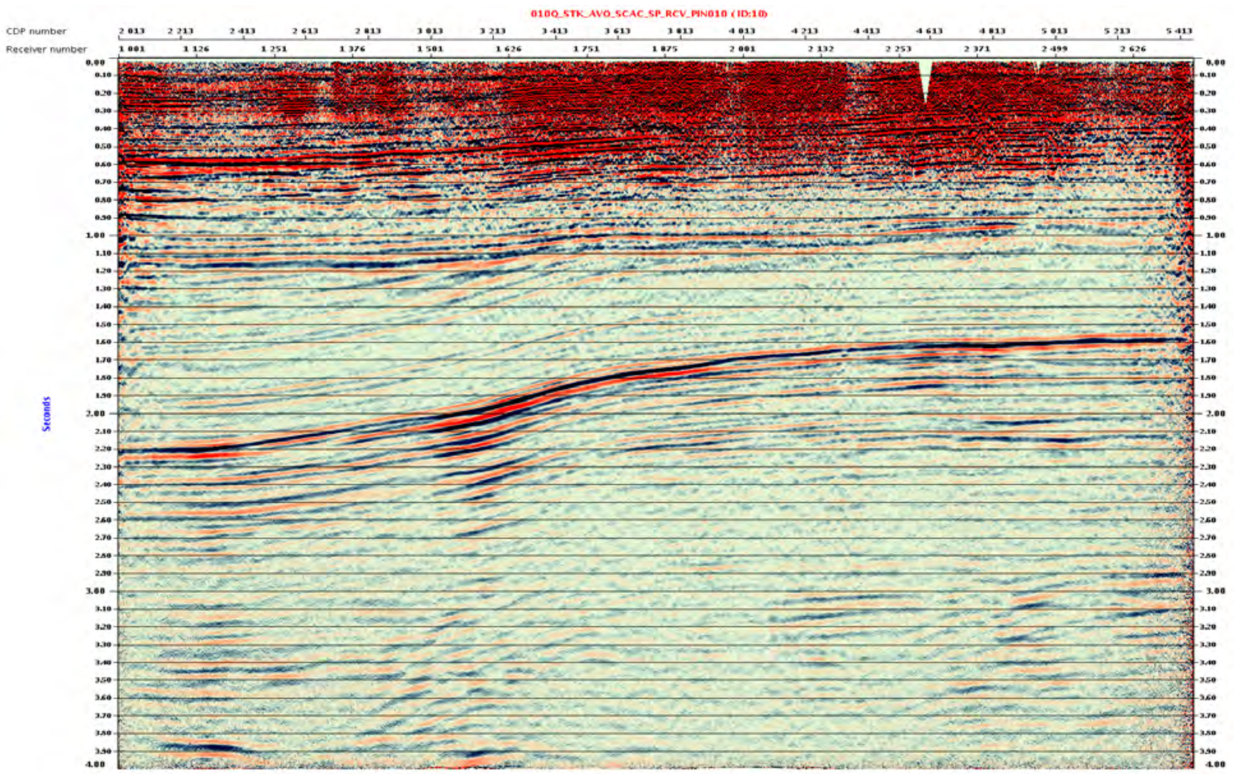

Fig 8.10.10 PIN12-010 stack after 1st pass surface consistent amplitude correction

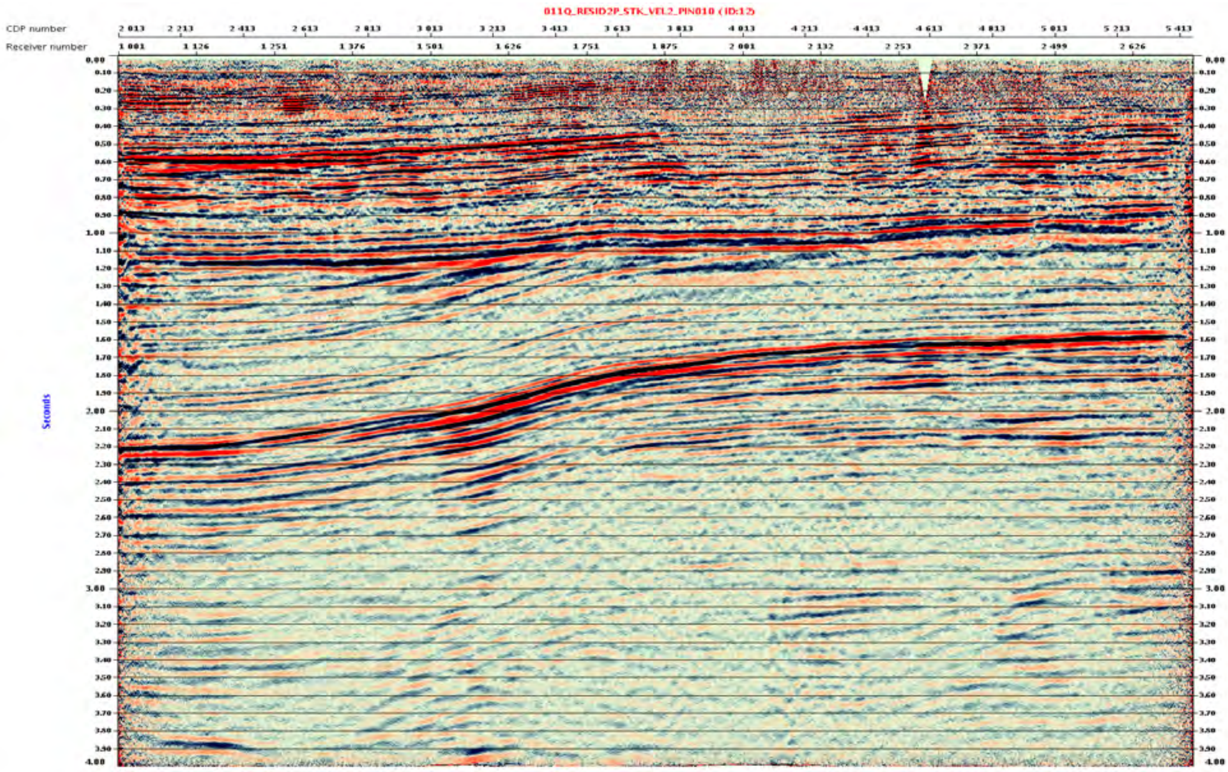

Fig 8.10.11 PIN12-010 stack after 2nd pass of residual statics (pre-stack AGC applied)

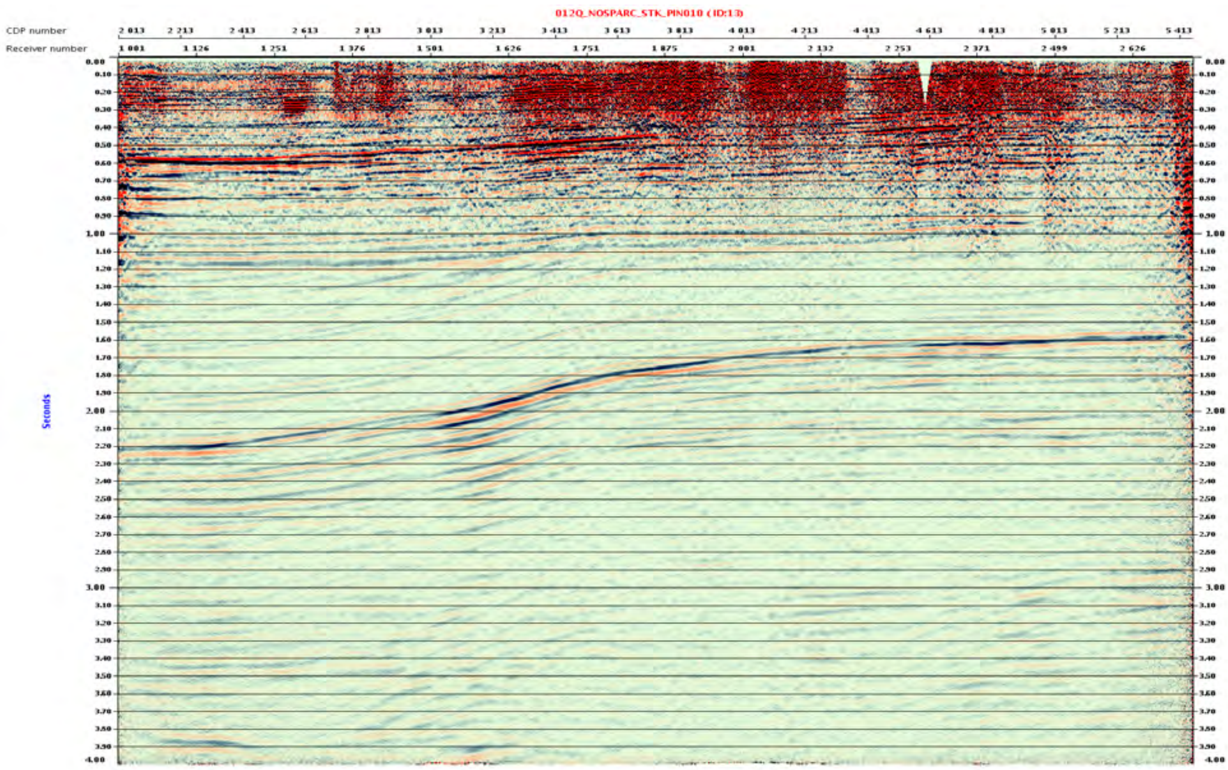

Fig 8.10.12 PIN12-010 stack before CDP-Offset domain denoise

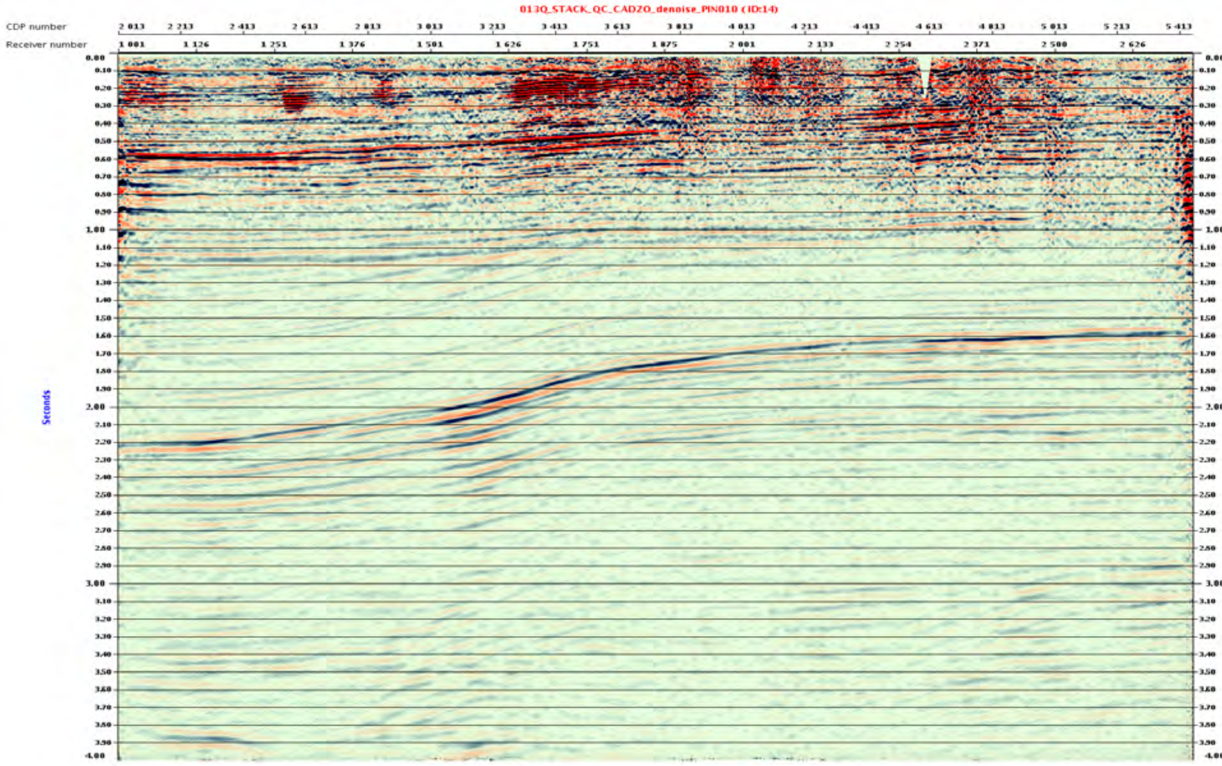

Fig 8.10.13 PIN12-010 stack after CDP-Offset domain denoise

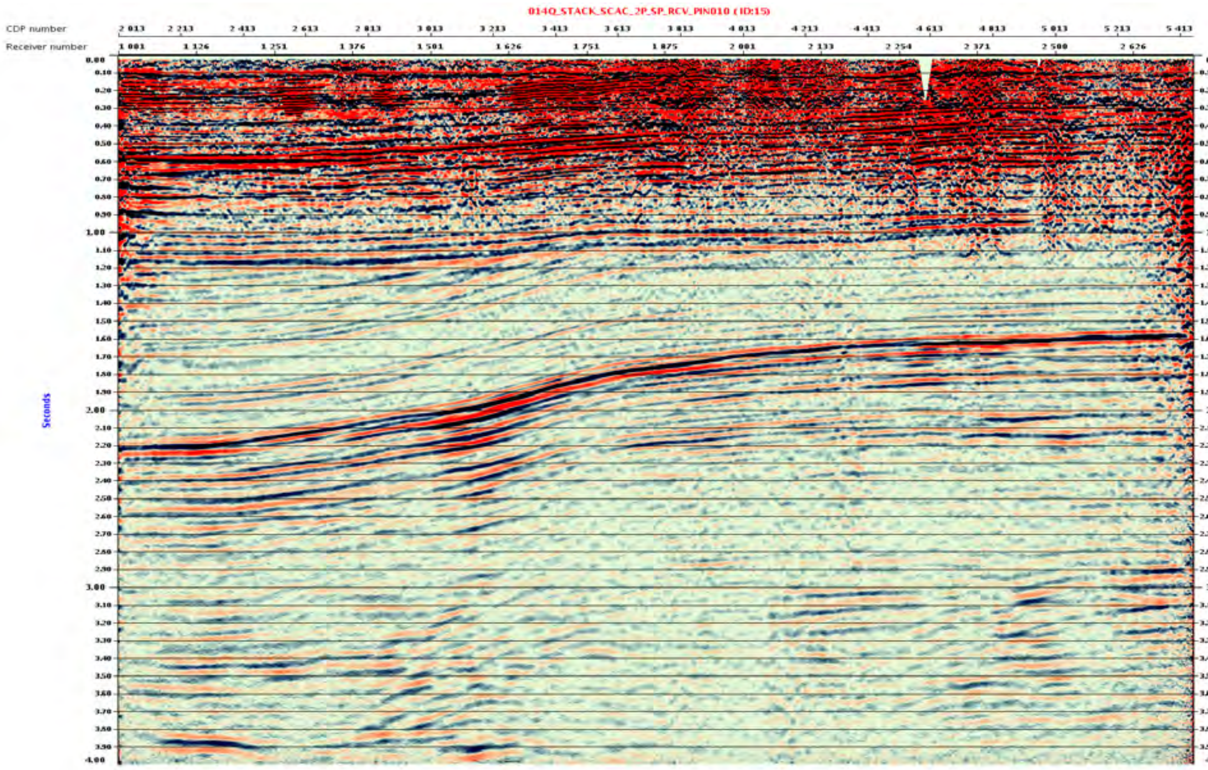

Fig 8.10.14 PIN12-010 stack after 2nd pass of surface consistent amplitude correction

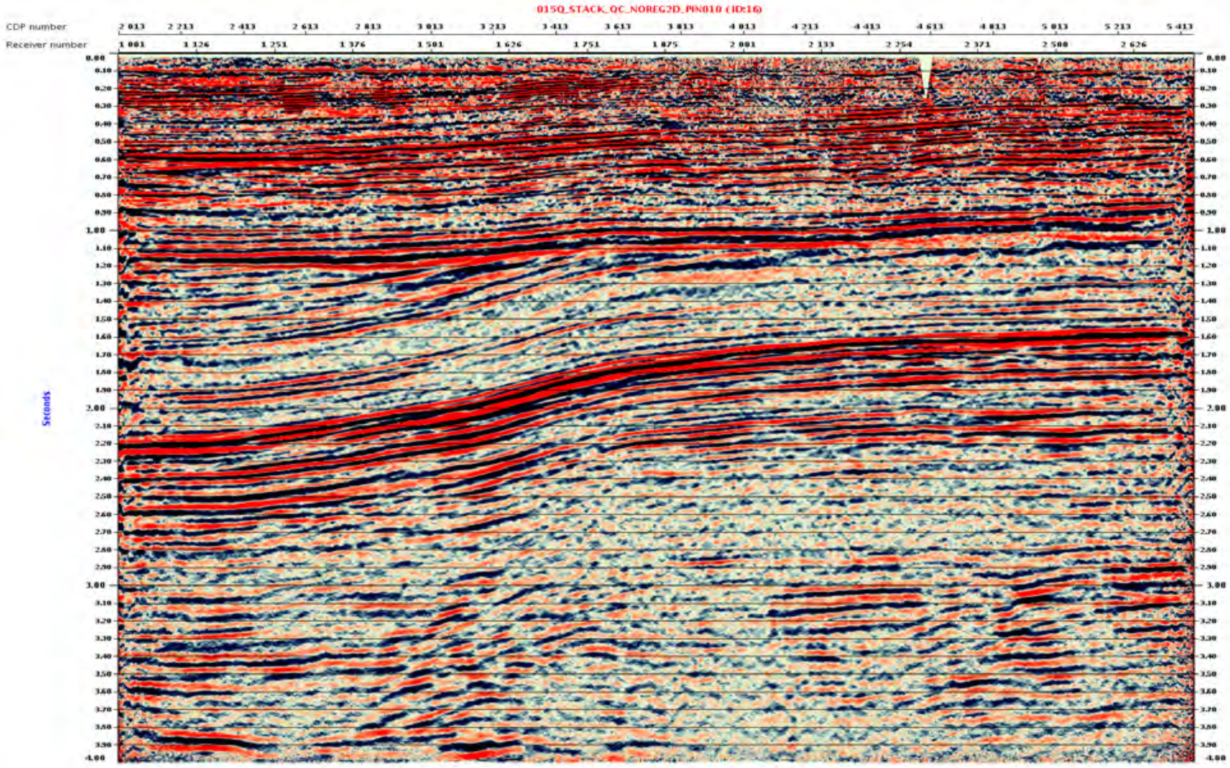

Fig 8.10.15 PIN12-010 stack before 2D Regularization (pre-stack AGC applied)

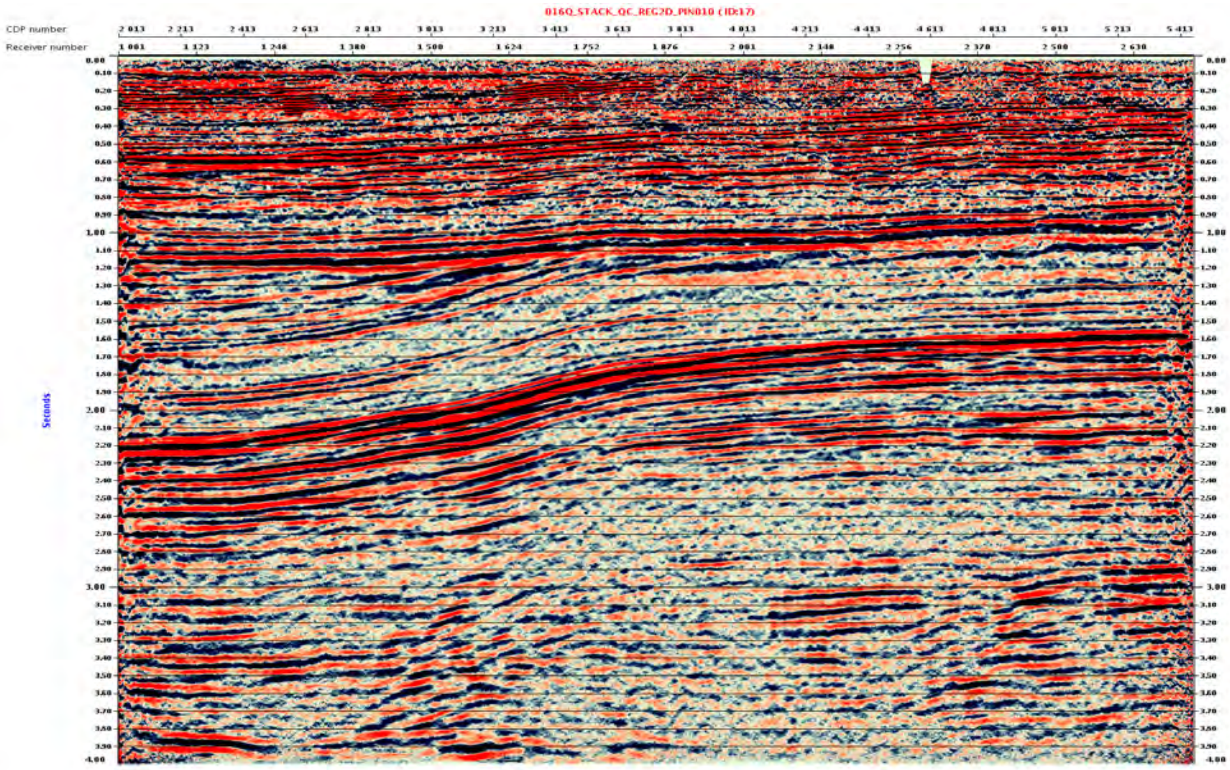

Fig 8.10.16 PIN12-010 stack after 2D Regularization (pre-stack AGC applied)

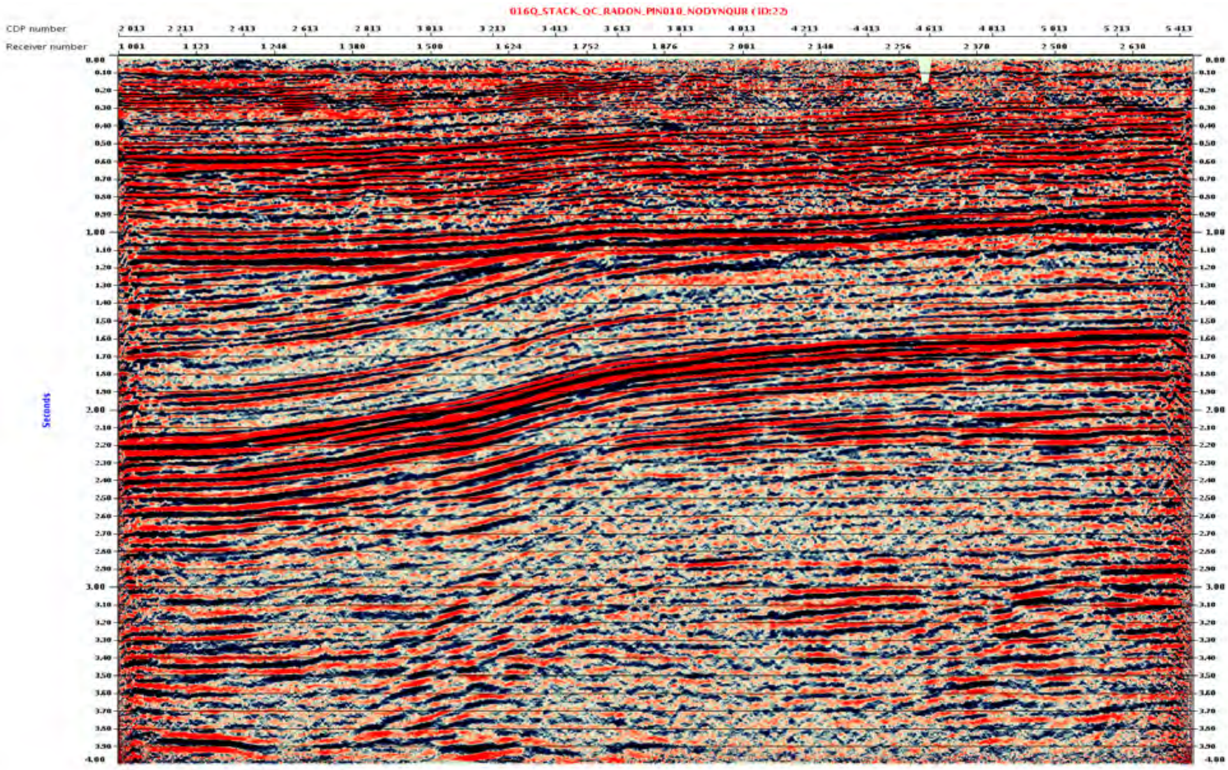

Fig 8.10.17 PIN12-010 stack after Radon demultiple (pre-stack AGC applied)

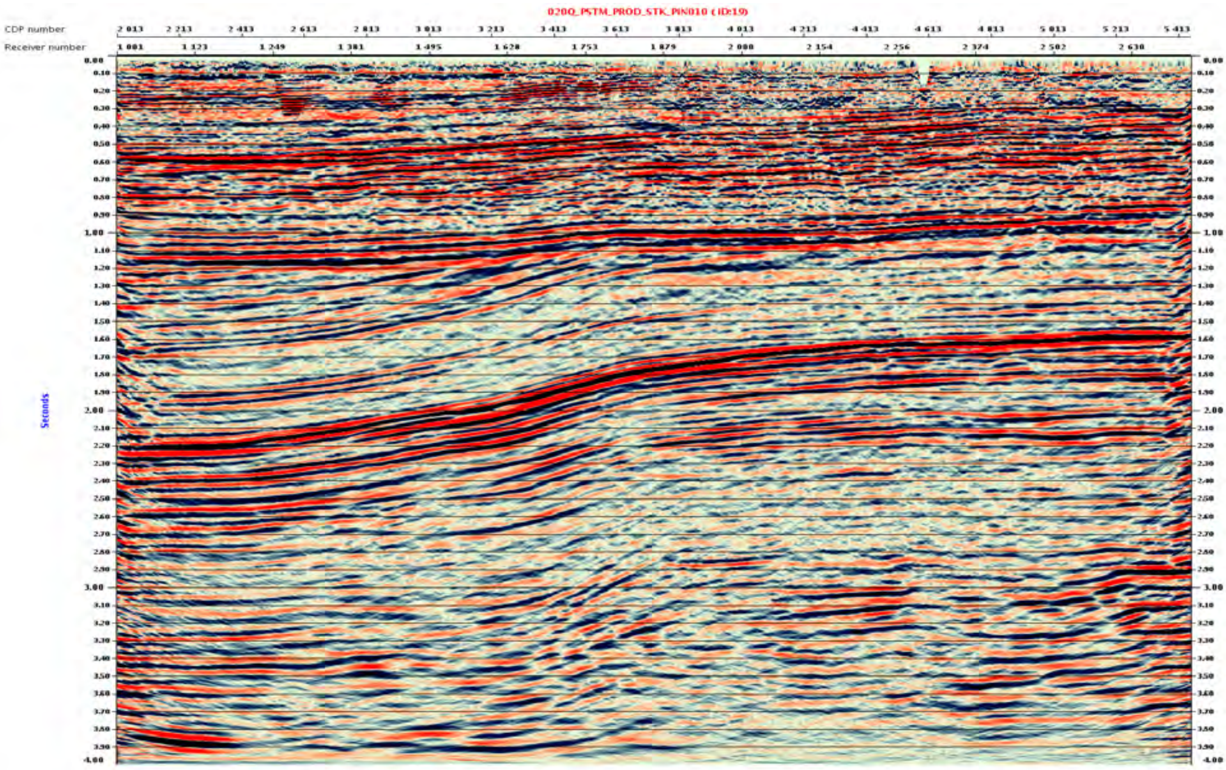

Fig 8.10.18 PIN12-010 PSTM after pre stack migration(pre-stack AGC applied)

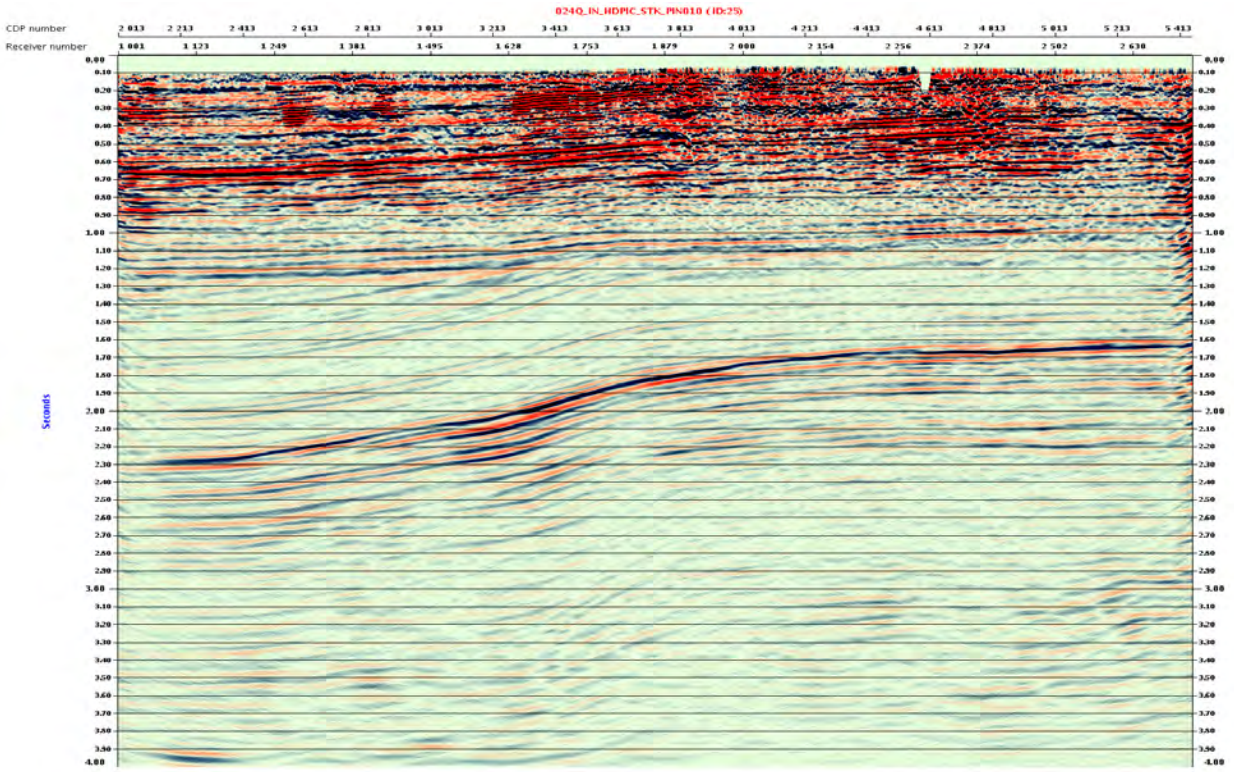

Fig 8.10.19 PIN12-010 PSTM stack before RMO velocity analysis

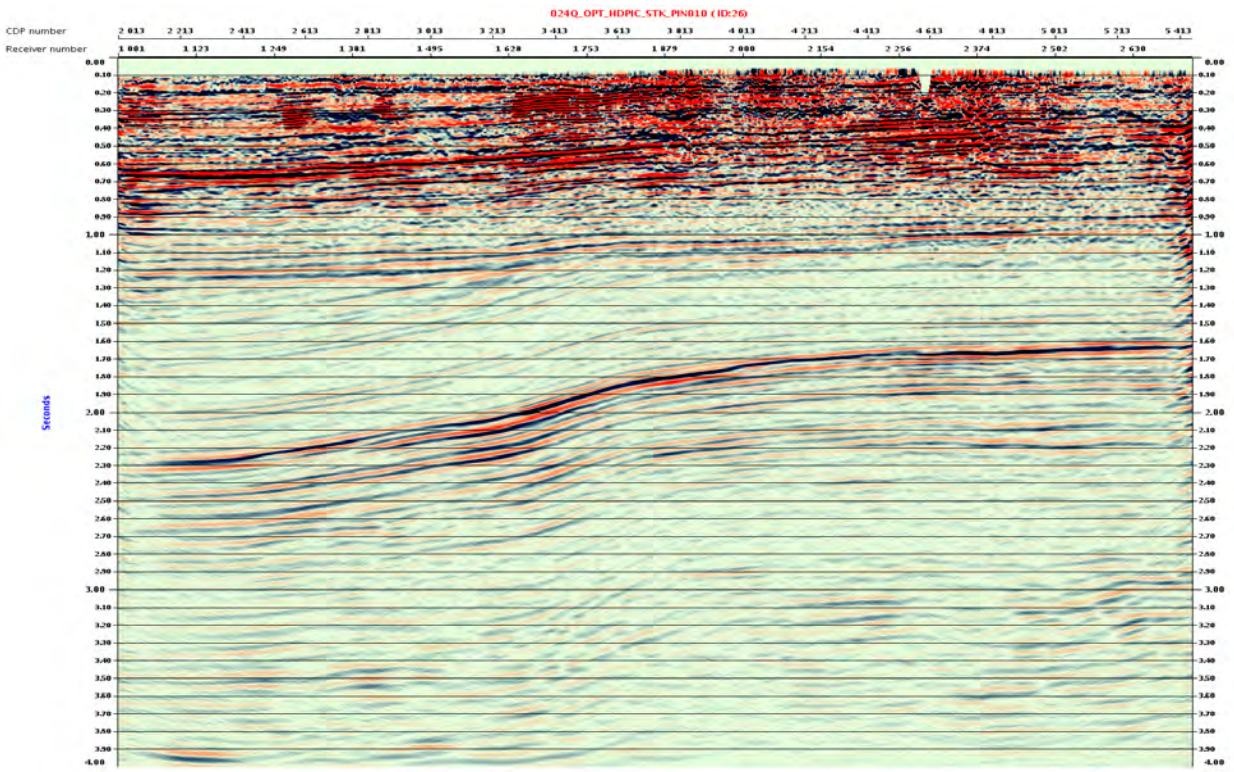

Fig 8.10.20 PIN12-010 PSTM stack after RMO velocity analysis

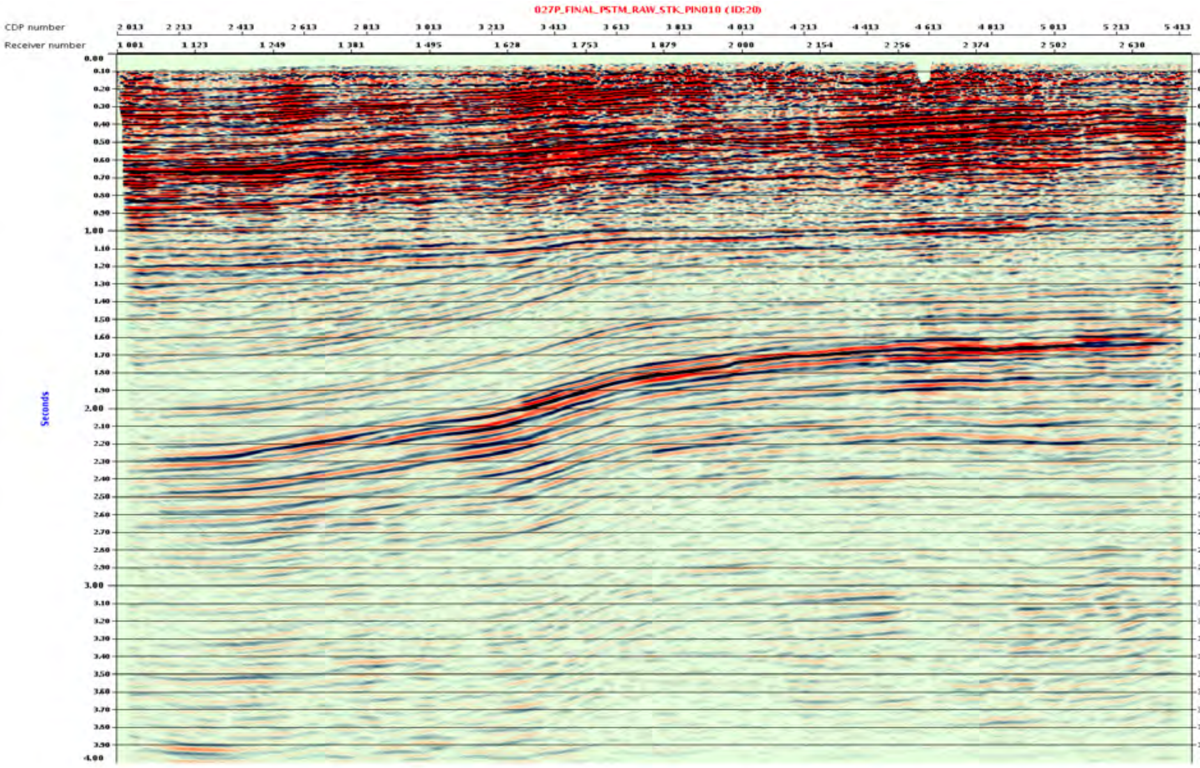

Fig 8.10.21 PIN12-010 Final PSTM stack

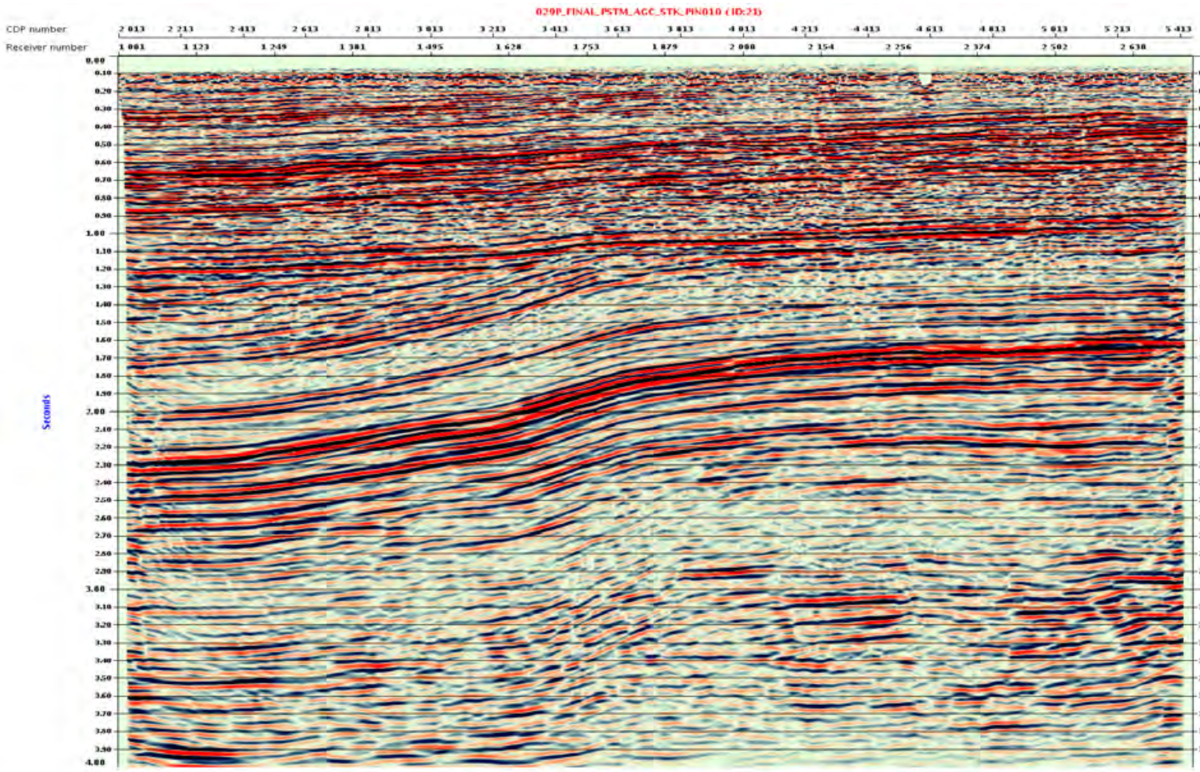

Fig 8.10.22 PIN12-010 Final PSTM stack with pre-stack AGC

8.11 Sample line stacks (Pre-STM sequence)- Jen/Argyle 2012

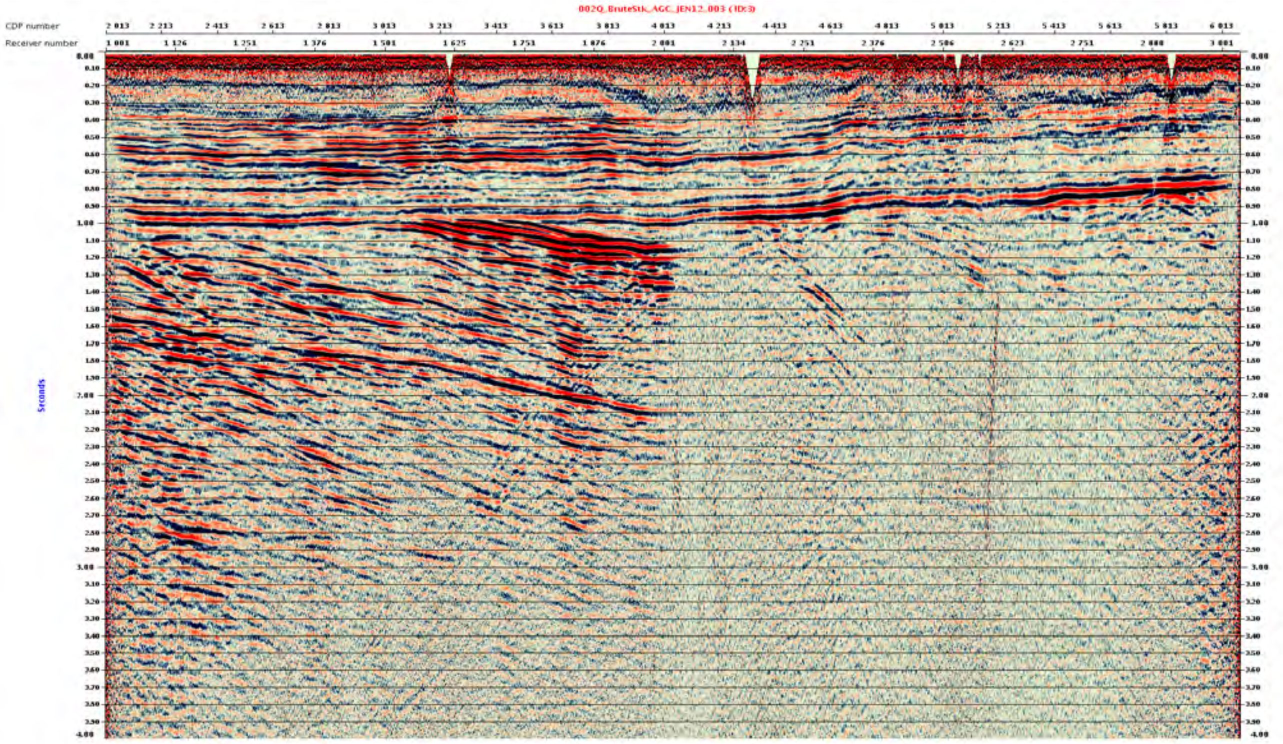

Fig 8.11.01 JEN12-003 Brute stack after geometry merge (pre-stack AGC applied)

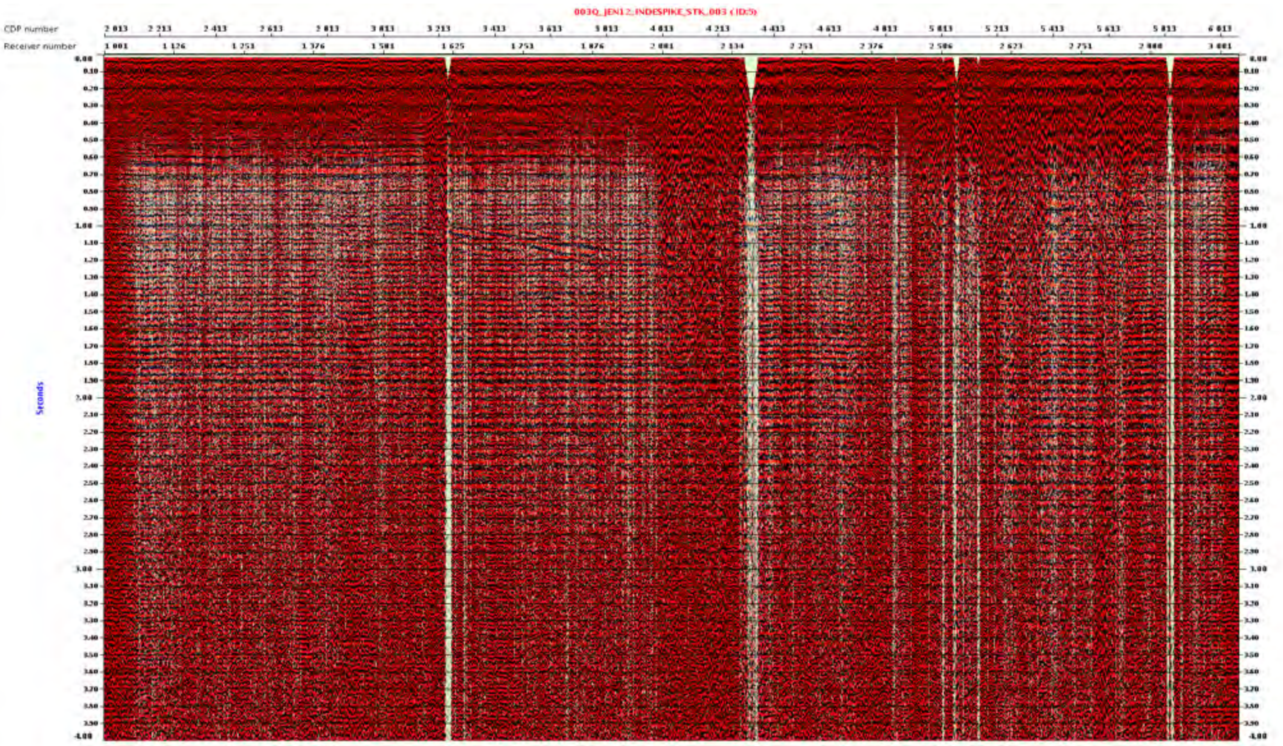

Fig 8.11.02 JEN12-003 stack before first pass of denoise

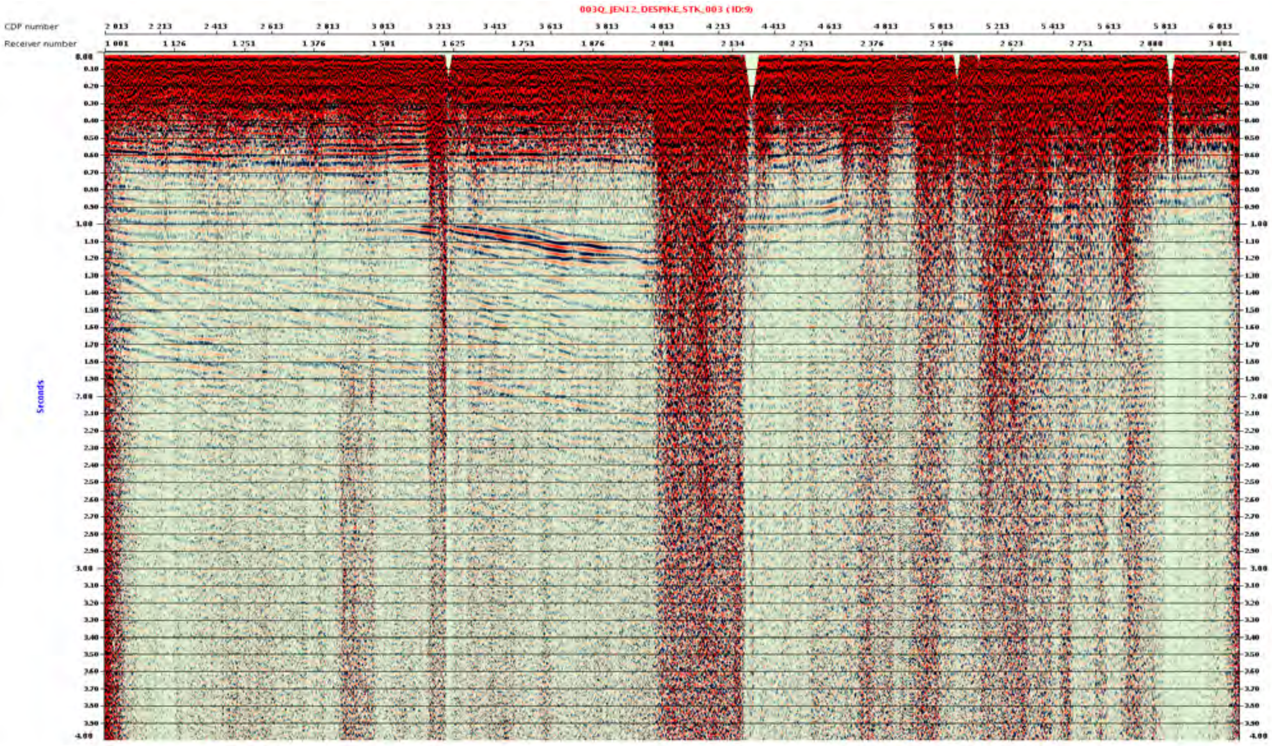

Fig 8.11.03 JEN12-003 stack after first pass of denoise

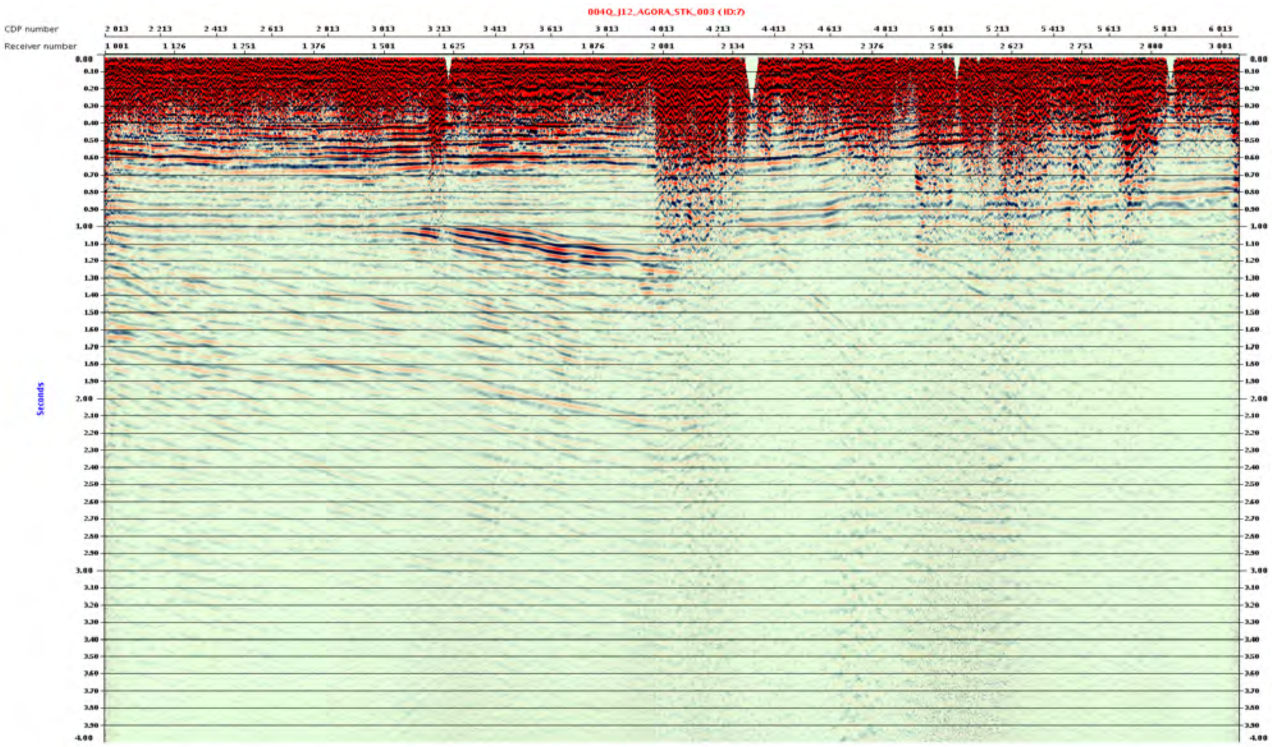

Fig 8.11.04 JEN12-003 stack after linear noise attenuation

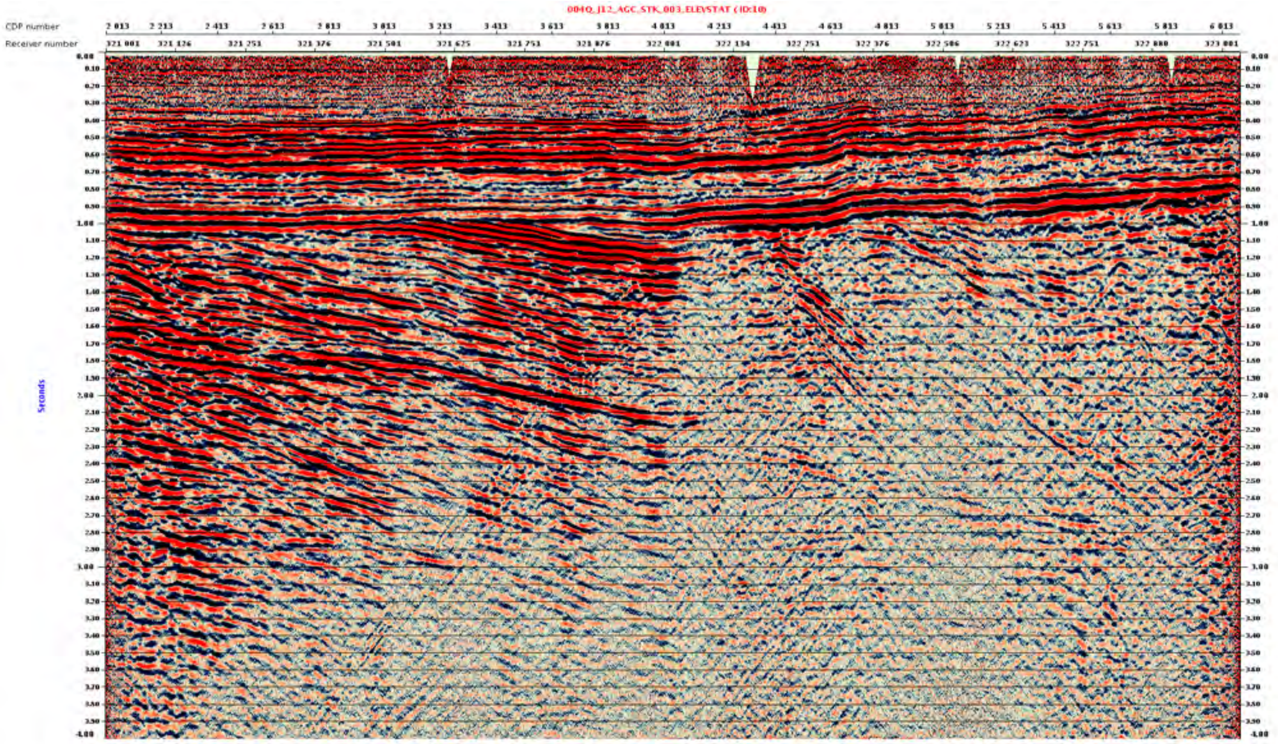

Fig 8.11.05 JEN12-003 stack with elevation statics (pre-stack AGC applied)

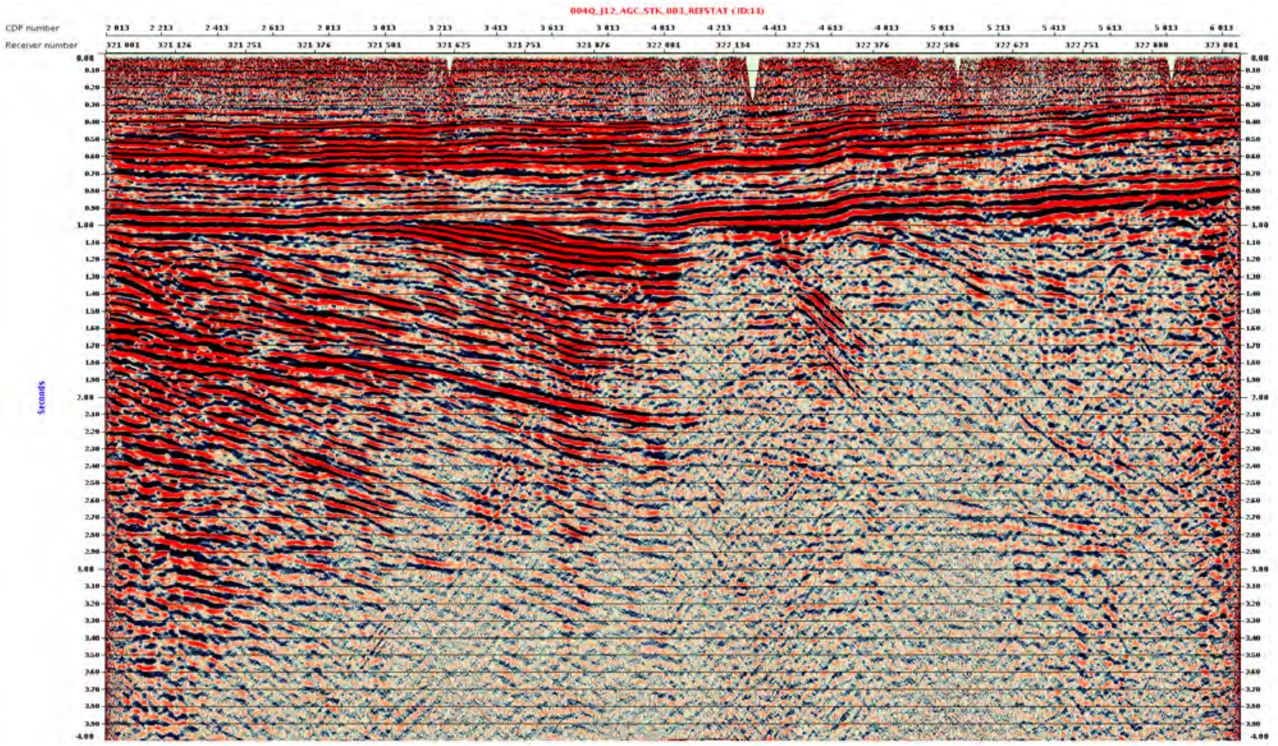

Fig 8.11.06 JEN12-003 stack with pseudo 3D refraction statics (pre-stack AGC applied)

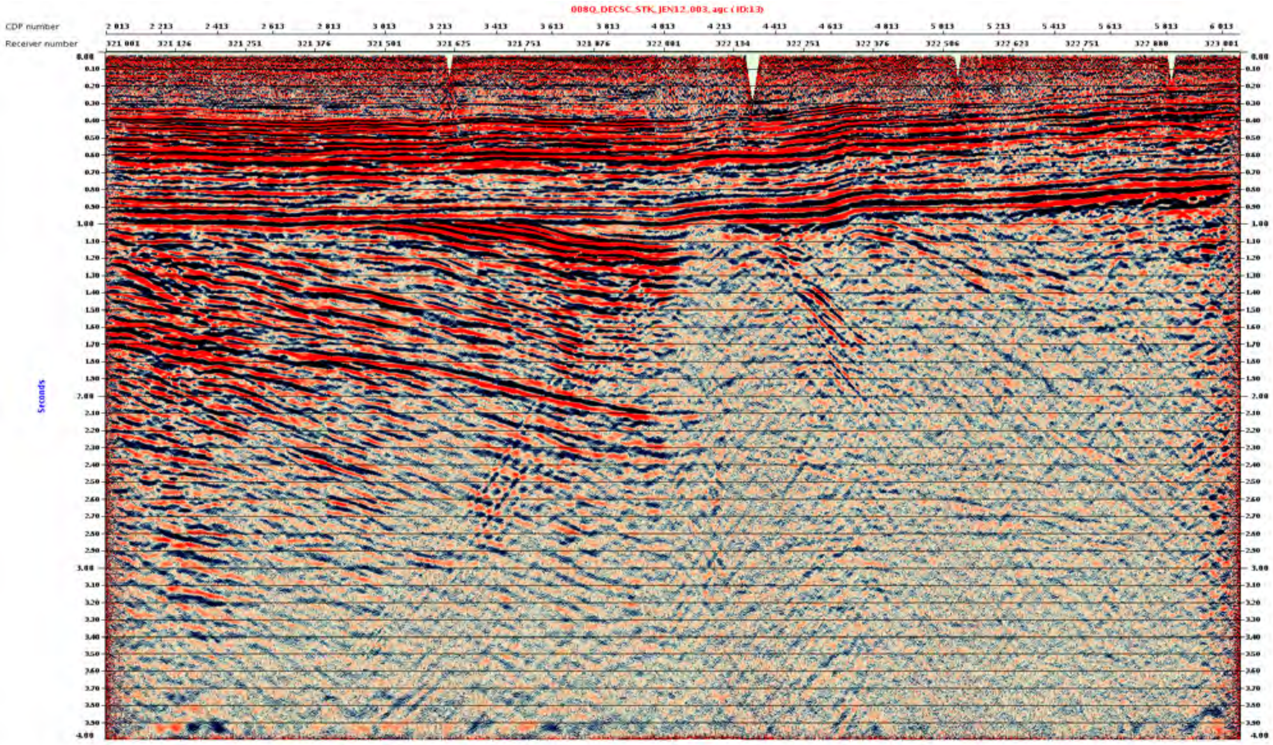

Fig 8.11.07 JEN12-003 stack after surface consistent deconvolution (pre-stack AGC applied)

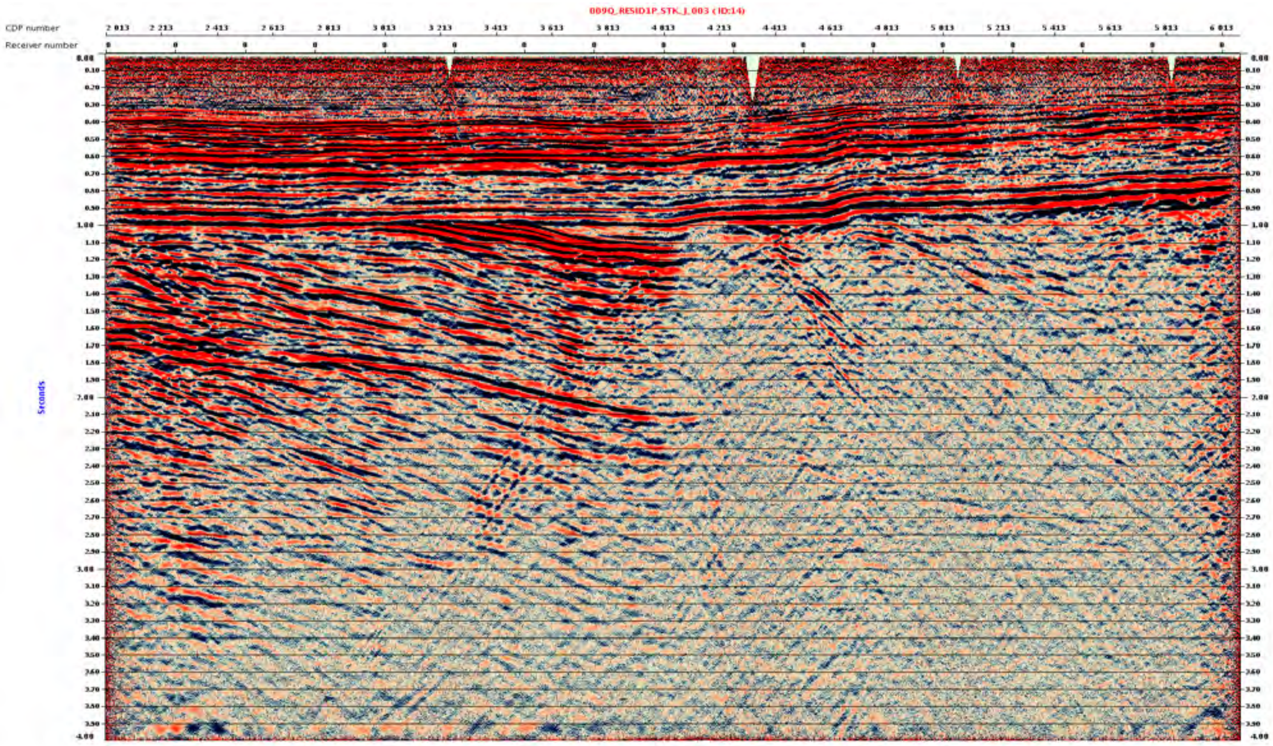

Fig 8.11.08 JEN12-003 stack after 1st pass residual statics (pre-stack AGC applied)

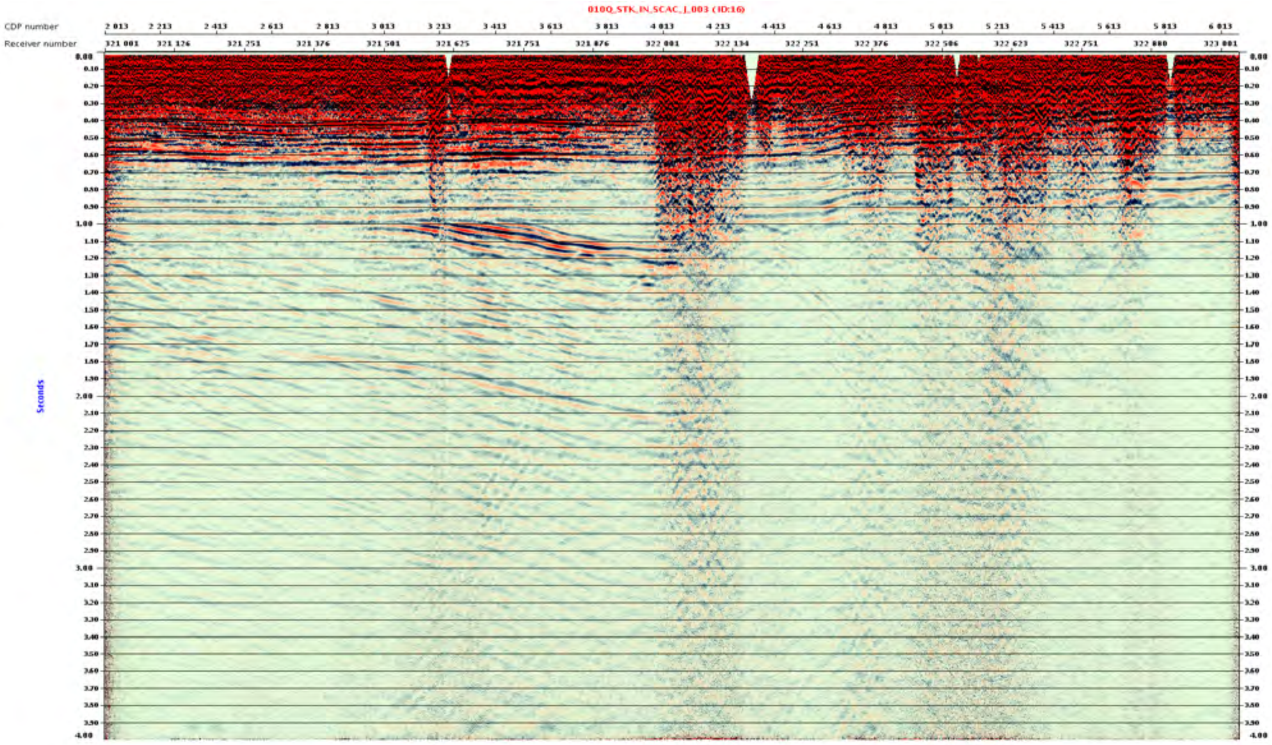

Fig 8.11.09 JEN12-003 stack before 1st pass surface consistent amplitude correction

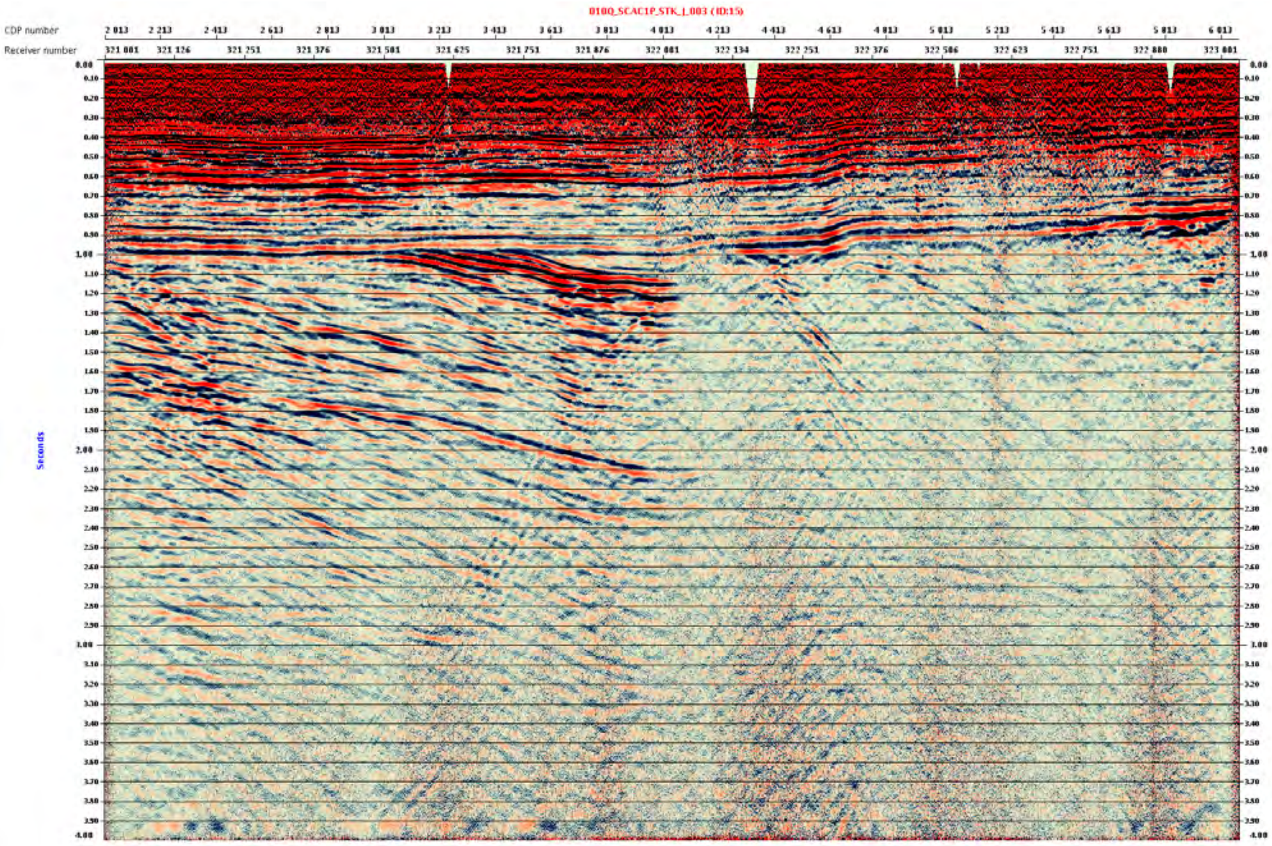

Fig 8.11.10 JEN12-003 stack after 1st pass surface consistent amplitude correction

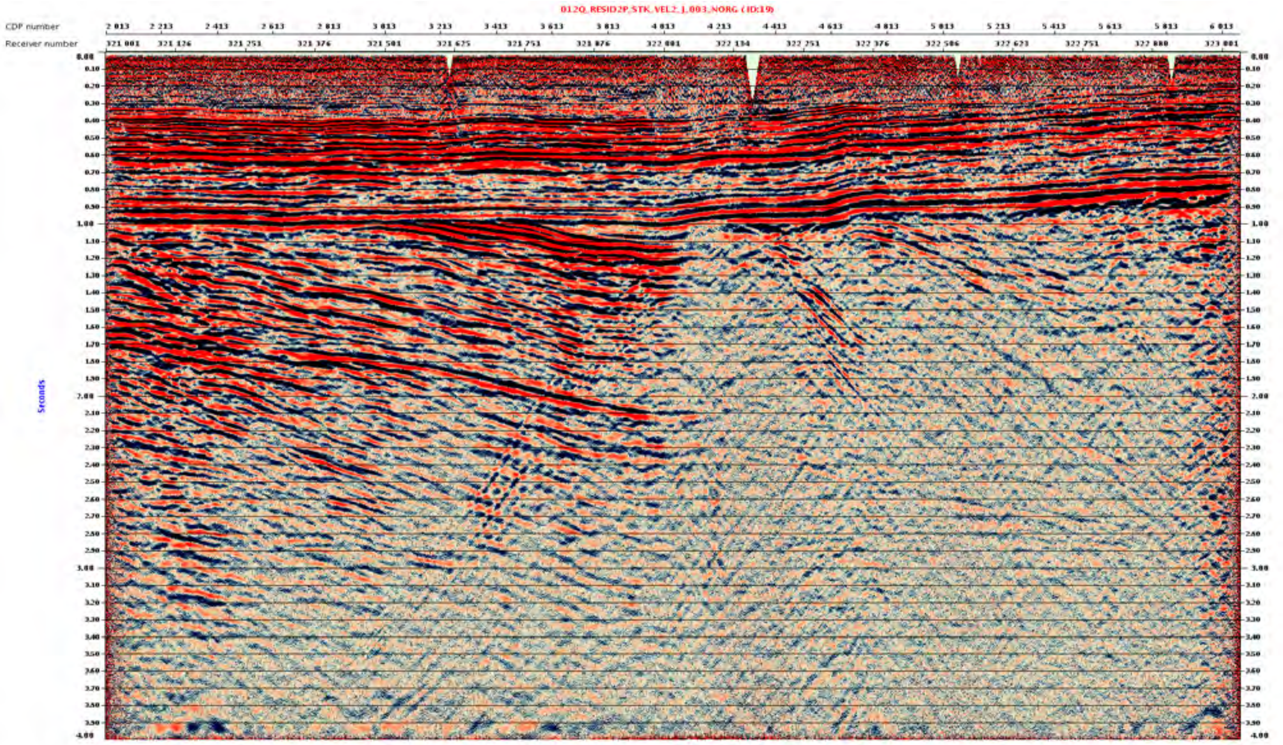

Fig 8.11.11 JEN12-003 stack after 2nd pass of residual statics (pre-stack AGC applied)

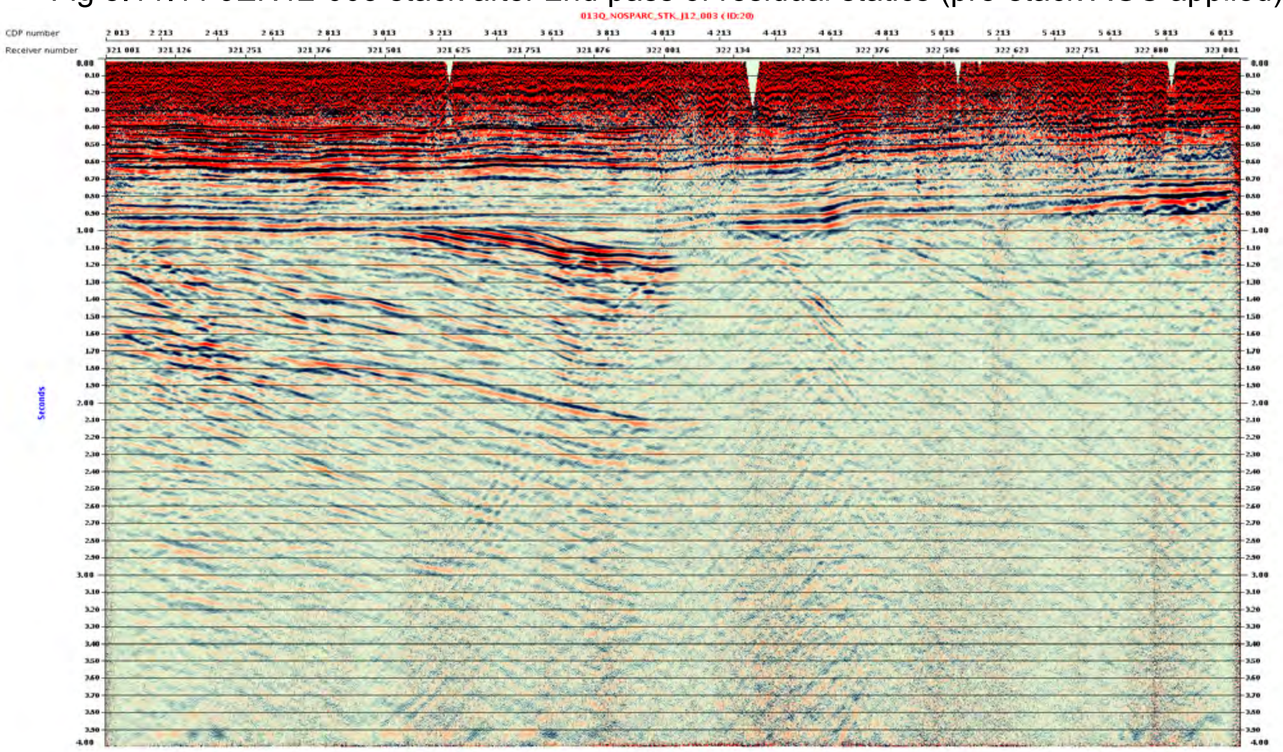

Fig 8.11.12 JEN12-003 stack before CDP-Offset domain denoise

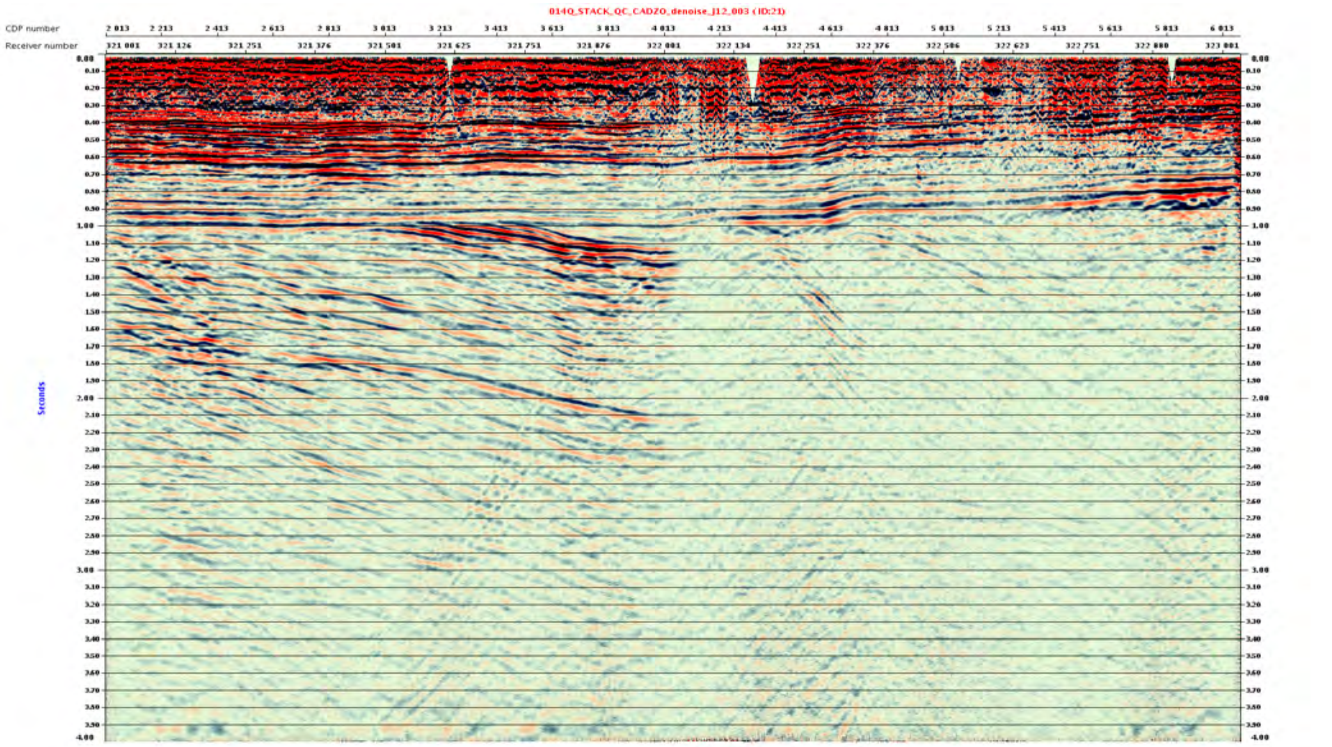

Fig 8.11.13 JEN12-003 stack after CDP-Offset domain denoise

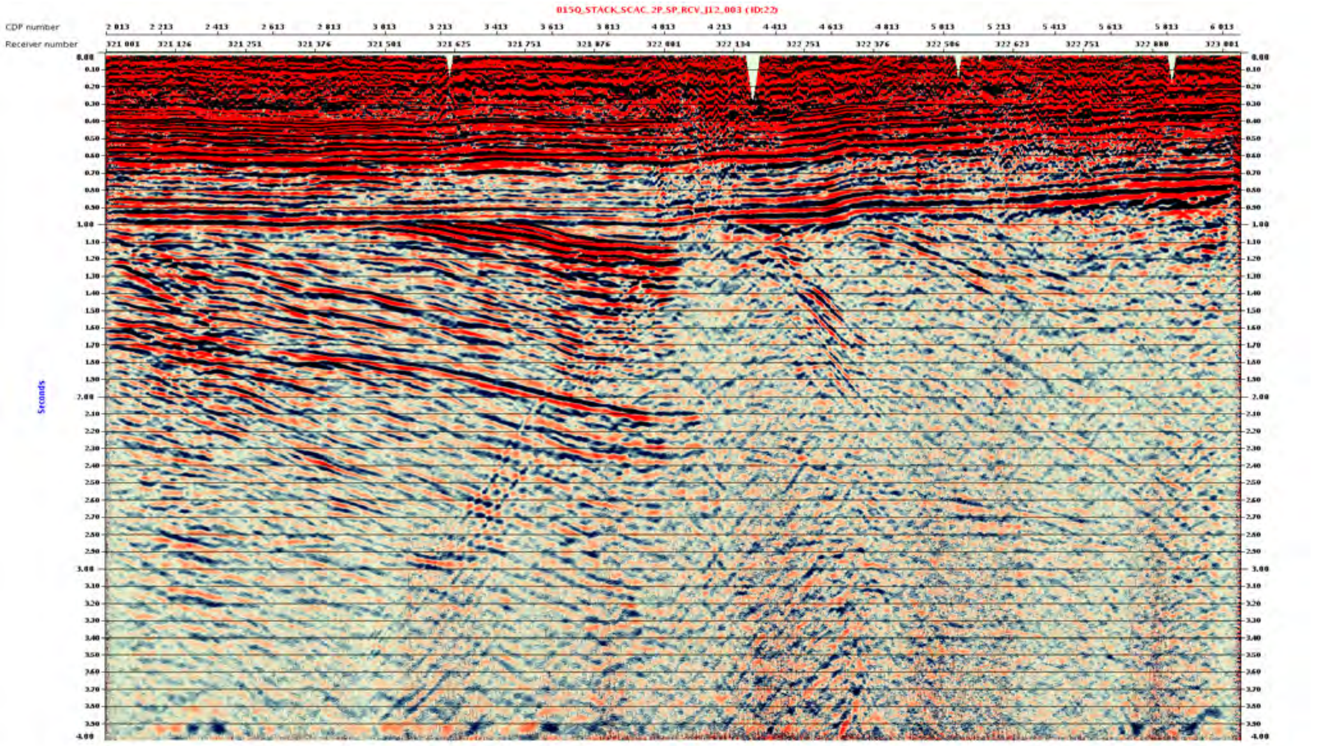

Fig 8.11.14 JEN12-003 stack after 2nd pass of surface consistent amplitude correction

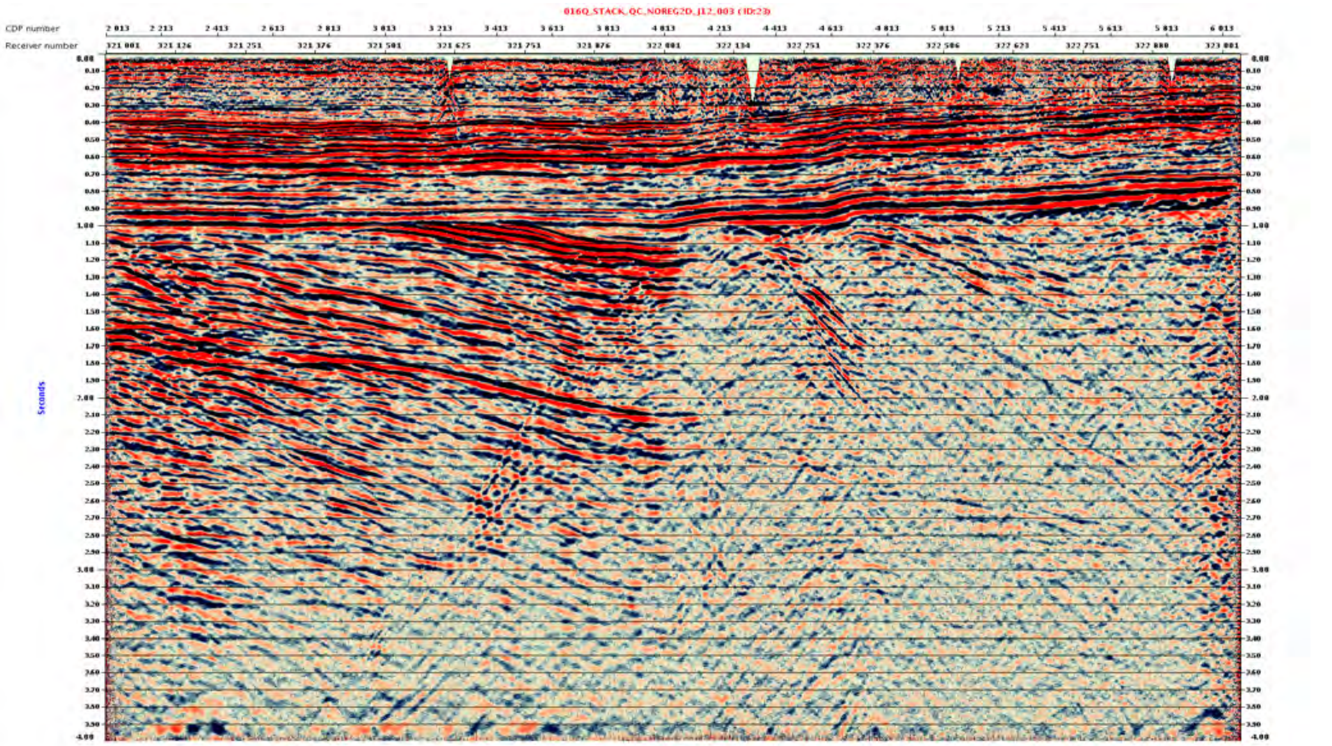

Fig 8.11.15 JEN12-003 stack after 2D Regularization

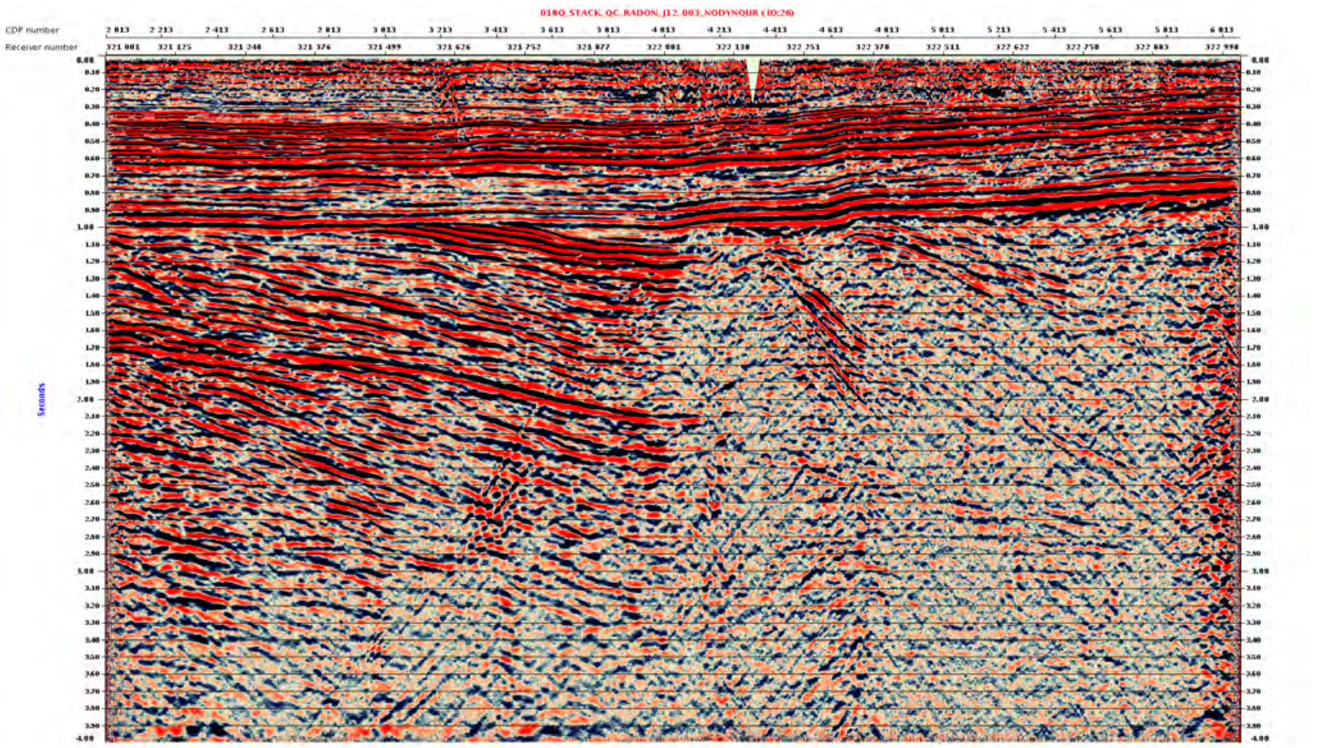

Fig 8.11.16 JEN12-003 stack after Radon demultiple

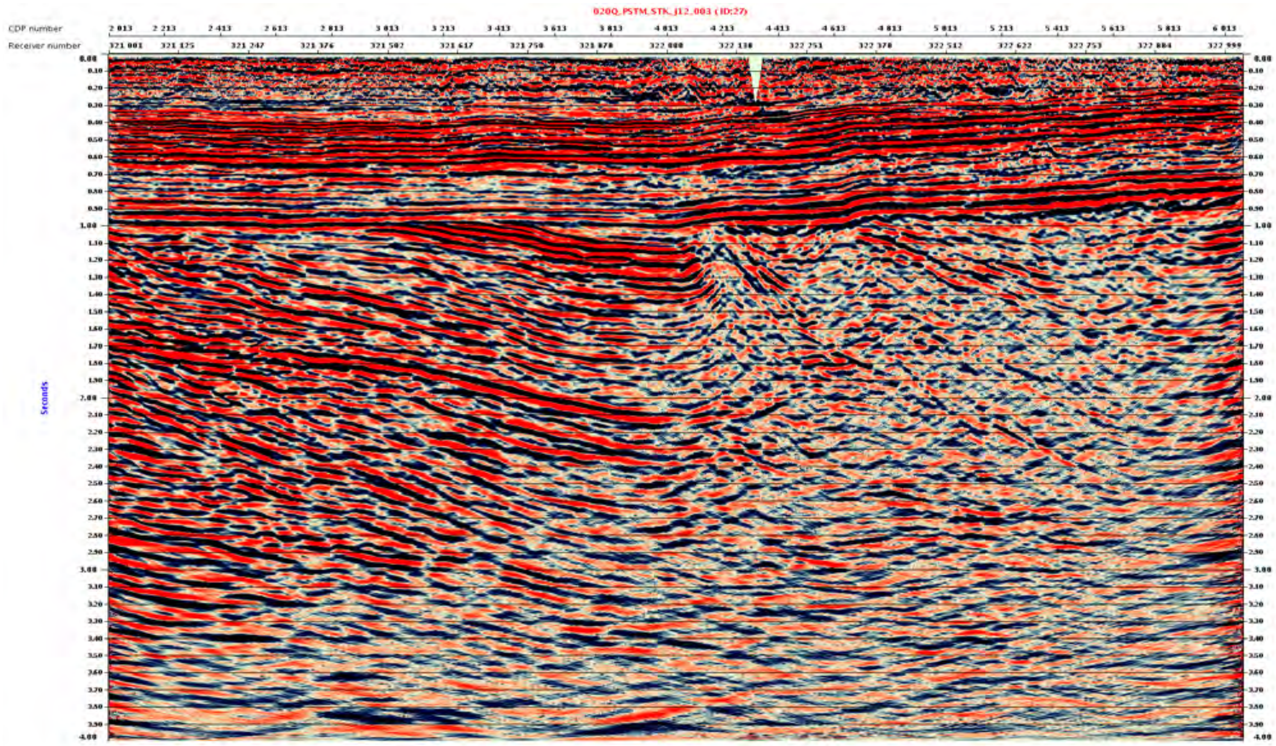

Fig 8.11.17 JEN12-003 PSTM after pre stack migration

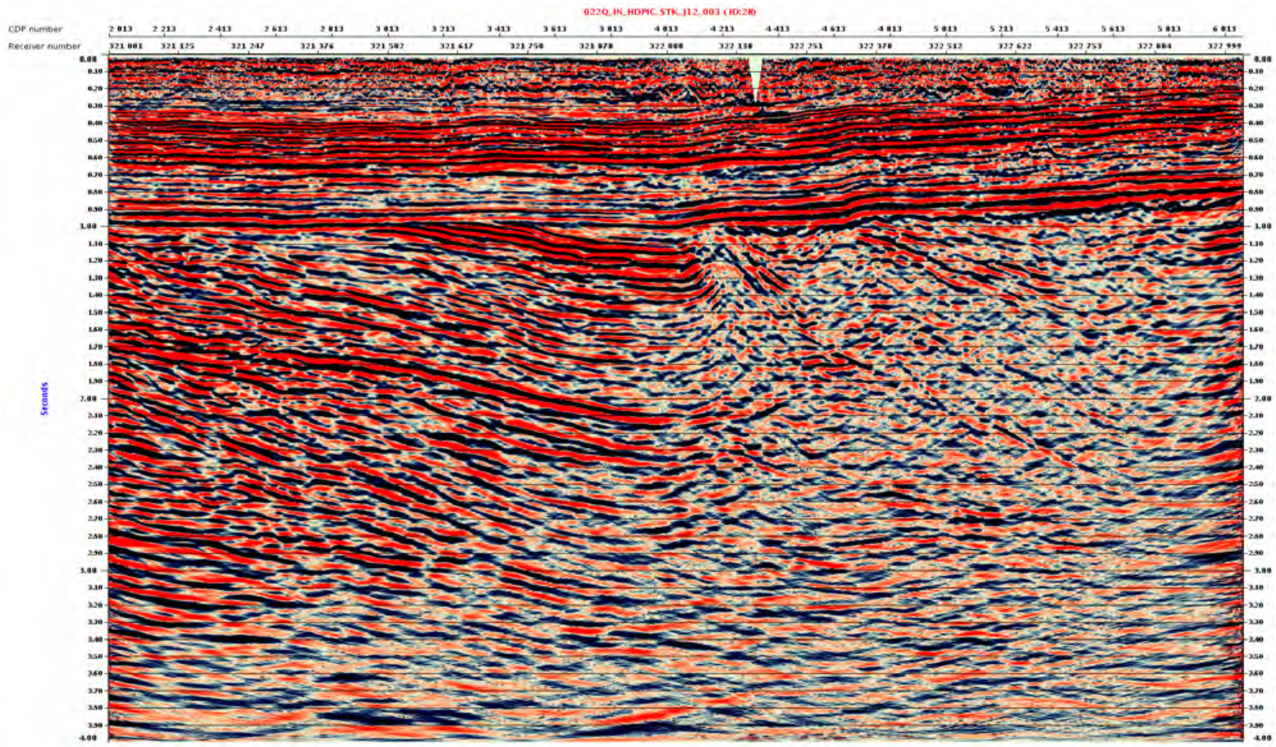

Fig 8.11.18 JEN12-003 PSTM stack before RMO velocity analysis(pre-stack AGC applied)

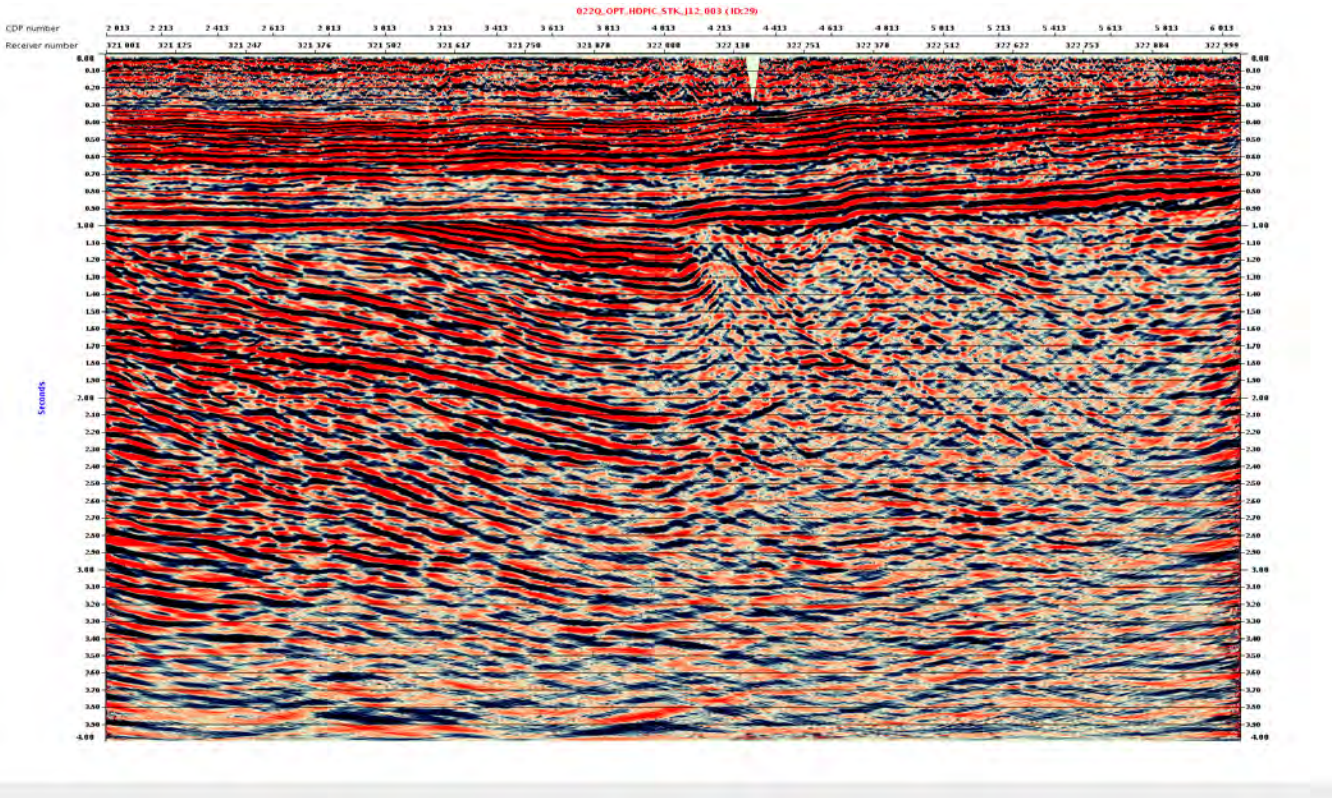

Fig 8.11.19 JEN12-003 PSTM stack after RMO velocity analysis(pre-stack AGC applied)

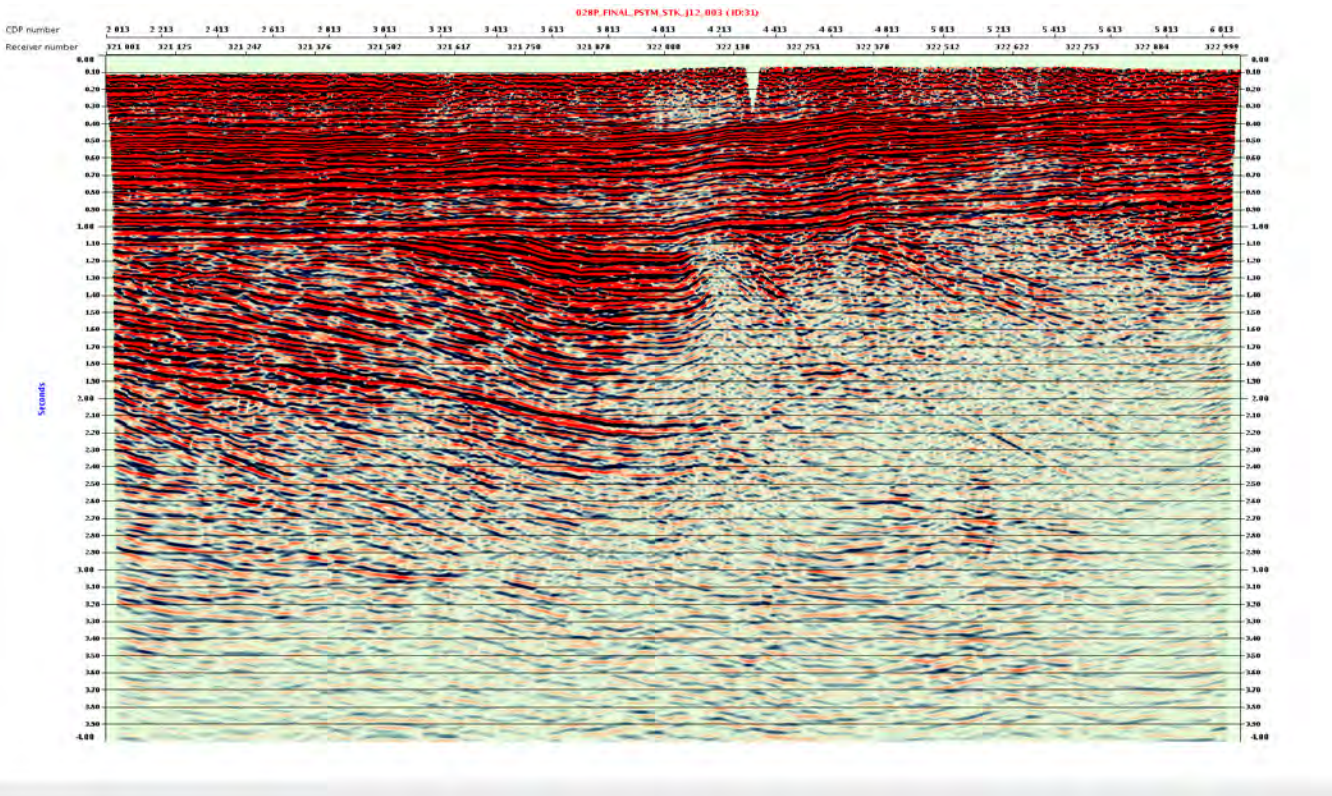

Fig 8.11.20 JEN12-003 Final PSTM stack

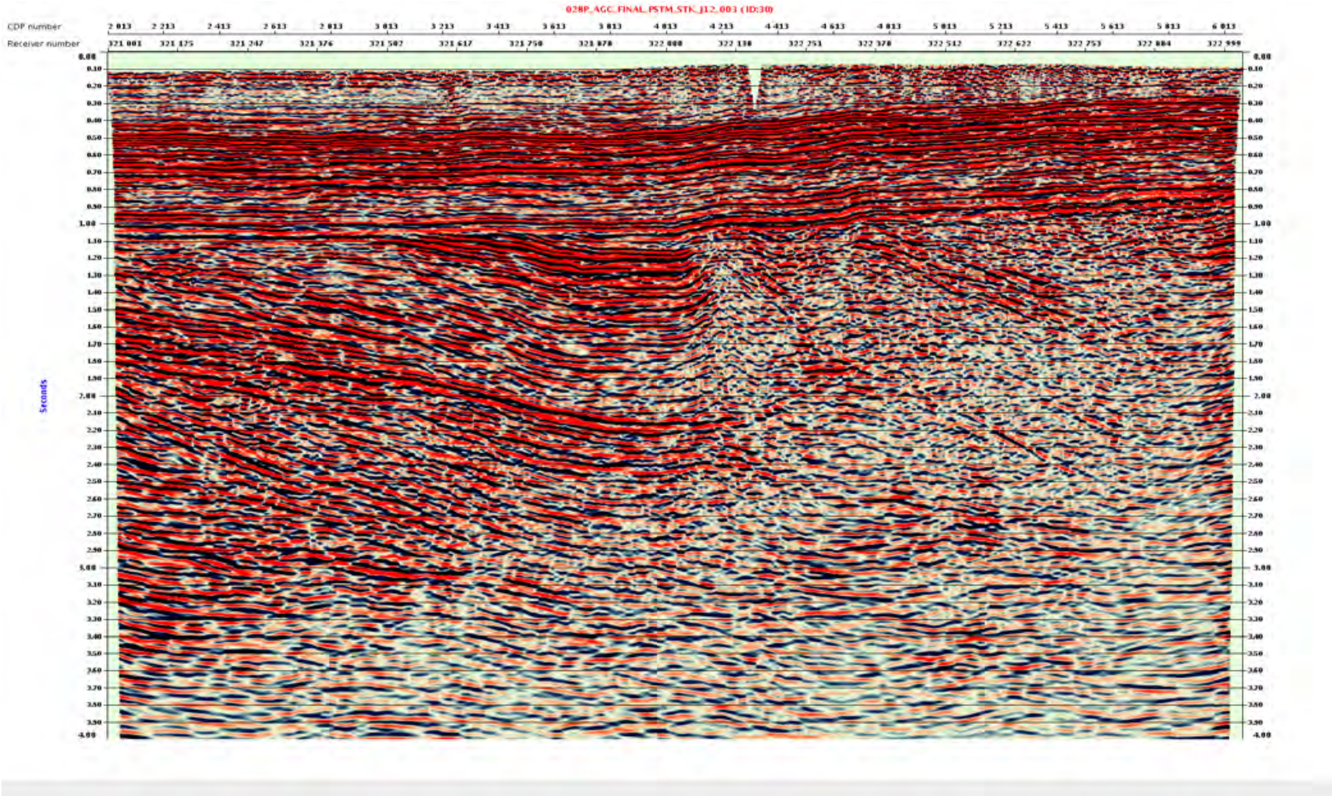

Fig 8.11.21 JEN12-003 Final PSTM stack with pre-stack AGC

8.12 Sample line stacks (Pre-STM sequence)- Spofforth 2012

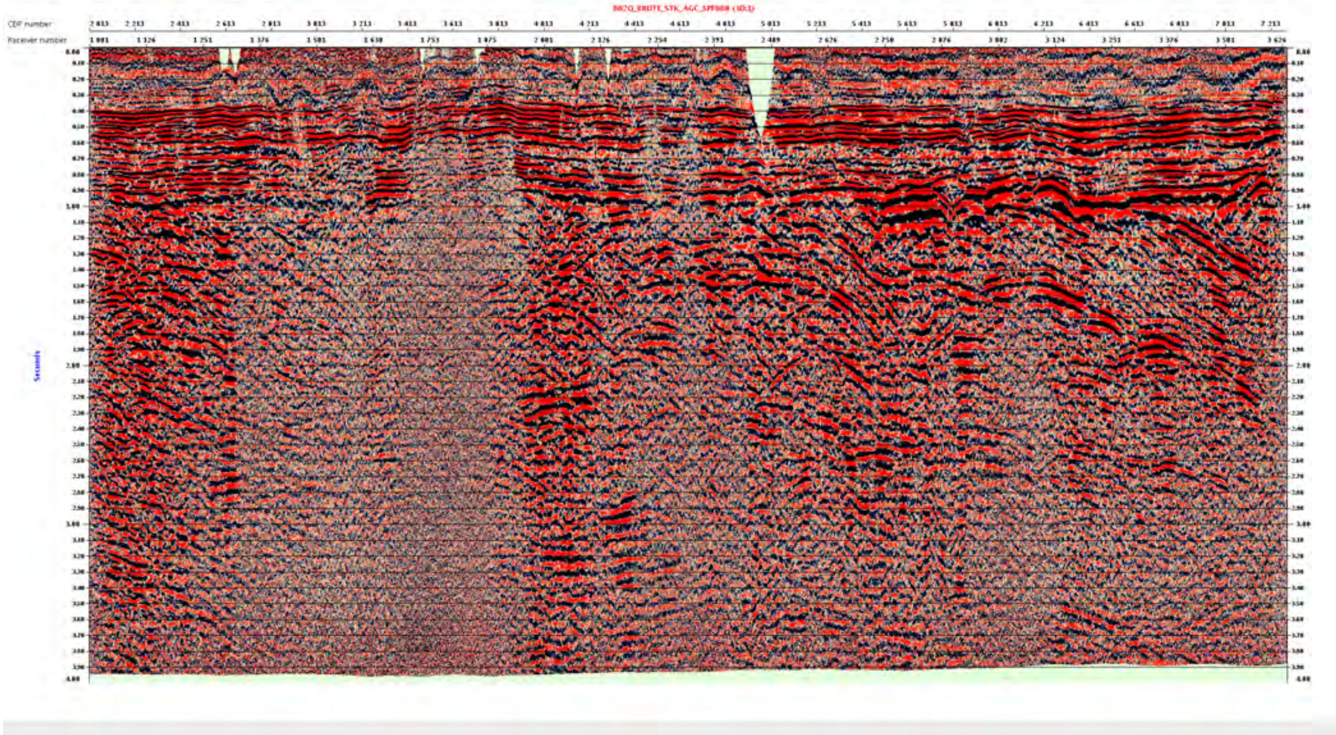

Fig 8.12.01 SPO12-008 Brute stack after geometry merge (pre-stack AGC applied)

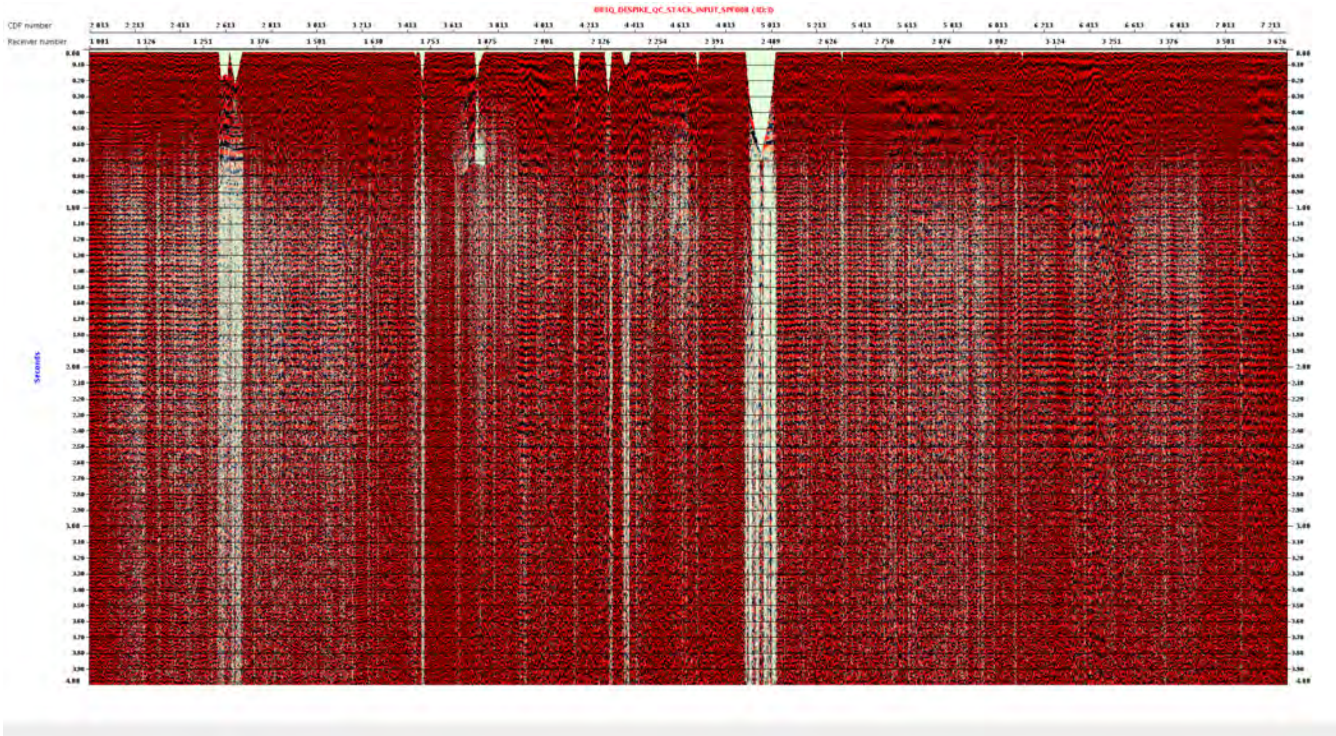

Fig 8.12.02 SPO12-008 stack before first pass of denoise

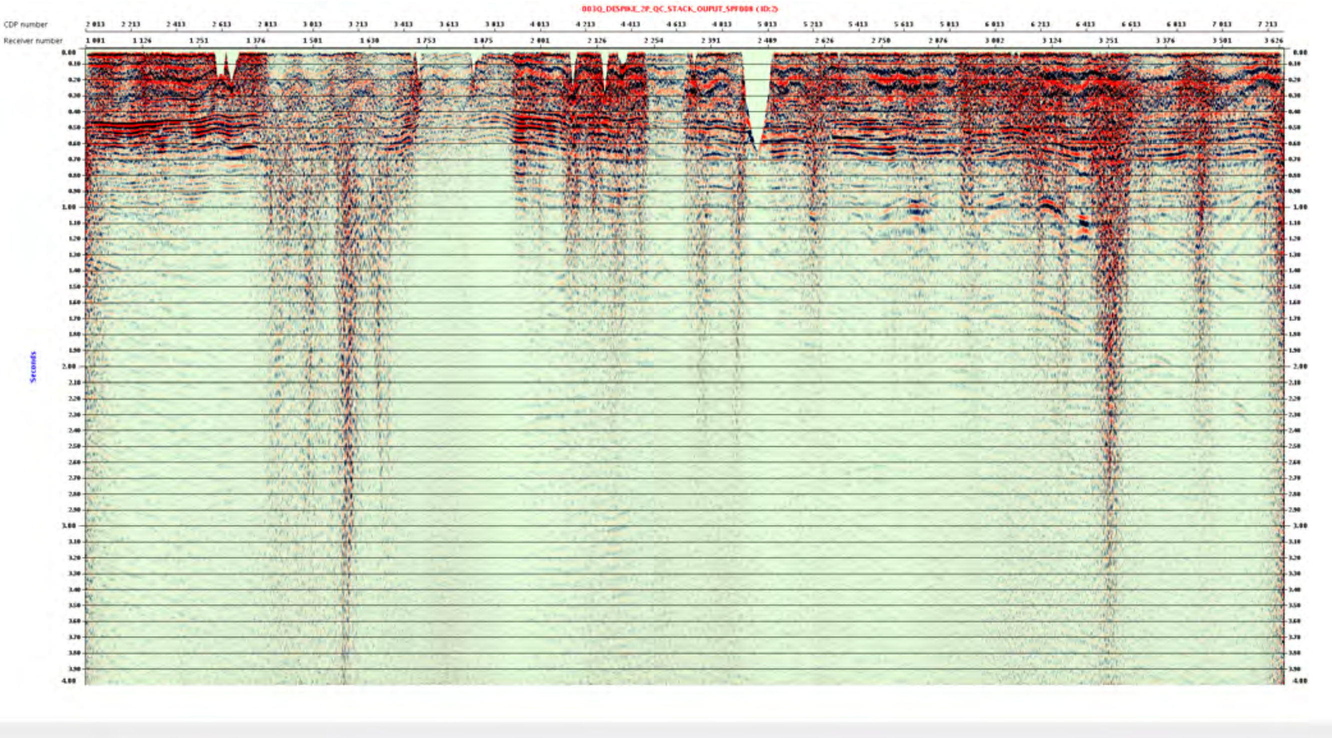

Fig 8.12.03 SPO12-008 stack after first pass of denoise

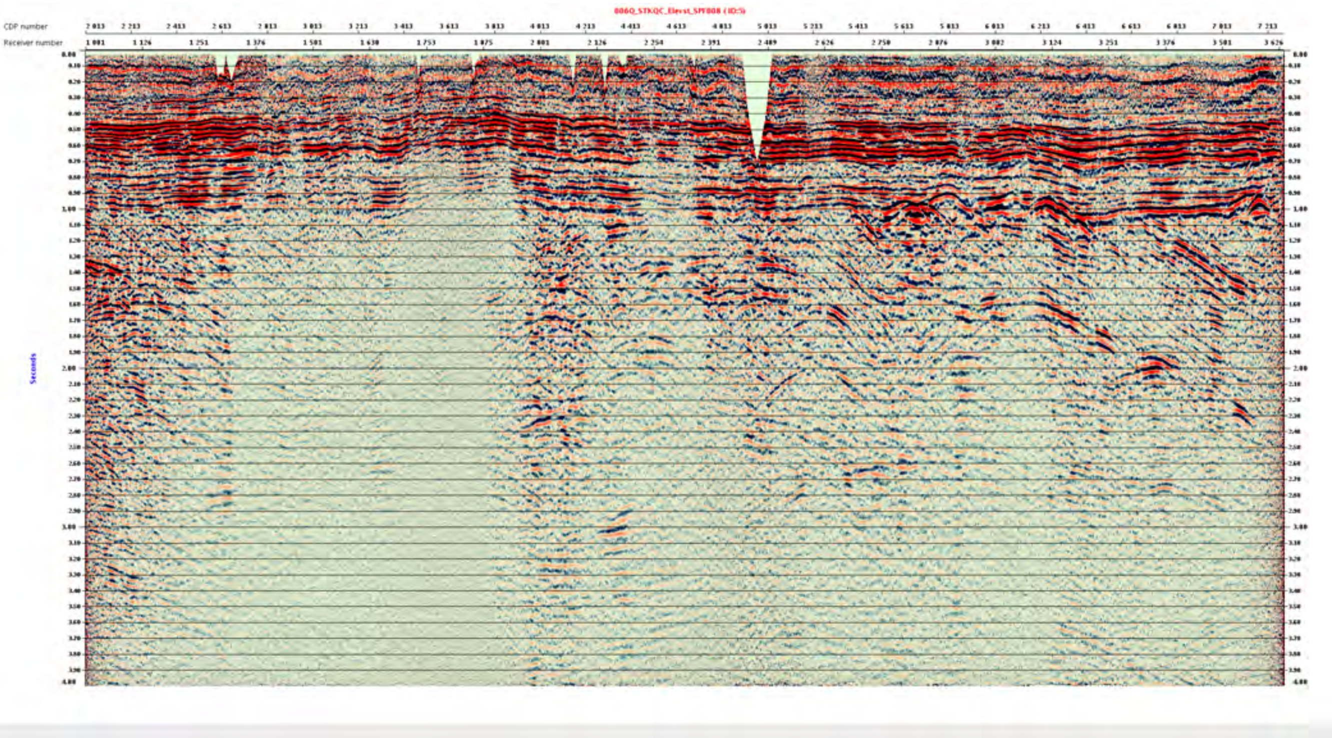

Fig 8.12.04 SPO12-008 stack after linear noise attenuation

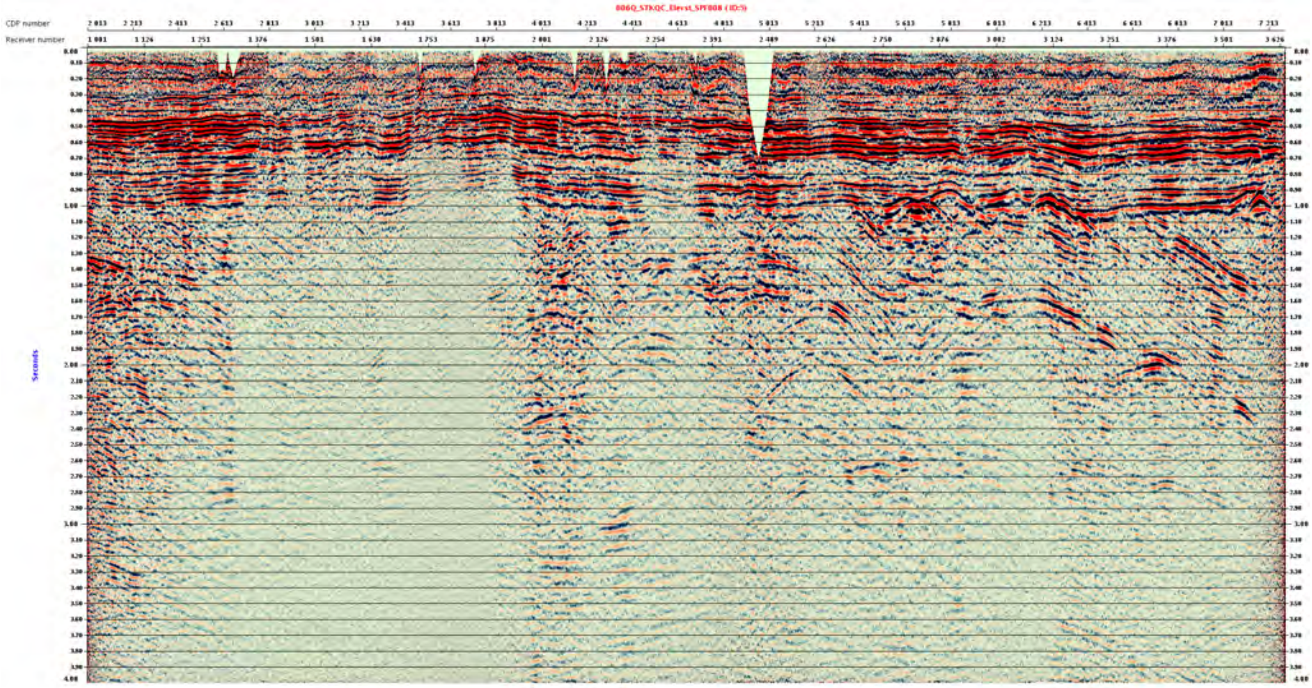

Fig 8.12.05 SPO12-008 stack with elevation statics (pre-stack AGC applied)

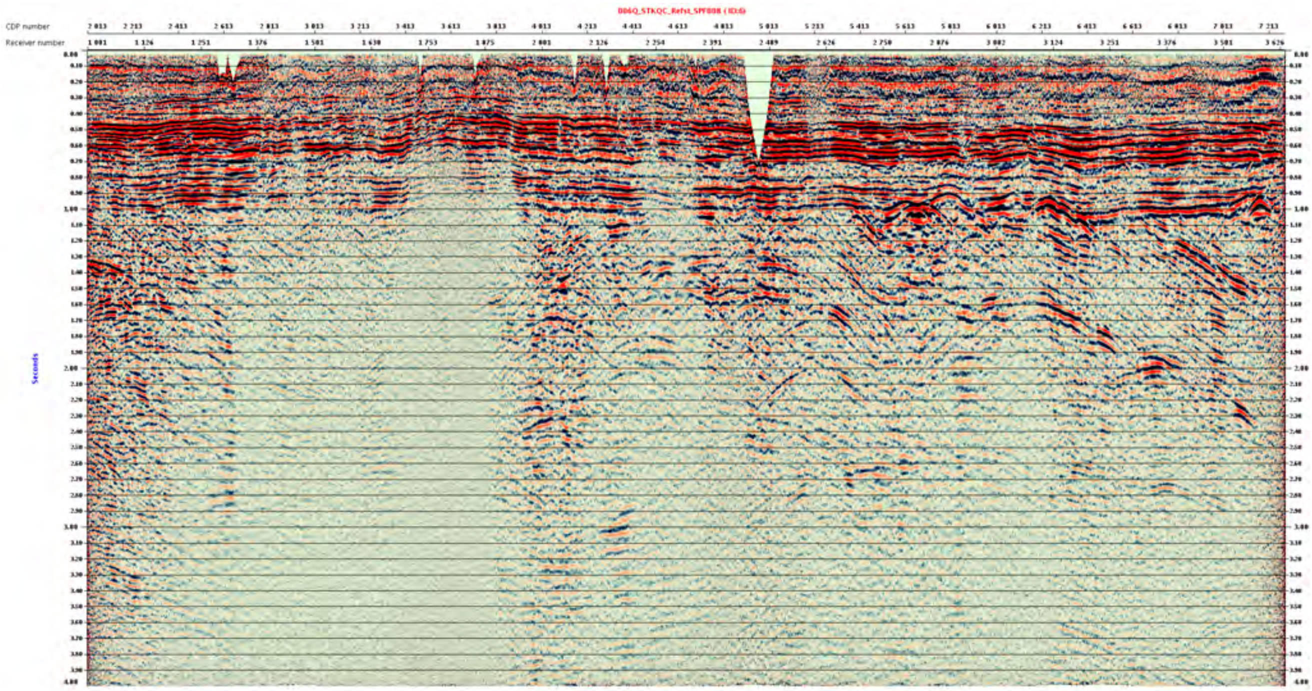

Fig 8.12.06 SPO12-008 stack with pseudo 3D refraction statics (pre-stack AGC applied)

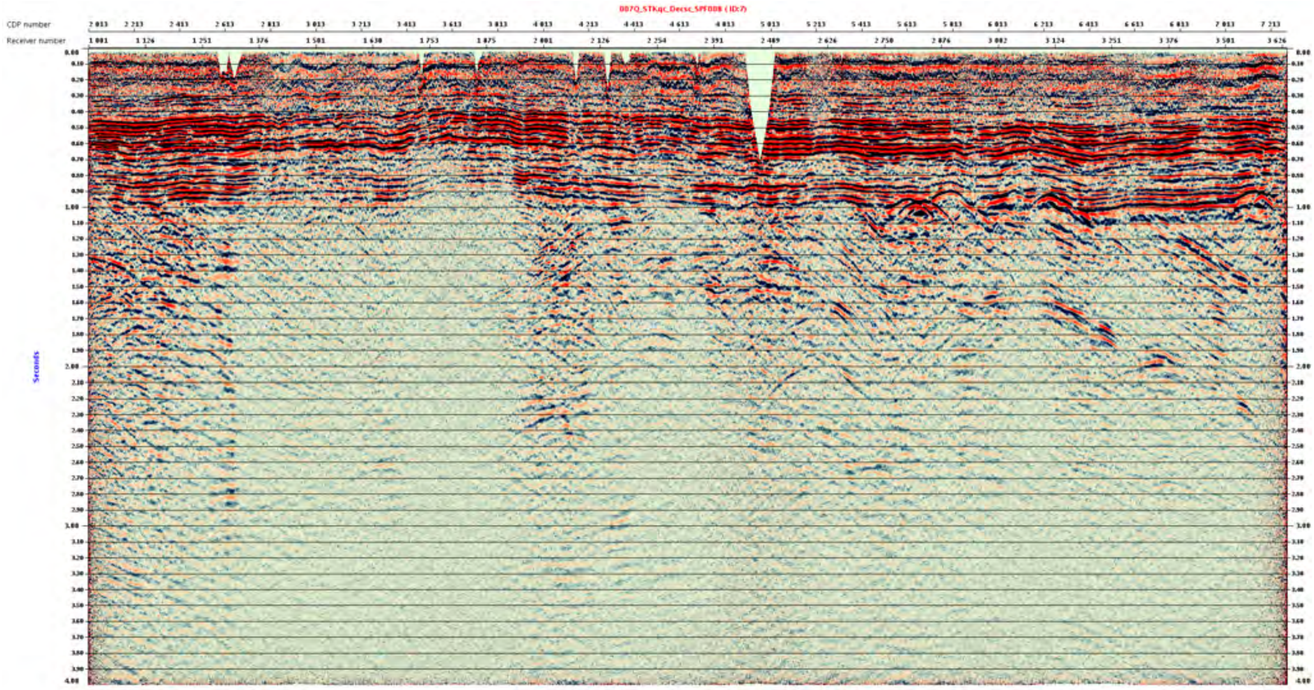

Fig 8.12.07 SPO12-008 stack after surface consistent deconvolution (pre-stack AGC applied)

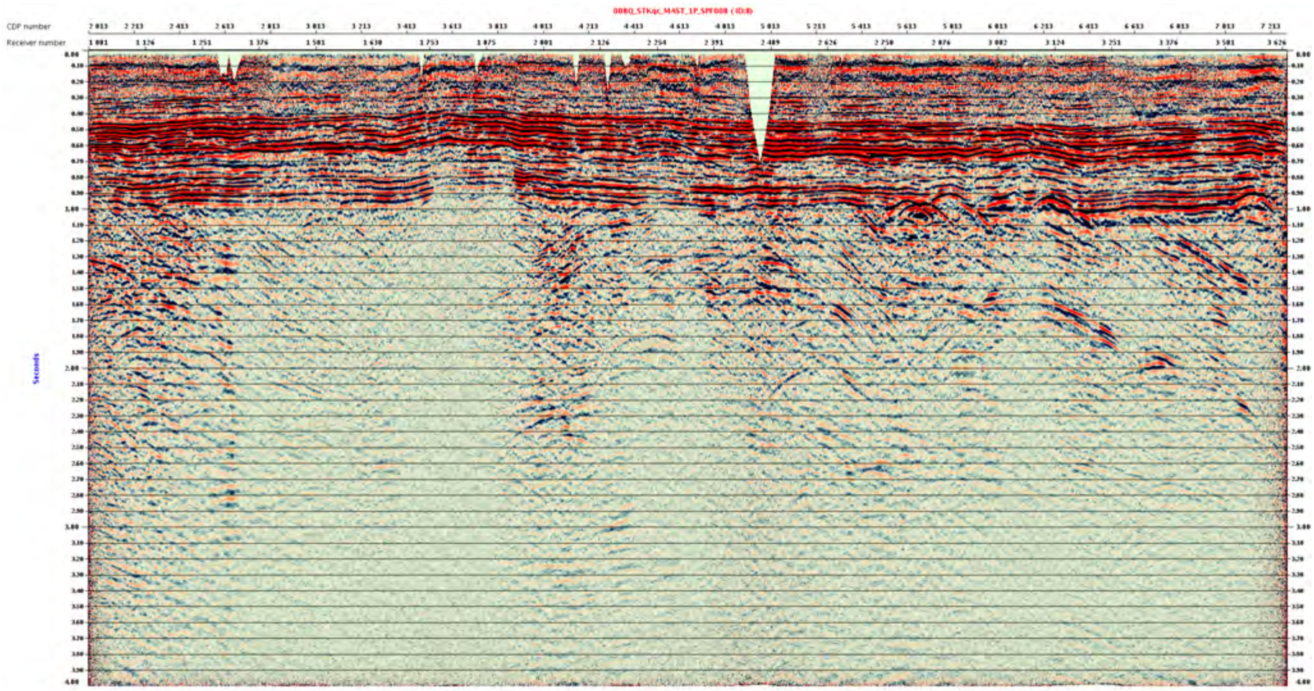

Fig 8.12.08 SPO12-008 stack after 1st pass residual statics (pre-stack AGC applied)

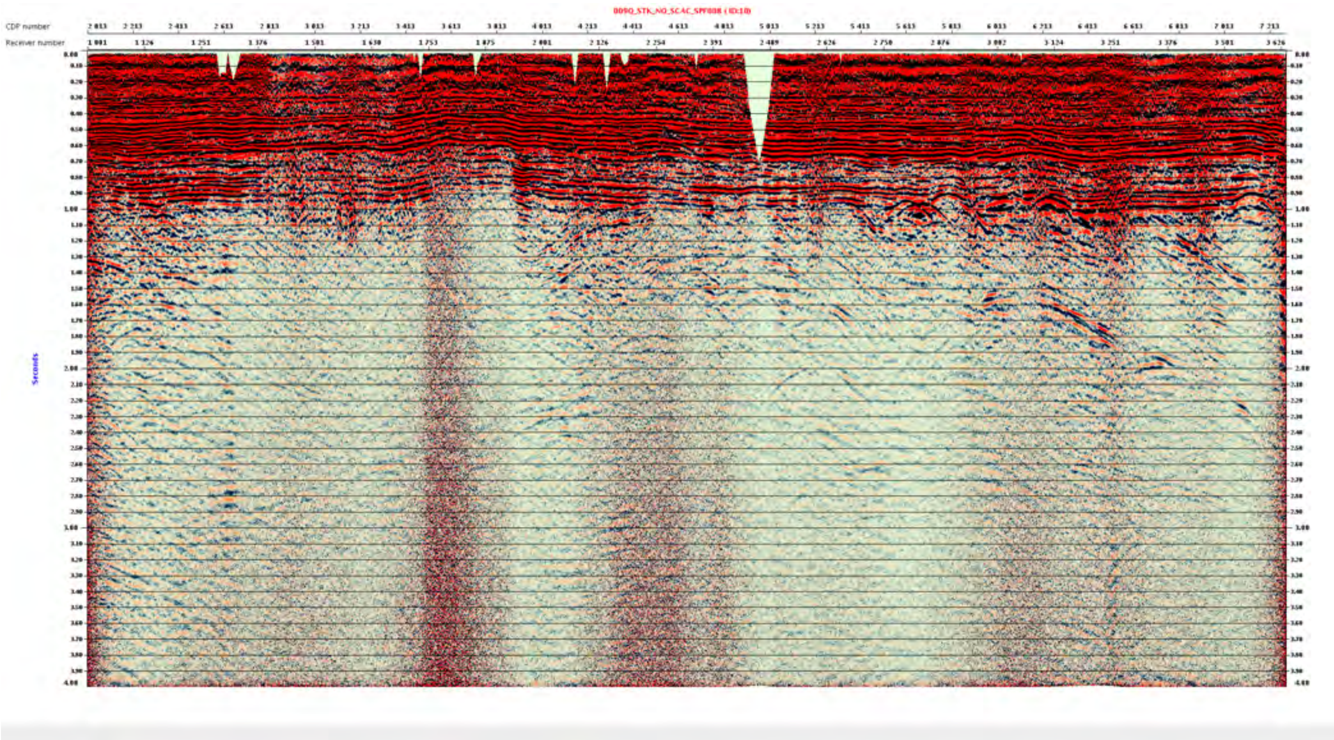

Fig 8.12.09 SPO12-008 stack before 1st pass surface consistent amplitude correction

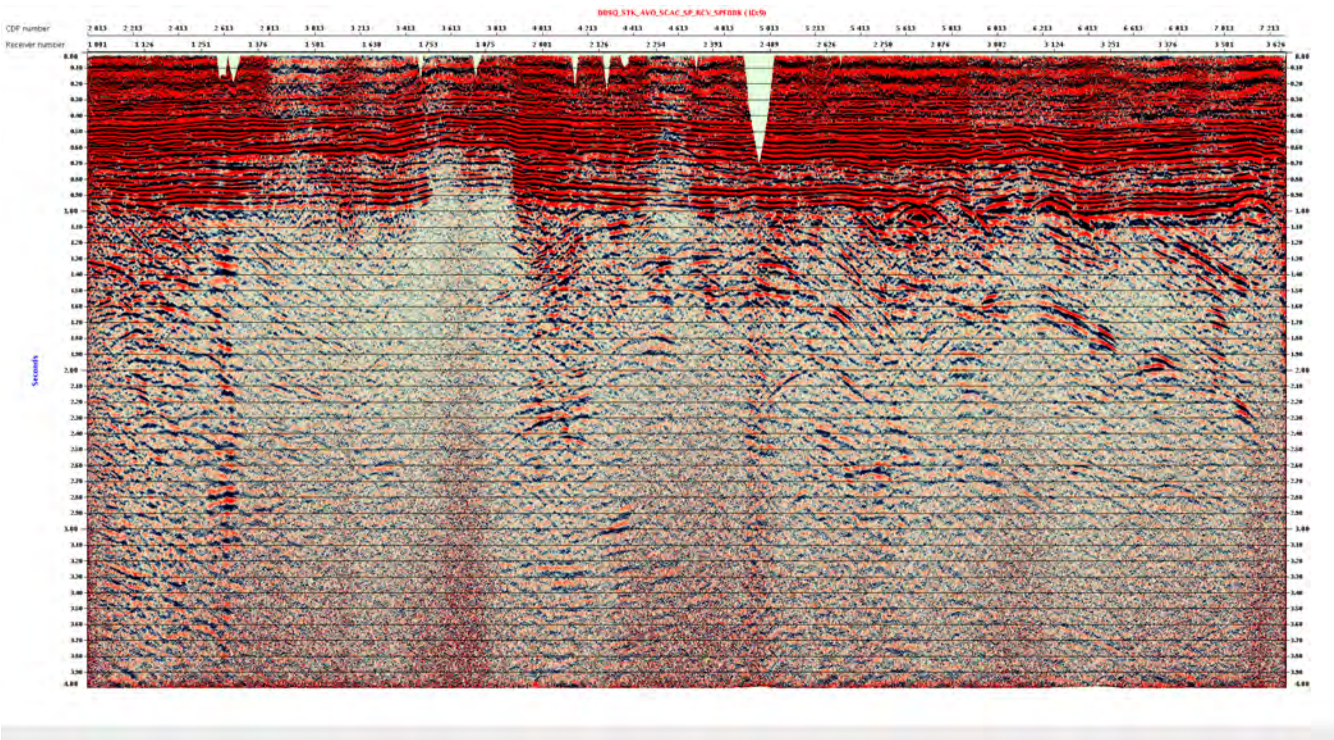

Fig 8.12.10 SPO12-008 stack after 1st pass surface consistent amplitude correction

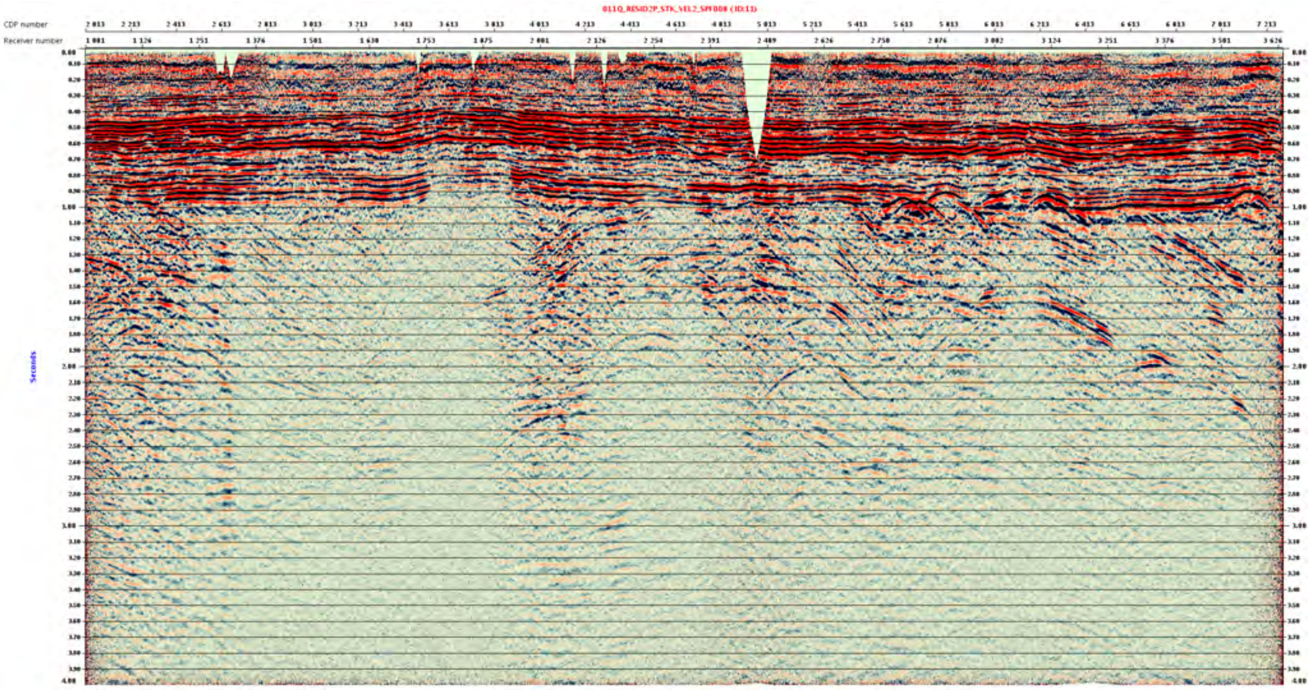

Fig 8.12.11 SPO12-008 stack after 2nd pass of residual statics (pre-stack AGC applied)

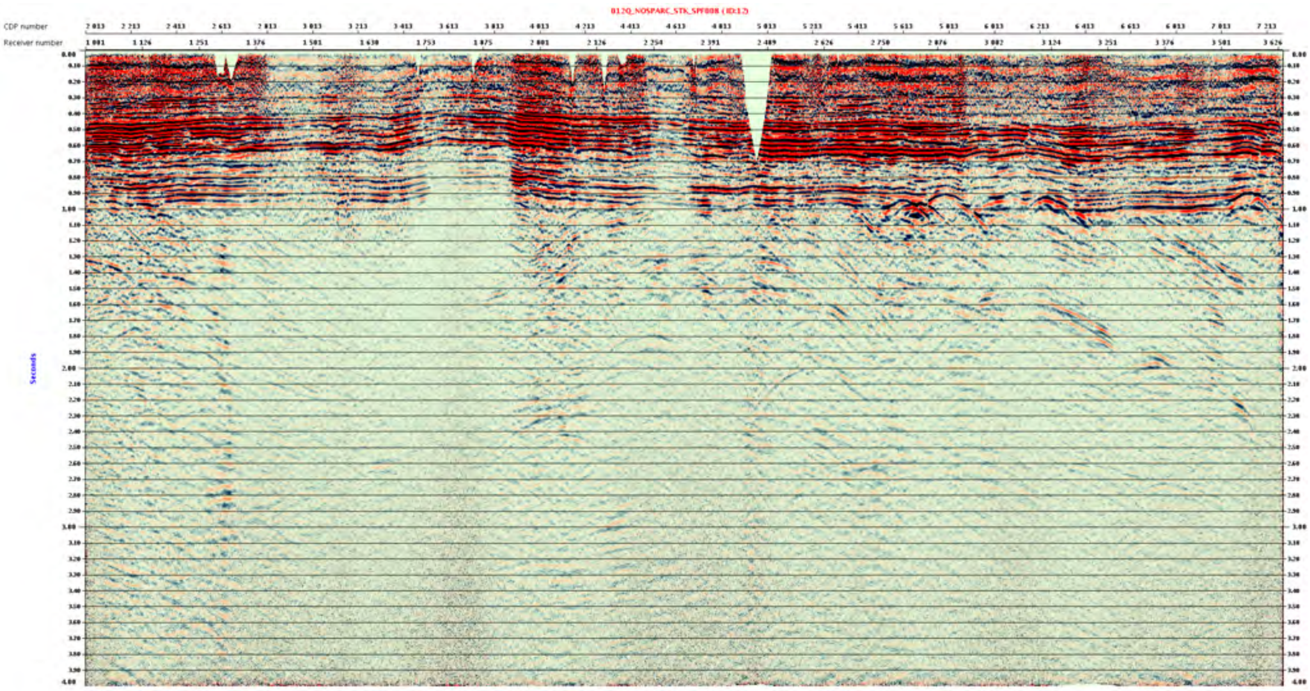

Fig 8.12.12 SPO12-008 stack before CDP-Offset domain denoise

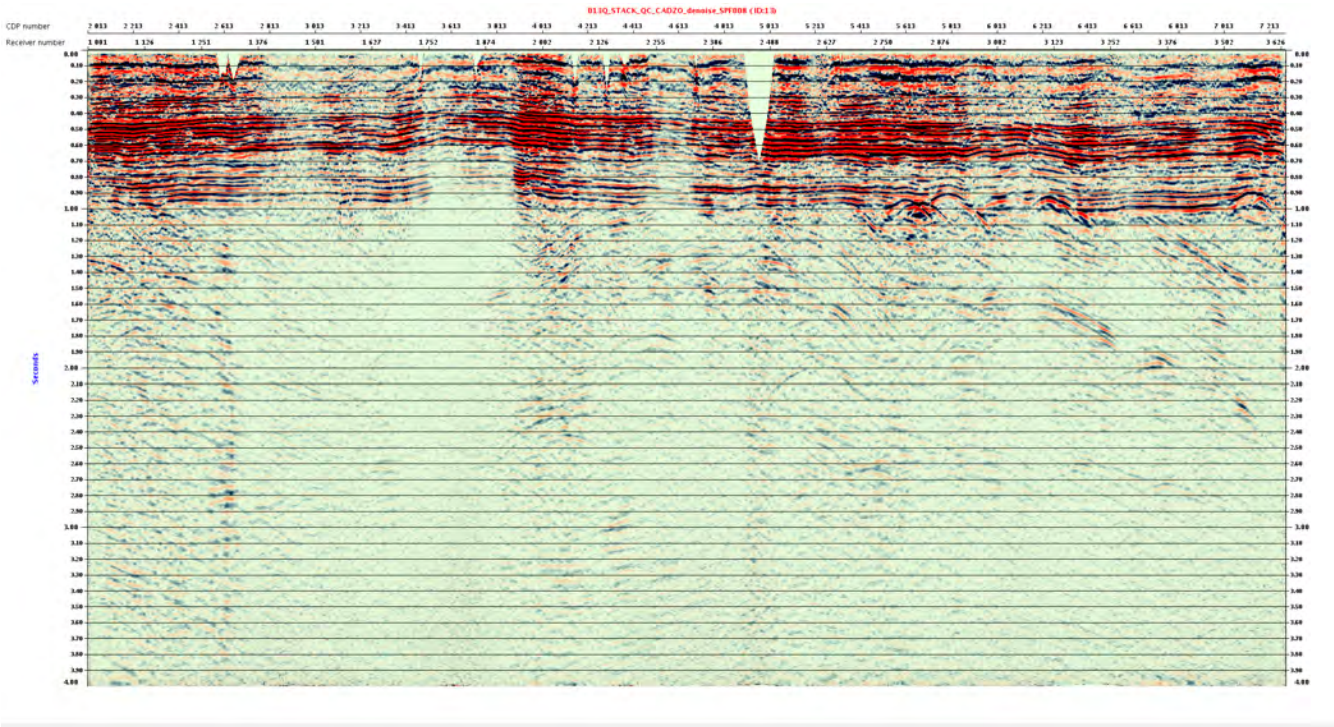

Fig 8.12.13 SPO12-008 stack after CDP-Offset domain denoise

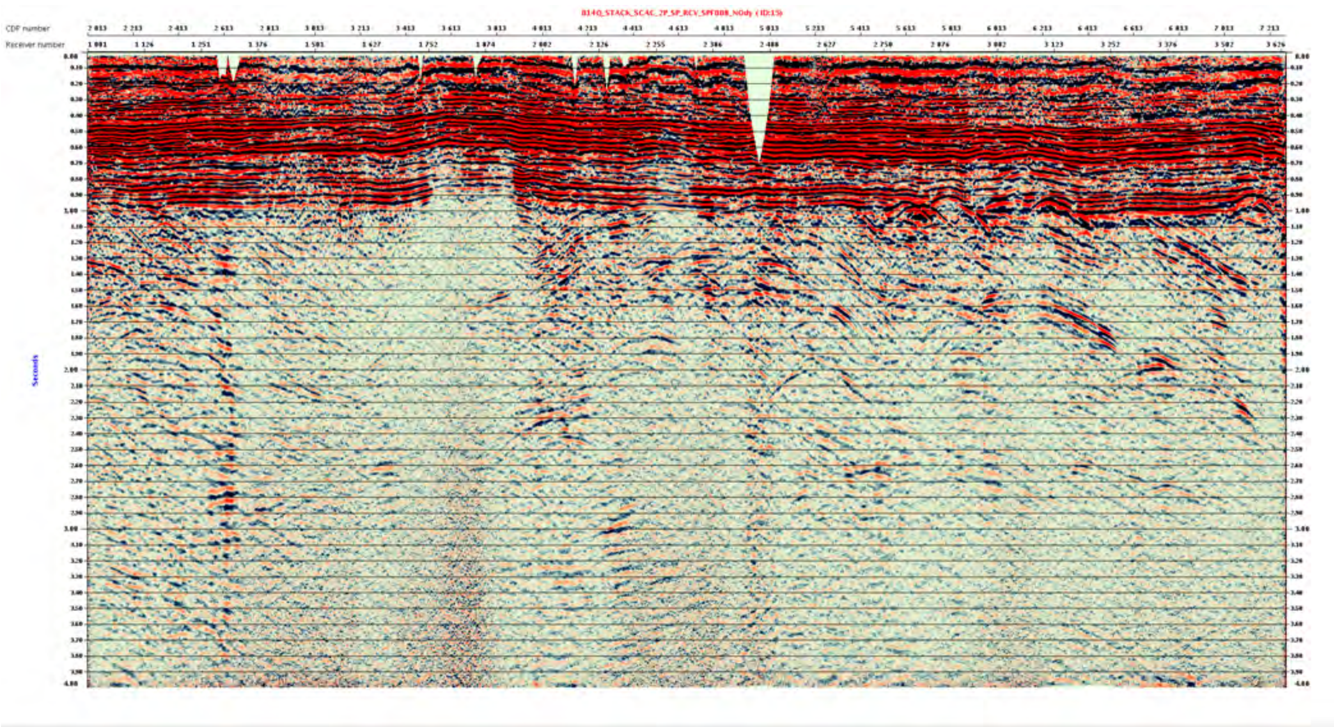

Fig 8.12.14 SPO12-008 stack after 2nd pass of surface consistent amplitude correction

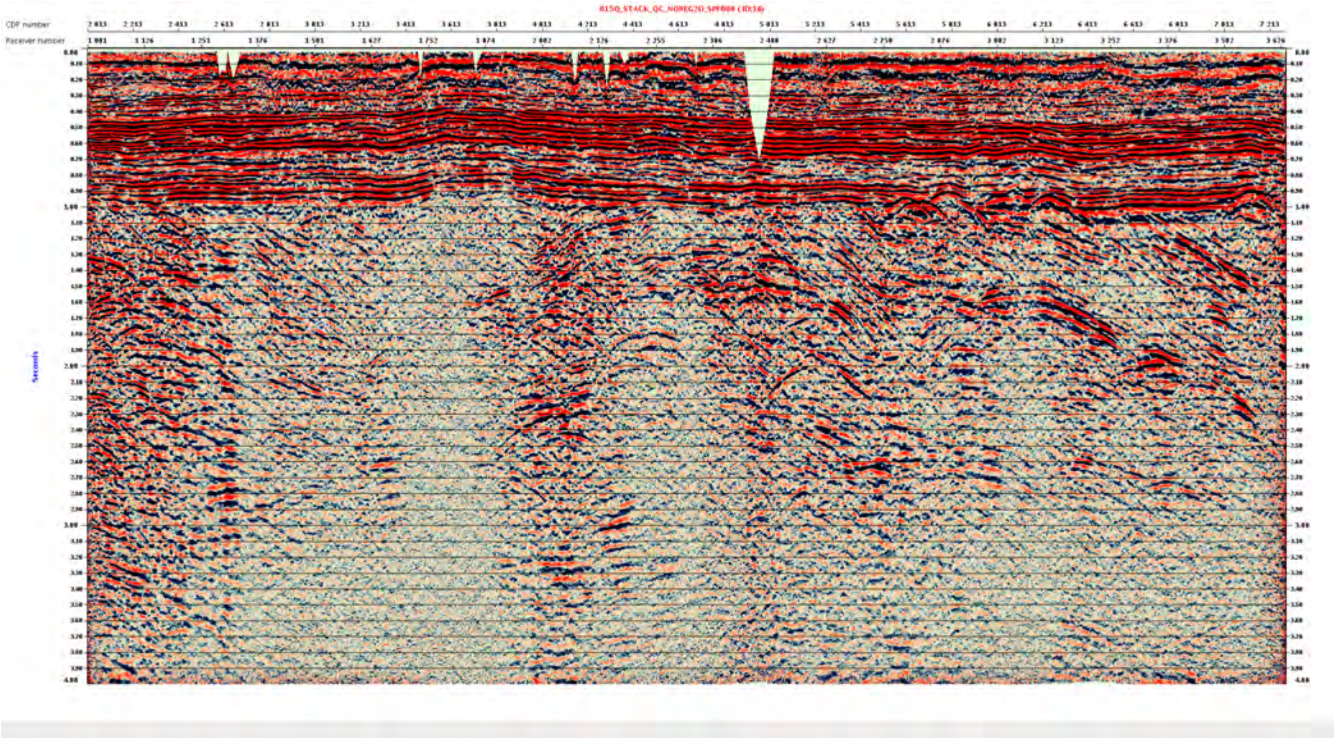

Fig 8.12.15 SPO12-008 stack after 2D Regularization

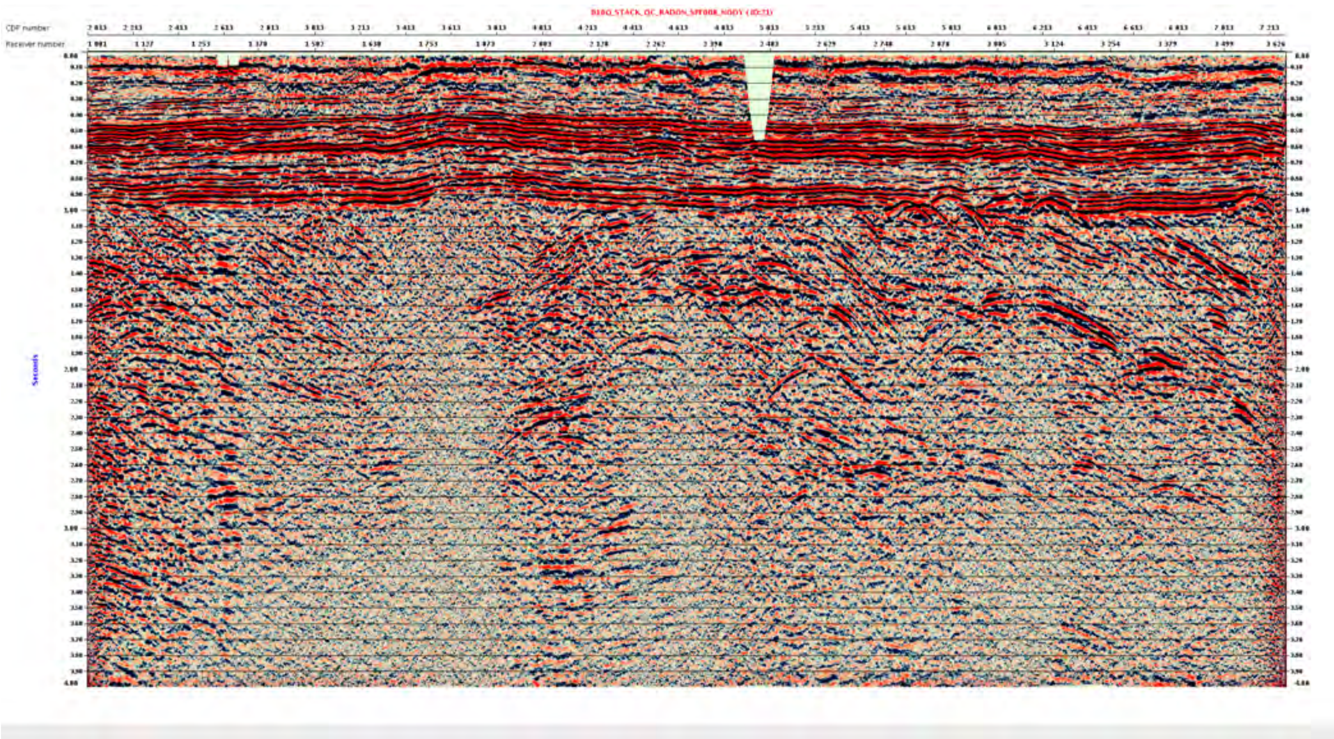

Fig 8.12.16 SPO12-008 stack after Radon demultiple

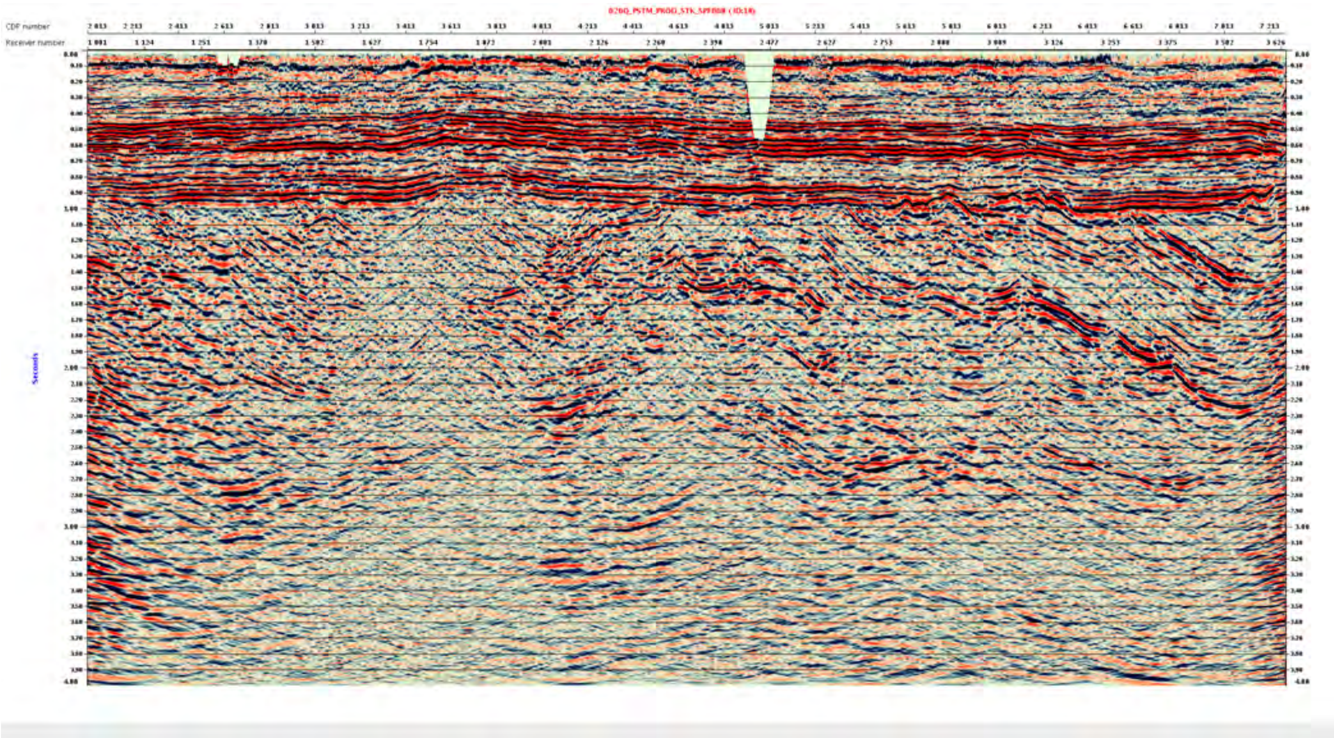

Fig 8.12.17 SPO12-008 PSTM after pre stack migration

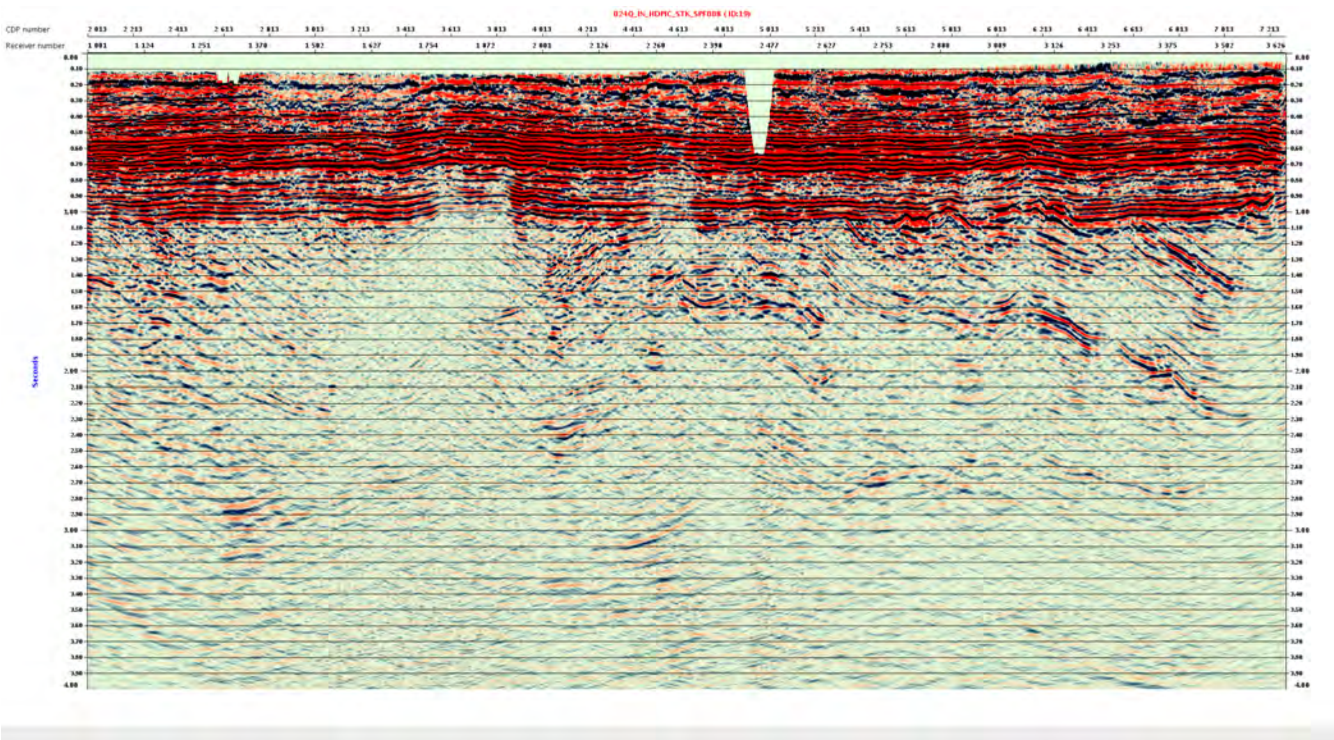

Fig 8.12.18 SPO12-008 PSTM stack before RMO velocity analysis(pre-stack AGC applied)

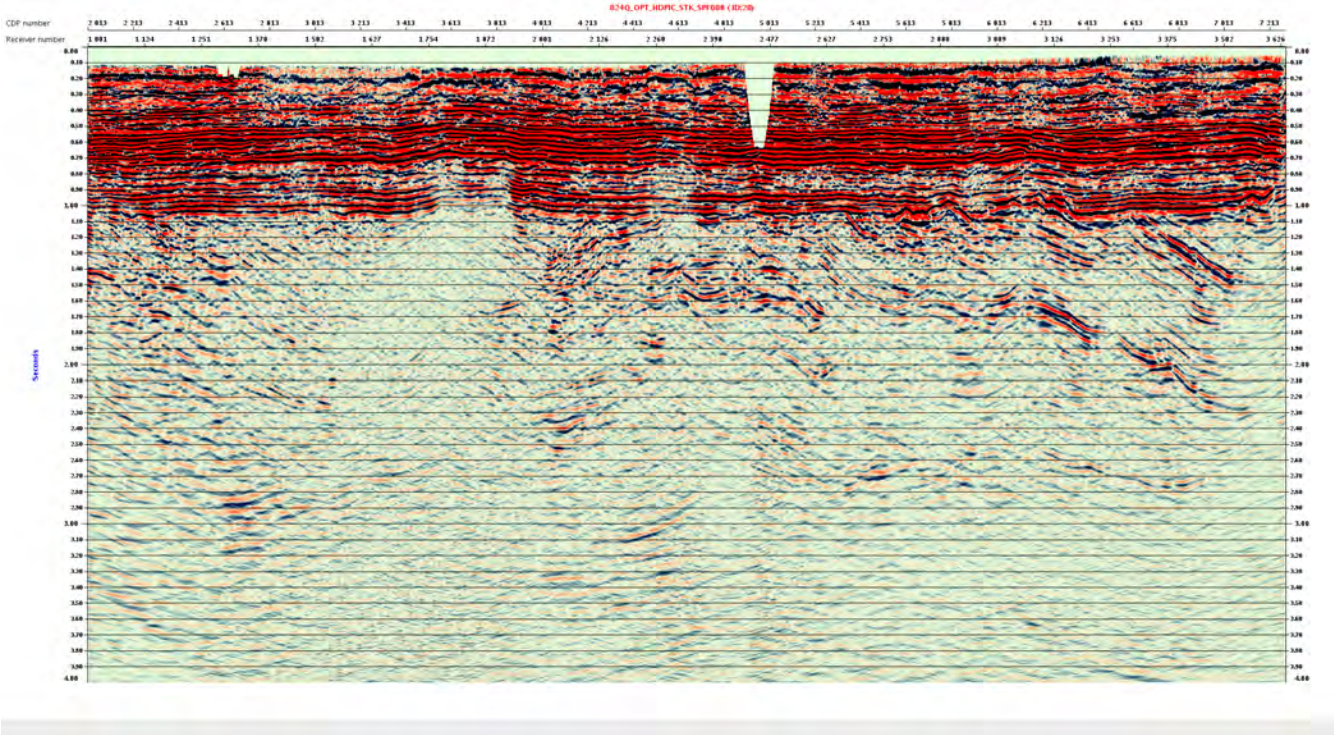

Fig 8.12.19 SPO12-008 PSTM stack after RMO velocity analysis(pre-stack AGC applied)

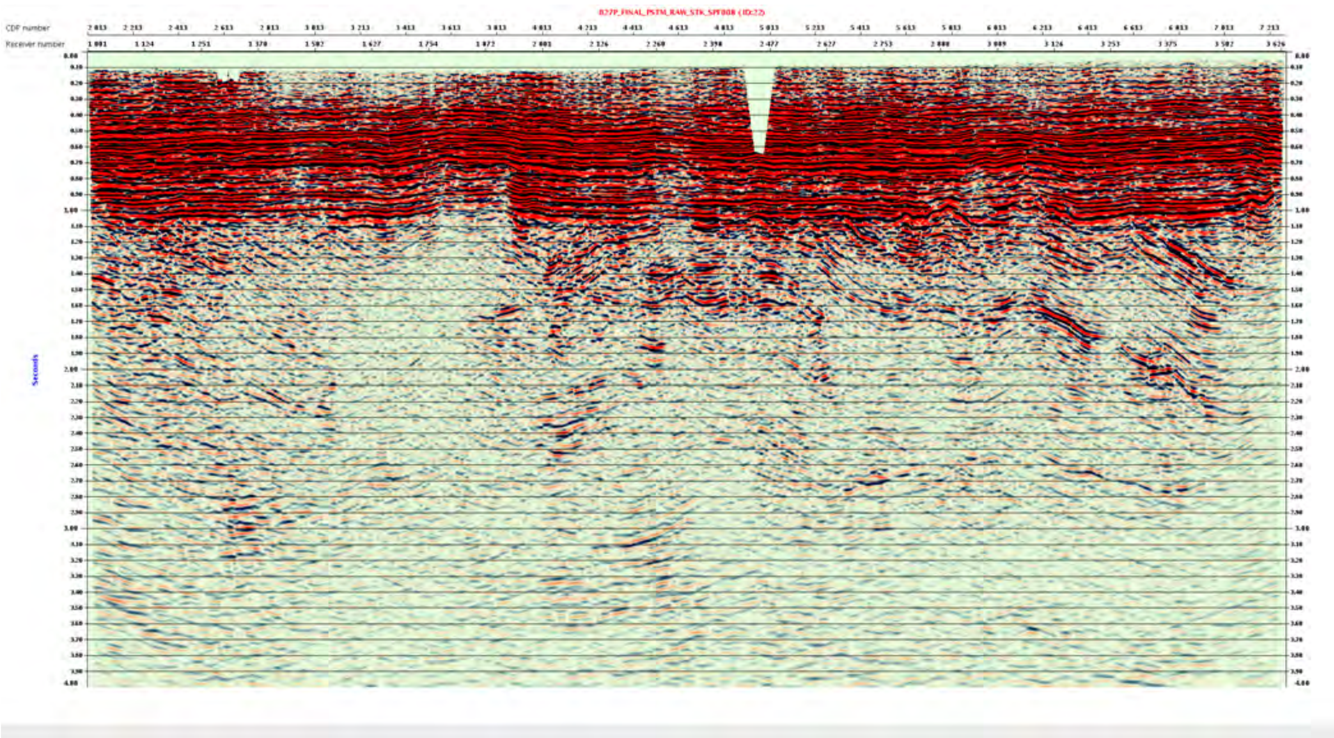

Fig 8.12.20 SPO12-008 Final PSTM stack

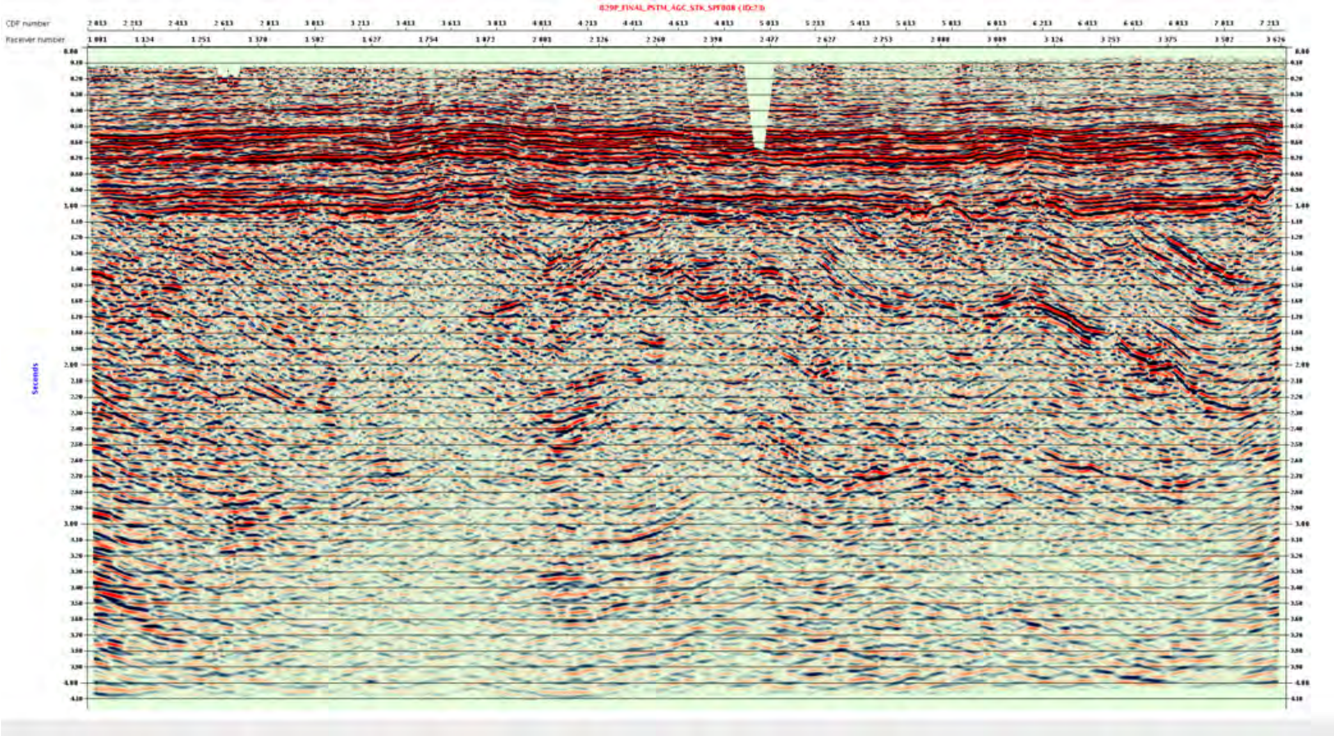

Fig 8.12.21 SPO12-008 Final PSTM stack with pre-stack AGC